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Report No. 15A

Determinants of Fertility in Developing Countries:

A Summary of Knowledge
Part A

Edited by
Rodolfo A. Bulatao and Ronald D. Lee
with Paula E. Hollerbach and John Bongaarts

Panel on Fertility Determinants
Committee on Population and Demography
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PREFACE

This is the first of two reports that review the research evidence about determinants of fertility differentials and fertility change in the developing countries. Following a scheme set out in the introductory chapter, this report (which is in two parts) discusses supply and demand for children, fertility regulation and its costs, fertility decisions, nuptiality, and the effects of social institutions. The second report (Committee on Population and Demography Report No. 16) provides a brief overview of the findings and an agenda for further research.

Fertility and its determinants have been urgent topics for research in recent decades with the rapid expansion in world population. Attempts to control population growth have focused on reducing fertility, with some apparent effect. The peak rate of growth in the world's population has now been passed, but growth is still at a high level in almost all the developing countries. In absolute numbers, the increase in the world's population continues to rise; according to United Nations medium projections, more people will be added each year for the next 50 years than were added in 1980. Long-term trends in population therefore still pose considerable problems.

These volumes are an attempt to summarize and integrate scientific knowledge about the determinants of the fertility levels that contribute to continued population growth. It was prepared by the Panel on Fertility Determinants of the Committee on Population and Demography. This panel was created by the Commission on Behavioral and Social Sciences and Education of the National Research Council in response to a request from the Agency for International Development to assess research in this area and make recommendations for further work. In addition to this report, the panel has prepared studies of several developing countries and a few illustrative cross-national analyses.

Part of the background for the panel reports was provided by previous work of the Committee on Population and Demography and its other panels to pin down actual fertility levels and trends in selected developing countries; this work, also supported by the Agency for International Development, is detailed in a series of country reports from the National Academy Press, and the demographic methodology developed for this purpose is laid out in a volume issued

by the United Nations.

The causes of fertility reductions in some developing nations, as well as the causes of continued high fertility in others, are strongly debated. What contribution is made to lower fertility by such factors as lower infant mortality levels, improvements in the status of women, and spreading knowledge of and access to efficient methods of contraception and abortion, and what contribution is made to higher fertility by such factors as cultural and religious norms, the economic benefits children provide, and traditional reluctance to interfere with reproduction--all these matters continue to be investigated by researchers in several fields. To encompass such research, the panel was of necessity a heterogeneous group, including scholars from several disciplines: anthropology, demography, economics, epidemiology, psychology, sociology, and statistics. This report contains many perspectives, generally congenial but occasionally contrasting, held together, one would like to say, by a carefully crafted framework, though an act of will may be at least part of the truth.

To design and prepare the report, the panel formed a working group composed of Ronald D. Lee (Chair), Paula E. Hollerbach, John Bongaarts, and Rodolfo A. Bulatao. This group drew upon the analytical framework prepared by a separate working group (chaired by Ronald Freedman), devised the scheme for the volumes, and, with much advice and suggestions from the panel, solicited the help of 42 authors to prepare the individual papers of the report.

Each author received an early version of the analytical framework and a description of that part of it he or she was expected to develop. It is an indication of the good sense of this group that, working within this imposed structure, they were able to focus on substantive problems and summarize important areas of research.

The papers were reviewed, often unmercifully, at several levels. The working group reviewed all the papers and panel members reviewed papers in their areas, in many cases suggesting extensive improvements that authors took with surprisingly good grace. At the working group's request, additional reviews were carried out by other researchers, including Bryan Boulier, Mead Cain, Ruth Dixon, Peter Lindert, Geoffrey McNicoll, Eva Mueller, Dorothy Nortman, Toni Richards, Michele G. Shedlin, Christopher Tietze, and Hania Zlotnik. For the panel's parent Committee on Population and Demography, Conrad Taeuber and Samuel Preston undertook the daunting task of reviewing the entire collection. The second volume was also reviewed by the Commission on Behavioral and Social Sciences and Education. The sum of these reviews was a considerable improvement, for many of the papers, in concept and precision.

Ensuring that the mountain of often dense scientific prose in fact contained readable English sentences was mainly the responsibility of Rona Briere, who performed this task with vigor and understanding. Carol Bradford Ward assisted in keeping all the pieces of the work together and moving on track. Elaine McGarraugh handled production editing details. Among several who worked at the alternately intriguing and boring task of typing and correcting drafts, Carole

Turley and Solveig Padilla deserve special acknowledgment.

Finally, although the views expressed in the papers are those of the authors rather than of the organizations with which they are affiliated, those organizations nevertheless contributed considerably by making time and resources available. Their incalculable contribution is hereby acknowledged.

W. PARKER MAULDIN, Chair
Panel on Fertility Determinants

Chapter 1

A FRAMEWORK FOR THE STUDY OF FERTILITY DETERMINANTS*

Fertility in the developing countries is a complex phenomenon, affected by cultural preferences of diverse roots and strengths, family structures that distribute power over fertility decisions in different ways, customs and taboos relating to sexual behavior, childbirth, and childrearing, varying and rapidly changing economic conditions, and, in many countries, an increasing amount of government concern and activism. In this chapter this complexity is reduced to a very simple framework for the analysis of fertility determinants. Succeeding chapters address particular elements of this framework, detailing the research evidence and gradually restoring layers of complexity to the analysis.

NATURE OF THE FRAMEWORK

A framework for the analysis of fertility determinants ideally provides a comprehensive and coherent list of the components that affect human fertility and specifies their interrelationships. Although the present framework aspires to be comprehensive, it may appear more eclectic than coherent because it incorporates concepts and insights from different disciplines. Since fertility research has come to involve a wide circle of social and biological scientists, the present approach is based on work in economics and public health, in psychology and anthropology, in sociology and statistics. In none of these disciplines, however, are all the relationships among fertility components fully specified; this framework therefore provides only a

*This chapter is based on reports and deliberations of a working group of the Panel on Fertility Determinants: Ronald Freedman (Chair), Richard A. Easterlin, Jane Menken, Robert Willis, Robert J. Lapham, and Rodolfo A. Bulatao. After joining the Panel's staff, Bulatao was responsible for the revision and final formulation of the chapter under the general supervision of the working group. The group was charged with preparing an analytical framework for fertility determinants. It chose to begin with a framework suggested by Easterlin (1978), which was adapted to the present task, avoiding where possible the strong assumptions that framework makes.

general treatment of these relationships.

Thus this framework is a propaedeutic to theory rather than a theory in itself. A complete theory of fertility is beyond the scope of this paper, and probably beyond the current capacities of the field. The framework is meant to organize thinking about fertility, allowing systematic interpretation of fertility situations where the data are available; it is not meant to provide specific predictions of fertility responses to changes in determinants. It can accomodate findings and concepts from different disciplines, but does not translate them into a mathematical model. As the succeeding chapters demonstrate, however, the framework does suggest and can incorporate various hypotheses, some more precise than others, about particular determinants.

The framework is developed at the level of the couple or household since it is assumed that they are the ultimate decision makers about fertility. If the community or society desires higher or lower fertility, they must somehow influence couples or households. Although the framework is meant to apply to both developing and developed countries, its emphasis is on former.

BASIC COMPONENTS

Fertility involves both biology and individual choice, the former modified by cultural patterns and the latter strongly influenced by economic and social conditions. The biology, as well as the cultural patterns shaping it, is represented under the rubric of the "supply of children." Individual choices about family size, along with the conditions influencing them, are covered under the rubric of the "demand for children."[1] Choices are made effective through fertility regulation, which constitutes the third basic component of the framework.

This distinction among components follows Easterlin (1975, 1978), though some differences between his treatment and the present framework should become evident later. The terms supply and demand are derived from economic theory, but do not correspond strictly to the economic concepts: the supply of children does not change in response to demand, since responsiveness is captured in the third component, fertility regulation.

In this framework, supply and demand both refer to surviving children rather than to births; these will differ because of infant and child mortality. It is assumed that, on the demand side, parents make choices mainly among alternative family sizes rather than among alternative numbers of births. Consequently, mortality is also considered on the supply side. The question of the age at which children can be counted as survivors is not addressed; different ages may be specified for different purposes (see Bongaarts and Menken, in these volumes).

The Supply of Children

The supply of children is the number of surviving children a couple would have if they made no deliberate attempt at limitation; an alternate term for supply might be the "biocultural potential for surviving children." Supply depends on number of births and chances of survival. Number of livebirths in the absence of limitation is referred to in demography as "natural fertility," defined by Henry (1953) as the "fertility of a human population that makes no deliberate effort to limit births."[2]

Theoretically, the absence of an intention to limit births is critical in defining natural fertility. In practice, however, intention may be difficult to determine, and one may usefully define natural fertility instead by the absence of parity-dependent fertility behavior, although this approximation does involve some ambiguities (Knodel, in these volumes). Following this definition, natural fertility is typically represented by a family of age schedules of fertility that show very gradual decline with age.[3] As a further simplification, the qualification is sometimes added that contraception and induced abortion, because they generally imply some intention to limit births, must be absent (Bongaarts and Menken, in these volumes); instances where these practices are used solely to affect the timing of births, though they may be rare, create problems for this approach, however.

Because natural fertility depends partly on cultural practices relating to such behaviors as intercourse, abstinence, and breastfeeding, it is not purely biological and indeed varies widely among populations. In general, it is determined by the average interval between births and the length of the reproductive span. Five major influences on natural fertility can be identified (Bongaarts and Menken, in these volumes):

1. Postpartum infecundability. Conception and birth interrupt a woman's normal pattern of ovulation and menstruation. How long after a birth the interruption lasts depends to a great extent on breastfeeding practices. Taboos against intercourse after birth or during lactation overlap in their effect with the contraceptive effect of breastfeeding, but could have an added effect.

2. The waiting time to conception. This is the period from the first postpartum ovulation (or from the end of postpartum abstinence, if it comes later) to the next conception. Its duration depends largely on frequency of intercourse; however, it is also affected by fecundity factors (such as the frequency of ovulation, the duration of the period within which the ovum is fertile, and the duration of viability of sperm). The determinants of frequency of intercourse are not well understood, but include at least ceremonial and religious practices that lead to temporary abstinence (other than postpartum abstinence), migration, which sometimes separates spouses, impotence, illness, stress, or individual proclivities.

3. Intrauterine mortality. A substantial number of pregnancies end prematurely, either through spontaneous abortion or as stillbirths, effectively lengthening the interval between births.

Intrauterine mortality shows a decided upward trend with age, and may also be affected by specific diseases (Gray, in these volumes).

4. Permanent sterility. Both spouses must be fecund or nonsterile for the couple to reproduce. The proportion of couples with at least one spouse sterile rises with age, eventually including all couples. Terminal abstinence may precede the onset of permanent sterility, though typically it has at most a minor effect (Knodel, in these volumes). The reproductive span may also be terminated by the dissolution of a sexual union, whether by divorce, separation, or the death of either member.

5. Entry into the reproductive span. The age at menarche, for females, and the age at puberty, for males, define the start of the reproductive span. The precise ages are usually considered of only minor significance for fertility because age at marriage (which is discussed below) is typically older than these; however, menarche may affect age at marriage.

These factors (together with contraception and induced abortion, which belong under fertility regulation) are sometimes referred to as intermediate variables (Davis and Blake, 1956) or proximate determinants of fertility (Bongaarts, 1978). The effects of these factors on fertility can be estimated (Bongaarts and Menken, in these volumes); on the other hand, their determinants, whether health- and nutrition-related, sociocultural, or economic, are less well known (Gray, in these volumes; Nag, in these volumes). The first three of these factors determine the interval between births; the last two define the length of the reproductive span. Combined with survival chances (see Chen, in these volumes), these five factors determine the potential number of children a couple could have.

The Demand for Children

In contrast to the potential number, a couple may have some idea of the number of children they desire. The demand for children refers to this number. By definition, these desires that make up demand do not take into account either supply[4] or the possibilities for or costs of family limitation. Besides ultimate family size, couples may have preferences about the sex of children, the spacing between them, the education they should receive, and similar matters. Such preferences are also of concern because they affect number preferences in various complicated ways. Whether most couples in developing countries actually formulate desires about family size is a question to be discussed later (see McClelland, in these volumes; Lee and Bulatao, in these volumes). For purposes of developing this framework, it is assumed that they do.

Demand can be seen as determined by the interplay between tastes for children and constraints on the couple, apart from the constraints of supply and fertility regulation costs (Becker, 1960; Mincer, 1963; Willis, 1973). A couple is assumed to have some preferences between children and other goods, including such things as consumer goods and leisure activities (that is, there is some number of children the

couple would "trade" for some quantity of the competing goods). These preferences are what we refer to as tastes. They are constrained by the resources available to the couple (where resources refer principally to income and time), combined with the relative prices and time-intensities of children and other goods. Evaluating these constraints requires attention to the direct economic benefits and costs of children (Caldwell, in these volumes); to the desired "quality" of children and the consequent time and goods inputs they require; to the time costs and other opportunity costs the couple may bear (Standing, in these volumes; Oppong, in these volumes); to the relative costs of competing goods (Lindert, in these volumes); and to the couple's sources of income and wealth (Mueller and Short, in these volumes). Should children constitute a net gain rather than a net loss to the couple, however, these constraints may not be effective.

Although resource constraints are objective limitations on what a couple can acquire, like tastes they are weighed subjectively, and may be perceived accurately or not. This subjective weighing is partly captured in the couple's perceptions of the values and disvalues attached to children (Fawcett, in these volumes). Such perceptions, though more difficult to measure than objective indices, should be more immediately relevant to demand. Family-size desires, which can be taken provisionally to represent demand, may be seen as resulting from the interplay between tastes and constraints, as perceived by the couple (McClelland, in these volumes; Pullum, in these volumes).

Fertility Regulation and Its Costs

For demand to have some effect on fertility, couples must have some means for making their choices effective; fertility regulation covers the means they use. However, fertility regulation also involves costs the couple must consider in weighing their choices. Thus regulation enters the framework in two ways: as the means for effecting choices and as a factor in choice (Hermalin, in these volumes).

Fertility regulation includes both contraception and induced abortion (David, in these volumes). Infanticide, whether overt or through neglect (Scrimshaw, in these volumes), might also be added: in a strict sense, it affects not fertility but mortality; however, it does affect the number of survivors. Regulation less often involves abstinence or prolonged breastfeeding. Regulation is considered here only as used to limit family size; regulation used for other purposes, such as postponing or spacing births, with no intention to limit their number, properly belongs in the framework as a factor affecting the supply of children (Easterlin, 1978:74-75).[5] This distinction is important to make conceptually, though difficult to make empirically.

Fertility regulation involves some effort, occasionally some inconvenience, embarrassment, or guilt, often some monetary cost; the generic term cost is used to cover all of these (Schearer, in these volumes; Bogue, in these volumes). Many costs vary by contraceptive method; moreover, they may be greater for more effective contraception, which requires better information and more careful

use. Costs also generally differ between contraception and abortion.

Costs are attached to both obtaining and using contraception or abortion. Costs of access include the monetary cost of supplies and services, as well as the time needed to obtain them or information about them. There may also be psychic and social costs of access, such as fear of being observed going to a family planning clinic. Access to contraceptives and abortion can be improved by family planning programs, contraceptive distribution schemes, outreach projects to provide supplies in remote rural areas, and similar programs, both public and private. Besides reducing the monetary and time costs of fertility regulation, such programs may legitimate regulation and therefore also reduce its psychic and social costs (Mauldin, in these volumes). Costs of use or potential use include health risks, both real and imagined; they also include social costs, such as the fear of violating social norms, and psychic costs, such as those related to engaging in behavior that is unfamiliar, unpleasant, or considered morally questionable. There is some overlap between these psychic and social costs and those connected with access.

Fertility regulation may also have some benefits apart from that of avoiding a birth or achieving a smaller family. These might include protection from maternal mortality risks, favorable side effects of contraception, or, in some groups, conformity with social norms. However, these are typically of lesser consequence.

The Fertility Outcome

The relative levels of supply, demand, and regulation costs determine whether a couple will control their fertility. There are several alternative ways to express the fertility outcomes of the interplay among these components. For purposes of the present discussion, it is convenient to imagine that a couple first compares supply and demand, and then considers the costs of regulation.[6]

The more a couple's potential supply of children exceeds their demand, the more motivated they should be to control fertility. If their demand equals or exceeds their supply, on the other hand, they should have no motivation to control. (If demand exceeds supply, they should in fact be motivated to raise their fertility; however, this framework ignores behavior that promotes conception, because of its minimal demographic significance.) Whether motivation to control is translated into actual control should depend not only on the strength of the motivation but also on fertility regulation costs. Higher regulation costs should make actual control less likely, though high costs could conceivably be overcome if motivation were very strong; low costs, however, will not lead to regulation if the motivation to control is absent.

The regulation behavior resulting from the combination of sufficient motivation to control and reasonable regulation costs should be intended to limit family size. Regulation for other purposes may or may not be common, but is not predicted from this combination of factors. Although most studies do not distinguish

types of regulation by their intent (Ross, in these volumes), the distinction is critical for the present framework.

It should be noted that the framework does not directly address a number of other questions about the use of regulation that have some importance. These include the choice between contraception and abortion, as well as among contraceptive methods; the importance of different costs in choice of methods; the relative importance of fixed costs and those that vary with number of births averted; the relationship between method efficacy and method choice; the effects of changing demand and supply on method choice; the timing of use of different methods; changes in the determinants of use and method choice over the life cycle; the impact of access to and use of contraception on the availability of and attitudes toward abortion; and the relationship between regulation for spacing purposes and regulation for termination of childbearing (see Hermalin, in these volumes, for some discussion).

In the absence of regulation, completed family size (i.e., the number of surviving children a couple ends up having) is determined directly by supply factors; demand and regulation costs are irrelevant. Regulation should reduce completed family size somewhat, though not necessarily to the level of demand, since regulation costs may make this less than optimal. Completed family size, which is used as the major dependent variable in this framework, does not correspond to any particular demographic measure of fertility, since it incorporates information about infant and child mortality. Given appropriate mortality data, it is of course straightforward to compute completed family size from some corresponding fertility measure like the total fertility rate.

This discussion of the basic components of the framework can be summarized with a schematic diagram (Figure 1). This figure shows the relationships that have been discussed, as well as determinants of the basic components, to be discussed below. It bears repeating that the relationships shown in Figure 1 represent only one way supply, demand, and regulation costs may be seen as combining to affect fertility. The figure assumes that a couple can work out separately what their supply, their demand, and their regulation costs are, and then compare these to arrive at a regulation decision. Avoiding this assumption would require alternate algorithms for segmenting fertility decisions or combining their elements, and these are not available so far.

DETERMINANTS OF SUPPLY, DEMAND, AND REGULATION

The determinants of the basic components include all the variables commonly used in empirical analyses of fertility, such as education, female employment, urban residence, and income. In this framework, these and all other variables are viewed as affecting fertility by modifying the supply of children, the demand for children, or fertility regulation costs. The determinants represented in Figure 1 are in highly abbreviated form; they are grouped into three main blocks: the reproductive history of the couple; their other

socioeconomic, demographic, and biological characteristics; and aspects of their social group, society, and culture.

Reproductive History

Reproductive history covers both nuptiality and childbearing experience. The former includes the formation and dissolution of marriages and other sexual unions and the types of these unions. Such variables as age of entry into a sexual union, dissolution of a sexual union by separation, divorce, or death, and reentry into a sexual union affect exposure to intercourse and therefore natural fertility. Nuptiality patterns may also affect demand: being in one type of sexual union may discourage childbearing; being in another may encourage it. Fertility regulation costs may also be affected if, for instance, being married makes contraception more legitimate and convenient. Distinctions among consensual, visiting, and legal unions, monogamy and polygamy, nuclear and extended households, and so on, could therefore be relevant to fertility in several ways (Burch, in these volumes).

Couples seldom enter into sexual unions primarily in order to have children. Therefore, understanding such unions requires investigating various other determinants of whether, when, and whom to marry, including the cost of setting up a new household, the desire for higher education (which may be curtailed by marriage), the age structure and marriage market possibilities for individuals, obligations to parents and siblings that may impede marriage, the inheritance structure, and so on (Smith, in these volumes). Similarly, there are various determinants of divorce, remarriage, and type of sexual union.

The second aspect of reproductive history, childbearing experience, may have a variety of effects. On the supply side, having had children may change a couple's perceptions of potential fertility and improve their capacity to care for children and ensure their survival. On the demand side, it may affect tastes for children and change perceptions of children's values and disvalues. Further, it may lead to more efficient and therefore less costly fertility regulation.

Socioeconomic, Demographic, and Biological Characteristics

A variety of socioeconomic, demographic, and biological characteristics of the individual or couple also affect the basic components. These include, at minimum, the education of each spouse, their income and wealth, urban versus rural residence, the wife's employment status, their ages and the differences between their ages, their health and nutritional status, their religion, their ethnicity, and their degree of exposure to the mass media (Cochrane, in these volumes, discusses two of these factors). Some of these characteristics affect supply, others affect demand, still others

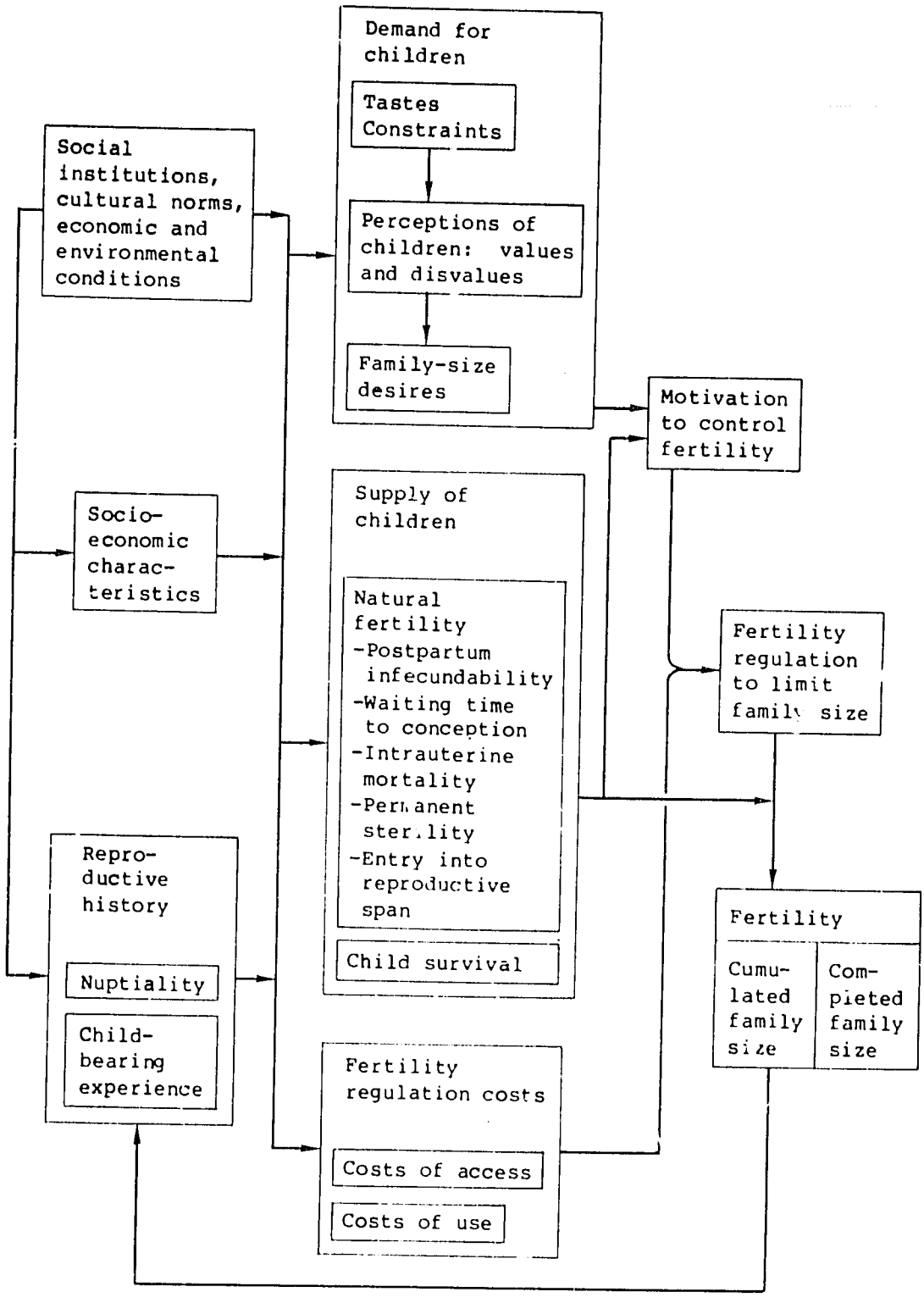

FIGURE 1 One Possible Representation of the Interrelationships Among the Basic Components of the Framework

affect regulation costs, and some, like education, affect all three components; several also affect nuptiality. These individual and couple characteristics also have fairly complex interrelationships that are not addressed in the present discussion.

Society and Culture

The third block of determinants covers features of the social group, society, and culture that affect the basic components. Some of these factors may have direct impact; for example, sanitary conditions may affect survival chances, the price structure may affect demand for children, and government policies may reduce regulation costs. Other factors may affect supply, demand, or regulation costs through their effect on couple characteristics or on the couple's reproductive history: the level of societal development, for instance, should affect the couple's income, their level of education, and other characteristics.

In Figure 1, this block is eclectically labelled "Social institutions, cultural norms, economic and environmental conditions." Precisely specifying the variables in this block is difficult, since there are many alternate ways of classifying social and cultural phenomena, none of which is widely accepted (Potter, in these volumes; LeVine and Scrimshaw, in these volumes). Nevertheless, it is possible to distinguish two components that deserve special mention.

Of particular significance for fertility is the demographic structure of a society. At a basic level, this structure defines the proportion of childbearers, female and male, in the society; in its spatial aspect, it also helps define the availability of mates in each particular community. The demographic structure also has more complex effects: it sets various problems for a society (the need to provide more schools if the number of school-age children is growing, for instance, or the need to provide more facilities for the aged if their numbers are increasing; it also partly defines the human capital available to deal with these problems. In this manner, it sets the conditions under which couples evaluate their demand. Finally, there is a feedback loop (not represented in Figure 1) from fertility to demographic structure; one notable result is that the median age in a population drops as fertility rises.

A second component of this block of variables is social norms. Norms are understood as shared expectations about how those in particular statuses should behave, usually reinforced by sanctions imposed for deviations. Societies usually have norms relating to most elements of the framework: norms specify appropriate family sizes, indicate the desirable period for postpartum abstinence, suggest the standard of living one should preserve in preference to having more children, prescribe or proscribe the use of regulation methods, and so on. Their influence is therefore pervasive, though difficult to separate from other influences. Because norms are embedded in different social institutions and cultural patterns, a given effect might be alternatively labeled either normative or

institutional-cultural. Systematic discussion of the nature and formation of norms and their influence is scanty, and related empirical data are often suspect; therefore, aside from noting their importance, particularly in the area of demand (Mason, in these volumes), it is difficult to add further elaboration.

The other elements of this block of variables may be characterized in several ways. To give some idea of what might be included, Figure 2 lists major social institutions and briefly describes their potential effects on fertility (see also Freedman, 1975).

KEY QUESTIONS AND ASSUMPTIONS

Of the questions that might be raised about this framework, six seem to be of fundamental importance. First, to be useful, the framework must distinguish independent sets of fertility determinants; it must therefore be asked whether the basic components identified are in fact distinct and independent. Second, since utilization of the framework is impossible without measurement of its elements, it is important to ask how far the development of appropriate measures has progressed. Third is the question of whether the framework necessarily assumes that couples make decisions about their fertility, or whether it allows for the possibility that they do not. Fourth is the question of whether the framework always implies a single decision for each couple (on the assumption that decisions are made), or whether it allows for sequential decisions. Fifth, the applicability of the framework to both the married and unmarried must be considered. Finally, it may be asked how the framework applies to fertility levels in social groups or societies and how it handles fertility change. These questions are discussed in the subsections below.

Separability of the Basic Components

If the basic components of the framework are not entirely separable, it should still be possible to summarize research within the categories provided, though some overlap will occur. However, the algorithm provided in Figure 1 for combining the basic components may then be less applicable, since it implies separate decisions on supply, on demand, and on regulation costs and a second decision stage in which these components are combined. There is indeed some overlap among the basic components, and decisions in one area are not entirely separate from decisions in another; how serious the overlap is, however, is difficult to say at present.

One area of overlap concerns supply and regulation costs. The major influence of both mortality and age at marriage should be on supply, with mortality affecting child survival and age at marriage affecting exposure to intercourse. However, if some couples take less care of unwanted children, or deliberately delay marriage in order to have fewer children, these variables could fall under regulation costs.[7]

FIGURE 2 Illustrative Effects of Major Social Institutions on Fertility

Economy	The differentiation of economic institutions from the family and the extent to which impersonal markets exist (for goods and services, credit, insurance, etc.) are believed to be important in lowering the demand for children. Specific economic arrangements will alter the significance of reproductive patterns to the attainment of socially defined needs (for food, health care, shelter, education, employment, etc.) over the life cycle.
Polity	Legislation may attempt to regulate marriage and childbearing; its enforcement will depend on characteristics of the polity. A government-organized or -subsidized family-planning program may be particularly important. A polity that can make fundamental changes affecting the individual in such matters as the structure of the family, the status of women, and the benefits and costs of children may influence relevant parts of the framework at the micro level.
Family	The nature of the reproductive unit, the manner in which it is embedded in the extended family network, the nature and direction of obligation flows within the family, and other aspects of the family should affect the demand for children, fertility regulation costs, and the decision process. Also important is the status of women in the family.
Health Care	The health care system should affect fertility through its effects on mortality, morbidity, fecundity, and other supply factors, and through its delivery and legitimation of fertility control services.
Education	Educational institutions may affect fertility regulation costs by providing information about services; may provide contact with ideas and institutions transcending the local and the familial, thus changing tastes for children and reducing the force of profertility norms; may increase the costs and decrease the benefits of children during the instructional period; and may provide means for increasing the returns from children, though delaying their availability, and incentives for investing in higher-quality children.

FIGURE 2 (continued)

Religion	Religious institutions may attempt to enforce norms about desired family size and about reproductive behavior. Religious rituals may also provide particular roles for children to play, affecting demand.
Belief Systems	Integral to every institution and often linking several institutions, belief systems have important implications for reproduction. For example, Chinese beliefs about filiality linking the family to religious beliefs about the past and future are related to strong tastes for children, especially sons. Such belief systems may influence reproduction in ways not captured by formal structural categories. Such belief systems are what are often described residually as "cultural factors."
Stratification	The facilities and resources provided to each social class in the stratification system should affect their preferences for children, their experience of natural fertility, and their sensitivity to fertility regulation costs. The degree of inequality in the stratification system may also have an effect.
Ethnic Differentiation	Linguistic, regional, and nationality groups may have distinctive values and institutions pertinent to fertility. Such groups may also serve as either channels or barriers to the diffusion of ideas that affect fertility.
Demographic Structure	Population composition should affect nuptiality, affect the benefits and costs of childbearing, and alter the shape of various institutions in the society, thus influencing fertility indirectly.
Ecological System	The resources available to a society, directly and from its location within the modern worldwide system of interdependence, should affect the way the consequences of fertility are assessed.

There may also be a theoretically nettlesome link between regulation costs and demand. It is sometimes argued that the initial use of contraception or the realization that control is possible can lead to downward revision of the demand for children. If this is common, if it is not simply a matter of incremental regulation costs falling after initial use, then the fertility outcome does not follow as simply as described from the basic components.

Similarly, there are possible links between supply and demand. It has already been noted that couples' attempts to raise their fertility are generally of little demographic consequence; nevertheless, such measures as increasing the frequency or changing the timing of intercourse could, in some cases, affect supply. In the other direction, demand will be affected by supply if couples who are more fecund decide for that reason to have more children, or if those who are less fecund decide they are, after all, happier with fewer. Child survival may also affect demand, since it is related to child costs and to the desirability of investments in child quality. Furthermore, decisions on demand may be bound up with female employment decisions, and therefore interact with breastfeeding practices.

If these instances of overlap or interaction among the basic components, hypothetical though several are, are seen as an important limitation of the framework, one might prefer to think not of separable decisions on the components but of a global maximization process encompassing all these factors simultaneously. Such a conception, however, provides insufficient structure for current purposes.

Measurement of Components

If the framework is taken only as a loose set of categories for summarizing research, there need be no urgency about measuring the basic components of supply, demand, and regulation costs. Measures will be important, instead, for particular elements of each component (like postpartum infecundability, in the case of supply, or tastes, in the case of demand), depending on the specific theories relating them to fertility. If, on the other hand, the combinatorial algorithm provided in Figure 1 is taken seriously, measuring supply, demand, and regulation costs directly, both for couples and for social groups, becomes an important task.

None of the elements of the framework has been measured in a fully satisfactory manner; only a few relatively primitive attempts, by Easterlin and his associates (e.g., Easterlin and Crimmins, 1982; see also Boulier and Mankiw, 1980), have been made to measure the basic components simultaneously, and as for the elements of the components, more work has been done on some than on others.

In the demand area, for instance, work on family-size desires gives some idea of levels of demand, and work on values and disvalues of children provides some representation of couples' perceptions of demand factors. A sense of the economic constraints can also be obtained from a few studies of the economic costs and benefits of

children and slowly improving measurements of income and wealth in developing countries. Time costs, however, remain difficult to assess and are at best determined by inference. Similarly, tastes for children have never been measured directly, and an appropriate methodology for doing this has still not been developed.

In the supply area, the situation is somewhat similar. Although natural fertility has been determined for certain groups, measurement at the individual level is exceedingly difficult and may not in fact be feasible, though couple perceptions of expected supply should be measurable. Of the primary determinants of natural fertility, some, like the duration of postpartum infecundability, can be determined with much greater precision than others, like frequency of intercourse and intrauterine mortality. Levels of child survival can be determined where sufficient demographic data are available, but couples' perceptions of these levels have generally not been investigated.

Substantial amounts of data are available on fertility regulation, from which inferences can be drawn about regulation costs. The regulation costs concept has not, however, been directly investigated. Work has been done on contraceptive acceptability, for instance, but translating such data into some measure of contraceptive costs has not been attempted. Developing some composite measure for psychosocial, health, and economic costs would seem a particularly difficult undertaking. Moreover, as previously noted, much of the research does not distinguish whether contraception is being used to space or to limit births, a crucial distinction in the framework.

Measurement is less of a problem in regard to motivation to control fertility: in Figure 1, this is simply the difference between supply and demand, and does not need to be measured directly (though in principle this may be possible). Measurement of fertility outcomes, similarly, poses no major problems.

Thus, for the strict version of the framework represented in Figure 1 to be fully utilized, much work remains to be done, though various inferences can be drawn about its elements from available studies. For the framework as a loose set of categories, however, these particular measurement issues are less relevant.

Fertility Decisions

Within the framework, fertility regulation can be used only after a decision is made. However, it may be argued that, if fertility regulation is not to be used--if demand clearly exceeds supply, for instance, or if regulation costs are extremely high--no conscious decision is necessary. The framework is consistent with either the idea that decisions are always made or the idea that decisions are made only in some cases. Some contend that fertility decisions are seldom made in developing countries because the force of social norms compels certain fertility behavior, because people are unaware of alternatives, because they are unenlightened about the possibilities for controlling their own lives, or for some such reason. These

arguments are evaluated elsewhere (Hull, in these volumes; Hollerbach, in these volumes); they are not in principle inconsistent with the framework, as long as they can be interpreted to mean that either demand or regulation costs are excessive.

The framework is meant to capture the essentials of any fertility decision, though the steps in Figure 1 are not intended as a literal representation of the process. The reproducing couple are taken as the ultimate decision makers; however, strong and even decisive influence may be exercised by others, such as the couple's parents in an extended family system, or peer groups that can impose strong sanctions, as in the Chinese family planning program. A more realistic depiction of the decision process would therefore have to include consideration of the interactions between spouses and the influence processes through which other people affect a decision (Beckman, in these volumes). As discussed in later chapters (Hull, in these volumes; Hollerbach, in these volumes), such a depiction would also require representation of the cognitive steps involved in reaching a decision; consideration of styles of decision making, such as active and passive decisions; comparisons among various optimizing and satisficing strategies; and attention to the way the decision process changes through the family life cycle. This last point merits separate consideration below.

Single and Sequential Decisions

One way to interpret the framework is to assume that, at some point early in their marriage, a couple evaluates supply, demand, and regulation costs, and on this basis develops a fertility plan. However, this single-decision perspective is not the only one possible. It may alternatively be assumed that a couple evaluates the situation several times in the course of their fertility career, each time adjusting their plans to allow for economic contingencies, changes in perceptions and values, unexpected reproductive outcomes (like infant loss or having a child of the "wrong" sex), and similar unanticipated events, including possible marital dissolution and remarriage. In fact, it may be assumed that each evaluation leads not to a long-term fertility plan, but only to a decision about whether or not to have another child. The sequential perspective allows for the reformulation of plans given the uncertainty often associated with family decisions (Namboodiri, in these volumes). In this perspective, the concept of demand should be broadened to include desired timing of births. The present discussion is not concerned with comparing the sequential and single-decision perspectives; each is consistent with the framework.

Figure 1 illustrates the sequential perspective by representing fertility as cumulated family size, which affects subsequent childbearing as an aspect of reproductive history. Adding cumulated family size as a dependent variable in the framework is useful for another reason: the measures available for individuals generally capture cumulated rather than completed fertility.

The Married and the Unmarried

The framework has been developed from the perspective of married couples. In principle, however, it should apply equally to the unmarried, whether they be single, widowed, or divorced, as well as to couples who have less formal marital arrangements. For the unmarried, the supply of children may be largely dictated by frequency of intercourse, given the taboos against and the practical difficulties often attendant on nonmarital sexual relations. The desired number of children in the absence of a stable union, on the other hand, is most often zero. Thus the analysis of fertility among the unmarried has a somewhat different character, although the basic framework still applies (see Easterlin, 1978:123-126).

Levels of Analysis and Analysis of Change

The balancing of demand, supply, and regulation costs described by the framework takes place at the level of the couple or household. Since the fertility of a social group or a society is no more than the combined fertility of all its member households, the framework should apply equally to fertility differentials among groups, if the distribution of households by whether or not they have potential childbearers is also considered. Of course, in analyzing group differentials, it may be convenient to ignore many factors that can be assumed constant in their distribution across groups, though they may vary between households, and to focus on some few remaining factors. A framework for analyzing group or societal differentials could therefore be more selective, but all its elements would necessarily be among those included in this household framework.

Which elements might be more important across groups or societies? Given the tremendous variation among less developed countries, there is no easy answer to this question. Regulation costs (meaning not simply monetary but also psychosocial costs of access and use) vary considerably. Demand is also quite variable: very high in some countries that have barely started the demographic transition and quite low, close to Western levels, in some more advanced developing countries. Supply is also variable: child survival is considerably better in some settings than in others, and it has been shown that natural fertility levels vary considerably (e.g., Knodel, in these volumes), with the influence of breastfeeding in particular producing great differences in fertility (Bongaarts, in these volumes). It might be possible to leave out specific factors for some well-defined comparisons between groups, but the entire framework seems to be needed in the general case.

It might be argued that societies somehow regulate their fertility and mortality to produce an appropriate equilibrium, taking account of the environmental and technological resources at hand. If this argument is correct, it seems to imply some mechanism for controlling fertility that falls outside the household framework discussed here. It is more likely, however, that any such attempt, deliberate or not,

to bring fertility into balance with mortality in fact involves the components in the framework: somehow, supply, demand, or regulation costs are being manipulated by the society.

Similarly, fertility change should result from change in some elements of the framework or in the number and age distribution of households (Richards, in these volumes; Ryder, in these volumes). The most important case to consider is the fertility change that is part of the demographic transition. Easterlin (1978; in these volumes) shows how the fertility effects of institutional changes accompanying modernization can be broken down into effects on demand, supply, and regulation costs. He argues, for instance, that the growth in formal education and the proliferation of the mass media should increase natural fertility and improve child survival, raise the relative price of children and reinforce tastes for competing goods, and reduce both the economic and psychic costs of regulation. The supply effect leads to higher fertility, but the demand and regulation effects leading to lower fertility should more than compensate, leading to a net negative effect of education and media on fertility. The effects of other institutional changes, such as improved public health, greater urbanization, and the increased autonomy of nuclear families, can similarly be worked out within the framework.

One aspect of fertility change that is not fully represented in the framework is the role played by diffusion, which involves the transmission of ideas, attitudes, and practices within social networks through personal communication or the mass media. Most elements of the framework can be affected, but the impacts of diffusion on regulation costs and tastes for children are particularly significant. An adequate discussion of this would require modeling the process by which fertility-related perceptions and behaviors diffuse in social groups; determining how location within a social network affects exposure to diffused cultural patterns; characterizing stages in diffusion and particular groups mobilized in each stage; identifying and describing the operation of barriers to diffusion, such as linguistic, religious, and other ethnic boundaries; describing the way institutions operate to promote or block diffusion; and addressing the interplay among different elements that may be diffused, such as the interactions between changing fertility control practices and changing tastes. Such issues are beyond the scope of this framework, but are considered elsewhere (Retherford and Palmore, in these volumes).

THE ORGANIZATION OF THESE VOLUMES

Many other questions might be raised about this framework. In particular, it might be asked how applicable it is to the analysis of particular fertility differentials or instances of fertility change. This question might be answered on the basis of the succeeding chapters, which summarize the evidence on fertility determinants in developing countries within the categories provided by the framework. Part II (following this introduction) deals with the supply of

children, Part III with the demand for children, and Part IV with fertility regulation and its costs. Part V discusses fertility decision making, which has been identified as a key aspect of the framework. Part VI deals with nuptiality, and Part VII with the effects of modernization on fertility. Finally, Part VIII (in Report No. 16 of the Committee on Population and Demography) provides a brief summary and lays out an agenda for research on fertility determinants in developing countries based on this review of evidence.

Each part (except Part VI, which contains only two papers, and Part VIII) includes an introductory essay giving an overview of the topic, followed by papers addressing specific issues. The topics for the papers were selected to cover all the important aspects of the framework rather than simply to summarize the literature. Some papers therefore deal with a substantial amount of research evidence, whereas a few explore relatively unstudied fields. The papers were meant to be empirical rather than theoretical, though a few do contain the authors' theoretical ideas. Many of the papers present propositions or hypotheses about specific fertility determinants.

The authors began with an early version of the framework presented here and a framework-based description of their assigned topic, but were not constrained by that description. These volumes therefore contains a few departures from the perspective provided by the framework.

One way to read these papers is go through the introductory essays, including the two papers on nuptiality, first, and then to select the specific papers that develop themes of interest. The introductory essays are not intended as thorough summaries and cannot stand by themselves, however; a great deal that is of interest about fertility is contained in the other papers.

NOTES

1. As will shortly become evident, the distinction is rough and imperfect: the supply of children is also influenced by socioeconomic factors and does involve some choices, whereas the demand for children is also partly cultural. Another way to make the distinction is to say that demand involves the number of children a couple would have if they gave no thought to the process of bearing or avoiding them, and supply the number they would have if they gave no thought to how many they wanted.
2. The term "natural fertility" was originally chosen to contrast with the "controlled fertility" of populations that contracept. It is now recognized, however, that control is also exercised in the "natural" fertility situation: behaviors like sexual intercourse and breastfeeding are culturally patterned and involve personal choices.
3. These are generally concave downward, in contrast to the concave upward curves for populations with fertility control (see Knodel, in these volumes, for illustrations).

4. Demand may however be affected by child mortality, which affects the "price" of children and the quality-quantity tradeoff.
5. For instance, deliberately prolonged breastfeeding and postpartum abstinence, practiced for the health of the child, would be considered supply factors. The qualification might be added that the duration of these practices should not change with parity if they are to be consistent with natural fertility. Contraception and induced abortion might also be considered supply factors if a couple used them solely for spacing with no intent to limit family size. However, it is also argued that this is almost never the case: every use of contraception or abortion involves some idea of limiting family size (Bongaarts and Menken, in these volumes). Consequently, a number of demographers (e.g., Henry, 1979) consider any use of contraception or induced abortion inconsistent with natural fertility (but see Knodel, in these volumes).
6. These comparisons are discussed here in lay language; Easterlin (1978) provides a basically consistent discussion using indifference curves.
7. Deliberate spacing behavior, as discussed in note 5, is another possible area of overlap.

BIBLIOGRAPHY

Becker, G. S. (1960) An economic analysis of fertility. In Demographic and Economic Change in Developed Countries. Universities-National Bureau Conference Series, No. 11. Princeton, N.J.: Princeton University Press.

Bongaarts, J. (1978) A framework for analyzing the proximate determinants of fertility. Population and Development Review 4:105-132.

Boulier, B. L., and N. G. Mankiw (1980) An Econometric Model of the Demand, Supply, and Regulation of Fertility. Unpublished paper. Office of Population Research, Princeton University, Princeton, N.J.

Bulatao, R. A. (1979) On the Nature of the Transition in the Value of Children. Paper No. 60-A. Honolulu: East-West Population Institute.

Davis, K., and J. Blake. (1956) An analytical framework. Economic Development and Cultural Change 4:211-235.

Easterlin, R. A. (1969) Towards a socio-economic theory of fertility: A survey of recent research on economic factors in American fertility. In S. J. Behrman et al., eds., Fertility and Family Planning: A World View. Ann Arbor, Mich.: University of Michigan Press.

Easterlin, R. A. (1975) An economic framework for fertility analysis. Studies in Family Planning 6:54-63.

Easterlin, R. A. (1978) The economics and sociology of fertility: A synthesis. Pp. 57-113 in C. Tilly, ed., Historical Studies of Changing Fertility. Princeton, N.J.: Princeton University Press.

Easterlin, R. A., and E. M. Crimmins (1982) An Exploratory Study of the "Synthesis Framework" of Fertility Determination with WFS Core Questionnaire Data. Unpublished manuscript. Panel on Fertility Determinants, National Academy of Sciences, Washington, D.C.

Easterlin, R. A., R. A. Pollak, and M. L. Wachter (1980) Toward a more general economic model of fertility determination: Endogenous preferences and natural fertility. Pp. 81-135 in R. A. Easterlin, ed., Population and Economic Change in Developing Countries. Chicago: University of Chicago Press.

Freedman, R. (1961-62) The sociology of human fertility: A trend report and annotated bibliography. Current Sociology 10/11(2).

Freedman, R. (1963) Norms for family size in underdeveloped areas. Proceedings of the Royal Society, Series B, 159:220-245.

Freedman, R. (1975) The Sociology of Human Fertility: An Annotated Bibliography. New York: Irvington Publishers, Inc.

Henry, L. (1953) Fondements theoriques des mesures de la fecondite naturelle. Revue de l'Institut International de Statistique 21:135-151.

Henry, L. (1961) Some data on natural fertility. Eugenics Quarterly 8:81-91.

Henry, L. (1979) Current concepts and empirical results concerning natural fertility. In H. Leridon and J. Menken, eds., Natural Fertility. Liege: Ordina Editions.

Menken, J., and J. Bongaarts (1978) Reproductive models in the study of nutrition-fertility interrelationships. In H. Moseley, ed., Nutrition and Human Reproduction. New York: Plenum Press.

Mincer, J. (1963) Market prices, opportunity costs, and income effects. In C. Christ et al., eds., Measurement in Economics: Studies in Mathematical Economics in Memory of Yehuda Grunfeld. Stanford, Calif.: Stanford University Press.

Sheps, M. C., and J. A. Menken (1973) Mathematical Models of Conception and Birth. Chicago: University of Chicago Press.

Willis, R. J. (1973) Economic theory of fertility behavior. Pp. 25-75 in T. W. Schultz, ed., Economics of the Family: Marriage, Children, and Human Capital. Chicago: University of Chicago Press.

Chapter 2

THE SUPPLY OF CHILDREN: A CRITICAL ESSAY

John Bongaarts and Jane Menken

The supply or potential "output" of children is defined as the number of surviving children a couple would have if fertility were not deliberately limited (Easterlin 1975, 1978). Previously, economists stressed demand factors as the primary determinant of fertility; thus the introduction of supply considerations into the economic analysis of fertility has been an important innovation. In the analytic framework of these volumes, actual fertility is seen as a function of these two factors of supply and demand, as well as the costs of fertility regulation. In modern developed societies, demand is well below supply and, given the relatively low cost of fertility regulation, is indeed the principal determinant of observed fertility. In contrast, in many poor developing countries, as well as in historical societies, either the demand for surviving children is close to or exceeds the supply, or the desire for children may not be perceived in demand terms. As a consequence, there is little or no motivation to limit family size. Fertility in these societies is determined primarily by supply factors, and natural fertility obtains.

The supply of children can be directly measured only where demand factors have very little effect on fertility. The usual indication that fertility is governed by supply variables is provided by the absence of deliberate fertility control by contraception or induced abortion. In societies where many couples resort to contraception, induced abortion, or infanticide to limit family size, the supply of children is not directly observable; however, its estimation may be possible through the application of reproductive models.[1]

The supply of children is a function of a number of direct and indirect determinants whose principal links are summarized in Figure 1. The potential number of surviving children depends directly on the level of natural fertility and on the infant's chances of survival to adulthood. Natural fertility is defined as that which prevails in the absence of contraception, induced abortion, or any other reproductive behavior that depends on the number of children already born (Henry, 1961, 1979). Natural fertility is in turn a function of a set of behavioral and biological proximate determinants such as age at marriage, duration of lactational infecundability, frequency of intercourse, intrauterine mortality, and age at onset of permanent sterility. Finally, background variables, including socioeconomic

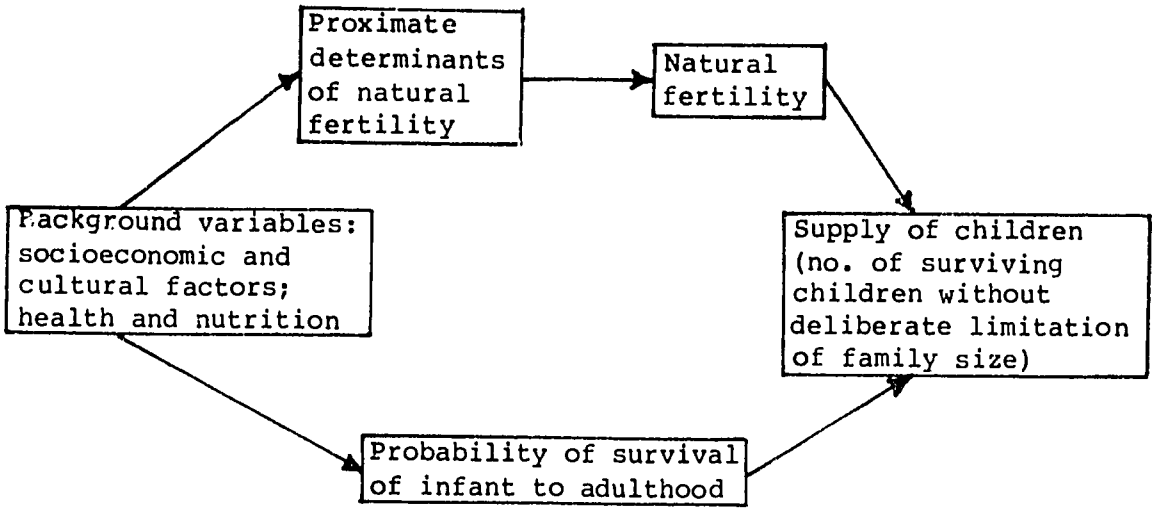

FIGURE 1 Direct and Indirect Determinants of the Supply of Children

factors and health and nutrition, must operate through these proximate determinants to affect natural fertility.

This paper will briefly review each of the variables listed in Figure 1. In doing so, it will perform a quantitative analysis of the relationships between various measures of the supply of children and their determinants, attempting to identify the variables primarily responsible for supply variations among populations. This discussion will rely heavily on several detailed reviews of concepts and empirical evidence presented in these volumes related to levels and trends in natural fertility (Knodel), child survival (Chen), the proximate determinants (Bongaarts), sociocultural factors (Nag), and health and nutrition (Gray).

THE SUPPLY OF SURVIVING CHILDREN

The above definition of the supply of children involves two central concepts: the "surviving child" and "no deliberate limitation of fertility." The latter has received a great deal of attention in the literature on natural fertility, as discussed in a later section. In contrast, relatively little has been written about the most appropriate definition of a surviving child.

Easterlin (1978) suggests that the supply of children be estimated as the number of children that survive to age 20. The considerable advantage of this definition is its simplicity; as a general index, it is certainly adequate. On closer examination, however, a shortcoming becomes apparent: no reference is made to a crucial factor in the parents' desire for surviving offspring--the parents' age or life-cycle stage. For example, a parent may want a surviving child to take care of him or her in old age, say at age 65; however, it is possible for children to survive until age 20 and die before the

parent reaches age 65. Consequently, more refined measures of the supply of children are needed, based on particular reasons why parents consider surviving children to be assets. It is beyond the scope of this paper to review all the economic, social, and psychic rewards of children (see also Caldwell, in these volumes; Heer, in these volumes; Lindert, in these volumes). Instead, the discussion below presents three different supply measures corresponding to three distinct economic reasons for wanting surviving children (Leibenstein, 1957; Cain, 1982); these measures illustrate how the concept of supply varies according to the reasons chosen as their basis.

Children as a Source of Labor

Children in many traditional societies make significant economic contributions to the household in the form of labor. Work may start at an age well below 10, and, after age 15, the value of children's labor approaches that of an adult's. The age at which the child's contributions stop depends, among other things, on its sex, its age at departure from the household, and the degree of parental control once the child reaches adulthood, either within or beyond the household. The value of girls is usually greatest between ages 10 to 15 and marriage (at which time they are likely to move to the households of their spouses). Although there is considerable variation across cultures, boys often contribute labor until an older age; this is partly because they marry later and partly because parents may have control over their sons after marriage, if for example the son stays in the parental household or if the parent retains possession of the family land. To have as many boys and girls surviving to these age groups as possible would therefore be the goal of parents attempting to maximize the supply of labor from their children. In practice, however, the number of children surviving to age 20 is likely to be a good overall indicator of the supply of children as a source of labor.

Children for Old Age Security

Savings, pensions, and social security income help support many aging parents in developed countries, but are often unavailabl in traditional societies. Parents in these societies must therefore rely on their children for care and economic support in old age. Although this dependency in reality grows gradually with age, it is convenient to take the number of children who are adult at some fixed age of the parent, say age 65, as an indicator of the supply of children in old age. Any child over age 15 may be considered an adult for this purpose.

Children as Insurance Against Economic Risk

Households living close to subsistance level are highly vulnerable to fluctuations in income or food supply. Perhaps the most serious threat to a household's economic survival arises when the head of the household dies or becomes seriously ill or permanently disabled and there are no able-bodied sons to assume responsibility for the family. Parents can minimize their risk by maximizing the number of surviving adult children (sons) they have. The need for surviving adult sons as insurance against economic risk exists throughout the life cycle, but is greatest when the parents are middle-aged, say around age 45. At earlier ages, the probability of the head of the household dying is relatively small, and later, the number of dependent children in the household rapidly diminishes.

One important aspect of the measurement of the supply of children, related to supply variations, deserves brief comment. In any real population, there will be significant proportions of parents with no surviving children or with more than double the average. The above three measurements are usually discussed according to averages; by ignoring large variations in actual numbers of surviving children they neglect a crucial dimension. It may well be that parents are more interested in minimizing the risk of having no surviving child or son than in maximizing the average number. Thus any comprehensive analysis of the supply of children will at a minimum have to include measures of the proportions of households without surviving children.

FACTORS AFFECTING THE SUPPLY OF CHILDREN

Natural Fertility

Natural fertility is defined by Henry (1961) as fertility in the absence of deliberate birth control which is ". . . bound to the number of children already born and is modified when the number exceeds the maximum which the couple does not wish to exceed." In practice, fertility may be considered natural if no contraception or induced abortion is used (Henry, 1979). A slightly different working definition of natural fertility used by some demographers, including the present authors, is the fertility that prevails in the absence of deliberate attempts to limit the number of surviving children. Practices such as prolonged breastfeeding or postpartum abstinence lower fertility to well below its biological maximum but also increase the chances of child survival. Such practices are considered natural in either case if they are not deliberately modified with increases in the number of children already born. Henry admits that the adjective "natural" is not ideal, but prefers it over "physiological" or "biological" because of the nonbiological factors that must be included in the term. Natural fertility is further reduced in all human societies by delayed marriage and marital disruption. Infanticide, not mentioned by Henry, might be considered compatible with natural fertility if not parity-dependent; however, it is clearly

excluded from the present definition based on surviving children. (For a discussion of the controversy surrounding the concept of natural fertility, see Knodel, in these volumes.) The terminology of the framework for these volumes implies that fertility is natural either if the demand for surviving children equals or exceeds the supply or, in case the demand is lower than the supply, if deliberate fertility regulation through contraception or induced abortion is absent.

Empirical research in a wide variety of societies with natural fertility has demonstrated that these populations are characterized by a relatively invariant age pattern of marital fertility (Coale and Trussell, 1974; Henry, 1961; Knodel, 1977). Regardless of the overall level, age-specific natural marital fertility rates show a very similar decline with age. On the basis of this finding, Coale and Trussell (1974) have proposed a standard schedule of natural marital fertility which yields the age pattern in Table 1 relative to the 20-24 year old age group.[2]

The convex shape of the natural-fertility pattern is very different from the concave shape that characterizes societies in which deliberate parity-dependent birth control is exercized through the use of contraception and/or induced abortion. In fact, because of this striking difference, natural-fertility populations can be identified solely on the basis of the shape of their age-specific marital fertility rates (Coale and Trussell, 1974; Knodel, 1977).

On the other hand, this constancy of the natural age pattern does not mean that overall levels of natural fertility are also relatively invariant. In fact, there is a great deal of variation in natural fertility, on both the aggregate and individual levels. In a review of levels of natural fertility in 23 populations, Leridon (1977) found that the total fertility rate (TFR) ranged from 3.7 in the French village of Thizels Saint-Sernin (marriages 1700-1791) to 9.5 among the Hutterites (marriages 1921-1930), a religious sect living in the north-central U.S. Even this highest reliably observed fertility of the Hutterites is still restrained by delayed marriage (the median age

TABLE 1 Age Pattern of Natural Marital Fertility

Age	Relative Marital Fertility Level
20-24	100
25-29	94
30-34	86
35-39	70
40-44	36
45-49	5

at first marriage of females is 22) and by breastfeeding. It has been estimated that natural fertility can reach around 15 births per woman if the fertility-inhibiting effects of delayed marriage, marital disruptions, and breastfeeding are also removed (Bongaarts, 1978). These variations in aggregate levels of natural fertility are due to variations in the proximate determinants, such as age at marriage and duration of breastfeeding.

Differences in natural fertility among individuals are even larger than those among populations. For example, the number of children ever born ranges from 0 to 16 among married Hutterite women age 45 and over, and nearly half of these women had fewer than 7 or more than 12 children (Eaton and Mayer, 1953). Similar and occasionally even larger ranges in the number of children ever born have been observed in a number of contemporary developing countries with high fertility (Hodgson and Gibbs, 1980). Some of this variation is due to systematic differences among individuals in the proximate determinants, such as age at marriage or duration of breastfeeding; however, most is due to chance or random variation. In the absence of deliberate fertility control, reproduction is a stochastic process in which conceptions, intrauterine deaths, returns of ovulation after birth, and onset of permanent sterility occur randomly or have large random components (Sheps and Menken, 1973). Because this random component is usually more important than the systematic component of the variation in individual fertility, the total number and the spacing of children born to a woman are predominantly matters of chance in natural-fertility populations. For this reason, there is no way at present to measure the underlying natural fertility of an individual; rather, it is considered a group or population characteristic.

Child Survival

Child survival is an important determinant of the average supply of children because a substantial number of infants do not survive to adulthood in many natural-fertility populations, and because this probability of survival varies widely among populations. Before this century, life expectancies between 20 and 30 years were common in historical societies, as well as in developing countries. A life expectancy of 25 years implies that about a third of all live-born infants fail to reach their first birthday and that just over half die before age 20 (according to the "West" model life tables of Coale and Demeny, 1966). In contrast, the proportion of live births not surviving to age 20 is only 2 percent when life expectancy is 75 years. Although there is little disagreement about these estimates of mortality variations and some of their causes, there is no clear consensus in the literature about the relative importance of the various known or suspected determinants. Since a discussion of this still controversial subject is not essential for quantitative analysis, it will be deferred to a later section.

Effects of Natural Fertility and Child Survival on the Supply of Children

Natural fertility and child survival together determine the supply of children. Although it would be preferable to use empirical data to examine the effects of variations in the levels of these two determinants on different measures of the supply of children, such data are lacking. The present discussion therefore relies on model estimates. In an appendix, a set of equations is derived to calculate the number of children reaching age 20 and surviving to ages 45 and 65 of the parent in stable populations with given levels of fertility and mortality. To simplify this exercise, the following assumptions were made:

--All women marry at age 20.[3]
--Age-specific fertility rates after age 20 follow the standard Coale-Trussell age pattern, which is inflated or deflated proportionately to arrive at a given TFR.
--Husbands are the same age as their wives.[3]
--The probability of survival to a given age is derived from model life tables (Coale-Demeny, 1966).
--Males and females have the same life expectancy and life table.
--Sex ratio at birth equals 1.05.

The average numbers of children surviving to age 20 in stable populations with different levels of natural fertility and mortality are presented in Table 2. An increase in life expectancy from 25 to 75 slightly more than doubles this measure of supply of children: from 1.83 to 3.91 when the TFR = 4.0 and from 4.58 to 9.78 when the

TABLE 2 Average Number of Children Surviving to Age 20 in Stable Populations with Different Levels of Mortality and Natural Fertility

	Natural Total Fertility Rate			
Life Expectancy	4	6	8	10
25	1.83	2.75	3.66	4.58
35	2.39	3.58	4.77	5.97
45	2.86	4.30	5.73	7.16
55	3.29	4.95	6.58	8.23
65	3.65	5.48	7.30	9.13
75	3.91	5.87	7.83	9.78

Source: Model estimates, see text.

TFR = 10.0. Similarly, an increase in the TFR from 4 to 10 more than doubles the supply of children at each level of mortality. As a population proceeds through the demographic transition, it can be expected to move from a position somewhere in the upper left corner of Table 2 to the lower right corner, with simultaneous increases in life expectancy and natural fertility. (The level of natural fertility is assumed to rise during the transition primarily because breastfeeding declines; the appropriateness of this assumption will be discussed later.) The supply of children can quadruple in the process, with the rise in life expectancy and natural fertility contributing more or less equally to that increase.

The three measures of the supply of children proposed earlier are plotted in Figure 2 as a function of the mortality level. To simplify this figure, only one level of natural fertility, with TFR = 7.0, is presented (estimates of the supply measures for other TFRs are easily obtained because these measures vary proportionately with the TFR). As life expectancy rises, so do the measures of supply of children: from 3.21 to 6.85 for the number of children surviving to age 20; from 2.49 to 6.78 for the number of adult children surviving to age 65 of the parent; and from 1.58 to 3.39 for the number of adult children surviving to age 45 of the parent. The differences between the indexes are substantial, especially between the third and the first two. The relatively low level of supply of adult children surviving to age 45 of the parent is readily explained by the fact that only children over 15 are considered adult, so that only those born before the mother reaches age 30 can be adult when she reaches age 45.

A rather crude attempt to simulate what might happen to the supply

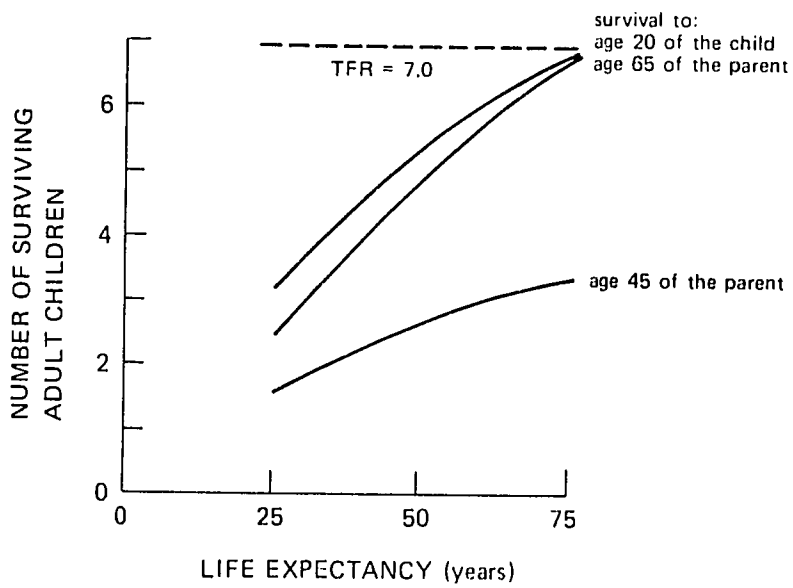

FIGURE 2 Three Measures of the Supply of Children in Stable Populations with Different Levels of Mortality and a Natural Total Fertility Rate of 7

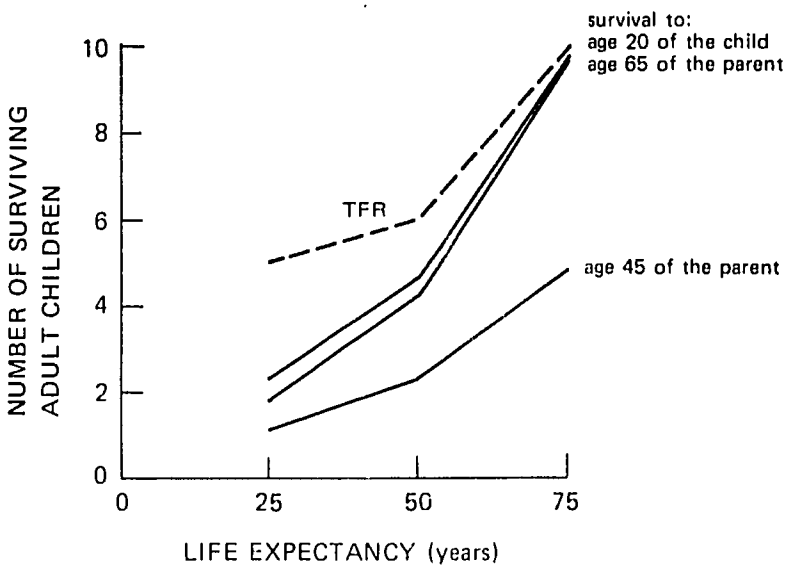

FIGURE 3 Three Measures of the Supply of Children in Stable Populations with Different Levels of Mortality and Natural Fertility

of children over the course of a demographic transition is summarized in Figure 3. The life expectancy is used as a rough indicator of the stage in the transition and, as before, natural fertility is assumed to rise over the course of the transition. At the beginning, the TFR is assumed to change only modestly--from 5 to 6--because the proximate determinants of natural fertility do not change much, except for a slight decline in breastfeeding and a decline in marital disruption as the risk of widowhood decreases. In the last part of the transition, the level of natural fertility rises rapidly, primarily because breastfeeding is largely abandoned. At the end of the transition, the TFR under natural fertility is assumed to reach 10. As will be demonstrated below, this is approximately the level of fertility that would be observed in contemporary developed countries with short durations of breastfeeding if all contraception and induced abortion were to be abandoned; actual fertility at the end of the transition is, of course, much lower because most couples deliberately control their fertility. The three measures plotted in Figure 3 show a large increase over the course of the hypothetical transition depicted here: regardless of the measure employed, the supply of children more than quadruples between the beginning and end of the transition. In the first half of the transition, the rise in life expectancy is the primary cause for this increase because the TFR changes little; in the second half, the rise in natural fertility contributes most.

As was noted earlier, the measures of supply of children used here deal with averages that conceal a great deal of variation on the household level. As a first step towards an analysis of this variation, the effects of natural fertility and child survival on the probability of having no surviving children can be examined. This is

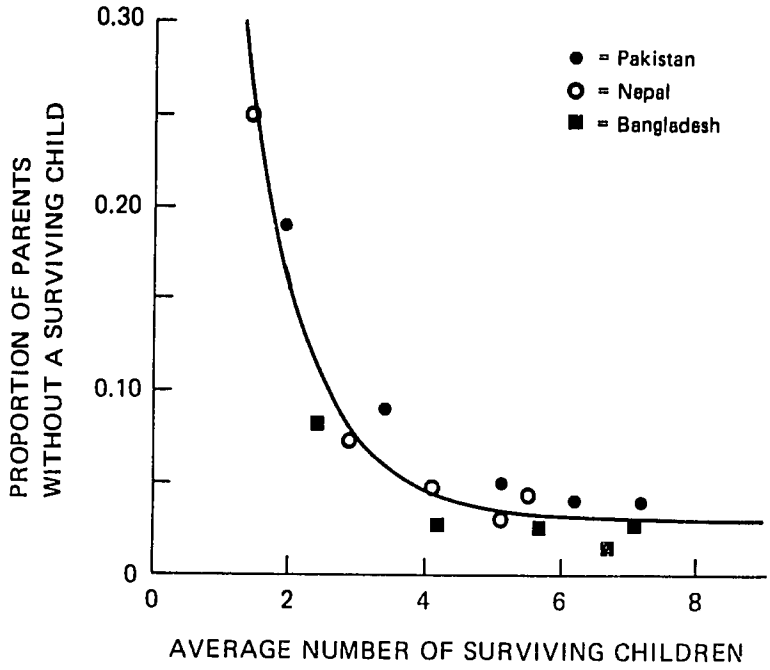

FIGURE 4 Model Estimated (curved line) and Observed Relationship Between the Average Number of Surviving Children and the Proportion of Parents Currently Without a Surviving Child

Note: Data points refer to observed values in age groups 20-24 to 40-44 in each country.

Sources: World Fertility Survey (1976, 1977, 1978).

made possible by a simple relationship that exists between the average number of surviving children and the proportion of parents without offspring. An equation linking these variables in populations with natural fertility is given in the appendix, and the resulting relationship (under the assumption that the level of primary sterility is 3 percent) is plotted in Figure 4. The proportion of parents without surviving offspring declines as the mean number of surviving children rises, but the decline is not linear. The proportion approaches an asymptote of 3 percent when the mean rises over 4 surviving children (except in populations with significant levels of pathological sterility where the asymptote would be higher). Data points representing observations in three contemporary populations are also plotted in Figure 4. The close fit between observed and model-estimated proportions without offspring tends to confirm the validity of the relationship.

Using this relationship, the proportion of parents who never have a child surviving to age 20 is calculated for different levels of fertility and mortality; the results are presented in Table 3. As life expectancy rises from 25 to 75, the proportion declines from 18

to 3 percent when the TFR = 4, and from 4 to 3 percent when the TFR = 10. Also given in Table 3 (in parentheses) are the corresponding proportions of parents without a son surviving to age 20. This proportion is generally more than double the proportion without a child of either sex, except at the highest levels of fertility and life expectancy.

Figure 5 plots the proportion of parents without a son surviving to age 20 and the proportion without a surviving adult son at ages 45 and 65 of the parent for different levels of mortality and a fixed level of natural fertility, TFR = 7.0. The same proportions are given in Figure 6, but it is assumed that the TFR rises from 5 to 10 with declining mortality to simulate a pattern of change that might be observed during a demographic transition. Perhaps the most noteworthy feature of Figure 6 is the sharp decline in proportions with no surviving adult son over the course of this hypothetical transition. At the end of the transition, each of the proportions has been reduced to a fraction of the level at the beginning of the transition. For example, the proportion of parents without a surviving adult son in old age (age 65) has declined from 42 to 4 percent. This finding suggests that the proportion of parents without surviving offspring (or sons) at a given stage in their life cycle is a more sensitive indicator of the supply of children than the average number of surviving children. Moreover, since the risk of having no children or sons may well be more relevant to the parents' fertility decision-making process than the average number, this measure should be given more prominence in future analyses of the supply of children.

THE PROXIMATE DETERMINANTS OF NATURAL FERTILITY

The proximate determinants of fertility are a set of biological and behavioral factors that affect fertility directly, and through which socioeconomic and other background variables must operate to have an effect. The proximate determinants were first identified by Henry

TABLE 3 Proportion of Parents Without a Child (Son) Surviving to Age 20 in Stable Populations with Different Levels of Mortality and Natural Fertility

	Natural Total Fertility Rate		
Life Expectancy	4	7	10
25	0.18 (0.40)	0.07 (0.21)	0.04 (0.12)
50	0.07 (0.22)	0.03 (0.09)	0.03 (0.05)
75	0.05 (0.15)	0.03 (0.06)	0.03 (0.04)

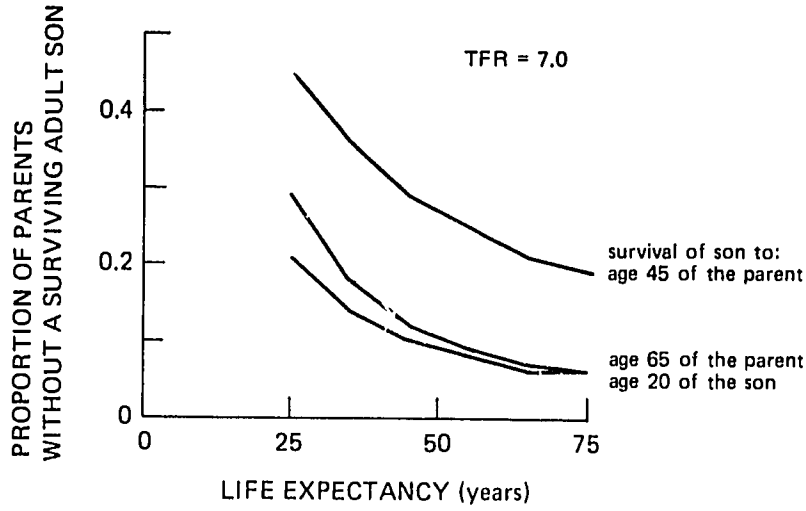

FIGURE 5 Three Measures of the Proportion of Parents Without a Surviving Adult Son in Stable Populations with Different Levels of Mortality and a Natural Total Fertility Rate of 7

(1953, 1957) and independently by Davis and Blake (1956), who used the term intermediate fertility variables. Because Henry's approach is somewhat simplier, it will be used as the basis for the present analysis. Slightly modified, it yields the following set of proximate determinants of natural marital fertility (for further discussion, see Bongaarts, in these volumes).

The Duration of Postpartum Infecundability Following a birth, a woman experiences an infecundable period during which the normal pattern of ovulation and menstruation is absent. The duration of this interval, which may be up to two years, is largely determined by the duration and pattern of breastfeeding. In a few societies, prolonged postpartum abstinence is practiced, lengthening the postpartum infecundable period to the extent that it lasts beyond the resumption of ovulation.

The Waiting Time to Conception This is the interval from the resumption of both ovulation and sexual relations to the next conception. Its duration is primarily determined by the average frequency of intercourse (including the effects of involuntary abstinence due to spousal separation).

Intrauterine Mortality A substantial proportion of pregnancies end prematurely in spontaneous intrauterine deaths.

Onset of Permanent Sterility A couple can reproduce only as long as both spouses are nonsterile (i.e., fecund). With increasing age, the proportion of couples with at least one sterile spouse rises,

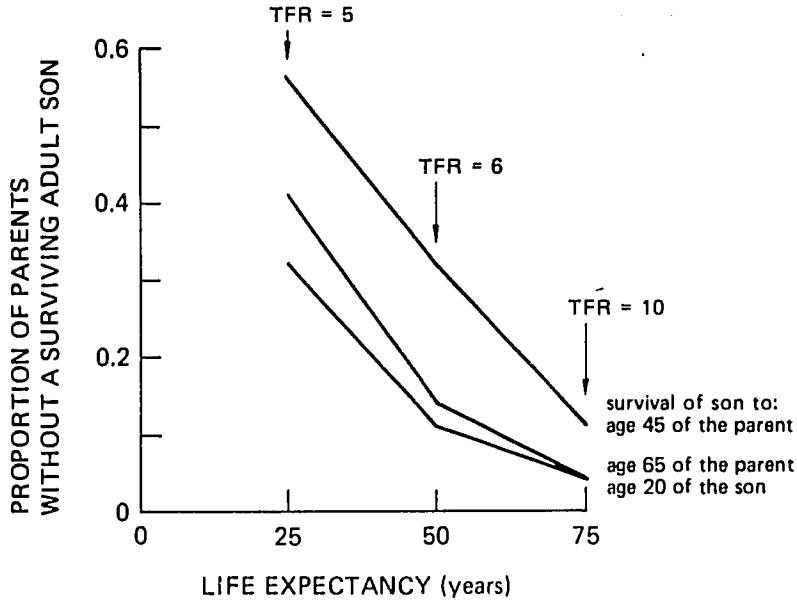

FIGURE 6 Three Measures of the Proportion of Parents Without a Surviving Adult Son in Stable Populations with Different Levels of Mortality and Natural Fertility

reaching 100 percent by the end of the reproductive lifespan.

Exposure to Intercourse One variable, exposure to intercourse, which is closely related to the marriage pattern, should be added to the list proposed by Henry (menarche is not considered a separate proximate determinant because any effect on fertility is seen as operating through this exposure pattern).

This is a complete set of proximate determinants in that natural fertility can be affected only through these five factors, and variations in them will always account for trends and differences among populations in natural fertility. However, although all five proximate determinants can affect natural fertility, their impact differs substantially, and in practice, just two or three account for most variation in natural fertility. These most important proximate determinants can be identified through an arithmetic exercise (a so-called sensitivity analysis) consisting of three steps. First, a simple reproductive model is described that estimates the TFR in a hypothetical natural-fertility population if estimates of the five proximate determinants are available. Next, each of the proximate determinants is varied through its normal observed range while the other determinants are left constant at a standard level, and the corresponding changes in natural fertility are noted. Finally, the variations in natural fertility caused by these changes in each of the proximate determinants are ranked in size so that their importance can be determined.

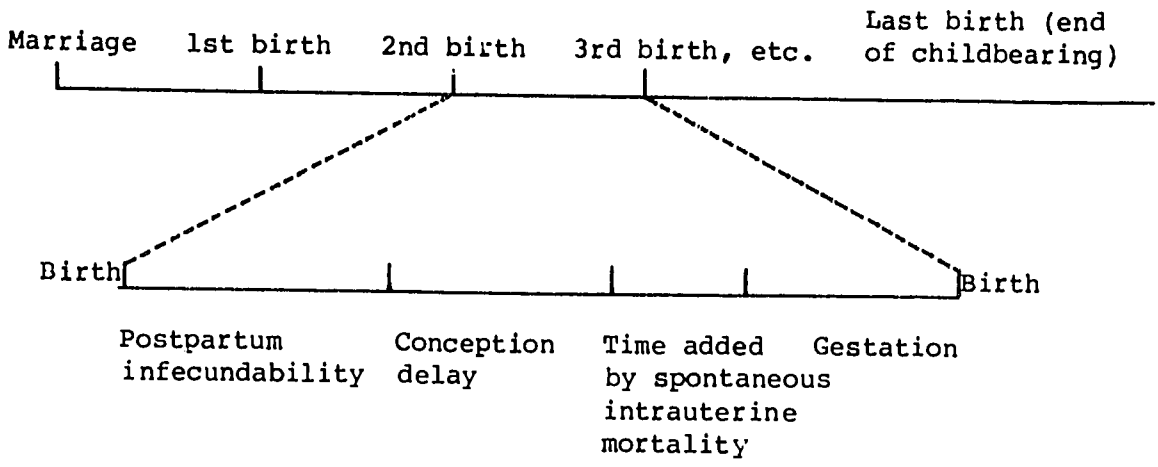

FIGURE 7 Segmentation of Childbearing Years and Birth Intervals

The basic segmentation of the childbearing years into birth intervals and birth interval components used in this model exercise is summarized in Figure 7. The TFR is now simply estimated as the number of birth intervals between marriage and the end of the childbearing years, measured by the age at last birth. The birth interval equals the sum of its components, the postpartum infecundable period, the waiting time to conception, time added by intrauterine mortality, and a full-term pregnancy. For example, a population with a mean age at marriage of 22.5 years and a mean age at the last birth of 40 years would have a 17.5-year childbearing span. With a mean birth interval of 2.5 years, the TFR would be 7 births per woman (17.5/2.5). An average birth interval of 2.5 years could consist of (on average) 1 year postpartum infecundability, 0.6 years conception delay, 0.15 years added by intrauterine mortality, and 0.75 years for a full-term gestation.[4]

Table 4 presents estimates of the observed ranges of the proximate determinants in a wide variety of natural-fertility populations (including both developing countries and historical populations). Based on a review by Bongaarts (in these volumes) these ranges cover what might be considered normal values; that is, the large majority of natural-fertility populations can be expected to fall within the ranges given. Not included here are exceptional cases, such as populations in parts of tropical Africa with high levels of sterility due to venereal disease; similarly, populations in which spousal separation is exceptionally frequent or prolonged would have longer conception delays than are allowed for here. Terminal abstinence is also assumed to be negligible.

The sensitivity analysis is now carried out by varying the proximate determinants through their ranges one at a time, while the

TABLE 4 Approximate Observed Ranges and Standard Model Values of Population Averages of Proximate Determinants of Natural Fertility

Proximate Determinants	Approximate Range of Averages (in years)	Model Standard (in years)
Age at first marriage	15.0 - 27.5	22.5
Age at last birth	38.5 - 41.0	40.0
Duration of postpartum infecundability	0.25 - 2.0	1.0
Conception delay	0.40 - 0.85	0.6
Time added by intrauterine mortality	0.1 - 0.2	0.15

Source: Bongaarts (in these volumes).

other determinants are set at the "standard" values given in the last column of Table 4. These standard values together produce a TFR of 7 (a 17.5-year childbearing span with 2.5-year birth intervals). Any change in a proximate determinant results in a departure from this standard rate. The extent of change is estimated with the simple numerical model already described. For example, an increase in postpartum infecundability interval from 1 to 2 years would change the average birth interval from 2.5 to 3.5 years and would produce only 5 births in 17.5 years of actual childbearing. The results of the complete sensitivity analysis are plotted in Figure 8. The largest variations in TFR are caused by changes in age at marriage and in postpartum infecundability; the smallest are found for age at last birth and spontaneous intrauterine mortality. As age at marriage increases from 15 to 27.5 years, the TFR declines from 10 to 5. In contrast, an increase in the average time added by spontaneous intrauterine mortality from .1 to .2 years produces only a small decline in the TFR, from 7.14 to 6.86. It can therefore be concluded that variations in age at marriage and duration of postpartum infecundability are in general the most important determinants of variations in natural fertility. This conclusion does not imply that marriage and postpartum infecundability are always the only or even the principal causes of those variations. For example, the smaller effect of variations in the conception delay, which cause the TFR to deviate 0.6 births from the standard value of 7, is still quite significant by itself.

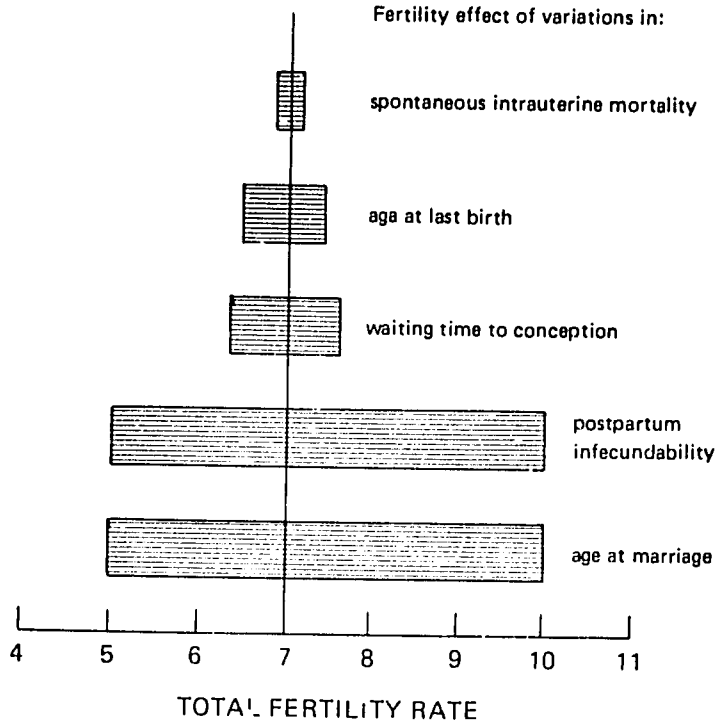

FIGURE 8 Variations in the Total Fertility Rate Induced by Variations in Five Proximate Determinants of Natural Fertility

One final comment should be made about the standard population used here. Although the standard values of the proximate determinants are roughly in the middle of the observed ranges, as is the standard TFR of 7, these figures are not representative of any class of natural-fertility populations. Contemporary developing countries with fertility close to natural levels typically have lower mean ages at marriage and longer postpartum infecundability than the standard; however, since these two effects tend to compensate one another, the resulting observed TFR is often still around 7 births per woman. In historical European societies, marriage is typically later than 22.5 years. The TFR is therefore lower, despite some compensatory effect from a shorter postpartum infecundability interval, which is usually between 6 and 12 months. Finally, in contemporary developed countries, postpartum infecundability is short, say around 3 months, which would yield a TFR of 10 in the absence of contraception and induced abortion; this value of TFR was used in Figures 3 and 6 as the level of natural fertility at the end of the demographic transition. It should also be noted that these results are based on the range of observed values of each proximate determinant and do not tell us how these factors are concentrated within their ranges and which actually vary much between populations.

THE EFFECTS OF BACKGROUND VARIABLES

Effects on the Proximate Determinants of Fertility

Nutrition and Health

The bulk of available evidence suggests that moderate chronic malnutrition is not a major determinant of fertility in the developing world today (Gray, in these volumes; Bongaarts, 1980; Menken et al., 1981). When food supplies are scarce enough to cause starvation, however, there is little doubt that fecundity is lowered as a result of some combination of cessation of ovulation, loss of libido in both males and females, and reduction in sperm production.[5] These effects of famine raise the possibility that chronic or endemic malnutrition may also affect the reproductive system. Frisch has proposed that this is indeed the case and has written that malnourishment affects the female reproductive system (and therefore the supply of children): it operates through the proximate determinants to cause a shorter childbearing span (later menarche and earlier menopause), longer periods of postpartum amenorrhea, and greater frequency of anovulatory cycles, increasing the waiting time to conception (Frisch, 1975, 1978a, 1978b). These hypotheses engendered lively debate and led to a number of careful studies. It is worth noting that the existence of a generally accepted explicit framework for analyzing the proximate determinants helped the research community respond quickly to the challenge of these proposals.

Much of the research on the links between nutrition and fertility has been summarized in recent reviews (Gray, in these volumes; Bongaarts, 1980; Menken et al., 1981). Briefly, there is evidence that well-nourished girls reach menarche earlier (perhaps on the order of two or three years) than those with a poor diet; chronic malnourishment may also be responsible for small differences (typically one or two months) in the duration of postpartum amenorrhea. There is, however, no evidence of a significant increase in the waiting time to conception or in the frequency of spontaneous abortion among poorly nourished women. Methodological difficulties and a lack of reliable data prevent any firm conclusion about the effect of nutrition on menopause; nevertheless, if such an effect exists, it is likely to be small.

It thus seems likely that any effects of chronic malnutrition on fertility would have to operate primarily through changes in age at menarche and duration of postpartum amenorrhea. In one study employing a computer simulation model to estimate the effect of changes in age at menarche on fertility, large increases had little effect on reproduction when marriage did not closely follow menarche (Menken et al., 1981); an extraordinary rise in age at menarche from 12 to 18 years had less than a three percent effect on fertility when the average age at marriage was 20. In another study, in which marriage was assumed to follow soon after menarche, it was found that the fertility impact of a two-year change in age at menarche was only five percent (Bongaarts, 1980). Similarly, nutritionally induced

variations in postpartum amenorrhea of one to two months would only have marginal impact on fertility because birth intervals typically range from two and one-half to three years in developing countries. Thus, the balance of the available data from carefully designed studies in contemporary populations does not support the proposition that nutrition significantly affects fertility except when the extreme of famine is approached.

With regard to the relationship between health and fertility, Gray (in these volumes) points out that malnourishment and ill health frequently occur together and interact, and that it may be impossible to distinguish between nutrition and health effects on fertility. He does find some indication of small health effects on fertility; however, in view of the above discussion, his conclusion that illness and physical vigor are not major determinants of fertility is no surprise. According to Gray (in these volumes), it is unlikely that health or nutrition have a major impact on fertility among large populations in the developing world today, since malnutrition or morbidity severe enough to inhibit reproduction probably affects only a minority of disadvantaged women. There is one important exception: the pelvic inflammatory diseases that are almost certainly responsible for high levels of primary and secondary sterility and consequent low fertility in some parts of the world, especially sections of Africa.

In addition to the relatively small direct effect of health, there are two notable indirect effects, one that tends to decrease and the other to increase fertility. As childhood survival increases, the number of children born can decline because of an effect on the postpartum infecundable period. If infants are normally breastfed for many months, the death of a nursling may shorten the postpartum period. As mortality declines, the average duration of infecundability increases, the pace of reproduction slows, and fewer children are born. It is important to note, however, that if the duration of breastfeeding is declining at the same time as infant mortality, the decrease in lactation can more than compensate for the effect of changing death rates.

The positive indirect fertility effect of improved health operates through a decline in widowhood, and may be particularly pertinent in societies with little widow remarriage. As life expectancy improves, there is a decrease in the frequency of early widowhood (before age 50), so that by the time they become widows, women have generally been married longer and had time to have more children. These statements were quantified in simulations carried out by Ridley et al. (1967) using reproductive parameters typical of the Indian subcontinent. It was assumed that husbands were seven years older than their wives and that few widows remarried; life expectancy was allowed to rise in approximately 10-year steps from 31 to 72. Marriage duration for ever-married women age 50 increased by almost 10 years. Among women of that age who had not been widowed, the number of children born declined by over 11 percent because of the change in infant deaths; the number of widows decreased by two-thirds. The declines in the fertility rate and in both the number of widows and duration of widowhood turned out to be compensatory: the average number of

children borne by all women age 50 remained constant as life expectancy increased by over 40 years. Thus, in addition to the small direct effect of mortality improvements on fertility, there are indirect effects that tend to counterbalance one another in the population as a whole. The effect on the fertility of widows, on the other hand, is highly significant unless nearly all widows remarry quickly.

Socioeconomic and Cultural Factors

Because health and nutrition effects are relatively small, it must be concluded that variation in the proximate determinants of fertility must be due largely to sociceconomic and other cultural variables. The sensitivity analysis presented above indicated that the factors whose variation was most important were, in order, age at marriage, postpartum infecundability, waiting time to conception, and sterility. Neither age at marriage nor waiting time to conception will be discussed in this section. Age at marriage is receiving major attention as the topic of two papers in these volumes (Burch and Smith). As for time to conception, although it is known to be affected by the frequency and timing of intercourse, little is known of variation among regions, ethnic groups, and larger populations in this aspect of sexual behavior (Nag, in these volumes). Moreover, the fertility effects of postpartum infecundity and worldwide changes in breastfeeding practices are increasingly recognized as having the greater importance.

Postpartum infecundability is determined by the duration of amenorrhea (which in turn is extremely sensitive to breastfeeding practices) and, in certain cultures, by the extent of postpartum taboos against sexual intercourse. It has long been known that taboos against sexual intercourse during lactation exist in many societies, especially in sub-Saharan Africa; only recently, however, has the extent to which fertility may be affected by such taboos been recognized. Nag (in these volumes), Page and Lesthaeghe (1981), and Lesthaeghe (1981) review what is known about this practice both during lactation and after children are grown, although the latter affects fertility less because it generally occurs at ages when fertility is already low due to biological or other factors.

Variations in amenorrhea and breastfeeding according to socioeconomic and cultural factors are a rather recent topic of research. It is now generally accepted that in many areas, breastfeeding is initiated less frequently and decreases in duration as education increases, is higher in rural than in urban areas, and exhibits marked differences across regions or ethnic groups (Nag, in these volumes; Lesthaeghe, 1981). The role of changing economic pressures and labor force participation in determining breastfeeding practices is not well understood, although there is considerable concern that the net effect is increased pressure to reduce lactation (Lesthaeghe, 1981).

Other elements of social change have also been considered to

promote a decline in breastfeeding. When human milk substitutes are not available, there is no alternative to breastfeeding an infant in the early months of life; the availability of commercial formula has thus made it possible for mothers to choose not to breastfeed at all. Beyond the neonatal period, there has always been substantial leeway in determining the limitation of supplemental feeding and the time of weaning. Recent evidence shows that traditional foods are given to infants at quite early stages in their development in many societies (Caldwell, 1981). Controversy remains over whether or not the availability and advertising of formula encourage earlier supplementation and weaning that have a deleterious effect on the infant and contribute to fertility change.

The ovulation-inhibiting effect of lactation is responsive not only to overall length of breastfeeding and introduction of supplementary foods, but also to variation in the frequency and duration of suckling (Short, 1982; Howie et al., 1981, 1982a, 1982b). Variation in the way mothers breastfeed in different cultures is extensive, yet little is known of the background variables involved. In fact, only recently have there been efforts to characterize breastfeeding patterns in a search for regularities and major differences.

Thus it is known that if breastfeeding practices change enough to reduce dramatically the duration of amenorrhea, the supply of children will increase equally dramatically; however, there is little understanding of what determines these practices. There is also mounting evidence from widely separated parts of the developing world that declines in breastfeeding are taking place. In reviewing the available data, Margulies (1982) finds that in Asia, surveys taken a number of years apart document falls in both the initiation and duration of breastfeeding in Thailand (Knodel and Debavalya, 1980; Knodel et al., 1982) and Taiwan (Millman, 1981). There is evidence of similar declines in Malaysia (Butz and DaVanzo, 1981) and Korea (Coale et al., 1979), and for Latin America, in Mexico (Keller et al., 1981) and Chile (Monckeberg, 1969). For Africa, the little information available suggests that, at least in some urban areas, there is a move away from traditional breastfeeding practices (Page and Lesthaeghe, 1981).

In sum, the bulk of the evidence demonstrates that infant feeding practices in many developing countries are changing in ways that will cause fertility to rise unless there is a major increase in the use of contraception or other methods of fertility control. If fertility change is to be understood, attention must be given to the complex determinants and consequences of patterns of feeding the young.

Effects on Child Survival

Survival of children from infancy to adulthood has increased sharply. It is recognized that infant and child mortality varies with the mother's age and parity; socioeconomic status, including education (of both parents) and income; adequacy of water supply; availability of

health care and control of disease; nutrition; and a host of other factors. There is major disagreement, however, over the relative importance of these factors. Because the decline in mortality has slowed in much of the developing world in recent decades, it has become especially important to address this issue, in particular to assess where changes in these determinants could promote improved survival.

Chen (in these volumes) outlines how research in this area might proceed. He suggests that mortality could be better understood if there were, as there is for fertility, a set of generally accepted proximate determinants whose effects on mortality at the individual level could be studied separately and in combination. He and Mosley (1980) have developed closely related examples of such a framework that postulate four major sets of proximate determinants, each to be considered in relation to the age of the child: (1) intergenerational maternal factors (e.g., age, parity, previous birth interval, nutrition); (2) dietary and feeding variables; (3) infections and infestations; and (4) childcare behavior, particularly in response to illness. All the remaining socioeconomic, cultural, and environmental factors influencing mortality are assumed to work through these. This kind of framework could help investigators coordinate research activity in ways that might yield effective strategies for improving health and survival. At this time, however, although there is no lack of theories and speculation, there is a surprising lack of consensus about the relative importance of the determinants of early mortality.

SUMMARY PROPOSITIONS

The above review of the supply of children and its determinants leads to the following conclusions:

1. The supply of children can be measured in a variety of ways; further research is needed to determine which measures are most appropriate to specific applications.
2. The supply of children differs widely among societies. Variations in natural fertility and in child survival are both responsible for these differences.
3. The most important determinants of natural fertility are the marriage pattern and postpartum infecundability.
4. Variations in the proximate determinants of natural fertility are caused primarily by socioeconomic and cultural factors; health and nutrition are relatively unimportant except in unusual circumstances.
5. Despite the importance of child survival in influencing the supply of children and population growth rates, our understanding of the determinants of early mortality, both proximate and socioeconomic or cultural, is poor.

NOTES

1. If demand factors limit fertility for a sizeable portion of the population, the remaining group, those whose fertility is determined by supply considerations, may not have the same distribution along supply factors as the total group. It is difficult, a priori, to predict the direction of this bias. If the group whose supply has not exceeded their demand consists mainly of low-fertility couples, overall supply will be underestimated; if it is made up predominantly of couples for whom there is abundant supply and childbearing and rearing are easy, supply will be overestimated. Thus, an unbiased estimate of supply for the entire population can be obtained only when fertility regulation is absent.
2. The age group 15-19 is usually not included in this standard schedule because its relative marital fertility varies considerably and eratically among populations. For example, if significant numbers of premarital conceptions occur, marital fertility between ages 15 and 20 is biased upwards, while a downward bias is found in populations where there is a delay between marriage and its consummation.
3. Although some of these assumptions may appear highly restrictive, they have in fact little or no impact on the results. For example, a higher or lower age at marriage would not influence the TFR because the age-specific fertility rates are proportionately inflated or deflated to obtain the desired TFR. Thus the supply of children as measured by the number surviving to age 20 would not be affected by a different age at marriage, and the number surviving to age 65 of the parent would be changed only very slightly. The assumption that husbands are the same age as their wives greatly simplifies the presentation because it permits all results to be given with reference to a single age of the parent rather than to either husband or wife. If there is a difference of x years between husband and wife, all estimates of supply variables refer to age (a) of the wife, and the same estimates are valid for the husband's age (a+x).
4. This calculation does not take into account the absence of postpartum infecundability after marriage; however, the resulting small error is ignored because it does not affect the conclusions reached here.
5. Some portion of this decline may be due to the exceptional emotional stress that accompanies famine and starvation; severe stress is itself known to interfere with regular ovulation in women who are not suffering from malnutrition. It is likely, however, that the acute malnutrition associated with famine has a direct physiological effect on the reproductive process.

APPENDIX

Define
- x = age of the child
- a = age of the mother
- c = age at which child reaches adulthood
- $l(x)$ = probability of survival from birth to age x
- $m(a)$ = probability of giving birth at age a
- TFR = total fertility rate
- N = average number of children surviving to age 20
- N' = average number of adult children surviving to age 45 of the parent
- N" = average number of adult children surviving to age 65 of the parent.

In stable populations it is easily shown that

$$N = l(20)\ \mathrm{TFR} \tag{1}$$

$$N' = \sum_{a=15}^{45-c} m(a)\ l(45-a) \tag{2}$$

$$N'' = \sum_{a=15}^{65-c} m(a)\ l(65-a). \tag{3}$$

In the calculations in this paper, it is assumed that c = 15 years. Define further:

- P(a) = probability of not having a live birth by age a
- PS(a) = probability of not having a surviving child by age a
- PSA(a) = probability of not having a surviving adult child by age a
- B(a) = average number of live births by age a; B(50) = TFR
- PN = probability of never having a child survive to age 20
- PN' = probability of not having a surviving adult child at age 45 of the parent
- PN" = probability of not having a surviving adult child at age 65 of the parent.

Brass (1958) has demonstrated that the probability of not having a live birth after T years of childbearing at a fixed rate E in a homogeneous population equals e^{-ET}. We can substitute ET = B(a) if the period of childbearing runs from a-T to a:

$$P(a) = e^{-B(a)}. \tag{4}$$

Krishnamoorty (1979, 1980) has demonstrated that this equation is also valid if the rate of childbearing varies with age, allowing the substitution of

$$B(a) = \sum_{y=15}^{a} m(y) \tag{5}$$

in equation (4), and that by using m(y) l(a-y) as the rate of production of children alive at age a of the mother, the probability PS(a) is estimated as

$$PS(a) = e^{-\sum_{y=15}^{a} m(y)\ l(a-y)} . \tag{6}$$

Using a similar argument and by introducing m(y) l(20) as the probability of producing a child that will survive to age 20, we find

$$PN = e^{-\sum_{y=15}^{45} m(y)\ l(20)} = e^{-N}. \tag{7}$$

A slight revision of equation (6) yields the probability of not having a surviving adult child at age a:

$$PSA(a) = e^{-\sum_{y=15}^{a-c} m(y)\ l(a-y)} , \tag{8}$$

so that $$PN' = e^{-\sum_{y=15}^{45-c} m(y)\ l(45-y)} = e^{-N'} \tag{9}$$

$$PN'' = e^{-\sum_{y=15}^{65-c} m(y)\ l(65-y)} = e^{-N''}. \tag{10}$$

The corresponding probabilities of not having a surviving son are obtained by multiplying N, N', and N" by the proportion of births that is male in equations (7), (9), and (10).

The above equations assume unrealistically that all women have the same rate of childbearing, m(a), at age a. In any actual population, this is of course not the case for several reasons, including celibacy and sterility. The nonexposure problem is taken care of by limiting the calculations to married women; however, this simple solution is not available to adjust for the effect of sterility because measurements of sterility are generally not available. An adjustment of the above equations can be made, however. Let s be the proportion of women that has never been fecund while married. In that case, equations (7), (9), and (10), after adjustment to take account of the effect of sterility, become

$$PN = s + (1-s)e^{-N/(1-s)} \tag{11}$$
$$PN' = s + (1-s)e^{-N'/(1-s)} \tag{12}$$

$$PN'' = s + (1-s)e^{-N''/(1-s)}. \qquad (13)$$

In Figure 4, which plots the relationship between PN (or PN' or PN") and N (or N' or N"), it is assumed that s = 0.03. This value is the estimated incidence of permanent sterility at age 20 (Henry, 1965), and therefore should be a reasonable estimate of s in populations where age at first marriage is below 20. A higher value of s should be used in populations with a higher mean age at marriage because the incidence of permanent sterility increases with age (Bongaarts, 1981; Henry, 1965).

For simplicity, it has been assumed in the derivation of the above equations that male and female infants have the same life expectancy and the same survival curve, l(x). This was not a necessary assumption, and a straightforward extension of the derivation produces equations for populations with a sex difference in mortality.

BIBLIOGRAPHY

Bongaarts, J. (1978) A framework for the analysis of the proximate determinants of fertility. Population and Development Review 2:105-132.

Bongaarts, J. (1980) Does malnutrition affect fecundity? A summary of the evidence. Science 208:564-569.

Brass, W. (1958) The distribution of births in human populations. Population Studies 18:51-72.

Butz, W., and J. DaVanzo (1981) Determinants of Breastfeeding and Weaning Patterns in Malaysia. Paper presented at the annual meeting of the Population Association of America, Washington, D.C.

Cain, M. T. (1982) Perspectives on family and fertility in developing countries. Population Studies 36:159-175.

Caldwell, J. (1981) Personal communication.

Coale, A. J., and P. Demeny (1966) Regional Model Life Tables and Stable Populations. Princeton, N.J.: Princeton University Press.

Coale, A. J., and T. J. Trussell (1974) Model fertility schedules: Variations in the age structure of childbearing in human populations. Population Index 40:185-258.

Coale, A. J., N. Goldman, and L. J. Cho (1979) Nuptiality and Fertility in the Republic of Korea. Paper presented at the Seminar on Nuptiality and Fertility sponsored by the International Union for the Scientific Study of Population, Bruges.

Davis, K., and J. Blake (1956) Social structure and fertility: An analytic framework. Economic Development and Cultural Change 4:211-235.

Easterlin, R. A. (1975) An economic framework of fertility analysis. Studies in Family Planning 6:54-63.

Easterlin, R. A. (1978) The economics and sociology of fertility: A synthesis. Pp. 57-113 in C. Tilly, ed., Historical Studies of Changing Fertility. Princeton, N.J.: Princeton University Press.

Eaton, J. W., and A. J. Mayer (1953) The social biology of very high fertility among the Hutterites: The demography of a unique population. Human Biology 25:206-264.

Frisch, R. E. (1975) Demographic implications of the biological determinants of female fecundity. Social Biology 22:17-22.

Frisch, R. E. (1978a) Nutrition, fatness and fertility: The effect of food intake on reproductive ability. Pp. 91-121 in W. H. Mosley, ed., Nutrition and Human Reproduction. New York: Plenum Press.

Frisch, R. E. (1978b) Population, food intake, and fertility. Science 199:22-30.

Henry, L. (1953) Fondements theoretiques des mesures de la fecondite naturelle. Review de L'Institut International de Statistique 21:132-252. (Translated in On the Measurement of Human Fertility, Elsevier.)

Henry, L. (1957) Fecondite et famille, models mathematiques. Population 12:413-444. (Translated in On the Measurement of Human Fertility, Elsevier.)

Henry, L. (1961) Some data on natural fertility. Eugenics Quarterly 6:81-91.

Henry, L. (1965) French statistical research in natural fertility. In M. C. Sheps and J. C. Ridley, eds., Public Health and Population Change. Pittsburgh, Pa.: University of Pittsburgh Press.

Henry, L. (1979) Current concepts and empirical results concerning natural fertility. In H. Leridon and J. A. Menken, eds., Natural Fertility. Liege: Ordina.

Hodgson, M., and J. Gibbs (1980) Children Ever Born. Comparative Studies No. 12. London: World Fertility Survey.

Howie, P. W., A. S. McNeilly, M. J. Houston, A. Cook, and H. Boyle (1981) Effect of supplementary food on suckling patterns and ovarian activity during lactation. British Medical Journal 283:757-759.

Howie, P. W., A. S. McNeilly, M. J. Houston, A. Cook, and H. Boyle (1982a) Fertility after childbirth: Postpartum ovulation in bottle and breastfeeding mothers. Clinical Endocrinology, in press.

Howie, P. W., A. S. McNeilly, M. J. Houston, A. Cook, and H. Boyle (1982b) Fertility after childbirth: Infant feeding patterns, basal prolactin levels and postpartum ovulation. Clinical Endocrinology, in press.

Keller, A., F. Samano, L. Nunez, and O. Mojarro (1981) Lactancia Materna: Tendencias Recientes en la Experiencia Mexicana. Mexico City: Direccion General de Salud Materno-Infantil y Planificacion Familiar de la Secretaria de Salubridad y Asistancia.

Knodel, J. (1977) Family limitation and the fertility transition: Evidence from the age pattern of fertility in Europe and Asia. Population Studies 31:219-249.

Knodel, J., and N. Debavalya (1980) Breastfeeding in Thailand: Trends and differentials 1969-1979. Studies in Family Planning 11:355-377.

Knodel, J., P. Kamnaunsilpa, and A. Chamratrithirong (1982) Breastfeeding in Thailand: Data from the 1981 Contraceptive Prevalence Survey. Population Studies Center Research Reports No. 82-20. University of Michigan, Ann Arbor, Mich.

Krishnamoorthy, S. (1979) Family formation and the life cycle, Demography 16:121-129.

Krishnamoorthy, S. (1980) Effects of fertility and mortality on extinction of family and number of living children. Social Biology 27:62-69.

Leibenstein, H. (1957) Economic Backwardness and Economic Growth. New York: Wiley and Sons.

Leridon, H. (1977) Human Fertility: The Basic Components. Chicago: University of Chicago Press.

Lesthaeghe, R. (1981) Lactation and Lactation-Related Variables, Contraception and Fertility: An Overview of Data Problems and World Trends. Paper prepared for the Seminar on Breastfeeding and Fertility Regulation sponsored by the World Health Organization and the U.S. National Academy of Sciences, Geneva.

Margulies, K. B. (1982) United States Opposition to the International Infant Formula Marketing Code. Unpublished Ph.D. thesis. Princeton University, Princeton, N.J.

Menken, J., J. Trussell, and S. Watkins (1981) The nutrition-fertility link: An evaluation of the evidence. Journal of Interdisciplinary History 11:425-441.

Millman, S. (1981) Breastfeeding in Taiwan: Trends and Differentials, 1966-1980. Paper presented at the annual meeting of the Population Association of America, Washington, D.C.

Monckeberg, F. B. (1969) The effect of malnutrition and environment on mental development. Pp. 216-220 in Proceedings of Western Hemisphere Nutrition Congress II, San Juan, Puerto Rico, August 1978. Chicago: American Medical Association.

Mosley, H. (1980) Social determinants of infant and child mortality: Some considerations for an analytical framework. Pp. 19-43 in Health and Mortality in Infancy and Early Childhood: Report of a Study Group. Cairo, Egypt: Population Council.

Page, H., and R. Lesthaeghe (1981) Childspacing in Tropical Africa: Traditions and Change. New York: Academic Press.

Ridley, J., M. Sheps, J. Lingner, and J. Menken (1967) The effects of changing mortality on natality. Milbank Memorial Fund Quarterly 45:77-97.

Sheps, M. C., and J. Menken (1973) Mathematical Models of Conception and Birth. Chicago: University of Chicago Press.

Short, R. V. (1982) The Biological Basis for the Contraceptive Effects of Breastfeeding. Paper prepared for the Seminar on Breastfeeding and Fertility Regulation sponsored by the World Health Organization and the U.S. National Academy of Sciences, Geneva.

World Fertility Survey (1966) Pakistan Fertility Survey. Pakistan: Population Planning Council of Pakistan.

World Fertility Survey (1967) Nepal Fertility Survey. Kathmandu: Ministry of Health.

World Fertility Survey (1968) Bangladesh Fertility Survey. Dacca: Ministry of Health and Population.

Chapter 3

NATURAL FERTILITY: AGE PATTERNS, LEVELS, AND TRENDS

John Knodel*

This paper begins with a discussion of the concept of natural fertility. This is followed by a discussion of the age pattern of natural fertility and a number of factors which could potentially influence it, in particular the following: breastfeeding, postnatal abstinence, terminal abstinence, declines in pathological infertility, age differences between spouses, age at marriage, and premarital pregnancy. Hypothetical examples are used to illustrate the potential impact of these factors on the age pattern. The final section of the paper discusses trends in the actual or underlying level of natural fertility, particularly how changes in the level could be related to modernization. Throughout the paper, reference is made to material both from historical demography and from studies based on contemporary developing countries.

DEFINING NATURAL FERTILITY

Although the term had been used earlier (e.g., Pearl, 1939), it was both the theoretical and empirical work of Louis Henry that made natural fertility a standard concept in the field of demography (e.g., Henry, 1953, 1956, 1961, 1979; Gautier and Henry, 1958). In his first article on the subject, Henry (1953:135) defined natural fertility as "fertility of a human population that makes no deliberate effort to limit births." He later refined the concept to refer to fertility in the absence of parity-dependent birth control or, as he put it, in the absence of behavior to control births which is "bound to the number of children already born and is modified when the number reaches the maximum which the couple does not want to exceed" (Henry, 1961:81). Behavior which prolongs the interval between births but is independent of parity is not considered contrary to natural fertility. Examples of such behavior include breastfeeding, postnatal abstinence, and temporary migration separating spouses, provided there is no

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association with the number of children already born. Henry also pointed out that the concept of natural fertility can be applied most appropriately to reproductive behavior within marriage or similarly stable sexual unions rather than to general fertility since the latter is so strongly contingent on prevailing marriage patterns.

However, the distinction between natural and controlled fertility, as defined by Henry and as typically used in the demographic literature, involves certain ambiguities. First, it is necessary to distinguish between deliberate attempts to stop childbearing before the end of the reproductive period and deliberate attempts to space children; it is also necessary to distinguish attempts to stop or space that are intended to limit family size from those that are not. These distinctions and their possible combinations are represented in Table 1.

Clearly, situations in which both deliberate stopping and spacing behavior are absent conform to the definition of natural fertility. Likewise, situations in which couples deliberately space their births, but not to limit family size, and at the same time make no attempt to stop childbearing before the end of the reproductive span, would generally be classed as another variant of natural fertility. Recent research suggests that this latter situation may be more common than previously recognized by most demographers. For example, surveys in Nigeria and Indonesia undertaken in areas where postnatal abstinence is common indicate that this practice is explicitly viewed by many as a way to space births for the benefit of the health of both the child and the mother, but not to limit family size (Caldwell and Caldwell, 1977; Singarimbun and Manning, 1976; Rehan and Abashiya, 1981).

TABLE 1 Natural and Controlled Fertility as Defined by the Occurrence of Deliberate Spacing and Stopping Behavior

	Deliberate Stopping		
Deliberate Spacing	Absent	Without Intent to Limit Family Size	With Intent to Limit Family Size
Absent	natural fertility	ambiguous	controlled fertility
Without intent to limit family size	natural fertility	ambiguous	controlled fertility
With intent to limit family size	ambiguous	ambiguous	controlled fertility

Data from a variety of less developed countries show a similar motive for other forms of birth control, including withdrawal and abortion (Caldwell and Caldwell, 1981; Weiss and Udo, 1981; Cantrelle and Ferry, 1979). In some populations, women may deliberately extend the period of breastfeeding for its contraceptive effect; for example, scattered comments by contemporary observers in preindustrial Europe suggest that, in some areas, women purposely prolonged breastfeeding to delay the next pregnancy (Shorter, 1975:176; Knodel, 1979). If these practices are not parity-specific and are intended only to space births rather than to reduce family size, they would seem compatible with natural fertility. Occasionally, arguments are made to the contrary (Caldwell and Caldwell, 1977), and scholars sometimes choose to exclude all forms of birth control in defining natural fertility (e.g., Leridon, 1975). The recent focus on child spacing, particularly in sub-Saharan Africa, will help to clarify this issue (Page and Lesthaeghe, 1981).

More problematic is a situation in which couples rely on spacing but not stopping as a way to limit family size. This violates the natural versus controlled fertility dichotomy, since it represents an intent to limit family size that is not parity-dependent. Although empirical situations of this type have yet to be convincingly identified, they do remain a logical possibility. There are good reasons for defining natural fertility to include deliberate birth spacing regardless of intent, provided it is largely non-parity-specific. From a practical point of view, it is easier to indirectly detect evidence of parity-dependent family-size limitation than deliberate attempts at birth spacing from fertility behavior (e.g., Henry, 1967; Wrigley, 1966; Knodel, 1979). Substantively, such a definition of natural fertility is useful; both the historical European experience and contemporary experience in developing countries indicate that parity-dependent family-size limitation rather than increased child spacing was the key feature in the onset of the fertility transition (Knodel, 1979, 1981; Knodel and Debavalya, 1978; Siddiqui, 1979; for a dissenting view, see Friedlander et al., 1980).

Controlled fertility is defined by attempts to stop (or at least slow down) childbearing once some target number of children has been reached. Thus deliberate stopping with the intent to limit family size is clearly controlled rather than natural fertility, regardless of the presence or absence of spacing. However, stopping behavior practiced without intent to limit family size again represents a grey area between natural and controlled fertility. Such circumstances might be present in populations where terminal abstinence is associated with grandmaternal or mother-in-law status. Only recently have empirical data on this practice become available (e.g., Ware, 1979; Caldwell and Caldwell, 1977; Caldwell, 1979; Bhatia and Ruzicka, n.d.). Clearly, such practices will be correlated with parity (the larger the number of children born, the greater the chance of being a mother-in-law or a grandmother); thus, such practices may have an effect on fertility similar to that of behavior designed to limit family size and may be difficult to distinguish without direct evidence.

On the other hand, although such ambiguities surround the concept of natural fertility, it can safely be used to characterize most populations prior to the modern decline of marital fertility. Deliberate birth control, for either spacing or limiting purposes, has probably been quite limited even recently in most populations in the developing world, especially if postpartum abstinence intended primarily to increase the survivorship of children and mothers is excluded. Considerable evidence from the early contraceptive knowledge, attitudes, and practice (KAP) surveys in the 1960s shows that birth control practice, and in many cases knowledge of birth control methods, was quite minimal throughout the developing world. Although the situation has changed radically in some countries during the last decade or two, recent surveys indicate that in many others it has not (Mauldin, 1965; Nortman, 1977; Nortman and Hofstatter, 1980; United Nations, 1979).

Reliable data on populations in a state of natural fertility are difficult to obtain: often, by the time a society has developed a statistical system capable of providing high-quality data, family-size limitation practices have also spread. Thus much of the work on natural fertility has been done within the framework of historical demography through analysis of geneologies or, more commonly, of data assembled from parish registers through family reconstitution. However, recent improvements in survey techniques have generated data of at least moderate quality for less-developed-country populations in which family-size limitation is not yet widely practiced. These data are frequently based on recall and thus are probably less accurate than data provided by historical demographers; however, they are often based on more representative samples and can also be supplemented with direct information about the prevalence of birth control, which is often collected as part of such surveys. Finally, it is evident that the concept of natural fertility recognizes social as well as biological influences on fertility in the absence of parity-specific control. The focus on marital fertility does ignore the question of the extent to which family size is regulated, deliberately or otherwise, through the age and prevalence of marriage. Investigation of this issue is not precluded by study of the determinants of natural fertility. However, the concept of natural fertility implies that incorporating demand or choice variables on the level of the individual couple is inappropriate to an explanation of temporal changes or cross-sectional differentials in marital fertility in natural-fertility settings provided spacing is not done with the intent of limiting numbers (see De Tray, 1979; Lesthaeghe, 1980). Instead, supply-side variables are expected to account for virtually all variations (Easterlin, 1978a, 1978b; Easterlin et al., 1980).

THE AGE PATTERN OF NATURAL FERTILITY

The distinction between natural and controlled fertility has important implications for the age patterns of childbearing. Although the concept of natural fertility does not imply a particular fertility

level, the specification that it be free of parity-dependent control suggests that the shape of the age-specific schedule of marital fertility will be determined primarily by the decline of fecundity with age. In contrast, in populations where family-size limitation is common, age-specific marital fertility rates tend to decline more rapidly at earlier ages and to be particularly low at older ages. This is because most married couples wishing to limit their family size typically concentrate childbearing in the early part of the wife's potentially fertile period. Since the proportion of couples reaching their desired family size increases with age, so do efforts to prevent further births. The result is to lower fertility disproportionately at the later reproductive ages in comparison with natural-fertility populations (see Henry, 1961; Knodel, 1977). Coale and Trussell (1974) have developed a standard age-specific schedule of natural fertility based on Henry's 1961 article. This standard is thought to embody the typical age pattern of natural fertility. In the upper left panel of Figure 1, age-specific marital fertility curves are plotted for five populations where deliberate birth control is assumed to be minimal; in the lower left panel, the same is done for three populations where desired family size is known to be low and birth control is virtually universally practiced. For comparative purposes, the Coale-Trussell natural fertility standard is also plotted in both panels. Fertility rates below ages 20-24 are not considered because premarital conceptions and teenage subfecundity have a large and irregular impact on teenage marital fertility in a number of populations.

Although the quality of the data vary, they do support the general absence of birth control practices in the five natural-fertility populations shown. Direct evidence is available for Bangladesh (Nortman and Hofstatter, 1980) and the Philippines (Laing, 1979); the lack of birth control is deduced for Northern Algeria (Vallin, 1978), Chinese farmers (Barclay et al., 1976), and Bavarian villages (Knodel, 1979). Direct evidence of contraceptive prevalence is available for all three of the controlled-fertility populations (Chang et al., 1981; Menken et al., 1979).

The natural-fertility examples were chosen to represent a wide range of the natural fertility levels thus far observed. The unusually high level found in the Bavarian villages is undoubtedly related to an aversion to breastfeeding (Knodel and van de Walle, 1967); indirect evidence confirms that postpartum infecundity was probably quite short in these villages, perhaps no more than two or three months (Wilson, 1980; Knodel, 1981). In contrast, in Bangladesh, the evidence suggests that postpartum amenorrhea is probably on the order of 18 months (Chen et al., 1974). Total marital fertility above age 20 (calculated as five times the sum of the age-specific rates for five-year age groups) is 10.3 for the Bavarian villages, 6.6 for Bangladesh, and 4.9 for the Chinese farmers; these differences largely reflect variations in average birth intervals. Despite these differences, however, all five of the natural-fertility age curves share a common convex shape. In contrast, the curves for the three populations characterized by extensive birth control are

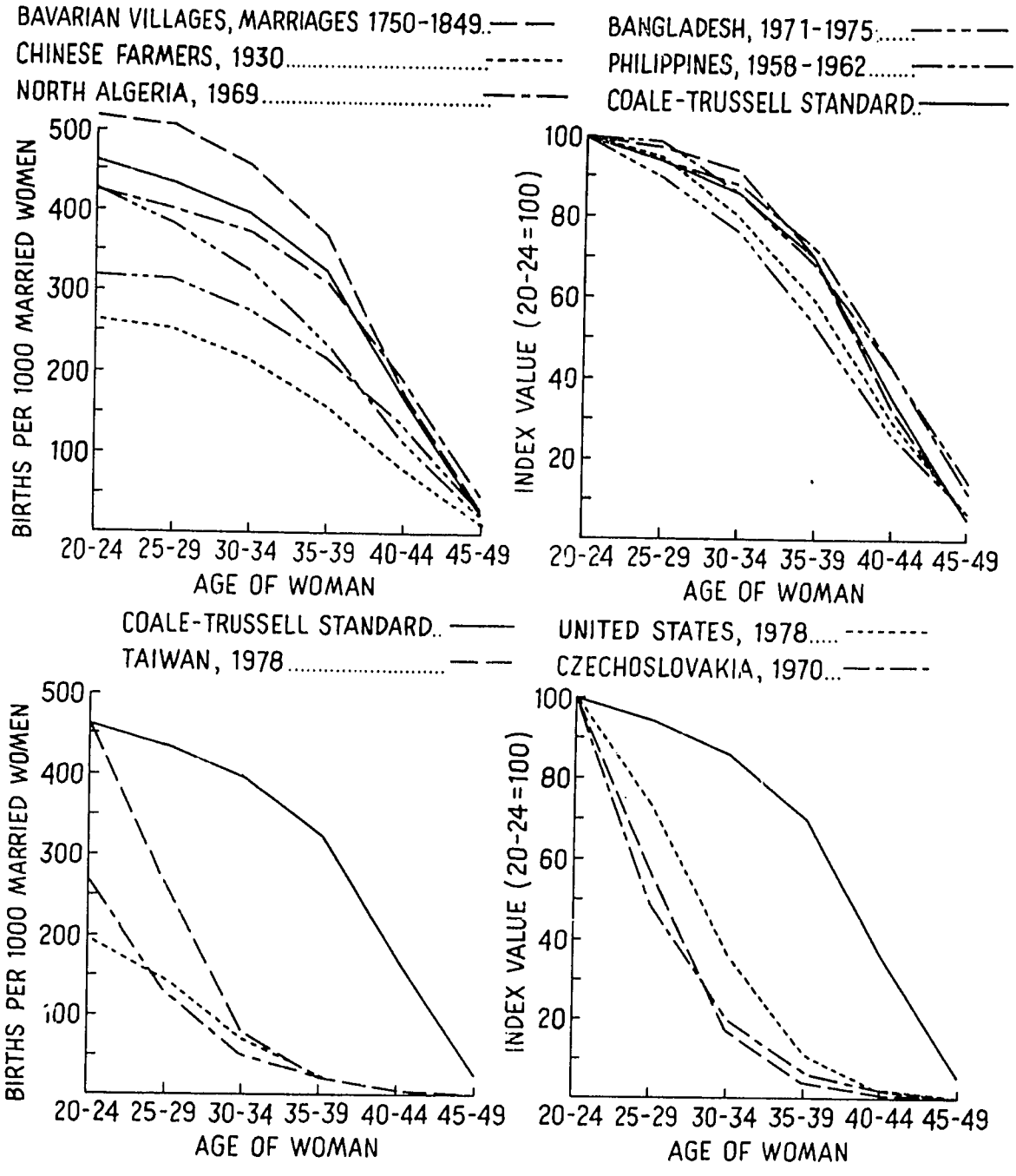

FIGURE 1 Age-Specific Marital Fertility Schedules: Rates and Index Values for Selected Populations

clearly concave. One way to standardize for the level of fertility is to express the rate at each age as a percentage of the rate at ages 20-24. This has been done in the right-hand panels of Figure 1. The results show even more clearly the similar convex shape of the five natural-fertility curves and their contrast with the concave shape of the controlled-fertility curves. One result of the common age pattern

of natural fertility is that the proportion of total marital fertility occurring up to a given age is quite similar in natural-fertility populations and sharply contrasts with that of controlled-fertility populations. Thus the percent of total marital fertility above age 20 occurring by age 30 is 50 and 52 percent, respectively, for the Bavarian villages and the Chinese farmers despite their very different levels of natural fertility; in contrast, between 78 and 87 percent of total marital fertility occurs by age 30 for the three controlled-fertility populations.

Not all age-specific marital fertility curves in natural-fertility populations conform as closely to the standard as those shown in Table 1. This is illustrated in Table 2, which presents index values of age-specific marital fertility rates for several such samples. Direct evidence on the virtual absence of contraceptive practice is available for all the populations shown (Nortman and Hofstatter, 1980; United Nations, 1961; Jones, 1977). Several deviations from the Coale-Trussell standard are evident from these examples: in two of the three fertility schedules presented for Nepal and in all three of those presented for Pakistan, marital fertility for women 25-29 is greater than for women 20-24; in rural Mysore, Sumatra, and West Java, fertility after age 30 falls considerably more rapidly with age than is indicated by the natural-fertility standard; and in all the Nepalese examples and two of the three Pakistani examples, marital fertility at ages 45-49 is much higher relative to fertility at ages 20-24 than the standard specifies.

These deviations may represent genuine departures from the usual pattern of natural fertility; however, it is unfortunately impossible to rule out problems of data quality as the source of most of these differences. Such problems make it particularly difficult to study age patterns of natural fertility in developing countries. Both age misstatements and differential completeness in the reporting of births by age of respondent can substantially affect the apparent patterns; problems of sample size cause further complications. These problems are underscored by the examples for both Nepal and Pakistan, which indicate that, within a single country, estimates derived from different surveys or different years can yield quite different patterns.

The age pattern of natural fertility is the net result of biological, environmental, and behavioral factors. Undoubtedly, the most important of these are the biological factors, particularly increased physiological sterility with age. Not only does female sterility increase with age, reaching 100 percent by about age 50, but also the risk of intrauterine mortality increases sharply toward the end of the women's reproductive span (Gray, 1979). The physiological ability of men to father a child also declines with age, although in a less well-defined manner than female fecundity. Age patterns in fecundity during the initial part of the reproductive span, especially for women, may also vary among different countries; this could affect the age pattern of natural marital fertility if cohabitation begins prior to the achievement of full fecundity. Environmental factors

TABLE 2 Index Values of Age-Specific Marital Fertility Rates, Selected Populations

Population and Year	Source	Index Values of Marital Fertility (20-24 = 100)					
		20-24	25-29	30-34	35-39	40-44	45-49
Nepal, 1975	A	100	103	85	74	30	11
Rural Nepal, 1974-75	B	100	107	96	65	37	22
Rural Nepal, 1977-78	B	100	96	85	63	27	10
Pakistan, 1974-75	C	100	102	81	62	29	3
Pakistan (West), 1968-71	D	100	103	96	78	50	38
Pakistan (West), 1963-65	E	100	106	100	72	35	22
Rural Mysore, 1951	F	100	98	60	55	19	n.a.
Rural Sumatra, 1963-70	G	100	89	76	58	31	5
Rural West Java, 1965-70	G	100	91	78	58	32	4
Coale-Trussell Standard	H	100	94	86	70	36	5

Note: n.a. = not available.

Sources:

A. Nepal, Health Ministry (1977:47).
B. Demographic Sample Survey of Nepal, cited in UN ESCAP (1980). Age-specific marital fertility rates were estimated by dividing the age-specific rates by the proportions currently married according to the Nepal Fertility Survey (Source A).
C. Pakistan, Population Planning Council (1979:78).
D. Population Growth Survey as cited in Source C.
E. Population Growth Estimation Experiment (CD results) as cited in Source C.
F. United Nations (1961).
G. McDonald et al. (1975).
H. Coale and Trussell (1974).

which might affect the age pattern of fertility include health conditions, the availability of medical care, and nutritional levels (see Gray, in these volumes). Finally, as noted above, a host of age- or parity-specific behaviors, even if not practiced with the intent of affecting fertility, may influence the age pattern of fertility in the absence of deliberate birth control. Examples include the prevalence and duration of breastfeeding, postnatal and terminal abstinence, a

decline in pathological infertility, age differences between spouses, age at marriage, and premarital pregnancy.

Undoubtedly, these biological, environmental, and behavioral factors are all intimately interwoven. For example, health conditions and nutritional levels may affect the age disposition toward secondary sterility, as well as the age pattern of intercourse; likewise, the influence of the age gradient of male sterility on the age pattern of natural fertility will vary with environmental and behavioral influences (see Bongaarts, in these volumes; Nag, in these volumes; Gray, in these volumes). Unfortunately, with the main exception of some of the biological factors, there is little empirical knowledge of the impact of many of these factors (see, however, Bourgeois-Pichat, 1979; Srinivasan and Jejeebhoy, 1980). The discussion below of potential influences on natural-fertility age patterns is therefore necessarily a rough assessment.

Breastfeeding

There is now substantial agreement within the scientific community that breastfeeding suppresses fertility by delaying the return of ovulation following a birth (see Bongaarts, in these volumes). There is some evidence of an awareness of this fact among women in historical populations who may have prolonged breastfeeding accordingly, although this evidence is scanty and does not permit any firm conclusions. Direct evidence is also scarce on the extent to which women in contemporary developing countries consider fertility suppression in determining their breastfeeding practices. In a 1976-77 Malaysian survey, 60 percent of the female respondents replied that they thought it more difficult to become pregnant while breastfeeding, and 20 percent believed it impossible (DaVanzo, 1980). In a 1970 Taiwan survey, over one-fifth of the women questioned indicated they believed it was impossible to get pregnant while breastfeeding (Millman, personal communication); unfortunately, this survey did not provide information on the proportion of women who felt that the <u>probability</u> of becoming pregnant while breastfeeding was reduced.

In both Thailand and Taiwan, women who say they want no additional children breastfeed longer on average than those who want additional children; in Taiwan, the former group are also more likely to initiate breastfeeding (Knodel and Debavalya, 1980; Millman, 1981). There is thus indirect evidence that at least some women may be using breastfeeding to postpone the next birth. Nevertheless, available evidence suggests that, unlike family planning practices, the relationship between breastfeeding and age or parity is generally weak and varies in direction from country to country. Based on data from surveys in eight developing countries done around 1976 in connection with the World Fertility Survey, Jain and Bongaarts (1981) conclude that the effect of age and parity on breastfeeding is unimportant. Ferry (1981) reviews an even larger number of the results from countries participating in the World Fertility Survey and finds a weak positive relationship with age in most. On the other hand,

interpretation is complicated by biases in the data and by the probability that in some countries, there has been a recent trend toward a decrease in the duration of breastfeeding. If older women are less receptive to change, they will be less likely to follow this trend; this will in turn result in a positive relationship with age independent of any relationship between age and the desire to limit future childbearing. However, as will be demonstrated below, although breastfeeding appears to vary little with age, differences in the average duration across populations can still have some influence on the age pattern of marital fertility.[1]

Postnatal Abstinence

The practice of postnatal abstinence is often linked to lactation (see Nag, in these volumes). Among the Yoruba in Nigeria and the Central Javanese in Indonesia, for example, there is a common belief that sexual intercourse has a detrimental effect on the mother's milk (Caldwell and Caldwell, 1981; Singarimbun and Manning, 1976). However, there is by no means a one-to-one correspondence between the period of sexual abstinence following a birth and breastfeeding (Schoenmaeckers et al., 1981). In many societies, abstinence is shorter than the period of breastfeeding; in others, such as the Yoruba, abstinence typically extends beyond the period of breastfeeding.

In contrast with breastfeeding, there are few systematic, quantitative data on the extent to which postnatal abstinence relates to age or parity. Two recent studies provide notable exceptions. In a Nigerian survey carried out in Ibadan City in 1973, almost no association was found between the number of surviving children and the most recent completed period of postnatal abstinence when all women were considered together (Caldwell, 1979). Indeed, almost identical periods of postnatal abstinence were reported for women with one through seven surviving children; only those with eight or more reported a slightly longer period of postnatal abstinence. When both age and number of surviving children were controlled, there was a general tendency for the period of abstinence to increase with age but to decrease with the number of surviving children within each age category. Caldwell suggests that women with shorter durations are more likely to achieve higher numbers of surviving children by any given age; moreover, because parents gain confidence about their children's survival chances as they successfully build a family, some become willing to risk reducing the period of abstinence. In an Indonesian study, Singarimbun and Manning (1976) report duration of postnatal abstinence by age for women living in the Central Javanese village of Mojolama. Their results, which refer to the reported usual period of abstinence rather than the most recent period, show very little variation among women of different ages, although the median reported period of abstinence for women aged 45 and over is slightly longer than that for younger women. They also report that average duration of abstinence declines slightly for higher-order births;

however, this may reflect the ability to have more births if the period of postpartum abstinence is shorter rather than an influence of parity on duration of abstinence. In both the Nigerian and Indonesian studies, the average period of abstinence reported is around two years. The slight positive association between period of abstinence and age found in both surveys may reflect a trend toward shorter abstinence over time in which older women participate less than younger women, rather than an age-specific effect for particular cohorts.

In general, the evidence for both breastfeeding and postnatal abstinence is compatible with the concept of natural fertility. Nevertheless, even independent of any relationship with age, variations among countries in the characteristic period of either practice could affect the age pattern of natural fertility: addition or subtraction of the same number of months to the birth interval at each age for those women who are still fertile would contribute proportionately different amounts to the fertility rates at each age. This can be illustrated by a simple hypothetical example. In his contribution for these volumes, Bongaarts reports the estimated percent of couples sterile according to the age of the wife at ages 20, 25, and so on through age 50. The average proportion fecund during each five-year age group can be estimated from these figures (by averaging the proportions not sterile at the end points). If we combine the percentage fecund with the standard natural fertility schedule provided by Coale and Trussell (1974), it is possible to estimate the fertility for each five-year age interval of those couples that were fecund during that interval (this is done simply by dividing the standard age-specific marital fertility rate by the proportion of couples fecund). The average birth interval experienced by these couples is approximated by the reciprocal of their fertility rate. By simply adding or subtracting a given amount (for example, half a year) from the estimated interval, we can then work backwards and calculate what the age-specific marital fertility rate would be if birth intervals were either extended or shortened by that amount. Such characteristically longer or shorter intervals could reflect differences in the length of breastfeeding or postnatal abstinence in different populations. The same lengthening or shortening of birth intervals is done at each age, on the assumption that breastfeeding or postnatal abstinence is not age-specific.

The results of this hypothetical exercise are shown in the second tier of figures in Table 3. Since the interest is in the age pattern rather than in the level of fertility, index values with the 20-24 group set at 100 are shown rather than absolute values of marital fertility rates. Comparison of the results of the exercise just described with the Coale-Trussell standard, shown in the first tier of figures, indicates that when half a year is added to the birth intervals at all ages, the age gradient is less steep than that of the standard; the opposite is true when six months is subtracted from the standard. This calculation is probably exaggerated, however, since it does not consider the compensating effect of the positive association between length of postpartum nonsusceptibility or abstinence and

TABLE 3 Illustrative Hypothetical Example of Impact of Various Factors on the Age Pattern of Natural Fertility

	Index Values of Marital Fertility (20-24 = 100)						
	20-24	25-29	30-34	35-39	40-44	45-49	Coale-Trussell m
Coale-Trussell Standard	100	94	86	70	36	5	.00
Impact of shorter or longer breast-feeding or postnatal abstinence							
Populations with birth intervals 6 months longer than standard	100	94	87	73	40	6	-.06
Populations with birth intervals 6 months shorter than standard	100	92	83	66	32	4	.09
Estimated impact of terminal abstinence associated with grandmaternal or mother-in-law status							
Abstinence and proportion of grandmothers as in Nigeria	100	94	86	66	27	2	.19
Abstinence as in Nigeria but proportion of grandmothers as in Nepal	100	94	83	56	20	1	.40
Increase in proportion pathologically sterile with age due to decline over recent period as in Zaire	100	89	77	59	29	4	.16

Note: The Coale-Trussell m index is calculated using the least squares regression technique applied to age groups 20-24 through 40-44, as proposed by Coale and Trussell (1978).

potential overlap with the onset of secondary sterility.

Also shown in Table 3 is the Coale-Trussell m index, frequently used to indicate the extent to which a given marital fertility schedule departs from the standard age pattern of natural fertility (Coale and Trussell, 1974). This index is constructed so that it will equal zero if the shape of the fertility schedule in question is identical to that of the standard. The more quickly marital fertility falls with age, the higher the value of the m index; thus in controlled fertility populations such as those shown in Figure 1, values can be well over 1.0 or even 2.0. Negative values of the index will result if marital fertility declines more slowly with age than in the standard. Thus the m values for the natural-fertility populations shown in Figure 1 range from -0.11 for Algeria to 0.22 for the Philippines, while for the controlled-fertility populations shown,

they range from 2.06 for the U.S. to 2.49 for Taiwan. Although there is no definitive way to identify a substantial deviation from zero, deviations of around 0.2 in either direction generally cannot be said to indicate an important departure from the typical pattern; therefore, the m index must be used cautiously as an indicator of deliberate family-size control.

In sum, differences in the length of postpartum abstinence or postpartum infecundability associated with breastfeeding, even though not age-specific, could affect the age pattern of natural fertility, although only to a relatively minor extent. Had larger amounts than six months been added to or subtracted from the birth interval, somewhat more striking departures from the standard schedule would have resulted.

Terminal Abstinence

As discussed above, terminal abstinence associated with grandmothers or mothers-in-law poses a greater challenge to the concept of natural fertility than does postnatal abstinence. Since any practice of terminal abstinence prior to the end of the reproductive span will be associated with age, the potential for altering the shape of the age pattern of natural fertility is substantial.

In a high-fertility population, becoming a grandmother and a mother-in-law are closely linked in time; therefore, although much of the following discussion will refer to grandmothers, it generally applies equally to mothers-in-law. There are many references to an aversion to sexual relations in connection with achieving grandmaternal status, particularly for Africa and India (e.g., Lesthaeghe et al., 1981; Nag, 1980; Ware, 1979; Srinivasan and Jejeebhoy, 1980); however, there is little quantitative evidence on the extent of this phenomenon. An important exception is a survey of 420 Yoruba females aged 40-44 in the Western state of Nigeria (Caldwell and Caldwell, 1977): approximately one quarter of these women who were not yet grandmothers indicated that they were terminally abstinent, compared to three-quarters of those who had already become grandmothers. On the other hand, in a Bangladesh survey, although grandmothers and women with married children were more likely to be abstinent than their age peers and were characterized by lower coital frequency, the differences were not very marked (Ware, 1979; Bhatia and Ruzicka, n.d.). Thus the relationship between terminal abstinence and grandmaternal or mother-in-law status is quite variable.

The effect of grandmaternal terminal abstinence on the age pattern of marital fertility will depend on a variety of factors, including the proportion of women at different ages that are grandmothers, the proportion of grandmothers that adhere to the practice of abstinence, and the proportion of nongrandmothers following the practice. The first of these factors is in turn strongly dependent on the age at first birth (and thus on age at marriage): where age at first birth is late, as in historical Europe, very few women will be grandmothers

before age 45, so that a proscription on intercourse for grandmothers will have virtually no effect on marital fertility; if the age at first birth is quite early, as in several developing countries, the effect could be substantial. The third tier of Table 3 illustrates the potential effect of grandmaternal terminal abstinence by presenting hypothetical examples for two countries--Nigeria and Nepal--having different proportions grandmothers.[2] As would be expected, the effect would be a more rapid decline of fertility at older ages than is true in the Coale-Trussell standard. This decline is considerably more pronounced when the higher Nepalese proportions of grandmothers are used.[3]

On the other hand, although the potential impact of grandmaternal terminal abstinence could be substantial, there is little empirical support for such an impact. For example, the age-specific marital fertility curves for Nepal shown in Table 2 do not show such a rapid decline in marital fertility with age. Similar observations may be made for Nigeria (Caldwell and Caldwell, 1977, Appendix B; Weiss, 1981). The example from rural Mysore in Table 2 does resemble rather closely the pattern of the more extreme example in Table 3, although factors other than grandmaternal terminal abstinence may well be at work; for example, there is some evidence that the frequency of intercourse falls faster with age (after excluding the terminally abstinent) in Hindu populations (Ware, 1979).

Decline in Pathological Infertility

There is evidence from several populations, particularly in sub-Saharan Africa, of recent dramatic declines in the levels of pathological infertility associated with venereal and other diseases (Nag, 1980). As an extreme example, Romaniuk (1980) cites several regions of Zaire where the percent childless among women in the prime reproductive ages declined from around 40 to around 10 percent. Such sharp decreases in pathological fertility are generally attributed to the introduction of modern antibiotics, often through mass campaigns. Since such campaigns have a greater impact on younger than older women, who already have irreparable damage, one result of this decline is a temporary distinct <u>positive</u> association between age and proportion childless among married women in the reproductive ages (Romaniuk, 1980).

The bottom tier of Table 3 illustrates a hypothetical example of how rapid declines in pathological sterility can temporarily distort the age-gradient of sterility, and hence the age pattern of fertility.[4] It should be noted, however, that this impact is sufficient to increase the Coale-Trussell m index only to 0.16, suggesting that even radical changes in pathological fertility have far less impact than moderate amounts of birth control on the age pattern of marital fertility. Moreover, it should be remembered that any impact of pathological sterility on the age pattern of fertility will be temporary, and that high levels of infertility such as those found in Zaire are quite unusual for most less developed countries.

Age Difference Between Spouses

Several studies using historical data have pointed to a significant influence of husbands' ages on their wives' fertility in populations practicing little family-size limitation (Anderson, 1975; Houdaille, 1976; Knodel, 1978). Table 4 shows two empirical examples from two sets of villages located in different areas of Germany. In both cases, the marital fertility of women at any given age is generally inversely related to the age of their husbands: those with husbands younger than themselves usually have the highest fertility, while those with husbands in the highest age-difference category have the lowest fertility. This relationship is conveniently summarized by the total marital fertility rate above age 20: in comparison with cases in which the husband was younger than the wife, women in the four Baden villages with husbands 20 or more years older than themselves experienced 14 percent lower fertility; in the four Waldeck villages, those with husbands five years older experienced 10 percent lower fertility. A closer examination of Table 4 reveals that proportionately, the impact of age differences between spouses generally increases toward the end of the woman's reproductive span. As a result, the age pattern of fertility is also affected by age differences between spouses. This is shown more clearly in the bottom panel of Table 4, which presents index values of the marital fertility rate for women aged 20-24 set to 100.

Several recent reviews of nuptiality patterns in developing countries have revealed considerable intercountry differences in age at marriage, as well as in age differences between spouses (Durch, 1981; Smith, 1980). For example, in Bangladesh, the mean age difference at marriage of men and women is approximately eight years, while in Thailand, it is only about two and a half years. This variation could be expected to result in some differences in the age pattern of natural fertility among developing countries. Moreover, the age gap between spouses in most contemporary developing countries is larger than it was in Western European populations (Laslett, 1977; Knodel and Maynes, 1976). This may contribute to the faster decline in marital fertility with age often found in the former, even when little contraceptive practice is reported. Judging from the results of Table 4, however, the impact of this factor on the age pattern of natural fertility is likely to be rather moderate.

Age at Marriage

Where efforts to terminate childbearing before the end of the reproductive period are absent, there is of course a very strong inverse relationship between the number of children ever born and age at marriage at the level of individual couples. However, only recently has it become generally recognized that, in most natural-fertility populations, there is also an association between age at marriage and age-specific marital fertility rates. Previously, such a relationship was assumed to exist only where deliberate

TABLE 4 Age-Specific Marital Fertility Rates, Total Marital Fertility Above Age 20, and Index Values of Marital Fertility by Age Difference Between Spouses in Two Groups of German Villages

Panel A. Fertility Rates

Location of Villages and Age Differences Between Spouses	Births per 1,000 Married Women Aged: 20-24	25-29	30-34	35-39	40-44	45-49	Total Fertility Above Age 20: Rate	Index
Four villages in Baden (marriages 1750-1824)								
Husband younger	492	461	400	339	193	36	9.61	100
Husband 0-4 years older	456	43[illegible]	382	308	164	22	8.82	92
Husband 4-9 years older	463	43[illegible]	371	285	167	19	8.69	90
Husband 10+ years older	422	404	344	262	120	3	7.78	81
Four villages in Waldeck (marriages prior to 1850)								
Husband younger	444	424	394	310	176	25	8.87	100
Husband 0-4 years older	447	386	362	297	174	26	8.46	95
Husband 5+ years older	424	402	332	261	150	20	7.95	90

Panel B. Index Values

Location of Villages and Age Differences Between Spouses	Index Values of Marital Fertility (20-24 = 100): 20-24	25-29	30-34	35-39	40-44	45-49
Four villages in Baden						
Husband younger	100	94	81	69	39	7
Husband 0-4 years older	100	95	84	68	36	5
Husband 5-9 years older	100	93	80	62	36	4
Husband 10+ years	100	95	82	60	28	1
Four villages in Waldeck						
Husband younger	100	96	89	70	40	6
Husband 0-4 years older	100	86	81	66	39	6
Husband 5+ older	100	95	78	62	35	5

Sources: Baden villages: previously unpublished results from research by the author; Waldeck villages: Knodel (1978:499).

fertility control is practiced: women who marry young are more likely to have achieved a given family size by any particular age, and thus are more likely to wish to stop childbearing, assuming that the distribution of desired family size does not differ much by age at marriage. It now appears that a number of nonvolitional factors can produce a similar positive association between age at marriage and age-specific marital fertility (Knodel, 1978).

Table 5 provides some empirical examples of this association. Two historical examples from European village populations are provided--one from Germany and the other from France. In these cases, almost without exception, the marital fertility rate at any given age increases with each successive age-at-marriage category. As a convenient way to summarize the relationship, total marital fertility rates above age 30 are presented, as well as index values for these rates, with the lowest age-at-marriage category set at 100. As can be seen, for the four Baden villages, the total marital fertility rate above age 30 is 26 percent higher for women who marry at age 30 or older than for those who marry under age 20; in the French example, the older marrying women experienced a total marital fertility rate 44 percent higher than that of the youngest age-at-marriage category. It should be noted, however, that women who marry later typically end up with fewer children due to shorter periods of exposure to childbearing.

Similar data for less developed countries are rare. One exception is a survey taken in Algeria in 1970 and reported by Vallin (1978). Since the age at marriage in Algeria is considerably younger on average than was true for the European historical examples, the age-at-marriage categories are not identical and do not go beyond age 24. However, age-specific marital fertility rates tend to show the same positive association with age at marriage. This is especially evident from the summary measure of total marital fertility above age 25.

A variety of factors is undoubtedly responsible for this positive association between age-specific marital fertility and age at marriage in natural-fertility populations. These include a possible negative association between frequency of intercourse and duration of marriage, independent of age; a negative association between age at marriage and length of exposure to the risk of sterility associated with childbirth complications by any given age; the somewhat artifactual inflation of fertility during the interval in which a woman marries due to premarital pregnancy; and a negative association between the age difference of husband and wife (Knodel, 1978; Henry, 1979). On the other hand, these factors are in some cases either absent or compensated for by contrary influences. Examples of essentially no relationship are found in the historical demographic literature (e.g., Gautier and Henry, 1958). In some cases, the relationship can actually be the opposite of that usually found. A striking example of this is provided by the population of the Cocos-Keeling Islands studied by Smith (1960), illustrated in the bottom panel of Table 5. However, this can probably be explained by the fact that premarital intercourse was common and that, for many couples, pregnancy appeared to be a precondition for marriage; thus the more fecund women, who

TABLE 5 Age-Specific Marital Fertility Rates and Total Marital Fertility Above Age 25 or 30, by Wife's Age at Marriage for Selected Populations

Population and Age at Marriage	Births per 1,000 Married Women Aged: 20-24	25-29	30-34	35-39	40-44	45-49	Total Fertility Rate[a]	Index[b]
							Above Age 30	
Four villages in Baden (marriages 1750-1824)								
Under 20	444	399	344	264	156	19	3.92	100
20-24	461	424	369	293	156	16	4.17	107
25-29	--	480	391	318	171	32	4.56	116
30 and over	--	--	429	341	187	27	4.92	126
Nine villages in S.W. France (marriages 1720-1769)								
Under 20	353	311	288	215	129	14	3.23	100
20-24	449	356	335	244	142	19	3.70	115
25-29	--	433	373	282	157	27	4.20	130
30 and over	--	--	401	331	166	34	4.66	144
							Above Age 25	
Algeria, 1960's[c]								
Under 17	412	394	355	277	172	23	6.11	100
17-19	441	405	360	319	192	54	6.65	109
20-24	n.a.	438	355	326	200	49	6.84	112
Cocos-Keeling Islands (women born ca. 1872-1907)[d]								
14-16	431	364	335	331	219	n.a.	6.25	100
17-19	400	386	328	306	96	n.a.	5.58	89
20-26	n.a.	375	300	201	34	n.a.	4.55	73

Note: n.a. = not available.

[a]Total marital fertility equals the sum of age-specific rates above the stated age multiplied by 5.
[b]Index values are based on the rate for the youngest age-at-marriage group set as 100.
[c]Results refer to age at first marriage and are based on women still in first marriages at the time of the survey.
[d]Results refer to age at first marriage and are restricted to women who survived to and lived in Cocos at age 40.

Sources: Baden villages: previously unpublished results from research by the author; French villages: Henry (1972:983); Algeria: derived from Vallin (1978:133); Cocos-Keeling Islands: derived from Smith (1960:111).

were more likely to get pregnant sooner, were probably disproportionately represented among the younger-marrying groups. It seems likely that the Cocos-Keeling Islands situation is unusual and that, in most of the less developed world, the usual positive relationship will hold during periods of natural fertility (and of course even more so once contraceptive practice spreads).

As a result of this relationship, the age pattern of natural fertility can be influenced by the composition of the population according to age at marriage. A hypothetical example based on the results shown in Table 5 for the nine villages in southwest France can illustrate this. Assume there are two populations, both of which experience the age-specific rates of marital fertility by age-at-marriage categories as shown for the French villages, but which differ according to the distribution of couples by age at marriage. In younger-marrying populations, assume 40 percent marry under age 20, 30 percent at ages 20-24, 20 percent at ages 25-29, and 10 percent at ages 30 or beyond; in the other population, where age at marriage is relatively late, assume the reverse relationship holds and only 10 percent marry under age 20, while 40 percent marry at age 30 and above. Based on these assumptions, the following age patterns of marital fertility (expressed as index values, with the rate for those aged 20-24 equal to 100) would result:

Population	20-24	25-29	30-34	35-59	40-44	45-49
Younger-marrying	100	90	84	63	36	5
Older-marrying	100	93	88	69	37	6

As the results show, a somewhat steeper fall-off in marital fertility is associated with the younger-marrying population, although the differences between the two are rather small. Very similar differences result when the exercise is repeated based on the results for the four villages in Baden.

The wide range in age at marriage in developing countries (e.g., Durch, 1981; Smith 1980) and the different distributions of age at marriage should therefore be expected to result in some slight differences in the age pattern of natural fertility. Moreover, as noted above, differences in the age-at-marriage distribution would probably contribute to differences in the age pattern of natural fertility between historical Western European populations, where age at marriage was typically quite late (Hajnal, 1965), and contemporary developing-country ones. Relative to other factors, however, the contribution of these differences is probably minimal.

Premarital Pregnancy

Another factor which can influence the age pattern of natural fertility is the extent and age pattern of premarital pregnancy. Prenuptial pregnancies leading to postnuptial births artificially inflate marital fertility rates at ages where newlyweds make up a large proportion of married women because too short a period of

exposure is attributed to women who were already pregnant as brides. Although this impact is essentially an artifact of the method of calculation, it can still contribute to differences in the reported age patterns of natural fertility for populations with different prevalences of bridal pregnancy. An example is provided by an 1800-49 sample of marriages in 14 German villages in which almost one out of four brides were pregnant at the time of marriage. To illustrate the impact, age-specific marital fertility rates (expressed as index values with the 20-24 rate set at 100) were calculated in the normal fashion and then again after adjusting for prenuptial pregnancy, with the following results:

Adjustment for bridal pregnancy	20-24	25-29	30-34	35-59	40-44	45-49
Unadjusted	100	87	77	59	30	3
Adjusted	100	92	83	65	33	4

Although the effect of adjusting for prenuptial pregnancy is to reduce the fertility rate in all age groups in which bridally pregnant women married, this effect is especially great in the younger age groups, which contain a disproportionately high number of bridally pregnant newlyweds. As a result, the age pattern of marital fertility falls less sharply after adjustment than before. The impact is in fact quite moderate: in the example cited, the Coale-Trussell m index would be reduced from 0.13 for the nonadjusted rates to 0.08 for the adjusted rates. For some of the individual villages where bridal pregnancy was particularly high, the impact was somewhat larger.

TRENDS IN THE LEVEL OF NATURAL FERTILITY

As compared to controlled-fertility populations, those characterized by natural fertility share a relatively common age pattern of marital reproduction. However, as indicated above, a number of biological, environmental, and behavioral factors can affect the age pattern of marital fertility, even in the absence of deliberate control. However, precise knowledge of the nature and extent of these influences, especially the environmental and behavioral, is so far lacking. For example, it is not known how such influences may differ for currently developing countries in comparison to the historical European or European-stock populations on which a disproportionate amount of our present knowledge of natural fertility is based. Moreover, problems of data quality, including age misstatement, can significantly distort results for developing countries. Using the age pattern of marital fertility to indicate the extent of family-size limitation practices has particularly limited value, both for these reasons and since the same surveys which provide the fertility data often provide direct estimates of birth control prevalence. Given the substantial variation in the level of natural fertility indicated in Table 1, there is a very real possibility that for any given population, the level of natural fertility could change over time.

Another essential consideration is that the behavioral and environmental factors which contribute both directly and through their interactions with biological factors to the determination of natural fertility levels can also change over time. Indeed, there is accumulating evidence of recent rapid changes in some of these factors in a number of developing countries. Although such changes could operate in either direction, most interest has focused on possible increases in natural fertility. Of particular interest is the potential rise in natural fertility accompanying the social and economic transformations conventionally associated with modernization. As in the previous section, the present discussion will draw on studies which refer both to the historical experience of Western countries and the more recent experience of developing countries.

The possible mechanisms through which changes in the level of natural fertility might occur are treated in detail elsewhere in these volumes (by Bongaarts, Gray, and Nag); they have also been subject to a recent review of evidence by Nag (1980). Those factors associated with modernization include the following: a reduction in the prevalence and duration of breastfeeding; eradication or treatment of diseases known to depress fertility, such as various venereal diseases and malaria; reduction in pregnancy wastage due to improved health or medical care; improved nutrition; reductions in long spousal separations due to a decline in the wife's customary return to her parental home at prescribed times, such as following childbirth, or to changes in traditional occupations which took the husband away for long periods of time; reductions in postnatal abstinence or terminal abstinence associated with grandmaternal or mother-in-law status; greater frequency of intercourse associated with a shift from arranged to romantic marriage or increased privacy; and increasing bridal pregnancy.

When considering the impact of changes in these factors on natural fertility, it is important to bear in mind several points. First, the potential contribution varies considerably from factor to factor. Second, their role will vary considerably by historical time period and the society or subgroup involved. Third, other changes, which have received less attention in the literature, may decrease the level of natural fertility. Two examples include a reduction in infant mortality, which would lengthen birth intervals in breastfeeding populations, and increased spousal separation because of temporary rural-to-urban migration in response to expanding urban economic opportunities. Fourth, it is often difficult to establish a direct empirical link between changing levels of natural fertility and underlying causal mechanisms. Fifth, changes in the determinants of natural fertility can occur in contexts other than modernization, no matter how broadly that term is defined; even when changes in natural fertility occur concomitantly with modernization, a link cannot be automatically assumed. Sixth, and perhaps most important for the relationship between modernization and changing natural fertility, changes in factors which could act to increase natural fertility often occur in concert with changes leading to the adoption and spread of

deliberate family-size limitation, so that the affected society can in fact no longer be said to be characterized by natural fertility.

Of course, before the underlying mechanisms accounting for changes in natural fertility can be explored, the fact of a change must be established. This is a difficult task both for historical and developing countries. In both cases, concerns about the data, especially changes in quality, are paramount: the data may come from the more distant past, with only limited direct support available, as is usually the case for historical studies; they may be based on a comparison of different sources, such as censuses, surveys, or dual record systems; or they may be based entirely on surveys which themselves contain errors to some unknown and probably different extent, as is typical in developing countries today. These difficulties are intensified by the fact that populations in a state of natural fertility are those most likely to present the severest problems of demographic data quality. Moreover, in examining age-specific rates, questions about the accuracy of age reporting and the completeness of fertility data must be raised. Fortunately, most demographers are keenly aware of these data problems, and a variety of techniques are being developed to correct at least in part for such problems. In general, however, it is wise to view most studies of changes in natural fertility with utmost caution. This is especially true for studies based on cross-sectional differentials that interpret the patterns displayed by the more modern segments of the population (e.g., urban or better-educated) as reflecting recent changes, or as indicating future directions.

With these qualifications in mind, it can be noted that recent research in historical demography has shown a number of apparent increases in either the actual or underlying levels of natural fertility. For example, Netting (1981) reports a steady 30 percent increase in the total marital fertility rate above age 20 between 1750-99 and 1900-49 for the Swiss Alpine village of Toerbel, with a variety of indirect measures suggesting that little if any family-size limitation was being practiced. Netting speculates that the cause is greater fecundity traceable to improved nutrition, stemming in part from the introduction and spread of potato cultivation, although, as is typical in such studies, direct verification of this hypothesis is impossible. A number of other village studies, though by no means all, show rising marital fertility in different parts of Europe during the eighteenth and nineteenth centuries; however, since these studies are often based on rather small numbers of cases and often leave questions of changing completeness of birth registration unaddressed, they do not lead to firm conclusions.

Evidence of improvements in natural fertility within a historical European setting is provided by a recent study, based on a relatively large sample of couples married between 1750 and the end of the nineteenth century in 14 German villages (Knodel and Wilson, 1981). Some of the results of this study are summarized in the top panel of Table 6. Two trends in the age-specific marital fertility rates of successive cohorts are revealed: one towards higher fertility among younger married women, particularly those aged 20-24; and another

towards lower fertility among older married women, especially those in their forties. These two trends offset one another, making total marital fertility almost the same for the earliest and most recent cohorts. The latter trend undoubtedly reflects the disproportionate impact of increased family-size limitation at older ages; thus the relatively constant level of fertility between the mid-eighteenth and later nineteenth centuries in the sample masks simultaneous increases in what might be considered the underlying level of natural fertility and efforts at family-size limitation.

Although there is no completely satisfactory way to measure the underlying level of natural fertility, an approximation is provided by the Coale-Trussell M index. This index tends to underestimate the underlying level of natural fertility once control becomes common; however, where family limitation is still modest and deliberate birth spacing is minimal or at least remains unchanged, the M index can be a useful indicator (Knodel and Wilson, 1981; Trussell, 1979). An M index of one indicates that the level of natural fertility is the same as that found in the Coale-Trussell standard. As can be seen in Table 6, the M index increases for virtually each successive marriage cohort in the German village sample, rising 27 percent between the earliest and the most recent cohort before the effect of bridal pregnancy is taken into account, and 23 percent afterwards. Thus in the case of the German villages, as the population moved away from an initial state of natural fertility towards control, important changes apparently occurred in the underlying components of fertility which would have raised the level of natural fertility had family-size limitation not intervened.

The study of the German villages also explored trends in several of the main components of fertility. There seems to have been little change in primary sterility since the proportion childless showed no distinct trend. In contrast, a steady and substantial increase in fecundability was indicated by the increasing proportion of postnuptially conceived first births occurring within the ninth through eleventh months following marriage. In addition, the postpartum nonsusceptible period, estimated from the difference between intervals following an early infant death and intervals following births surviving until at least age one, decreased considerably across marriage cohorts. This suggests a decline in either breastfeeding or the impact of breastfeeding on the nonsusceptible period (although part of the change was due to compositional shifts in the sample and to increases in the interval following an early infant death, which obviously would not be sensitive to changes in breastfeeding).

Hansen's (1979) study of fertility trends in Greenland shows a substantial rise in natural fertility between the late nineteenth and early twentieth centuries, and a subsequent increase during the initial spread of family-limitation practices. The results are summarized in the middle panel of Table 6. Based on comparisons of population growth from the censuses, Hansen believes that changes in registration do not account for the increase observed between the first two periods, although this possibility cannot be ruled out.

TABLE 6 Age-Specific Marital Fertility Rates, Total Marital Fertility Above Age 20 (TMF), and Coale-Trussell Indices of Underlying Fertility Level (M) and Fertility Control (m) for Selected Populations

Population and Method of Dating	Births per 1,000 Married Women Aged: 20-24	25-29	30-34	35-39	40-44	45-49	TMF	M	m
14 German Villages (marriage cohort)									
1750-1774	439	425	374	303	173	26	8.70	.95	-.03
1775-1799	455	426	376	301	155	25	8.69	.99	.05
1800-1824	463	412	362	285	151	18	8.46	.99	.08
1825-1849	502	430	379	286	141	15	8.77	1.04	.18
1850-1874	533	450	362	288	128	15	8.88	1.14	.27
1875-1899	547	462	353	247	104	6	8.60	1.21	.46
Percent change, 1750-1774 to 1875-1899									
Observed	+25	+9	-6	-18	-40	-77	-1	+27	n.a.
Adjusted for bridal pregnancies[a]	+18	+8	-6	-18	-40	-77	-3	+23	n.a.
Greenland (year of occurrence)									
1850-1900	335	313	303	257	133	20	6.81	.72	-.08
1901-1950	425	359	326	266	163	28	7.84	.86	-.03
1952-1960[b]	450	376	297	242	122	18	7.53	.93	.20
Percent change, 1850-1900 to 1956-1960	+34	+20	-2	-6	-8	-10	+11	+29	n.a.
Old Order Amish (birth cohort)									
Pre-1899	443	419	355	271	126	14	8.14	1.00	.18
1899-1908	455	412	348	248	122	15	8.00	1.01	.23
1909-1918	430	429	348	250	106	9	7.86	1.02	.29
1919-1928	481	452	354	248	87	n.a.	8.11[c]	1.15	.48
Percent change, pre-1899 to 1919-1928	+9	+8	0	-8	-31	n.a.	0	+15	n.a.

Note: n.a. indicates not applicable or not available.

[a]For a description of the methods of adjusting for bridal pregnancies, see the text and Knodel and Wilson (1981).
[b]Unweighted average of rates for 1952-55 and 1956-60.
[c]Based on ages 20-44.

Sources: German villages: Knodel and Wilson (1981) and unpublished results from research by the author: Greenland: Hansen (1979); Old Order Amish: Ericksen et al. (1979).

Instead, he attributes Greenland's relatively low fertility in the late nineteenth century to extensive breastfeeding, which was necessary in the absence of domestic livestock and a commercial milk industry; however, he does not present evidence on changes in breastfeeding.

An additional example of an apparent increase in the underlying level of natural fertility occurring during the early stages of family-size limitation is provided by a relatively socially isolated U.S. religious sect, the Old Order Amish, shown in the bottom panel of Table 6. As in the two previous cases, fertility among married women in their twenties increased at the same time that fertility among older women decreased. The net outcome was virtually no change in total marital fertility, but a concomitant increase in the Coale-Trussell M and m indices. One factor contributing to the increased fertility of the younger women appears to be a slight decline in primary sterility, which may be attributable to willingness among the Amish to use modern medical technology (Ericksen et al., 1979). The authors speculate that improved nutrition may also have contributed to increased fecundity. A different study of Amish fertility indicates an even sharper increase in marital fertility among women in their twenties during the middle third of the twentieth century (Markle and Pasco, 1977), as well as decreasing fertility among older women, again indicative of a modest spread of family-limitation practices.

All three examples in Table 6 demonstrate that the early stages of the transition from natural to controlled fertility can be obscured when evidence based only on fertility levels is examined. In a recent study of fertility trends in the state of Karnataka in India, Srinivasan et al. (1978), using data from two surveys carried out in 1951-52 and 1975, found again that marital fertility increased among younger women but decreased among older women. The result was only a minor change in marital fertility during a period when direct data on contraceptive prevalence indicated a moderate increase from initially very low levels. The authors speculate that several effects of modernization, especially its impact on the social and cultural traditions that held fertility down and on improvements in general health conditions, acccount for the increases in fertility at younger ages. They also conclude that the impact of family planning activities during this period is underestimated when only changes in the overall marital fertility level are judged.

Numerous studies report recent rising fertility levels in less developed countries, occurring during periods when birth control is assumed or known to be very limited and thus presumably reflecting changes in natural fertility. However, in these studies, it is difficult, if not impossible, to disentangle the effects of improved birth registration or problematic data sources from genuine changes in marital fertility. Thus, although some of the reported increases in marital fertility are probably genuinely unambiguous, few have been documented.

Kenya provides a prime example of this issue. The total fertility rate rose from 5.3 according to the 1962 census, to 6.6 according to

the 1969 census, to close to 8 according to both the 1977 National Demographic Survey and the 1978 Kenya Fertility Survey. However, detailed analysis of these results reveals a number of peculiarities that cast doubt on at least some of this indicated increase (Blacker, 1982). Retrospective analysis of the birth histories reported in the 1978 Kenya Fertility Survey also indicates quite a different trend, although these results are also questionable (Mott and Mott, 1980).

Coale and colleagues report a dramatic 49 percent increase in marital fertility (as measured by the Index I_g) between 1926 and 1970 in rural Central Asia in the USSR, an area similar in many respects to a developing country (Coale et al., 1979). Although the initial data were clearly faulty, they applied careful analytical techniques to arrive at their estimates. To buttress the plausibility of such a dramatic rise in marital fertility over so short a time, they cite carefully constructed estimates of marital fertility in Korea and Taiwan: for Korea, their estimates show a 32 percent increase between 1930 and 1966; for Taiwan, they show a 13 percent increase between 1915 and 1930, and an additional 5 percent between 1930 and 1956. In all three populations, an increase in the female age at marriage accompanied the rise in marital fertility. Unfortunately, no direct evidence is given on potential causes for such substantial increases.

Recent work by Romaniuk (1974; 1981) on the increase in natural fertility among the Canadian Indians, who were using little contraception by the end of the 1960s and who in a number of respects resemble populations of developing countries, comes closer than most analyses to establishing the underlying mechanisms involved. In particular, he is able to show that increases in the birth rate are probably associated with reduced birth intervals and a very considerable decline in the prevalence and duration of breastfeeding; a minor contribution may also have been made by reduced pregnancy wastage associated with improved maternal health care and reduced spousal separation as the earlier seminomadic lifestyle gave way to a more settled one. Even his careful analysis, however, is not without ambiguities associated with methodological and data problems.

Although there is evidence for declines in the prevalence and duration of breastfeeding causing increased levels of natural fertility, few other well-documented studies establish this link. Reliable data on breastfeeding trends are even scarcer than those on increased fertility, so that the researcher is forced to rely on speculations about possible changes in infant feeding practices (e.g., Vallin, 1978 for the case of Algeria). Indeed, in Thailand and Taiwan, two of the very few cases where genuine trend data show a decline in breastfeeding over the last decade or so, marital fertility has actually fallen (Knodel and Debavalya, 1981; Millman, 1981). In both cases, declining breastfeeding was accompanied by rapid increases in contraceptive use that more than adequately countered any fertility-enhancing effect of the reduced breastfeeding.

Another factor with a real potential for increasing natural fertility levels is a decline in primary or secondary sterility or associated miscarriages in populations where pathological infertility

has been high. Romaniuk (1980) shows such an association in Zaire. Pathological infertility, presumably due to venereal diseases, has been responsive to the widespread use of antibiotics, particularly penicillin, since World War II. The incidence of pathological infertility appears to be declining in a number of areas of Central Africa (Retel-Laurentin, 1981); this has probably led to increased natural fertility since little deliberate family-size limitation is practiced in these areas. However, given the lack of reliable demographic data for these areas, there is little likelihood that the actual impact can be reliably documented. Other areas show a similar pattern, for example, rural New Guinea (Ring and Scragg, 1973) and the Caribbean (United Nations, 1977); however, in most developing countries the incidence of pathological infertility is not high, and its reduction is therefore unlikely to generate any significant rise in fertility.

In summary, historical studies of marital fertility during periods when either natural fertility prevailed or family limitation was still quite modest yield interesting but limited results. A number of such studies suggest that during the nineteenth century, and for special groups during the twentieth century, either the actual or underlying level of natural fertility was increasing. Several examples indicate that relatively constant levels of marital fertility mask compensating increases in family-size limitation and underlying natural fertility levels. Indirect measures of the components of these changes are also possible based on reconstituted family history data, which typically serve as the basis for fertility studies done in the historical demography tradition. However, with the exception of direct measures of childlessness, it is not possible with historical demographic data to go beyond such indirect measures, and even more difficult to directly link the components of changes directly to their causes. Thus it seems likely that only suggestive conclusions can be reached about what aspects of modernization, if any, led to increased actual or underlying natural fertility levels in the historical experience of the West.

For contemporary developing countries, problems associated with data quality have seriously limited the definitive establishment of where, to what extent, and under what circumstances natural fertility has increased. Although data collection, estimation, and measurement techniques are improving, the number of populations or subgroups which remain in a state approximating natural fertility is rapidly decreasing, and with it the opportunity to accurately monitor changing natural fertility levels. On the more positive side, our recent increased understanding of the determinants of natural fertility, particularly those associated with modernization, should enable researchers to reanalyze existing data, especially those from the many surveys conducted during the last decade or two. It should also be possible to design future data collection and analysis techniques that will generate more direct answers to some of the questions now being raised about changes in natural fertility levels. Combining such data based on the experience of currently developing countries with further

work in historical demography may not provide definitive results, but it will greatly enhance our knowledge of natural fertility.

PROPOSITIONS

The evidence presented in this paper supports the following conclusions and hypotheses about natural fertility:

1. Populations characterized by natural fertility share a relatively similar age pattern of marital fertility in comparison to populations in which family-size limitation is common. In natural-fertility populations, the age-specific marital fertility curve is convex in shape, while in controlled-fertility populations it is concave.

2. Deliberate attempts to space births can exist when efforts to limit family size are absent or even opposed by the majority of reproductive couples. Deliberate birth spacing within the context of natural fertility is typically intended to enhance the survival chances of the child or the mother, rather than to limit births.

3. The level of natural fertility varies widely and is influenced by a variety of biological, environmental, and behavioral factors.

4. A variety of factors can cause modest variations in the age pattern of natural fertility across populations and perhaps over time. Therefore, small deviations from the standard pattern of natural fertility cannot be said to indicate deliberate fertility control.

5. Marriage duration is usually negatively associated with age-specific marital fertility in natural-fertility populations, although there are exceptions.

6. The age of the husband and thus the age gap between spouses influences age-specific rates of marital fertility in natural-fertility populations. In general, the older the husband, the lower the age-specific marital fertility rate of the wife. This effect becomes more pronounced towards the end of the woman's reproductive span.

7. There are a variety of factors, some culturally specific, some associated with modernization, which could lead to an increase in the underlying level of natural fertility. However, these factors are frequently offset by the onset and increase of family size limitation. There are also some aspects of modernization which would act to depress the level of natural fertility.

8. Increases in marital fertility during the early stages of the demographic transition probably do not represent a relinquishment of intentional control of marital fertility, but rather are the unintended consequence of changing behavior.

NOTES

1. I am grateful to Sara Millman for calling my attention to this.

2. From Caldwell and Caldwell's (1977) report that most Nigerian women are grandmothers by the age of 43 or 44 and well over three-quarters are grandmothers by age 50, it is inferred that roughly 40 percent of women in the 40-44 age group are grandmothers. With no further information on other age groups, it is assumed that there are no grandmothers below 35, that 10 percent are grandmothers at 35-39, and that 70 percent are grandmothers at 45-49. As indicated above, one Nigerian survey showed that 25 percent of nongrandmothers aged 40-44 were terminally abstinent compared to 75 percent of grandmothers. To be consistent with this, it is assumed that, among women 30-34, 5 percent of nongrandmothers are terminally abstinent; at 35-39, 10 percent of the nongrandmothers and 60 percent of the grandmothers are terminally abstinent; and, at 45-49, 40 percent of nongrandmothers and 90 percent of grandmothers are terminally abstinent. For comparison, it is assumed that, where there are no proscriptions on sexual relations for grandmothers, the proportions abstinent will correspond to the proportions just cited for nongrandmothers. These are the assumptions underlying the calculations in Table 3.
3. It should be stressed that there is no direct evidence that grandmaternal terminal abstinence is practiced in Nepal, much less to the extent embodied in the hypothetical example.
4. Assume that the proportion of women primarily sterile at age 20 decreased from 30 to 5 percent over the last 25 years, and that the proportion of married women currently sterile is 5 percent among those aged 20-24 and increases by 5 percentage points in each subsequent five-year age group, reaching 30 percent at 45-49. Assume also that the pattern of natural fertility would have resembled the Coale-Trussell standard had the proportion of women primarily sterile at age 20 been constant at 5 percent for the last 25 years. Then it is possible to calculate the impact of the decline in sterility on age-specific marital fertility. The Coale-Trussell rates must be divided by 0.95 to obtain the rates for women not primarily sterile at age 20, and then the rates at each age must be multiplied by the proportion not primarily sterile at age 20 under the hypothesized decline to obtain the rates that would result from the decline.

BIBLIOGRAPHY

Anderson, B. A. (1975) Male age and fertility results from Ireland prior to 1911. Population Index 41:561-567.

Barclay, G., A. Coale, M. Stoto, and T. J. Trussell (1976) A reassessment of the demography of traditional rural China. Population Index 42:606-635.

Bhatia, S., and L. T. Ruzicka (n.d.) Coital Frequency and Sexual Abstinence in Rural Bangladesh. Unpublished manuscript. Department of Demography, Australian National University, Canberra.

Blacker, J. (forthcoming) Levels and Trends in Fertility and Mortality in Kenya, 1948-79. Committee on Population and Demography. Washington, D.C.: National Academy Press.

Blackwood, L. (1981) Alaska native fertility trends: 1950-1978. Demography 18:173-179.

Bourgeois-Pichat, J. (1979) Complements a l'etude sur les facteurs de la fecondite non dirigee. In H. Leridon and J. Menken, eds., Natural Fertility. Liege: Ordina Editions.

Caldwell, J. C. (1979) Variations in the incidence of sexual abstinence and the duration of postnatal abstinence among the Yoruba of Nigeria. In H. Leridon and J. Menken, eds., Natural Fertility. Liege: Ordina Editions.

Caldwell, J. C., and P. Caldwell (1977) The role of marital sexual abstinence in determining fertility: A study of the Yoruba in Nigeria. Population Studies 31:193-213.

Caldwell, P., and J. C. Caldwell (1981) The function of child spacing in traditional societies and the direction of change. Pp. 74-91 in H. J. Page and R. Lesthaeghe, eds., Child Spacing in Tropical Africa: Traditions and Change. New York: Academic Press.

Cantrelle, P., and B. Ferry (1979) Approche de la fecondite naturelle dans les populations contemporaines. In H. Leridon and J. Menken, eds., Natural Fertility. Liege: Ordina Editions.

Chang, M.-C., T. E.-H. Sun, and R. Freedman (1981) Trends in fertility, family size preference, and family planning practice: Taiwan, 1961-80. Studies in Family Planning 12:211-228.

Chen, L. C., S. Ahmed, M. Gesche, and W. H. Mosley (1974) A prospective study of birth interval dynamics in rural Bangladesh. Population Studies 38:277-297.

Coale, A. J., and T. J. Trussell (1974) Model fertility schedules: Variations in the age structure of childbearing in human populations. Population Index 40:185-258. (See also Erratum, Population Index 41:572.)

Coale, A. J., and T. J. Trussell (1978) A new procedure for fitting optimal values of the parameters of a model schedule of marital fertility rates. Population Index 44:203-211.

Coale, A. J., B. Anderson, and E. Harm (1979) Human Fertility in Russia Since the Nineteenth Century. Princeton, N.J.: Princeton University Press.

DaVanzo, J. (1980) The Role of Breastfeeding in Population Growth: Conceptual Model, Brief Review of Evidence, and Suggestions for Future Research. Working draft. Paper prepared for the Bureau of Program and Policy Coordination of the Agency for International Development.

De Tray, D. (1979) The demand for children in a "natural fertility" population. Pakistan Development Review 18:55-67.

Durch, J. (1981) Nuptiality Patterns in Developing Countries: Implications for Fertility. Reports on the World Fertility Survey. Washington, D.C.: Population Reference Bureau.

Easterlin, R. (1978a) New directions for the economics of fertility. Pp. 57-133 in J. M. Yinger and S. Cutler, eds., Major Social Issues. New York: The Free Press.

Easterlin, R. (1978b) The economics and sociology of fertility: A synthesis. Pp. 57-133 in C. Tilly, ed., Historical Studies of Changing Fertility. Princeton, N.J.: Princeton University Press.

Easterlin R., R. Pollak, and M. Wachter (1980) Toward a more general economic model of fertility determination: Endogenous preferences and natural fertility. In R. Easterlin, ed., Population and Economic Change in Developing Countries. Chicago: University of Chicago Press.

Ericksen, J., E. P. Ericksen, J. A. Hostetler, and G. E. Huntington (1979) Fertility patterns and trends among the Old Order Amish. Population Studies 33:255-276.

Ferry, B. (1981) Breastfeeding. Comparative Studies No. 13. London: World Fertility Survey.

Friedlander, D., Z. Eisenbach, and C. Goldscheider (1980) Family size limitation and birth spacing: The fertility transition of African and Asian immigrants in Israel. Population and Development Review 6:581-593.

Gautier, E., and L. Henry (1958) La Population de Crulai, Paroisse Normande; Etude Historique. INED Cahier 33. Paris: Presses Universitaires de France.

Gray, R. H. (1979) Biological factors other than nutrition and lactation which may influence natural fertility: A review. In H. Leridon and J. Menken, eds., Natural Fertility. Liege: Ordina Editions.

Hajnal, J. (1965) European marriage patterns in perspective. In D. V. Glass and D. E. C. Eversley, eds., Population in History. London: Edward Arnold.

Hansen, H. O. (1979) From natural to controlled fertility: Studies in fertility as a factor in the process of economic and social development in Greenland c. 1841-1975. In H. Leridon and J. Menken, eds., Natual Fertility. Liege: Ordina Editions.

Henry, L. (1953) Fondements theoriques des mesures de la fecondite naturelle. Revue de l'Institut International de Statistique 21:135-151.

Henry, L. (1956) Anciennes Familles Genevoises; Etude Demographique: 16-20e Siecles. INED Cahier 26. Paris: Presses Universitaires de France.

Henry, L. (1961) Some data on natural fertility. Eugenics Quarterly 8:81-91.

Henry, L. (1967) Manual de Demographie Historique. Geneva: Librairie Droz.

Henry, L. (1972) Fecondite des mariages dans le quart sud-ouest de la France de 1720 a 1829. Annales 3:612-639 and 4-5:977-1023.

Henry, L. (1979) Concepts actuels et resultats emiriques sur la fecondite naturelle. In H. Leridon and J. Menken, eds., Natural Fertility. Liege: Ordina Editions.

Houdaille, J. (1976) Fecondite des familles souveraines du XVIe au XVIIIe siecle: Influence de l'age du pere sur la fecondite. Population 31:961-970.

Jain, A., and J. Bongaarts (1981) Breastfeeding: Patterns, correlates, and fertility effects. Studies in Family Planning 12:79-99.

Jones, G. (1977) Fertility levels and trends in Indonesia. Population Studies 31:29-42.

Knodel, J. (1977) Family limitation and the fertility transition: Evidence from the age patterns of fertility in Europe and Asia. Population Studies 31:219-249.

Knodel, J. (1978) Natural fertility in preindustrial Germany. Population Studies 32:481-510.

Knodel, J. (1979) From natural fertility to family limitation: The onset of fertility transition in a sample of German villages. Demography 16:493-521.

Knodel, J. (1981) Child Mortality and Reproductive Behavior in German Village Populations in the Past: A Microlevel Analysis of the Replacement Effect. Research Report No. 81-1. Ann Arbor, Mich.: Population Studies Center, University of Michigan.

Knodel, J., and N. Debavalya (1978) Thailand's reproductive revolution. International Family Planning Perspectives and Digest 4:34-49.

Knodel, J., and N. Debavalya (1980) Breastfeeding in Thailand: Trends and differentials 1969-1979. Studies in Family Planning 11:355-377.

Knodel, J., and N. Debavalya (1981) Breastfeeding trends in Thailand and their demographic impact. Intercom 9:8-10.

Knodel, J., and M. J. Maynes (1976) Urban and rural marriage patterns in Imperial Germany. Journal of Family History 1:129-168.

Knodel, J., and E. van de Walle (1967) Breastfeeding, fertility and infant mortality: An analysis of some early German data. Population Studies 21:109-132.

Knodel, J., and E. van de Walle (1979) Lessons from the past: Policy implications of historical fertility studies. Population and Development Review 5:217-245.

Knodel, J., and C. Wilson (1981) The secular increase in fecundity in German village populations. Population Studies 35.

Laing, J. E. (1979) Currently Relevant Findings and Implications from Family Planning Program-Oriented Research at the U.P. Population Institute. Unpublished manuscript. Population Institute, University of the Philippines System, Manila.

Laslett, P. (1977) Characteristics of the Western family considered over time. Journal of Family History 2:89-116.

Leridon, H. (1975) Biostatistics of human reproduction. Pp. 93-131 in C. Chandrasekaran and A. I. Hermalin, eds., Measuring the Effect of Family Planning Programs on Fertility. Dolhain, Belgium: Ordina Editions.

Lesthaeghe, R. (1930) On the social control of human reproduction. Population and Development Review 6:527-548.

Lesthaeghe, R., P. Ohadike, J. Kocher, and H. J. Page (1981) Child spacing and fertility in sub-Saharan Africa: An overview of issues. Pp. 3-23 in H. J. Page and R. Lesthaeghe, eds., Child Spacing in Tropical Africa: Traditions and Change. New York: Academic Press.

Markle, G. E., and S. Pasco (1977) Family limitation among the Old Order Amish. Population Studies 31:267-280.

Mauldin, W. P. (1965) Fertility studies: Knowledge, attitude and practice. Studies in Family Planning 1:1-10.

McDonald, P. F., M. Yasin, and G. W. Jones (1975) Levels and Trends in Fertility and Childhood Mortality in Indonesia. Jakarta: Demographic Institute.

Menken, J., T. J. Trussell, K. Ford, and W. F. Pratt (1979) Experience with contraceptive methods in developed countries. In Contraception: Science, Technology, and Application. Washington, D.C.: National Academy of Sciences.

Millman, S. (1981) Breastfeeding in Taiwan: Trends and Differentials, 1966-1980. Paper presented at the annual meeting of the Population Association of America, Washington, D.C.

Mineau, G. P., L. L. Bean, and M. Skolnick (1979) Mormon demographic history II: The family life cycle and natural fertility. Population Studies 33:429-446.

Mott, F. L., and S. H. Mott (1980) Kenya's record population growth: A dilemma of development. Population Bulletin 35(3).

Nag, M. (1980) How modernization can also increase fertility. Current Anthropology 21:571-587.

Nepal, Health Ministry (1977) Nepal Fertility Survey, 1976. First Country Report. Kathmandu: Nepal Health Ministry. (Reprinted by the International Statistical Institute, 1979.)

Netting, R. (1981) Balancing on an Alp. New York: Cambridge University Press.

Nortman, D. (1977) Changing contraceptive patterns: A global perspective. Population Bulletin 32(3).

Nortman, D., and E. Hofstatter (1980) Population and Family Planning Programs, 10th ed. New York: Population Council.

Page, H., and R. Lesthaeghe (1981) Child Spacing in Tropical Africa: Traditions and Change. New York: Academic Press.

Pakistan, Population Planning Council (1979) Pakistan Fertility Survey. First Country Report. Reprinted by International Statistical Institute, Voorburg, Netherlands.

Pearl, R. (1939) The effects upon natural fertility of contraceptive efforts. Pp. 198-248 in R. Pearl, The Natural History of Population. New York: Oxford University Press.

Rehan, N., and A. K. Abashiya (1981) Breastfeeding and abstinence among Hausa women. Studies in Family Planning 12:233-237.

Retel-Laurentin, A. (1981) Tackling the scourge of infertility. People 8:13-15.

Ring, A., and R. F. R. Scragg (1973) A demographic and social study of fertility in rural New Guinea. Journal of Biosocial Science 5:89-121.

Romaniuk, A. (1974) Modernization and fertility: The case of the James Bay Indians. Canadian Review of Sociology and Anthropology 11:344-359.

Romaniuk, A. (1980) Increase in natural fertility during the early stages of modernization: Evidence from an African case study, Zaire. Population Studies 34:293-310.

Romaniuk, A. (1981) Increase in natural fertility during the early stages of modernization: Canadian Indians case study. Demography 18:157-172.

Schoenmaeckers, R., I. H. Shah, R. Lesthaeghe, and O. Tambashe (1981) The child spacing tradition and the postpartum taboo in tropical Africa: Anthropological evidence. Pp. 26-71 in H. Page and R. Lesthaeghe, eds., Child Spacing in Tropical Africa: Traditions and Change. New York: Academic Press.

Shorter, E. (1975) The Making of the Modern Family. New York: Basic Books.

Siddiqui, M. (1979) The Initiation of Contraception in Taiwan. Ph.D. dissertation. Department of Sociology, University of Michigan, Ann Arbor, Mich.

Singarimbun, M., and C. Manning (1976) Breastfeeding, amenorrhea, and abstinence in a Javanese village: A case study of Mojolama. Studies in Family Planning 7:175-179.

Smith, P. (1980) Asian marriage patterns in transition. Journal of Family History 5:58-97.

Smith, T. E. (1960) The Cocos-Keeling Islands: A demographic laboratory. Population Studies 14:94-130.

Srinivasan, K., and S. Jejeebhoy (1980) Changes in Natural Fertility in India, 1959-1972. Paper presented at the International Union for the Scientific Study of Population Seminar on Determinants of Fertility Trends: Major Theories and New Directions for Research, Bad Homburg.

Srinivasan, K., P. H. Reddy, and K. N. M. Raju (1978) From one generation to the next: Changes in fertility, family size preferences, and family planning in an Indian state between 1941 and 1975. Studies in Family Planning 9:258-271.

Trussell, T. J. (1979) Natural fertility: Measurement and use in fertility models. In H. Leridon and J. Menken, eds., Natural Fertility. Liege: Ordina Editions.

United Nations (1961) The Mysore Population Study. Population Studies No. 34. Department of Economic and Social Affairs. New York: United Nations.

United Nations (1977) Levels and Trends of Fertility Throughout the World, 1950-70. Population Studies No. 59. New York: United Nations.

United Nations (1978) Factors Affecting the Use and Non-Use of Contraception: Findings from a Comparative Analysis of Selected KAP Surveys. Population Studies No. 69. New York: United Nations.

United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) (1980) The Population of Nepal. Country Monographs Series No. 6. New York: United Nations.

Vallin, J. (1978) Fertility in Algeria: Trends and differentials. Pp. 131-151 in J. Allman, ed., Women's Status and Fertility in the Muslim World. New York: Praeger.

Ware, H. (1979) Social influences on fertility at later ages of reproduction. Journal of Biosocial Science, Supplement 6:75-96.

Weiss, E. (1981) The Calabar Rural Maternal and Child Health/Family Planning Project. Final report, Draft dated February.

Weiss, E., and A. A. Udo (1981) The Calabar rural maternal and child health/family planning project. Studies in Family Planning 12:47-57.

Wilson, C. (1980) The Components of Marital Fertility in Historical Europe. Paper presented at the International Union for the Scientific Study of Population and World Fertility Survey Conferences on Maternity Histories, London.

Wrigley, E. A. (1966) Family limitation in pre-industrial England. Economic History Review 19:82-109.

Wrigley, E. A. (1978) Fertility strategy for the individual and the group. Pp. 135-154 in C. Tilly, ed., Historical Studies of Changing Fertility. Princeton, N.J.: Princeton University Press.

Chapter 4

THE PROXIMATE DETERMINANTS OF NATURAL MARITAL FERTILITY

John Bongaarts

In the absence of deliberate family-limitation practices such as contraception or induced abortion, populations experience natural fertility (Henry, 1961, 1979; Knodel, in these volumes). Most populations are at or near their natural level of fertility before the onset of the fertility transition. In contemporary developing societies, populations with high and stable fertility are governed by fertility regimens that are close to natural, especially among the rural and uneducated classes.

Among the most interesting findings of comparative studies of natural fertility is the large variation in the natural marital fertility rates of different populations: the highest levels are about twice as high as the lowest (Henry, 1961; Leridon, 1977). In addition to being highly variable, natural marital fertility is far below the biological maximum: typical birth intervals are two to three years, much longer than the minimum possible spacing of less than one year. These findings can be explained by a set of four fertility-inhibiting proximate determinants existing in all societies, but varying widely in their impact. These four factors have been identified by Henry (1953, 1957):

The Postpartum Infecundable Period Immediately after giving birth, a woman experiences an anovulatory period in which the normal pattern of ovulation and menstruation is absent. In a few societies, the total infecundable period is longer than this due to the practice of postpartum abstinence beyond the first postpartum ovulation.

The Waiting Time to Conception This period, also called the fecundable or ovulatory interval, follows the postpartum infecundable period. During this interval, a woman is at risk of conceiving if she ovulates regularly and engages in intercourse.

Intrauterine Mortality Once the waiting time to conception ends with a pregnancy, a substantial proportion of pregnancies terminate prematurely due to spontaneous intrauterine mortality.

Permanent Sterility A couple can reproduce only if both spouses are fecund. With increasing age, the proportion of couples with at

least one permanently sterile spouse rises, eventually reaching 100 percent.

These four proximate determinants are in turn influenced by a number of other factors. These include breastfeeding, which is the principal determinant of postpartum amenorrhea; frequency of intercourse, which affects the duration of the conception wait; and the length of the fertile period during a woman's menstrual cycle, which also affects the conception wait. In the sections below, the four proximate fertility determinants are discussed, with reference to these other influential factors.

POSTPARTUM INFECUNDABILITY

The first clear indication that periods of postpartum infecundability are demographically important was found in the birth patterns of women in historical societies with natural fertility. In these populations, the interval between marriage and the first birth was on average substantially shorter than that between the first and second births (Henripin, 1954; Gautier and Henry, 1958). Both of these intervals contain gestation and ovulation periods of approximately the same length, and conceptions during both are subject to similar intrauterine mortality risks (Henry, 1964); therefore, a plausible explanation for this difference in duration is the existence of an infecundable interval following a birth (but not marriage). Support for this explanation was found in the effect of an infant death on the birth interval: when an infant survives, the birth interval is on average longer than when it dies; moreover, the earlier the death takes place, the shorter the birth interval is (Knodel, 1968; Potter et al., 1965b; Henripin, 1954; Cantrelle and Leridon, 1971). Henry (1964) concludes that the death of an infant ends the anovulatory interval because breastfeeding is terminated, although it may also cause the resumption of sexual relations in societies with a postpartum taboo against intercourse.

Direct measurements of the postpartum anovulatory or amenorrheic interval are now available in a number of populations (these are discussed in detail in the following section). Very prolonged amenorrheic periods have been observed, ranging up to two years in some societies; thus a large proportion (up to half) of a women's potential reproductive years may be spent in the amenorrheic state. These long intervals have a powerful fertility-inhibiting effect. Most studies on the subject do not estimate the anovulatory interval directly, but instead measure the more well-defined interval from birth to the first postpartum menses. Although some earlier investigators added one or two anovulatory cycles to the observed duration of postpartum amenorrhea to obtain an estimate of the total duration of postpartum anovulation, this is now considered unnecessary. In the large majority of women, the first ovulation takes place within a few weeks before or after the first postpartum menses (Perez et al., 1971; Pascal, 1969); therefore, the mean

duration of amenorrhea is a good indicator of the mean duration of anovulation. On the other hand, because ovulation often takes place in the few weeks before the resumption of the menses, women who engage in intercourse without contraception are at risk of conceiving while still amenorrheic. Data from several populations indicate that up to about 7 percent of women conceive without having menstruated (Van Ginneken, 1978).

Finally, it should be noted that in a few populations, the practice of postpartum abstinence causes the period of infecundability to exceed the amenorrheic intervals of many women. In some societies, such as those in parts of western Africa, postpartum abstinence is associated with breastfeeding, and average abstinence intervals up to three years have been observed (Caldwell and Caldwell, 1977; Page and Lesthaeghe, 1981). The general influence of breastfeeding on the duration of postpartum amenorrhea is discussed in the following section.

BREASTFEEDING AND POSTPARTUM AMENORRHEA

The primary determinant of amenorrhea is breastfeeding. Without breastfeeding, the average amenorrheic interval is only 1.5 to 2 months. As the duration of breastfeeding increases, so, too, does that of amenorrhea, although not at the same rate: an additional month of breastfeeding increases amenorrhea, on average, by less than one month.

Statistics showing the relationship between average breastfeeding and amenorrheic intervals in a number of different populations are given in the upper panel of Table 1. Similar results are seen in the lower panel, which compares groups of women with different durations of breastfeeding in a single country. In Taiwan, the example chosen, both breastfeeding and amenorrheic intervals vary widely; however, these intervals are clearly related. Similar correlations between the mean durations of breastfeeding and amenorrhea of subgroups have been reported in Senegal (Cantrelle and Leridon, 1971), Guatemala (Delgado et al., 1978), the Philippines (Osteria, 1976), and the U.S. (Salber et al., 1966).

The breastfeeding and amenorrhea data from the populations in Table 1 and from the subpopulations in Taiwan, Senegal, the Philippines, and the U.S. are plotted in Figure 1. To summarize this relationship, a number of curves were fitted; the best fit was provided by

$$A = 1.753e^{0.1396B-0.001872B^2} \qquad (1)$$

with $R^2=0.96$, where A = mean or median duration of postpartum amenorrhea, in months, and B = mean or median duration of breastfeeding, in months.

The high correlation between the average durations of breastfeeding makes it possible to use this regression equation to estimate an approximate duration of amenorrhea in a population for which only breastfeeding data are available. While estimates of A

TABLE 1 Durations of Breastfeeding and Amenorrhea (in months) in Selected Populations

Panel A. Twenty Populations

Population	Mean (median)[a] Duration of Breastfeeding	Mean (median)[a] Duration of Amenorrhea
U.S. (Boston)	1.5	2.3
Colombia and Venezuela (cities)	6.0	2.9
Thailand (cities)	8.0	4.3
Turkey (cities)	9.0	3.7
Egypt (cities)	11.0	5.2
Philippines (rural)	11.9	5.2
Nigeria (Lagos)	12.2	8.1
Zaire (Bukavu)	15.5	9.0
Taiwan	16.1	10.1
India (Bombay)	16.5	11.9
Senegal (Pikine)	18.4	12.8
Zaire (Ngweshe)	18.8	13.8
Guatemala (rural)	19.2	14.8
India (Khanna)	21.0	10.6
Zaire (Idjiwi)	21.8	17.9
Korea	23.0	13.5
Bangladesh (Matlab)	24.0	18.9
Senegal (rural)	24.3	14.7
Zaire (rural)	26.0	20.0
Indonesia (Mojolama)	26.5	24.0

obtained from the equation can be as much as a few months higher or lower than the "true" values, it should be noted that at least part of this discrepancy is due to recall, sampling, or other errors in measuring the duration of breastfeeding or amenorrhea, especially if these data are obtained from retrospective surveys.

The inhibiting effect of breastfeeding on ovulation and menstruation is somewhat less predictable on the individual level than on the population level. This is because amenorrhea is affected not only by the duration of breastfeeding, but also, and perhaps more importantly, by the type and intensity of breastfeeding. It has been demonstrated that women who give their infants only breast milk are much less likely to resume menstruation than are those who supplement the diets of their infants with fluids by bottle or with solid food (Huffman et al., 1978; Malkani and Mirchandani, 1960; McKeown and Gibson, 1954; Perez et al., 1971). Because many existing studies do not make a distinction between full and partial breastfeeding and only

TABLE 1 (continued)

Panel B. Median Amenorrhea by Breastfeeding Duration in Taiwan

	Duration of Breastfeeding	Median Duration of Amenorrhea
Taiwan	0.0	1.8
	1-6	2.8
	7-12	5.2
	13-18	11.8
	19-24	13.5
	25+	14.8

[a]Estimates of means and medians have been combined because there is apparently little systematic difference between them (except perhaps at the shortest durations). Women who did not initiate breastfeeding, a small or negligible proportion in populations with long breastfeeding, were excluded except in Boston, Lagos, Bukavu, rural Guatemala, Senegal, Zaire, and Indonesia. Estimates taken from Lesthaeghe and Page (1980) are corrected for misreporting.

Sources: Lesthaeghe and Page (1980); Masnick (1979); Van Ginneken (1978).

measure the total duration of breastfeeding, they reveal nothing about important changes in the type and intensity of breastfeeding that take place as the infant grows older. Breastfeeding mothers usually give little or no other food to their infants during the first weeks after birth. Supplemental foods are introduced slowly; as they increase, the amount of breastmilk demanded by the infant decreases. The timing of this decrease in the mother's milk production is probably the principal determinant of the onset of menstruation. The end of amenorrhea occurs frequently while the woman is still breastfeeding; this is demonstrated in Figure 1, where the average duration of amenorrhea is substantially shorter than that of breastfeeding. Therefore, the correlation between breastfeeding and amenorrhea in most women is due not to the direct effect of the termination of breastfeeding, but to the correlation between the intensity of breastfeeding in the early months and its overall duration. In other words, in populations with the longest total durations of breastfeeding, the periods of intense breastfeeding that cause prolonged amenorrhea tend to be longest.

A number of recent investigations have clarified the physiological mechanism through which breastfeeding influences ovulation (Delvoye et al., 1976; Konner and Wortham, 1980; McNeilly, 1978; Tyson and Perez,

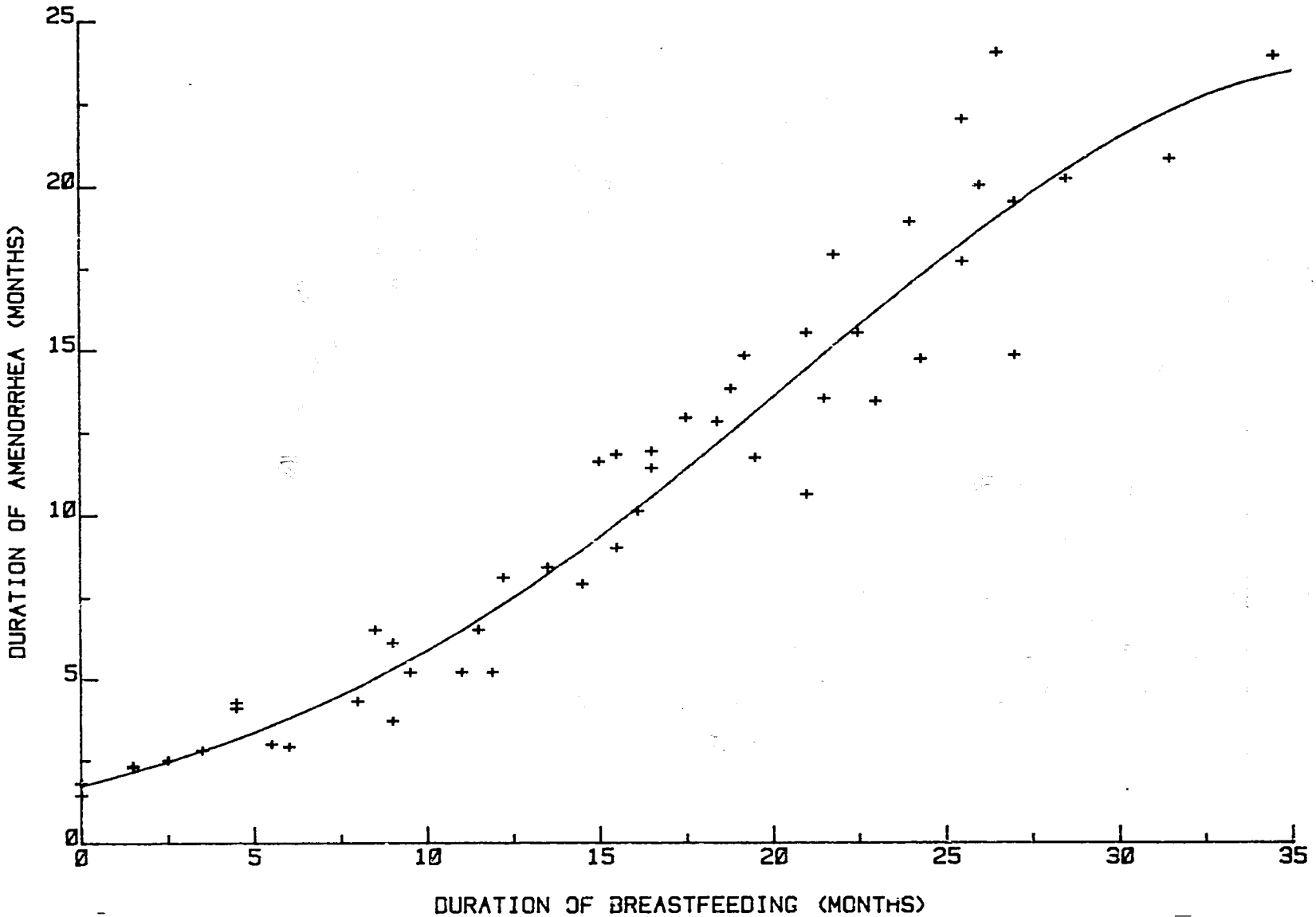

FIGURE 1 Mean (or Median) Duration of Postpartum Amenorrhea by Duration of Breastfeeding

1978; Short, 1976). Although many details remain to be specified, the principal factors involved appear to be as follows. The suckling by the infant stimulates receptors in the breast nipple, which initiates a neural signal to the hypothalamus, a nerve center in the brain. In response, the hypothalamus signals the pituitary gland to increase the production of the hormone prolactin. Prolactin in turn inhibits ovulation, either by reducing the release of gonadotropic hormones needed for ovulation or by directly affecting the ovaries. Thus frequent nipple stimulation seems to be the critical factor in maintaining anovulation. Only frequent suckling, as during full breastfeeding, produces a high concentration of prolactin; as the frequency and intensity of breastfeeding decrease, average prolactin levels decline, and once they fall below a certain threshold (which may vary among women), ovulation resumes.

WAITING TIME TO CONCEPTION AND FECUNDABILITY

In the following discussion, as is usual in the demographic literature, the term conception will refer only to pregnancies recognizable by the delay of the first menses after fertilization; fertilized ova that fail to implant or abort spontaneously before the woman knows she is pregnant will not be included.

Noncontracepting fecundable women who engage in regular intercourse take an average of several months to conceive. The most reliable and consistent estimates of this waiting time can be derived from measurements of the interval from marriage to first birth or first conception. Table 2 presents averages of these intervals for a number of populations (after exclusion of premarital conceptions). In historical populations, the conception wait is estimated by subtracting nine months for a full gestation and two months for time lost due to intrauterine mortality[1] from the interval between marriage and first birth. In other populations, direct information about the time of the first conception after marriage was obtained, although it is likely that the waiting time to conception is slightly overestimated due to unreported fetal losses or contraceptive use. The data in Table 2 suggest average conception waits ranging from about five to ten months, with typical values near seven months. This generalization applies to women in their twenties; waiting times tend to be longer for younger women in the years immediately following menarche (Balakrishnan, 1979; Jain, 1969), presumably because the incidence of anovulatory cycles is then higher. Conception waits are also longer among women who experience prolonged periods of separation from their spouses, such as those due to seasonal migratory work or long visits by the wife to her parental home.[2]

The duration of the waiting time to conception is determined by the rate of conception. The most widely used measure of the conception rate is fecundability, defined as the probability of conceiving in a month among fecundable women (i.e., pregnant, sterile, and amenorrheic women are excluded [Gini, 1924]). Estimates of fecundability levels following marriage are also presented in Table

TABLE 2 Observed and Estimated Mean Conception Waits and Fecundabilities in the First Pregnancy Interval of Noncontracepting Women in Selected Populations and Groups of Populations

Population	Average (and Range) of Mean Intervals Between Marriage and First Birth, in Months	Average (and Range) of Mean Waiting Times to Conception Before First Pregnancy, in Months	Average (and Range) of Estimated Mean Fecundabilities in First Pregnancy Interval
Historical Populations			
Fifteen English Parishes	19.0 (17.3 - 20.8)	8.0 (6.3 - 9.8)[a]	.22 (.18 - .25)
Thirteen German Villages	17.9 (16.4 - 19.5)	6.9 (5.4 - 8.5)[a]	.23 (.18 - .26)
Two Belgian Communities	17.0 (16.7 - 17.3)	6.0 (5.7 - 6.3)[a]	.28 (.28 - .29)
Three French Communities	17.0 (16.3 - 17.3)	6.0 (5.3 - 6.3)[a]	.23 (.18 - .31)
Developing Countries[b]			
Four Latin American Countries	--	7.9 (6.7 - 8.9)	.13 (.16 - .21)
Taiwan	--	6.3	.22
Other Populations			
U.S.A. (PFS)	--	10.0	.18
Hutterites	--	4.7	.25

[a]Estimated; see text.
[b]Women aged 20-24.

Sources: Balakrishnan (1979); Bongaarts (1975); Jain (1969); Leridon (1977); Majumdar and Sheps (1970); Potter and Parker (1964); Westoff et al. (1961); Wilson (1980).

2. A fairly typical value for fecundability appears to be 0.2, which means that in a group of fecundable women, 20 percent can be expected to conceive in the first month of exposure to the risk of conception. Fecundability is inversely related to the duration of the conception wait: the higher the fecundability, the shorter the conception wait, and vice versa. In fact, it can be shown that, in theory, there is an exact inverse relationship between the conception wait, W, and fecundability f: $W = 1/f$ in a homogeneous population of women with identical levels of fecundability (Henry, 1953; Sheps and Menken, 1973). In reality, however, fecundability is not the same for all women, because they have different frequencies of intercourse and different biological characteristics. In such a heterogeneous population, the average waiting time to conception is longer than in the homogeneous case: women with the highest fecundability conceive most quickly, leaving slower conceivers with decreasing levels of fecundability in successive months (Potter and Parker, 1964). Among the populations in Table 2, the observed waiting time to conception is on average about 50 percent longer than the inverse of fecundability, so that an approximate estimate of W is provided by the equation $W = 1.5/f$.

The estimates of the waiting time to conception and fecundability in Table 2 are for the period immediately after marriage for women mostly in their twenties, the prime childbearing years. Since frequency of intercourse tends to decline with age and/or duration of marriage, one can expect a rise in the average conception wait as women grow older. (It should be noted that with increasing age, the distribution of conception delays becomes more skewed. The mean is therefore not always a satisfactory indicator; however, there are no readily available alternatives.) Unfortunately, the available data are insufficient to make reliable generalizations about the extent of this rise. Taiwan is the only population in which estimates of the conception wait before the first pregnancy can be compared with waits before later pregnancies. The former average 6.3 months (see Table 2) and the latter about 6.8 months (obtained by subtracting the 10.1-month postpartum amenorrhea interval from the 16.9-month interpregnancy interval after a live birth [Jain, 1969]). This suggests that the change in the waiting time to conception for successive birth intervals may be modest, at least for ages up to the late thirties. Supporting this tentative conclusion are two other findings. First, observed effects of age on average closed birth intervals among natural fertility populations are quite small: increases in different populations range from 10 to 25 percent between age groups 20-24 and 35-39[3] (Henry, 1953; Potter et al., 1965a). If the increase in average birth interval is small, then such birth interval components as the conception wait or the postpartum amenorrhea interval can only lengthen by relatively modest amounts. Second, little difference is seen between the mean interval from marriage to the first birth and the mean of birth intervals in which the infant died shortly after birth. If the conception waits are the same, the latter should be 1.5 or 2 months longer than the former (to allow for a minimum amenorrhea interval). This has indeed been

observed. For example, in 13 German Villages studied by Knodel (1979), the mean birth interval was 19.7 months if the infant died within a month after birth, while the average interval from marriage to first birth was 17.9 months (Wilson, 1980).

One of the most striking aspects of the conception data presented here is that only about one in five noncontracepting women conceives in a month despite engaging in regular intercourse, and that the time to conceive can easily exceed six months. These conception rates are lower than one might have expected a priori. An explanation for these findings will be provided in the following section.

FECUNDABILITY AND THE FREQUENCY OF INTERCOURSE

The fecundability of a population is directly dependent on the frequency of intercourse. This is demonstrated in a unique study by Barrett and Marshall (1969), who analyzed daily calendars showing the timing of intercourse and ovulation in a group of 241 noncontracepting British women of proven fertility. From these records, the fecundabilities of women with different frequencies of intercourse in the six-day period around the time of ovulation were calculated by dividing the number of conception cycles by the total number of cycles observed in each group.

Although the results in Table 3 are subject to large sampling errors, there is a strong positive relationship between coital frequency and fecundability. To understand this relationship, it is necessary to examine the biological factors involved in the conception process. A recognizable conception takes place during a given menstrual cycle only if (1) the cycle is ovulatory, (2) insemination occurs during the fertile period in the middle of the cycle, (3) insemination during the fertile period leads to a fertilization, and (4) fertilization results in a recognizable conception (James, 1979; Potter, 1961). If the probabilities of these four events are denoted by the variables p1, p2, p3, and p4, respectively, then fecundability,

TABLE 3 Fecundability by Frequency of Intercourse

Number of Coital Acts in 6-Day Period	Observed Fecundability
1	.17 (=33/192)
2	.34 (=27/80)
3	.41 (=19/46)
4	.38 (=5/13)

Source: Barrett and Marshall (1969).

f, is equal to their product: $f = p1 \times p2 \times p3 \times p4$. These events are discussed in detail below.

p1: The probability that a cycle is anovulatory is fairly small, except in the years immediately following menarche or preceding menopause. Based on evidence from a number of studies, Potter (1961) estimates the incidence of anovulatory cycles in the central childbearing years at about 5 percent, so that $p1 = 0.95$. More recently, investigations have attempted to measure the incidence of anovulation according to a shift in the basal body temperature (BBT) in mid cycle; however, this method is not entirely reliable (Moghissi, 1980).

p2: Conception is possible only during the so-called fertile period, a brief interval around the time of ovulation. The probability of at least one coitus coinciding with this fertile period is given by the following equation:

$$p2 = 1 - \binom{M-F}{n} \Big/ \binom{M}{n} \qquad (2)$$

where F is the duration of the fertile period in days, and n is the number of coital acts occurring during an interval of M days (e.g., a month or a week) that includes the fertile period (Glass and Grebenik, 1954). It is assumed that intercourse takes place at random during the interval M, and at most once per day. As the following section will show, F is approximately two days, simplifying the above equation to $p2 = 1 - [(M-n)(M-n-1)/(M^2-M)]$.

p3: Even when a coitus coincides with the fertile period, fertilization does not always follow. Several things can go wrong; for example, the sperm may be low in quality or the ovum incapable of fertilization, and either the sperm or the ovum could fail to reach the fallopian tubes. Although little is known about these hinderances, they are generally considered to occur infrequently (Hertig, 1967; James, 1979). It can therefore be assumed that $p3 = 0.95$; this is slightly higher than the estimate of Hertig (1967), for reasons given in note 4.

p4: Hertig (1967) estimates that only half of the fertilized ova yield a recognizable conception; thus $p4 = 0.5$. The remainder either fail to implant or abort spontaneously before the first missed menses.

Multiplying the probabilities p1 through p4 gives the following equation for fecundability:

$$f = p1 \times p2 \times p3 \times p4 = 0.45\ [1 - (M-n)(M-n-1)/(M^2 - M)] \qquad (3)$$

Model estimates of f for different coital rates n can now be made if M is specified. Since the average duration of the menstrual cycle

equals about 29 days (Treloar, 1967; Vollman, 1956), one can estimate the average intermenstruum interval during which virtually all intercourse takes place at about 26 days. With M = 26, equation (3) yields the estimates of fecundability presented in Table 4. As the number of coital acts increases from 1 to 20 per cycle, fecundability rises from 0.035 to 0.429. The relationship is not linear: the increments in fecundability become smaller as coital frequency rises.

Strictly speaking, equation (3) should only be applied in a homogeneous population. In the heterogeneous case, substituting in the equation the average number of coital acts per cycle yields a slight overestimate of fecundability.[5] On the other hand, equation (3) calculates fecundability per cycle; to derive an estimate per month, a correction is required because the average month is longer than the average menstrual cycle. Fortunately, these two relatively small errors nearly compensate one another. Thus the results in Table 3 derived from equation (3) can be accepted as estimates of fecundability per month in a heterogeneous population.

TABLE 4 Model Estimates of Fecundability and Conception Wait for Different Coital Rates

Number of Coital Acts per Menstrual Cycle[a]	Average Coital Frequency per Week	Fecundability	Approximate Duration of Conception Wait[b]
1	0.27	.035	43.8
2	0.54	.068	22.1
3	0.81	.100	15.0
4	1.08	.130	11.5
5	1.35	.159	9.4
6	1.62	.187	8.0
7	1.88	.213	7.0
8	2.15	.238	6.3
9	2.42	.262	5.7
10	2.69	.284	5.3
11	2.96	.305	4.9
12	3.23	.324	4.6
13	3.50	.342	4.4
14	3.77	.359	4.2
15	4.04	.374	4.0
20	5.38	.429	3.5

[a]All coital acts are assumed to take place during the intermenstrual interval, estimated to average 26 days.
[b]Estimated as 1.5/f; see text.

The last column of Table 4 presents the approximate average duration of the conception wait (estimated at 1.5/f) for different levels of coital frequency. The results indicate that the normal range of 5 to 10 months for the average conception wait is associated with coital rates of between 4 and 11 per intermenstruum, or between 1.25 and 2.9 per week. Coital rates reported by women in their twenties in a variety of populations fall within this range (Cartwright, 1976; Leridon, 1977; Nag, 1972; Ware, 1979; Westoff, 1974), thus giving a very crude indication of plausibility of the results in Table 4.

The validity of equation (3) can be tested directly by comparing its estimates of fecundability for different coital rates with the levels observed in the Barrett and Marshall study. Substituting M = 6 and n = 1, 2, 3, and 4 in equation (3), and setting pl = 1.0 due to exclusion of anovulatory cycles, fecundability estimates of 0.16, 0.29, 0.38, and 0.44, respectively, are derived. These model estimates agree quite well with the observed values--0.17, 0.34, 0.41, and 0.39--suggesting that the biological mechanism linking coital frequency and fecundability as outlined here is fairly realistic.

The relationship between coital frequency and fecundability presented here is basically a revised version of an equation originally proposed by Glass and Grebenik (1954). Alternative models have recently been proposed by Barrett and Marshall (1969) and Schwartz et al. (1980); however, these studies assume a duration of the fertile period of about a week. This assumption is probably not realistic, as will be demonstrated in the following section.

THE DURATION OF THE FERTILE PERIOD

The exact duration of the fertile period has proven difficult to determine. Thus the existing estimates vary widely--from less than a day (Tietze, 1960) to a week or more (Hartman, 1962). Before the principal reason for this divergence can be identified, the basic biological and demographic data available for determining the duration of the fertile period must be examined.

The Biological Evidence

The fertile period is a brief interval around the time of ovulation during which an insemination can result in a fertilization. Fertilization is possible if insemination occurs before ovulation because sperm retains its viability for a short time after insemination; it is also possible after ovulation because the ovum remains viable for a brief interval. Thus an approximate estimate of the fertile period would be the sum of the fertile lifetimes of sperm and ovum. However, this estimate is slightly too high since it does not take into account the time required for sperm capacitation: sperm takes about six hours after insemination to become fertile (James, 1979; Gwatkin, 1977). This time should be subtracted to yield an

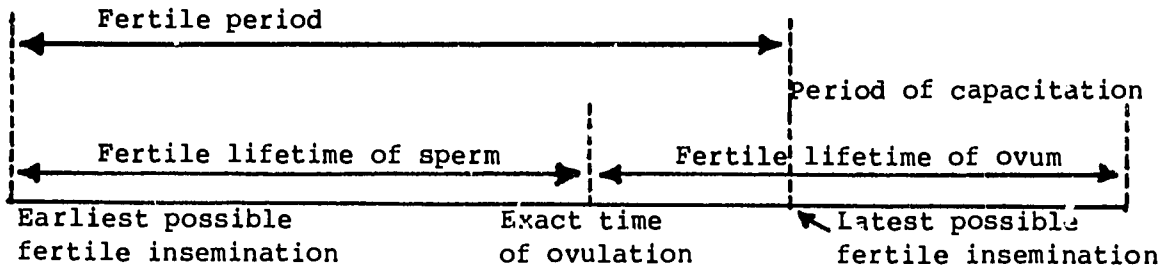

FIGURE 2 The Fertile Period

accurate estimate of the fertile period (see Figure 2).

Best available estimates of fertile lifetimes range from 24 to 48 hours for sperm (Vandervliet and Hafez, 1974) and from 12 to 24 hours for the ovum (Barrett and Marshall, 1969). Adding these lifetimes and subtracting 6 hours for capacitation gives a range of 30 to 66 hours for the fertile period, with an average of about 48 hours, or 2 days.

Although fertilization is possible with insemination during the fertile period, it does not always follow. This failure probability is about 5 percent ($p3 = 0.95$), while the probability of a recognizable conception is 0.475 ($p3 \times p4 = 0.95 \times 0.5$). Based on these estimates, the probability of conceiving around the time of ovulation is plotted in Figure 3(a): the risk of conception is zero until the beginning of the fertile period; it then rises more or less abruptly to 0.475, and after 2 days, declines again to zero. The "shape" of the fertile period is approximately rectangular according to this biological model.

The Demographic Evidence

A few studies have attempted to measure directly the probability of conceiving on days around the approximate time of ovulation. Vollman (1953), for example, analyzed calendars with daily records of the occurrence of intercourse in a group of noncontracepting women. The probability of conception on different days before and after the 14th day of the cycle can be calculated from these records. The results are plotted in Figure 3(c). The probability of conceiving is virtually zero before the 8th and after the 23rd day of the menstrual cycle, and reaches a maximum of less than 0.1 in the middle of the cycle.[6] Assuming an average incidence of anovulatory cycles among the women in this study, the daily probabilities of conception among ovulating women would be about 5 percent higher.

A similar set of data was available to Barrett and Marshall (1969). In addition to daily intercourse records, they collected daily temperature charts to approximate the time of ovulation according to temperature shift (BBT method). For menstrual cycles in which only one coitus took place, the daily conception probabilities

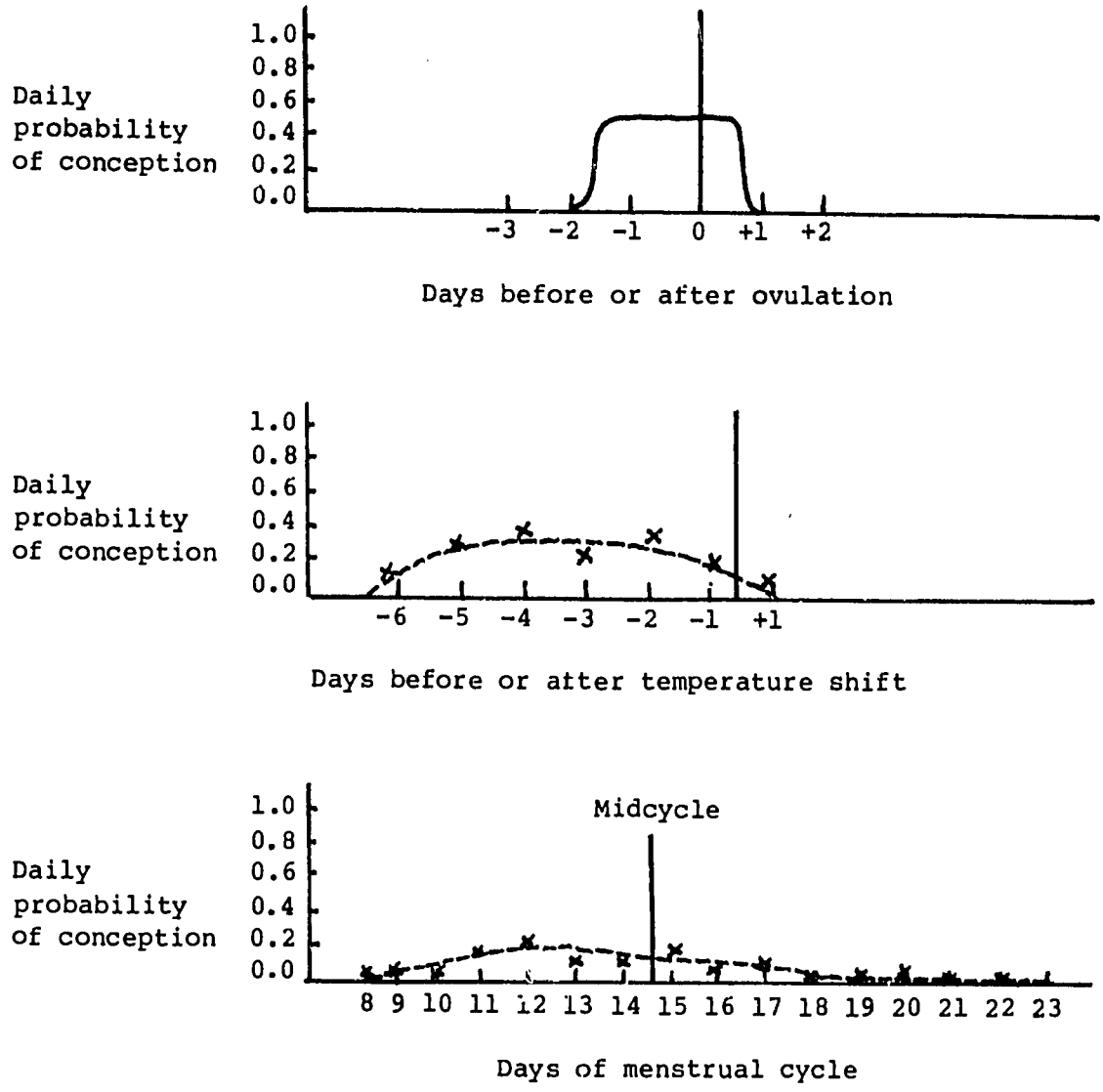

FIGURE 3 Daily Probabilities of Conception Around Exact or Approximate Time of Ovulation

can be calculated as shown in Table 5. These results from Table 5 are plotted in Figure 3(b). The fertile period ranged from six days before to one day after the temperature shift, with the conception risk reaching a maximum of about .25 a few days before the shift.

Divergence in Estimates of Fertile Period

As Figure 3 shows, the demographic studies yield much longer fertile periods and lower conception risks than the biological model. How can

TABLE 5 Conception Probabilities Around Day of Temperature Shift

	Time of Intercourse	Observed Fecundability
Days Before Temperature Shift	-6	.04
	-5	.20
	-4	.26
	-3	.15
	-2	.27
	-1	.15
Days After Temperature Shift	+1	.07

Source: Schwartz et al. (1980).

one explain these discrepancies between different estimates of the fertile period? Fortunately there is a simple explanation. The demographic and biological studies can be shown to be in good agreement when one considers that neither the 14th day of a cycle nor the day of the temperature shift indicates the exact time of ovulation. The fact that the middle of the menstrual cycle is not a good indicator of the time of ovulation is well known (Hartman, 1962); however, the BBT method also yields errors of up to several days[7] (Hartman, 1962; Buxton et al., 1950; James, 1969; Vollmann, 1953). As a result, the curves in Figure 3(b) and 3(c) represent average conception rates of women whose fertile periods start at different points in time. In other words, the approximately rectangular shape of the fertile period is "spread out" in the demographic studies as indicated in Figure 3. This distortion of the true shape is greatest in Figure 3(c) because the 14th day of the cycle is a less accurate indicator of ovulation than the temperature shift. If this hypothesis is correct, then the areas under the three curves in Figure 3 should be equal. Actually, the areas for Figures 3(a), (b), and (c) are 0.95 (= 2 x 0.475), 1.14, and 0.88, respectively. The agreement is quite good considering the various assumptions made in the biological model and the sampling errors in the demographic studies. It can therefore be concluded that the demographic results are consistent with an approximately rectangular fertile period of about two days' duration. This conclusion is supported by realistic relationships between the frequency of intercourse and fecundability discussed in the preceding section, where the fertile period was assumed to equal two days.

SPONTANEOUS INTRAUTERINE MORTALITY

Measures of intrauterine mortality usually include both spontaneous abortions and stillbirths, but exclude embryonic deaths before the first missed menses. A spontaneous abortion is a fetal death before the 28th week of gestation. After that date, the fetus becomes viable, and a fetal death is called a stillbirth. The duration of gestation is customarily measured from the first day of the last menstrual period and is about two weeks longer than the true duration of pregnancy.

A substantial number of studies have attempted to estimate the risk of intrauterine mortality, but these studies often suffer from significant shortcomings (Leridon, 1977; WHO, 1970a). Among the problems encountered are (1) incomplete reporting of fetal deaths, especially of early spontaneous abortions in retrospective studies; (2) the unrepresentative nature of the study population; (3) overstatement of spontaneous fetal mortality due to inclusion of induced abortions or misreporting of delayed menses; (4) errors in statistical estimation procedures; and (5) sampling errors if only a small number of fetal deaths are observed. As a consequence of these shortcomings, only a few studies can be considered reliable.

Excluding retrospective studies and others with obvious deficiencies, only four reports remain, all in the U.S., offering

TABLE 6 Intrauterine Mortality by Gestational Age

Gestational Age (weeks)	Intrauterine Mortality (percent)
4 - 7	8.1
8 - 11	5.9
12 - 15	2.9
16 - 19	1.0
20 - 23	0.6
24 - 27	0.3
28 - 31	0.2
32 - 36	0.2
36 - 39	0.3
40 +	0.5
Total	20.0

Source: Averages from studies by Erhard (1963), French and Bierman (1962), Shapiro et al. (1970), and Taylor (1970).

presumably reliable estimates of intrauterine mortality by duration of gestation.[8] Table 6 shows the average risk of an intrauterine death per 100 pregnancies in progress at four weeks from the last menstrual period as indicated by these four studies (Erhardt, 1963; French and Bierman, 1962; Shapiro et al., 1970; Taylor, 1970).

The overall risk of an intrauterine death after the fourth gestational week is about 20 percent (as noted earlier, the risk is much higher before the fourth week). The risk declines steeply from a high of 8.1 percent in the second month of gestation to a low of 0.2 percent around the 8th month, rising slightly thereafter. The great majority of deaths occur early in gestation. The risk of fetal mortality in the period from four to eight weeks is likely to be slightly overestimated, since in a number of cases a conception and fetal death were recorded solely on the basis of a report of a delayed menstruation. The actual proportion of conceptions failing to yield a live birth is therefore probably slightly smaller, perhaps around 17 percent. It is in practice very difficult to determine with certainty whether a fetal death takes place before the 5th or 6th week of gestation, except if a positive pregnancy test has been obtained. Menstrual delays of over a week occur not infrequently among nonpregnant women (Treloar et al., 1967), and widely used pregnancy tests are not very reliable during the first two weeks after the missed menses (E. Miller et al., 1976). Therefore, although most existing studies group estimates in the standard four-week periods, it would be preferable to estimate intrauterine mortality from the sixth week of gestation, when pregnancies can be reliably established. Presumably, the risk of fetal death after six weeks would be near 15 percent.

Intrauterine mortality rates vary substantially with age. They are lowest in the early twenties, rising slowly up to the mid thirties, and increasing sharply thereafter. Women aged 40 to 44 experience fetal mortality at about double the average rate. Teenagers may also have higher rates than women in their twenties, although this is not consistently observed (Leridon, 1977; Nortman, 1974).

Although very limited, the available evidence suggests that differences in intrauterine mortality between developing and developed countries may be quite small. Several carefully designed retrospective studies conducted in LDCs report fetal mortality rates in the same 12 to 15 percent range as was reported in similar studies in developed countries (Leridon, 1977). In addition, there is one reliable prospective study in Pakistan which estimates intrauterine mortality at 17.6 percent after the sixth gestational week (Awan, 1974). This estimate is very close to the levels observed in the U.S. Another prospective investigation in Bangladesh (Chen et al., 1974) reports an overall fetal death rate of 14.9; however, this result is based on a small sample, including only 14 fetal deaths. Further research is required before one can accept the hypothesis that intrauterine mortality is relatively invariant among populations. On the other hand, this hypothesis is broadly consistent with current understanding of the etiology of intrauterine mortality. In the early

months of gestation, the majority of fetal deaths are caused by genetic defects (Leridon, 1977), although other biological factors such as ectopic pregnancies also play a role. These biological causes presumably operate relatively independently from social, economic, and health factors (except for a few specific diseases); thus early fetal mortality, which constitutes the bulk of all intrauterine mortality, can be expected to show relatively little variation. In the later months of pregnancy, however, the fetus becomes more susceptible to such factors as infections and the general health of the mother (Yerushalmy, 1956). Stillbirth rates are indeed higher by about 3 percent in poor developing countries (WHO, 1970b), but this has a relatively small effect on the overall intrauterine mortality rate.

PREVALENCE OF PERMANENT STERILITY

Menopause signals the definite end of the potential reproductive years of women. In developed countries, the mean age at menopause ranges from about 47 to 50 years (medians slightly higher) (Gray, 1979b; McMahon and Worcester, 1966). The few estimates in developing countries are much less consistent, ranging from 43.7 to 50.7 years (Bongaarts, 1980). However, the quality of some of these estimates is questionable, and errors due to age misreporting, inaccurate recall, or inappropriate statistical analysis account for at least part of the variation (Gray, 1979a; McMahon and Worchester, 1966; McKinley et al., 1972). It is therefore not clear whether there is a systematic difference in the mean age at menopause between developing and developed countries; if such a difference does exist, it is probably rather small.

Sterility or infecundity is defined as the physiological incapacity to produce a live birth. Although a woman can be certain that she is sterile after menopause, actual sterility or severe subfecundity may set in years earlier. Several causes for this can be identified: (1) a number of abnormalities of the reproductive system which prevent otherwise healthy women from conceiving and bearing offspring even in the prime childbearing years (Speroff et al., 1978); (2) a high incidence of irregular and anovulatory cycles in the years immediately preceding menopause (Gray, 1979b; Metcalf, 1979; Treloar et al., 1967); (3) a rapid rise in intrauterine mortality and undetected embryonic mortality among women in their forties (Gray, 1979b); and (4) a high prevalence of specific diseases, primarily gonorrhea and genital tuberculosis (Gray, 1979a). The first three of these factors probably affect all populations to a similar extent; the impact of the fourth factor varies widely, from highly significant in some African societies (Belsey, 1976; Gray, 1979a; Retel-Laurentin, 1979; Romaniuk, 1968) to small or absent in most other populations. In addition to female sterility, there is of course sterility of the male, which is the cause of couple sterility in a third to a half of all cases (McFalls, 1979; Troen and Oshima, 1980).

The best available estimates of couple sterility have been calculated from historical data by Henry (1965), who developed a

TABLE 7 Proportion Sterile by Age of Wife

Age of Wife	Percent of Couples Sterile
20	3
25	5
30	8
35	15
40	32
45	69
50	100

Source: Henry (1965). Henry does not give an estimate of sterility for age 45 because he considers his methodology unreliable at that age. The estimate given here is taken from Vincent (1950), who proposed a set of age-specific sterility proportions almost identical to Henry's.

special methodology for this purpose. His estimates of sterility among couples by age of the wife are in Table 7. As the table shows, about 3 percent of couples in historical European societies are sterile from the beginning of the reproductive period and will consequently remain childless. Similar levels of childlessness are observed in developing countries with high fertility (Concepcion, 1980). With increasing age, sterility rises, slowly until the late thirties, and rapidly thereafter, reaching 100 percent at age fifty.

Comparable data for contemporary developed countries are not available, partly because the methodology developed by Henry requires that natural fertility prevail. Another complication in developed countries is the relatively high number of sterilizing operations. For example, 30 percent of U.S. women aged 35-44 in 1976 had undergone sterilizing operations, 17 percent for noncontraceptive and 13 percent for contraceptive reasons (Ford, 1978).

Based on Henry's age-specific sterility proportions, the mean age at onset of sterility can be estimated at 41.6 years. For reasons already given, this mean is well below the mean age at menopause. Sterile women cannot be fertile, but fecund women can be infertile, at least for brief periods. Therefore, if the onset of sterility occurs on average in the early forties, the end of childbearing in populations with natural fertility should take place at an even earlier age. The end of childbearing or the onset of infertility is

measured by the mean age at last birth, shown in Table 8 for a number of populations with natural fertility. The average of these estimates is 40 years, which, as expected, is slightly below the mean age at onset of sterility. The data in Table 8 indicate that the mean age at last birth is remarkably invariant. With very few exceptions, the

TABLE 8 Estimates of the Mean Age at Last Birth in Historical Populations

Population		Age at Last Birth
German Villages (pre-1850)		
Grafenhausen		39.7
Oshselbronn		39.2
Three Bavarian villages		40.6
Four Waldeck villages		40.7
Werdum		39.4
All Villages		
ge at marriage:	under 25	40.3
	25-29	40.1
Occupation of husband:	Artisans	39.8
	Farmers	39.8
	Landless	40.1
No. of infant deaths in first two confinements:	0	40.1
	1	40.4
	2	40.4
North American Communities		
Canada (17th century)		40.1
Canada (18th century)		41.0
Bois-Vert (20th century)		40.7
St. Jean-de-Cherbourg (1936-69)		38.6
Hingham (1641-1800)		39.1
Quakers (1730)		39.6
Hutterites (20th century)		40.9
Cris (20th century)		38.7
French Parishes		
Crulai (1674-1709)		40.0
Tourouvre au Perche (1665-1714)		40.3
English Population (mid-19th century)		41.7

Sources: Charbonneau (1970, 1979); Gautier and Henry (1958); Frisch (1978); Knodel (1978).

means fall in the 39- to 41-year range, even when subpopulations with different ages at marriage, occupations of husband, and numbers of infant deaths are considered. This mean age can be varied by such factors as taboos against intercourse at older ages (Caldwell and Caldwell, 1977; Ware, 1979), disease-induced sterility, and age misreporting; thus it would be unrealistic to expect all populations to fall within this range. Nevertheless, the uniformity of estimates in Table 8, as well as the fact that the well-nourished and healthy Hutterite population has a mean age at last birth of 40.9, suggests that the onset of natural sterility varies little among populations, except where gonorrhea or genital tuberculosis is widespread.

CONCLUSIONS

This review of the proximate determinants of natural marital fertility has touched only on the highlights of what has now become a large body of literature. These highlights include the fact that the duration of postpartum amenorrhea varies widely among populations, from a few months to about two years, and that this variation is largely if not entirely a result of differences in breastfeeding behavior. The waiting time to conception is found to vary within a narrower range, typically no more than two or three months from the average of about seven months; frequency of intercourse is the most influential factor. The remaining two proximate determinants--spontaneous intrauterine mortality and the prevalence of natural permanent sterility--are apparently relatively constant and are not directly influenced by behavior.

Among the four primary proximate determinants of natural marital fertility, postpartum amenorrhea is the only one for which there is clear evidence of an important change with modernization. In most developing countries or historical populations, the duration of postpartum amenorrhea exceeds six months and is often well over a year; in contemporary developed countries, on the other hand, this period is brief because the majority of women either do not breastfeed at all, or do so for only a short time. Although it is yet to be clearly documented, modernization may also influence sexual behavior and fecundability; however, any such changes will usually have a much smaller impact on fertility than the shortening of postpartum amenorrhea.

Several important topics, such as the effects of sociocultural and health factors on the proximate determinants, were outside of the scope of this paper (for reviews, see Nag, in these volumes; Gray, in these volumes). However, one subject not yet discussed, the relationship between changes in the proximate determinants and fertility, deserves brief comment. This relationship could in principle be studied empirically, but such studies are rare. Instead, reproductive models are used for this purpose. Typically, a proximate determinant is varied through a normal range of values, and corresponding changes in fertility levels are observed. A comparison of these changes then yields a ranking of the importance of the

proximate determinants. Two recent studies have gone through this exercise with very similar results (Bongaarts and Menken, in these volumes; Wilson, 1980). In brief, a change in postpartum amenorrhea from two years to three months causes fertility to double. This implies that, at least theoretically, differences in postpartum amenorrhea could explain most of the observed differences in marital fertility of populations with natural fertility. In contrast, the waiting time to conception had an intermediate impact, and normal variations in spontaneous intrauterine mortality and natural permanent sterility had only little effect.

PROPOSITIONS

The evidence presented in this paper supports the following conclusions and hypotheses:

1. There are four basic proximate determinants of natural marital fertility: (a) the duration of postpartum infecundability, (b) the duration of the waiting time to conception, (c) the risk of spontaneous intrauterine mortality, and (d) the incidence of permanent sterility.
2. The duration and pattern of breastfeeding are the main determinants of the duration of postpartum amenorrhea.
3. The frequency of intercourse is the principal determinant of fecundability and the conception wait.
4. The duration of the fertile period during which fertilization can take place in the middle of a cycle is approximately two days.
5. Only about half of all fertilized ova are followed by a missed menstruation; the remainder either fail to implant or abort spontaneously shortly after fertilization. Approximately 80 percent of all recognizable conceptions result in a live birth.
6. The mean age at last birth is close to 40 years in populations with natural fertility, except when taboos against intercourse at older ages are observed or when gonorrhea or genital tuberculosis is widespread.
7. Variations in the duration of postpartum amenorrhea are the main cause of variations in levels of natural marital fertility among different populations.

NOTES

1. The average time added to a birth interval due to intrauterine mortality is estimated by $aI/(1-a)$, where a is the proportion of conceptions ending in an intrauterine death and I is the sum of the means of the aborted gestation, the postabortum anovulation interval, and the waiting time to conception following the spontaneous abortion (Bongaarts, 1976). With a between 0.15 and 0.20 and I around ten months, the mean time added is about two months.

2. For example, in Bangladesh the mean waiting time to conception increased from 8.6 to 11.8 and 15.3 months for corresponding durations of husband's absence of 0-1, 1-4, and 5+ months. (Pregnancies of all orders are included in these estimates.) The mean waiting time to conception for all women combined was 10.9 months (Chowdhury, 1978). These estimates contain some upward bias because the conception waits of a proportion of the women overlapped with the 1974-1975 famine.
3. The observed change in age in the average birth interval depends on whether age is measured at the beginning or at the end of the birth intervals. The former introduces a negative bias in the older age groups due to the truncating effect of the onset of sterility, while the latter is associated with a negative bias at younger ages because shorter intervals have a higher chance of ending at an early age (Potter et al., 1965a; Sheps and Menken, 1973). (In addition, there is possibly a small upward bias in the oldest age groups if age is measured at the end of the birth interval, since longer birth intervals have a better chance of ending at a higher age.) To solve this problem, Potter et al. (1965) suggest that a reasonable trend with age is obtained by using birth intervals that start in age groups 20-24 and 25-29 in combination with birth intervals that end in the older age groups. With this method, they found a rise in the birth interval from 30.1 months in age group 20-24 to 35.8 in age group 35-39 in a study in India. This increase of 5.7 months or 19 percent is attributable to five factors: (1) an increase in intrauterine mortality; (2) a lengthening of the waiting time to conception and a decline in fecundability associated with decreasing frequency of intercourse and/or a rise in undetected embryonic mortality; (3) a lengthening of the postpartum amenorrhea interval; (4) the use of some contraception, presumably to a greater extent among older women; and (5) the small upward bias in the estimates of mean birth intervals at older ages. Another indication of the generally small rise in birth intervals with age is the modest decline in fertility rates of fecund women, which is inversely related to the mean birth interval in natural-fertility populations. In historical populations, the fecund fertility rate for the age group 35-39 is typically between 10 and 25 percent lower than that for the age group 20-24 (Charbonneaux, 1979; Henry, 1961).
4. Hertig (1967) estimates that fertilization did not occur in 15 percent of a group of women who had intercourse within 24 hours before or after the time of ovulation as determined from the endometrial morphology. If all these women had intercourse during the fertile period, pl would be 0.85, but this is likely to be an underestimate. Some women probably missed the fertile period, partly because the time of ovulation cannot be determined with complete accuracy and partly because the fertile period does not extend to 24 hours past the time of ovulation (see text).

5. A formula for estimating the correction factor required in the heterogeneous case is given in Bongaarts (1976). The size of the correction varies with the mean and variance of the coital rate distribution, but a typical correction is around 5 percent.
6. Three conceptions occuring 28, 29, and 36 days after the onset of the last menstrual period are excluded. It may be assumed that recording errors were made or that the cycles were abnormal.
7. In addition to a random error, there appears to be a systematic error. The temperature shift occurs on average about two days after the actual time of ovulation. Vollman (1953) reports that the temperature shift follows by about two days the "mittelschmertz," an intermenstrual pain believed to be associated with the rupture of the ovarian follicle.
8. Leridon (1977) examined seven studies which give life table estimates of intrauterine mortality. Of these seven, the Petterson study is excluded here because no fetal deaths after the 24th week were observed. Only one of the three life tables from Shapiro's work is selected here because in one case (Shapiro et al., 1962), the fetal mortality in the 4- to 8-week period is obviously underestimated, while in another, the estimates of intrauterine mortality are biased upward (Shapiro et al., 1970).

BIBLIOGRAPHY

Awan, A. K. (1974) Some biological correlates of pregnancy wastage. American Journal of Obstetrics and Gynecology 119:525-532.

Balakrishnan, T. R. (1979) Probability of conception, conception delay and estimates of fecundability in rural and semi-urban areas of certain Latin American countries. Social Biology 26:226-231.

Barrett, J. C., and J. Marshall (1969) The risk of conception on different days of the menstrual cycle. Population Studies 23:455-461.

Belsey, M. (1976) The epidemiology of infertility: A review with particular reference to Subsaharan Africa. Bulletin of the World Health Organization 54.

Bongaarts, J. (1975) A method for the estimation of fecundability. Demography 12:645-659.

Bongaarts, J. (1976) Intermediate fertility variables and marital fertility rates. Population Studies 30:227-241.

Bongaarts, J. (1980) Does malnutrition affect fecundity? A summary of evidence. Science 208:564-569.

Buxton, C. L., and E. T. Engle (1950) Time of ovulation. American Journal of Obstetrics and Gynecology 60:539-553.

Caldwell, J., and P. Caldwell (1977) The role of marital sexual abstinence in determining fertility: A study of the Yoruba in Nigeria. Population Studies 31:193-217.

Cantrelle, P., and H. Leridon (1971) Breastfeeding, mortality in childhood, and fertility in a rural zone of Senegal. Population Studies 25:505-533.

Cartwright, A. (1976) How Many Children? London: Routledge and Kegan Paul.

Charbonneaux, H. (1970) Tourouvre au perche aux XVII eme et XVIII eme siecles: Etude de demographie historique. Travaux et Documents 55. Paris: I.N.E.D.

Charbonneaux, H. (1979) Les regimes de fecondite naturelle en Amerique du Nord. In H. Leridon and J. Menken, eds., Patterns and Determinants of Natural Fertility. Liege: Ordina Editions.

Chen, L., et al. (1974) A prospective study of birth interval dynamics in rural Bangladesh. Population Studies 28:277-297.

Chowdhury, A. (1978) Effect of maternal nutrition on fertility in rural Bangladesh. In W. H. Mosley, ed., Nutrition and Human Reproduction. New York: Plenum Press.

Concepcion, M. (1980) Family Formation and Contraception in Selected Developing Countries: Policy Implications of WFS Findings. Paper presented at the World Fertility Survey Conference, London.

Delgado, H., A. Lechtig, E. Brinerman, R. Martorell, C. Yarborough, and R. E. Klein (1978) Nutrition and birth intervals components: The Guatemalan experience. In W. H. Mosley, ed., Nutrition and Human Reproduction. New York: Plenum Press.

Delvoye, J., M. Demaegd, J. Delogue-Desnoeck, and C. Robyn (1976) Serum prolaction in long-lasting amenorrhea. The Lancet 2:288-289.

Erhardt, C. L. (1963) Pregnancy losses in New York City, 1960. American Journal of Public Health 53:1337-1352.

Ford, K. (1978) Contraceptive use in the United States 1973-1976. Family Planning Perspectives 10:264-269.

French, F. E., and J. E. Bierman (1962) Probabilities of fetal mortality. Public Health Reports 77:835-847.

Frisch, R. E. (1978) Population, food intake and fertility. Science 199:22-30.

Gautier, E., and L. Henry (1958) La population de Crulai, Paroisse Normande: Etude historique. Travaux et Documents 33. Paris: I.N.E.D.

Gini, C. (1924) Premieres recherches sur la fecondabilite de la femme. Pp. 889-897 in Proc. Math. Congr. Toronto.

Glass, D. V., and E. Grebenik (1954) The trend and pattern of fertility in Great Britain. Papers of the Royal Commission on Population 6(Part I):255.

Gray, R. (1979a) Biological factors other than nutrition and lactation which may influence natural fertility: A review. In H. Leridon and J. Menken., eds., Patterns and Determinants of Natural Fertility. Liege: Ordina Editions.

Gray, R. (1979b) Biological and social interactions in the determination of late fertility. Journal of Biosocial Science, Supplement 6:97-115.

Gwatkin, R. (1977) Fertilization Mechanism in Man and Mammals. New York: Plenum Press.

Hartman, C. C. (1962) Science and the Safe Period. Baltimore, Md.: The Williams and Wilkins Co.

Henripin, J. (1954) La fecondite de menages Canadienne an debut du XVIII-eme siecle. Travaux et Documents 22. Paris: I.N.E.D.

Henry, L. (1953) Fondements theoriques des mesures de la fecondite naturelle. Review de l'Institut International de Statistique 21:135-151. Translated in M. Sheps and E. Lapierre-Adamcyk, eds. (1972) On the Measurement of Human Fertility. Amsterdam: Elsevier.

Henry, L. (1957) Fecondite et famille, model mathematiques. Population 12:413-444. Translated in M. Sheps and E. Lapierre-Adamcyk, eds. (1972) On the Measurement of Human Fertility. Amsterdam: Elsevier.

Henry, L. (1961) Some data on natural fertility. Eugenics Quarterly 8:81-91.

Henry, L. (1964) Mesure du temps mort en fecondite naturelle. Population 19:485-514. Translated in M. Sheps and E. Lapierre-Adamcyk, eds. (1972) On the Measurement of Human Fertility. Amsterdam: Elsevier.

Henry, L. (1965) French statistical research in natural fertility. In M. C. Sheps and J. C. Ridley, eds., Public Health and Population Change. Pittsburgh, Pa.: University of Pittsburgh Press.

Henry, L. (1979) Conceps actuals et resultats empiriques sur la fecondite naturelle. In H. Leridon and J. Menken, eds., Patterns and Determinants of Natural Fertility. Liege: Ordina Editions.

Hertig, A. T. (1967) The overall problem in man. P. 11 in K. Berirschke, ed., Comparative Aspects of Reproductive Failure. New York: Springer-Verlag.

Huffman, S. L., A. K. M. A. Chowdhury, J. Chakraborty, and W. H. Mosley (1978) Nutrition and postpartum amenorrhea in rural Bangladesh. Population Studies 32:251-259.

Jain, A. K. (1969) Fecundability and its relation to age in a sample of Taiwanese Women. Population Studies 23:169-185.

Jain, A. K. (1969) Pregnancy outcome and the time required for next conception. Population Studies 23:421-433.

Jain, A. K., T. C. Hsu, R. Freedman, and M. C. Chang (1970) Demographic aspects of lactation and postpartum amenorrhea. Demography 7:255-271.

James, W. H. (1968) A note of correction with reference to parameters of the menstrual cycle and the efficiency of rhythm methods of contraception. Population Studies 22:281-282.

James, W. H. (1979) The causes of the decline in fecundability with age. Social Biology 26:330-334.

Knodel, J. (1968) Infant mortality and fertility in three Bavarian villages: An analysis of family histories from the 19th century. Population Studies 22:297-318.

Knodel, J. (1978) Natural fertility in pre-industrial Germany. Population Studies 32:481-510.

Knodel, J. (1979) Demographic Transition in German Villages. Paper prepared for the summary conference on European fertility, Princeton.

Konner, M., and C. Worthman (1980) Nursing frequency, gonadal functions and birth spacing among Kung hunter-gathers. Science 207:788-791.

Leridon, H. (1977) Human Fertility: The Basic Components. Chicago: University of Chicago Press.

Lesthaeghe, R., and H. J. Page (1980) The postpartum non-susceptible period. Development and application of model schedules. Population Studies 34:143-170.

Majumdar, H., and M. Sheps (1970) Estimators of a type I geometric distribution from observations on conception times. Demography 7:349-360.

Malkani, P. K., and J. J. Mirchandani (1960) Menstruation during lactation. Journal of Obstetrics and Gynecology/India 11:11-22.

Masnick, G. (1979) The demographic impact of breastfeeding: A critical review. Human Biology 51:109-125.

McFalls, J. (1979) Frustrated fertility: A population paradox. Population Bulletin 34:2. Washington, D.C.: Population Reference Bureau.

McKeown, T., and J. Gibson (1954) A note on menstruation and conception during lactation. Journal of Obstetrics and Gynecology/British Empire 61:824-826.

McKinley, S., M. Jefferys, and B. Thompson (1972) An investigation of the age at menopause. Journal of Biosocial Science 4:161-173.

McMahon, B., and J. Worcester (1966) Age at menopause: United States 1960-1961. U.S. Vital and Health Statistics Monographs. Series 11, No. 19. Washington, D.C.: U.S. Government Printing Office.

McNeilly, A. S. (1978) Effects of lactation on fertility. British Medical Bulletin 35:151-154.

Metcalf, M. (1979) Incidence of ovulatory cycles in women approaching the menopause. Journal of Biosocial Science 11:39-48.

Miller, E., J. A. Fortney, and E. Kessel (1976) Early vacuum aspiration: Minimizing procedures to nonpregnant women. Family Planning Perspectives 8:33-39.

Moghissi, K. S. (1980) Prediction and detection of ovulation. Fertility and Sterility 34:89-97.

Nag, M. (1972) Sex, culture and human fertility: India and the United States. Current Anthropology 13:231-237.

Nortman, D. (1974) Parental age as a factor in pregnancy outcome and child development. Reports on Population and Family Planning 16. New York: Population Council.

Osteria, T. (1976) Lactation, amenorrhea and birth intervals in an urban community in the Philippines. Mimeo. Institute of Public Health, University of the Philippines, Manila.

Page, H. T., and R. Lesthaeghe (1981) Childspacing in Tropical Africa: Tradition and Change. New York: Academic Press.

Pascal, J. (1969) Quelque Aspects de la Physiologie du Postpartum. These pour le Doctorat en Medicine, Nancy France (quoted in H. Leridon, 1977).

Perez, A., P. Vela, R. Potter, and G. S. Masnich (1971) Timing and sequence of resuming ovulation and menstruation after childbirth. Population Studies 25:491-503.

Potter, R. G. (1961) Length of the fertile period. Milbank Memorial Fund Quarterly 39:132-162.

Potter, R. G., and M. P. Parker (1964) Predicting the time required to conceive. Population Studies 18:99-116.

Potter, R. G., J. B. Wyon, M. Parker, and J. E. Gordon (1965a) A case study of birth interval dynamics. Population Studies 19:81-94.

Potter, R. G., J. B. Wyon, M. New, and J. E. Gordon (1965b) Applications of field studies to research on the physiology of human reproduction. Journal of Chronic Diseases 18:1125-1140.

Retel-Laurentin, A. (1979) Quelques elements de la fecondite naturelle dans deux populations Africaines a faible fecondite. In H. Leridon and J. Menken, eds., Patterns and Determinants of Natural Fertility. Liege: Ordina Editions.

Romaniuk, A. (1968) Infertility in tropical Africa. In J. E. Caldwell and C. Okonjo, eds., The Population of Tropical Africa. New York: Population Council.

Salber, E., M. Feinlieb, and B. MacMahon (1966) The duration of postpartum amenorrhea. American Journal of Epidemiology 82:347-358.

Schwartz, D., P. D. M. MacDonald, and V. Henchel (1980) Fecundability, coital pregnancy and the viability of ova. Population Studies 34:397-400.

Shapiro, S., E. Jones, and P. Densen (1962) A life table of pregnancy termination and correlates of fetal loss. Milbank Memorial Fund Quarterly 40:7-45.

Shapiro, S., H. S. Levine, and M. Abramowiez (1970) Factors associated with early and late fetal loss. Advances in Planned Parenthood 6:45-63.

Sheps, M., and J. Menken (1973) The Mathematics of Conception and Birth. Chicago: University of Chicago Press.

Short, R. V. (1976) Lactation--The central control of reproduction. In Breastfeeding and the Mother. Amsterdam: Elsevier.

Speroff, L., R. H. Glass, and N. G. Kase (1978) Clinical Gynecologic Endocrinology and Infertility. Baltimore, Md.: The Williams and Wilkins Co.

Taylor, W. F. (1970) The probability of fetal death. Pp. 307-320 in F. C. Fraser and V. A. McKusick, eds., Congenital Malformations. Amsterdam: Excerpta Medica.

Tietze, C. (1960) The probability of pregnancy resulting from a single unprotected coitus. Fertility and Sterility 11:484-488.

Treloar, A. E., R. E. Boynton, B. G. Bolin, and B. W. Brown (1967) Variation of the human menstrual cycle through reproductive life. International Journal of Fertility 17(1, Part 2):77-126.

Troen, P., and H. Oshima (1980) The male factor. New England Journal of Medicine 303:751-752.

Tyson, J. E., and A. Perez (1978) The maintenance of infecundity in postpartum women. In W. H. Mosley, ed., Nutrition and Human Reproduction. New York: Plenum Press.

Vandervliet, W. L., and E. S. Hafez (1974) Survival and aging of spermatozoa: A review. American Journal of Obstetrics and Gynecology 118:1006-1015.

Van Ginneken, J. K. (1978) The impact of prolonged breastfeeding on birth intervals and on postpartum amenorrhea. In W. H. Mosley, ed., Nutrition and Human Reproduction. New York: Plenum Press.

Vincent, P. (1950) La sterilite physiologique des populations. Population 5:45-64.

Vollman, R. F. (1953) Uber fertilitat und sterilitat der frauinnerhalb des menstruations cycles. Archiv fur Gynakologie 187:602-622.

Vollman, R. F. (1956) The degree of variability of the length of the menstrual cycle in correlation with age of woman. Gynaecologia 142:310-315.

Ware, H. (1979) Social influences on fertility at later ages of reproduction. Journal of Biosocial Science, Supplement 6:75-96.

Westoff, C. F. (1974) Coital frequency and contraception. Family Planning Perspectives 6:136-141.

Westoff, C. F., R. G. Potter, P. C. Sagi, and E. C. Mishler (1961) Family Growth in Metropolitan America. Princeton, N.J.: Princeton University Press.

Wilson, C. (1980) The Components of Marital Fertility in Historical Europe. Paper presented at the International Union for the Scientific Study of Population Seminar on the Analysis of Maternity Histories, London.

World Health Organization (1970a) Spontaneous and induced abortion. World Health Organization Technical Report Series. Geneva: WHO.

World Health Organization (1970b) The prevention of perinatal mortality and morbidity. World Health Organization Technical Report Series 407. Geneva: WHO.

Yerushalmy, J., J. M. Bierman, D. H. Kemp, A. Couner, and F. E. French (1956) Longitudinal studies of pregnancy on the Island of Kauai, Territory of Hawaii. American Journal of Obstetrics and Gynecology 71:80-96.

Chapter 5

THE IMPACT OF HEALTH AND NUTRITION ON NATURAL FERTILITY

Ronald Gray

INTRODUCTION

Examining the effects of health and nutrition on natural fertility is a complex effort requiring consideration of data from demographic, epidemiological, clinical, and biological studies. It is also necessary to note some important qualifications. First, seldom do we have an empirical paradigm of health and nutritional status against which to measure deviations. The concept of "normality" in these areas embraces not only the absence of specific disease, but also a state of general physical and social well-being permitting the individual to fulfill his or her genetic potential. In fact, few individuals enjoy such optimal health. Second, both health and nutrition need to be defined with some precision before their effects on natural fertility can be studied.

For descriptive purposes, diseases can be divided into seven categories corresponding to the major causes of pathology: infectious and parasitic diseases, nutritional diseases, metabolic and endocrine disorders, degenerative disorders, neoplasms, genetic or chromosomal abnormalities, and the effects of chemical and physical agents. Although all illnesses may potentially influence reproduction simply because debility can affect the frequency of intercourse, the present discussion will focus upon those diseases of public health importance in which there is substantive evidence of a direct impact on fertility. Some diseases may affect a specific component of the reproductive process. For example, gonorrhea may cause occlusion of the fallopian tubes, leading to sterility, and syphilis leads to an increased risk of spontaneous abortion or stillbirth. Other diseases may influence fertility by a more general effect on the individual, as with the multiple parasitic infestations, chronic infections, or poor nutrition frequently observed in developing countries. This broad spectrum of disorders may disturb the physiology of reproduction, leading to delays in puberty, the impairment of ovulation, or abnormalities of the menstrual cycle, gestation, and lactation; there may also be negative effects on male spermatogenesis.

The effects of nutrition on fertility have received considerable

attention both because there is evidence of an association between malnutrition and amenorrhea, and because poor nutrition is widespread in many developing countries. However, before evaluating the evidence for an association between nutrition and fertility, it is necessary to consider the complex nature and consequences of malnutrition. A deficiency of protein, calories, vitamins, or minerals impairs the multiplication of cells and the maintenance of cellular integrity. The consequences of these defects will vary with the severity and duration of malnutrition, the nature of the deficient nutrient, the age of the individual, and the presence of concomitant illness. Malnutrition seldom occurs in isolation, and there is a complex interaction between nutrition and infectious or parasitic diseases. Malnutrition disrupts the integrity of the body's surfaces, such as the skin or intestinal mucosa, and undermines the immunological defense mechanisms responsible for resistance to infection, thus increasing both the risk of disease and the severity of illness. Conversely, ill health undermines nutrition both because anorexia, nausea, and vomiting reduce food intake, and because disease processes such as fever lead to tissue breakdown (Chandra and Newberne, 1977). Thus it is often impossible to assess whether any negative effects of nutrition on fertility are the result of the malnutrition per se, or of an interaction between nutrition and infection. As a result, simple anthropometric indices of nutritional status may only reflect a limited spectrum of the ill health associated with poor nutrition.

It is also important to distinguish between the acute malnutrition associated with starvation under famine conditions and the more frequently observed chronic protein-calorie undernutrition found in many poor societies. The effects of acute starvation tend to be extreme, both because the stress is severe and because the organism has little time to adapt; chronic undernutrition may be less debilitating because of metabolic adjustments to long-term dietary deficiencies. It is therefore important to be cautious about applying evidence from studies of acute starvation to less severe chronic conditions.

Finally, it must be noted that reproduction itself is an important cause of nutritional disorders in women. Menstrual blood loss contributes substantially to iron deficiency anemia in societies with inadequate dietary iron supplies, while pregnancy and lactation make major demands upon maternal protein, calorie, vitamin, and mineral stores. Thus, repeated cycles of pregnancy and lactation may be a factor leading to the state of chronic undernutrition observed in many women in developing countries (Jelliffe and Jelliffe, 1978).

With these qualifications in mind, the following discussion reviews the available data on the effects of nutrition and health on five proximate determinants of natural fertility: breastfeeding and postpartum amenorrhea, fecundability, sterility, age at menarche and menopause, and intrauterine mortality. This is followed by a series of propositions summarizing the major conclusions of the discussion.

EFFECTS OF HEALTH AND NUTRITION ON THE PROXIMATE DETERMINANTS OF NATURAL FERTILITY

Breastfeeding and Postpartum Amenorrhea

Numerous epidemiological and demographic studies have clearly shown that the duration of postpartum amenorrhea is related to the duration of breastfeeding (see Bongaarts, in these volumes; Buchanan, 1975; Van Ginnekin, 1977; Billewicz, 1979). This is because suckling stimulates the secretion of prolactin from the pituitary gland; prolactin in turn leads to anovulation and amenorrhea both by a direct inhibitory effect on the hypothalamic/pituitary system and possibly by reducing ovarian sensitivity to the pituitary gonadotrophin horomones (McNeily, 1979). The levels of prolactin and the duration of amenorrhea depend upon the time lapsed since delivery, and the frequency, intensity, and duration of suckling (Tyson and Perez, 1978).

Poor maternal nutrition causes a reduction in milk volume; in extreme cases, maternal starvation may lead to the cessation of lactation (Jelliffe and Jelliffe, 1978). Recent studies in the Gambia show that during the rainy season, when dietary energy supplies are markedly reduced and the demands of agricultural labor are high, women experience a marked decline in the volume of their breast milk, while at the same time, there is a marked increase in the levels of serum prolactin. When massive dietary supplements of 720 calories per day were given to the mother, prolactin levels were reduced and there was indirect evidence of an earlier resumption of ovulation (Whitehead et al., 1978; Paul et al., 1979; Lunn et al., 1980, 1981). The most plausible explanation for these findings is that the reduction in milk volume caused by poor maternal nutrition during the wet season resulted in more aggressive and intense suckling by the hungry infant. This in turn stimulated higher prolactin release; however, because of the mother's poor nutritional status, these higher prolactin levels did not result in increased milk production. Also, if there is insufficient food available for the mother, it is likely that there will be an inadequate supply for infant supplementary feeding; this will in turn increase the dependence of the child on breastfeeding as the main source of nutrition and thus further intensify the suckling stimulus (Mosley, 1979; Bongaarts and Delgado, 1979).

Studies in Bangladesh, Guatemala, the Philippines, Zaire, and Mexico have investigated the relationship between maternal nutrition and the duration of postpartum amenorrhea (Chowdhury, 1978; Huffman et al., 1978; Huffman et al., 1980; Bongaarts and Delgado, 1979; Carael, 1978; Osteria, 1978; Chavez and Martinez, 1973). Maternal nutritional status was determined by anthropometric indices of weight and height or, in some cases, by dietary surveys. In the Mexican study, the infants were given supplementary foods, which may have reduced the intensity of suckling and of amenorrhea. All these investigations, with the exception of the Mexican report, show that women with poorer nutritional status have a longer average duration of postpartum amenorrhea than those with better nutritional levels. However, the

differences in duration of amenorrhea were only around one to two months, a relatively small component of the total birth interval. In general, therefore, the moderate levels of malnutrition observed in these surveys cannot alone account for variations in birth spacing and fertility levels reported among populations in developing countries or in studies of historic European populations (Bongaarts, 1980).

In extreme cases, it is possible that poor maternal nutrition can result in a more marked prolongation of amenorrhea. In one Bangladesh survey, women in the lowest tenth percentile of weight for height experienced a median duration of amenorrhea of 22.6 months, whereas well-nourished women had a median duration of approximately 19.3 months. This difference of 3.3 months is equivalent to about 10 percent of the average birth interval (Huffman et al., 1980). Studies of populations during famine have shown that acute starvation is associated with prolonged amenorrhea (Keys et al., 1950; Stein and Susser, 1978; Chowdhury, 1978). Therefore, in selected populations with severe malnutrition, or in a subgroup of disadvantaged women within a population, poor nutrition may prolong postpartum amenorrhea sufficiently to have a significant demographic effect. This is in part attributable to the slow-down of metabolic processes as a result of the lack of essential nutrients. However, these effects are by no means specific to the reproductive process (Keys et al., 1950).

In a number of publications, Frisch (Frisch and McArthur, 1974; Frisch, 1975, 1978) has suggested that there may be certain critical levels of body fat reserves below which menstruation ceases, and she has suggested that this explains the variations between populations in the duration of postpartum amenorrhea. However, her general argument has been challenged because of the inadequacy of her data and methodological problems in the analysis (Billewicz et al., 1976; Trussell, 1978). The empirical studies summarized above suggest that if nutrition influences lactational amenorrhea, the effect is, in general, relatively small. Moreover, in many societies, breastfeeding women progressively lose weight due to the caloric and protein requirements of lactation, so that their body weight and fat reserves are often lower at the time of resumption of menstruation than during the earlier period of amenorrhea (Bongaarts and Delgado, 1979). Thus, the attainment of a critical weight/height ratio or proportion of body fat alone cannot explain the resumption of menstruation during lactation.

On the other hand, the inadequate supplies of breast milk due to poor nutrition may have indirect effects which shorten the duration of amenorrhea. Inadequate supplies of breast milk may impair infant growth, requiring the earlier introduction of supplementary foods, or even causing premature weaning. Since artificial infant foods are often nutritionally unsatisfactory and, because of contamination, often act as a source of gastrointestinal infection, there is in turn an increased likelihood of infant morbidity and death. Thus poor maternal nutrition can lead to the cessation of lactation, the resumption of menstruation, and a shortening of the birth interval (Mosley, 1979). It is difficult to assess the public health importance of this chain of events, since direct studies of maternal

nutrition, lactational performance, and infant survival have only been conducted in small samples of often severely deprived women. However, it is likely that cultural change leading to a decline in breastfeeding and an increased reliance on artificial baby foods has a more significant effect by both shortening the birth interval and by increasing the likelihood of child death (Jelliffe and Jelliffe, 1978).

In summary, maternal nutrition per se is unlikely to be a critical factor determining the length of postpartum amenorrhea in most populations, although it could be of some importance to a minority of very poorly nourished women receiving massive food supplementation. It is therefore misleading to argue that maternal feeding programs which provide only moderate supplements are likely to lead to increased population growth by reducing postpartum amenorrhea (Lunn et al., 1980; New Scientist, 1980). In contrast, increased use of supplementary infant feeding may reduce the frequency and intensity of breastfeeding, which could in turn result in an earlier resumption of menstruation and a shortening of the birth interval. Several studies have in fact shown that the probability of resuming menstruation is higher among women who use supplementary infant foods than among those who rely entirely on breastfeeding, even after controlling for the duration of lactation (Buchanan, 1975).

Any severe illness, especially breast abscess, can cause a failure of lactation. However, this is unlikely to have important demographic effects. It is also noteworthy that lactational amenorrhea is very long in a number of African and Asian societies in which women suffer from a variety of chronic or recurrent debilitating illnesses.

FECUNDABILITY

The monthly probability of conception, or fecundability, is dependent upon acts of intercourse in the presence of a viable ova and sperm. The frequency of intercourse therefore has a marked effect on fecundability (see Bongaarts, in these volumes). Any severe illness or malnutrition can lead to a loss of libido and a reduction in the frequency of intercourse, significantly reducing the probability of conception. The effects of moderate malnutrition on fecundability have been studied in Bangladesh and Guatemala. In Bangladesh, conception waits were 11.3 months for poorly nourished women (body weight less than 38.5 kg), as compared to 10.7 months for better-nourished subjects weighing over 42.5 kg (Chowdhury, 1978); these differences were not statistically significant.[1] No difference in the waiting time prior to conception was observed in the Guatemalan survey (Bongaarts and Delgado, 1979).

Starvation leads to anovulation and amenorrhea in the female, and a reduction in sperm count and libido in the male. In severe cases, there may be testicular atrophy (Keys et al., 1950; Mosley, 1979). Obviously, such severe disruption of reproductive physiology could have a considerable effect on fertility. Studies of famine in Europe and Bangladesh show a marked decline in the birth rate expected for the period of maximum food shortage. Conversely, approximately nine

months after the restoration of food supply, there was a recovery in the birth rate (Stein and Susser, 1978; Mosley, 1979).

Seasonal variations in births have been reported from many countries, and it has been suggested that these patterns may be due to corresponding variations in a number of environmental influences on fecundability. Cowgill (1966) showed that in England and Wales, births peaked in the northern spring, whereas in Australia, New Zealand, and South Africa the birth peak occurred in the southern spring. However, in the continental United States, the peak season of birth is during the northern autumn months, while in Puerto Rico, the pattern shifted from a spring peak in 1941-45 to an autumn peak in 1956-61. The similarities in seasonal patterns between Britain and her ex-colonial countries, the dissimilarity between the United States and Britain, and the changing pattern in Puerto Rico all suggest that cultural factors predominate in the seasonality of births in industrialized countries.

In developing countries and historic European populations, there is a correlation between temperature and conception rates, with a peak of conception during the cooler months of the year. These observations have been reported in India, Bangladesh, Hong Kong, and nineteenth-century France (Bernard et al., 1978; Chen et al., 1974; Becker, 1980; Chang et al., 1963; Voranger, 1953; Dyson and Cook, 1979). This association between conception rates and temperature may be due to behavioral factors such as changes in sleeping habits which could increase the frequency of intercourse during the cooler months; however, there are no empirical data on seasonal patterns of intercourse to support this hypothesis.

In Bangladesh, there is a marked seasonal pattern to the resumption of postpartum menstruation: 52 percent of women experience their first menstrual period during the months of September to December following the harvest (Huffman et al., 1980). This is associated with a peak of conceptions during the spring months (Chen et al., 1974; Becker, 1980). Seasonal variations in body weight cannot explain these patterns (Huffman et al., 1980).

The Gambian pattern noted above of increased agricultural work, reduced nutrition, and decreased breast milk supplies during the June-November rainy season is associated with a relative deficit of births during May-July and a recovery of births during the August-October quarter. This suggests a reduced number of conceptions during the period of maximum occupational and nutritional stress. (There are no data on the seasonal resumption of menstruation in the Gambia.) This pattern is similar to that reported in Bangladesh (Chen et al., 1974; Becker, 1980) and other developing countries (Dyson and Cook, 1979). It therefore seems probable that seasonal variations in women's agricultural activities, food availability, and breastfeeding patterns are important factors influencing the seasonality of births in the wet tropics.

The prevalence of specific diseases may also influence the seasonality of births. In Sri Lanka, there was a deficit of conceptions during the period of peak malaria transmission prior to malaria control; after malaria control, the distribution of births

became more uniform throughout the year. This suggests a decreased fecundability during the malaria season, either because of a reduced frequency of intercourse, or because of an increased risk of fetal wastage in association with malaria infections (Newman, 1970).

Sterility

All women are sterile prior to menarche or following the menopause, and fertility is reduced during the early and late periods of reproductive life. These changes can be considered as "natural" sterility in that they do not have pathological causes (Gray, 1979a).

Primary sterility, defined by the World Health Organization (WHO) as the proportion of married women who are involuntarily childless at the end of their reproductive lives (WHO, 1975), varies from as low as 1 percent in countries such as Korea, to more than 20 percent in some African and New Guinean populations (Muir and Belsey, 1980). The very low figure for Korea may be an underestimate due to the abandonment or divorce of sterile women. It is generally considered that, in healthy populations such as the Hutterites, the prevalence of primary sterility is around 3 percent. Secondary sterility, defined by WHO as the proportion of parous married women who, despite exposure to the risk of pregnancy, fail to conceive over a period of two years or more, may also reach demographically significant levels (WHO, 1975). Epidemiological and clinical studies suggest that a high prevalence of primary and secondary sterility is often associated with pelvic inflammatory disease (PID), defined as any supracervical infection involving the uterus, fallopian tubes, ovary, or other internal pelvic organs; PID is also used as a synonym for salpingitis.

PID usually results from the ascending spread of organisms from the vagina, with sexually transmitted diseases constituting the most common source of infection. The microorganisms responsible vary from country to country. Gonorrhea has been identified in from 10 to 70 percent of women with salpingitis, although other organisms such as chlamydia trachomatis and mycoplasma hominis have been increasingly implicated in industrialized countries (Holmes et al., 1980; Mardh, 1980). It is thought that these organisms cause damage to the epithelium of the fallopian tubes, leading to tubal occlusion which prevents the passage of the sperm or ova. Moreover, the damage done by these sexually transmitted organisms may lead to structural changes which facilitate the overgrowth of other bacteria, thus exacerbating the tubal damage. Postabortion or postpartum infection may also be an important source of PID. Swedish workers have estimated that 0.5 percent of legal abortions are complicated by acute PID within three weeks of the operation (Westrom, 1980). In developing countries where obstetrical services are deficient, morbidity from postpartum or postabortal infections may be substantially higher (see David, in these volumes), although there are insufficient data available to estimate the relative contribution of obstetrically related PID (Muir and Belsey, 1980; Kochar, 1980). It has been suggested that the practice of female circumcision in some African countries may be

associated with a high prevalence of sterility or PID (Hoskin, 1979; Rushwan, 1980). However, a recent review of the literature on circumcision and infertility failed to support this hypothesis (Simpson-Hebert and Gray, 1981).

Prior to the advent of antibiotics, it is estimated that between 40 and 75 percent of women suffered from involuntary sterility following acute salpingitis. More recently, Swedish studies have shown that among treated cases of PID, infertility occurred in 11.4 percent of subjects with one episode of acute salpingitis, 23.1 percent with two episodes, and 54.3 percent with more than three episodes. Also, infertility was more frequently observed among women who had more severe signs of inflammatory changes in the tubes (Westrom, 1980).

Gonorrhea in the male is also a significant cause of infertility. Before the introduction of antibiotics, infection of the epididymis or prostate occurred in 17 to 30 percent of men with gonorrhea. Subsequent childlessness was observed in 42 percent of cases with bilateral epididymitis, 23 percent with unilateral epididymitis, and 10.5 percent with no epididymal involvement. In populations with a high prevalence of infertility, signs of chronic gonorrhea infections in the males are frequently reported (WHO, 1975).

There is evidence from some developing countries to suggest that gonorrhea is an important public health problem responsible for a high prevalence of primary and secondary sterility. Epidemiological surveys in two areas of Uganda showed that in the area (Teso) with a high level of primary sterility, clinical evidence of gonorrhea was detected in 18 percent of women; in the area (Ankole) with low sterility levels, gonorrhea was observed in only 5.9 percent of subjects. Also, a past history of gonorrhea was more frequently obtained from the husbands of infertile women in the Teso district (Arya et al., 1980). Further, a national survey of Uganda showed a correlation between the prevalence of chronic gonorrhea in males and low general fertility rates in 15 districts (Griffith, 1963). Retel-Laurentin (1979) also observed an association between the prevalence of signs of chronic gonorrhea among males and evidence of low fertility in a number of populations in Upper Volta. Scragg (1957) observed changes in the fallopian tubes suggestive of chronic gonorrhea in 70 percent of infertile women in New Ireland, where the prevalence of infertility was so high as to lead to depopulation.

In the past, gonorrhea was extremely sensitive to penicillin, and the mass use of antibiotics in both developed and developing countries was associated with a decrease in gonococcal transmission. New Ireland had a high prevalence of infertility and gonorrhea prior to a mass penicillin campaign in 1954; subsequently, there was a substantial rise in fertility, especially among more recent cohorts of women who reached sexual maturity after the introduction of antibiotics (Ring and Scragg, 1973; Gray 1979a). In Martinique, there was a decline in the proportion of sterile women following a mass penicillin campaign against yaws (Leridon et al., 1970); similar observations have been reported in postwar Jamaica (Tekse, 1968).

In summary, there is strong evidence that demographically

significant levels of infertility are associated with a high prevalence of PID, and that sexually transmitted diseases, predominantly gonorrhea, are the major causal agents.

It may be noted that genital tuberculosis also causes infertility; however, it is difficult to estimate the importance of this condition on a population basis. Hospital data do suggest that tuberculous salpingitis may be an important cause of infertility in some areas of India. Schistosomiasis and filariasis have also both been implicated as possible causes of infertility, although there are no satisfactory epidemiological or clinical studies to support this contention (Muir and Belsey, 1980).

Age at Menarche and Menopause

The age at menarche varies considerably from one population to another. On average, it is around 12 to 13 years in the industrialized countries and in developing countries such as Cuba with high standards of health; however, it can be delayed until 18 years or more in poor societies such as those observed in the highlands of New Guinea (Gray, 1979a). There is an association between nutritional status and the onset of menarche which might explain much of this intercountry variation. Direct evidence derived from surveys in the United States and India (Dreizen et al., 1967; Frisch, 1975; Bongaarts, 1980) show that girls with good diets have significantly earlier menarche than girls with poor diets. In addition, there is a direct correlation between weight for height and the probability of starting menstruation at a given age. The decline in the age of menarche observed in industrial countries over the past century, as well as the inverse relationship between socioeconomic status and age at menarche, provides further indirect evidence for the influence of nutrition on the onset of puberty (Tanner, 1968; Bongaarts, 1980).

On the basis of these observations, Frisch and McArthur (1974) suggested that there may be a critical body weight-for-height ratio or proportion of fat to lean body mass necessary for the attainment of menarche. However, menarche is only a late event in the pubertal process, which consists of a growth spurt as well the development of sexual maturity. As a result, the correlation between anthropometric indices and age at menarche cannot be interpreted in such a mechanistic fashion. If poor nutrition simultaneously impairs adolescent growth and sexual maturation, one cannot assume a causal relationship between anthropometric growth indices and menarche; rather, both are consequences of the same causal mechanism. Frisch's hypotheses has also been challenged because of methodological problems and the difficulty of drawing causal inferences from derived data (Billewicz et al., 1976; Trussell, 1978). In general, the consensus is that there is no evidence for a simple threshold or "critical" ratio of body weight to height or relationship between proportion of body fat and menarcheal age, although there is a clear correlation between nutrition and menarche.

It has been argued that delayed menarche and prolonged adolescent

subfertility are likely to have only a small effect on total fertility because age at marriage is the main factor determining the onset of reproduction (Menken and Bongaarts, 1978; Bongaarts, 1980). In modern societies, marriage is delayed and in general is independent of age at menarche. Moreover, in more traditional societies where marriage occurs shortly after menarche, variations in menarcheal age from 12 to 18 years are estimated to have only a small influence on total fertility of around 2 to 5 percent. On the other hand, these estimates are based on the assumption that age at marriage is relatively inelastic in relation to age at puberty. It is possible that with extremely late menarche, declines in menarcheal age, if associated with declines in marital age, could result in more significant increases in fertility. However, the malnourished societies where such changes might occur are small and few in number.

Data on age at menopause are less satisfactory than those on the age at menarche, both because the menopause is not a discrete event and because of difficulties in estimating the age of older women in nonindustrialized societies. In most modern populations, the median age of menopause is around 50 years[2]; in some developing countries such as India, New Guinea, and Francophone Africa, the median age may be less than 44 years (Gray, 1979a; Retel-Laurentin, 1979). There is some evidence to suggest that poor nutrition may be associated with an earlier menopause. An American study showed that thinner women reach menopause at an earlier age than obese women (MacMahon and Worcester, 1966). A survey of two New Guinean populations showed that in a poorly nourished group, the median age of menopause was 43.6 years, whereas in a better nourished group, it was 47.3 years (Gray, 1979a).

Some authors suggest that the age at menopause has increased by approximately four years over the past century in industrialized countries; however, a careful examination of the data shows that the trends are not as consistent as those observed with the changing age of menarche. Moreover, there are serious methodological shortcomings to the older surveys which could lead to an underestimate of menopausal age in earlier periods (Gray, 1976).

Although there is a marked decline of fertility for a decade prior to the onset of the menopause, there is very little information on how this terminal fertility is affected by a woman's health or nutritional status; moreover, frequency of intercourse tends to decrease with increasing maternal age. In most noncontracepting populations, the mean age of last birth is around 40 years (Knodel, 1979; Gray, 1979a, 1979b; Bongaarts, in these volumes). However, in one poorly nourished New Guinean population, the mean age at last birth was around 37 years (Scragg, 1973). This might indicate an effect of nutrition on fertility at later ages, but the data are too tenuous to permit any conclusions. Also, Frisch (1978) reports a median age at last birth over 40 years in a poorly nourished nineteenth-century English population; thus any effect of nutrition is likely to be minimal.

In a number of developing countries, women have been found to lose weight with increasing age and parity. This pattern, termed the "maternal depletion syndrone," is thought to be due to a chronic cumulative nutritional deficiency associated with hard physical work

and repeated cycles of pregnancy and lactation (Jelliffe and Jelliffe, 1978). Thus, older women may be at increased nutritional risk and more susceptible to any possible adverse effects of poor nutrition on fertility. However, a comparison of marital age-specific fertility rates among noncontracepting populations suggests that fertility declines at older ages in a remarkably homogeneous manner, irrespective of the levels of fertility at younger ages (Gray, 1979b). In addition, Menken and Bongaarts (1978) have shown that even major changes in the age at menopause are unlikely to have a marked effect on total fertility since reproduction at later ages contributes so little to completed family size.

Intrauterine Mortality

Intrauterine mortality includes both spontaneous abortion (i.e., fetal death prior to 28 weeks gestation or a birth weight less than 500 gms) and stillbirths. The focus here will be on spontaneous abortion since this is the most frequent cause of fetal loss and is likely to be of more demographic significance.

Embryological studies and more recent endocrinological investigations of early pregnancy suggest that between 10 and 15 percent of fertilized ova fail to implant in the uterus; among those that do implant, 33 to 42 percent fail to survive long enough to cause a missed period (Leridon, 1977; Schlesselman, 1979; Miller et al., 1980). Of those conceptions that can be identified after the missed period, it is estimated that around 25 percent terminate as a spontaneous abortion (French and Bierman, 1962). Thus, fetal loss occurs among approximately 63 percent of fertilizations and among 55 percent of implanted embryros (Schlesselman, 1979).

Spontaneous abortion increases markedly with age, especially after age 30 (Leridon, 1977). Chromosomal abnormalities are observed in around 60 percent of spontaneous abortions during the first 7 weeks of gestation, and in approximately 23 percent of abortions between 8 and 12 weeks of gestation. Because the rate of chromosomal abnormalities increases with maternal age, this could explain the rising incidence of spontaneous abortion observed among older women (Hook, 1976; Schlesselman, 1979). The age-related increase in the frequency of spontaneous abortion and chromosomal abnormalities could in part explain the decline in fertility during the decade preceding the menopause (Gray, 1979b).

Numerous diseases and environmental factors can increase the risk of spontaneous abortion. However, on a population basis, three main conditions could have demographic significance: venereal syphilis, malaria, and malnutrition.

Pregnancy in a woman with primary or secondary syphilis is frequently associated with the transplacental infection of the fetus and increased risk of spontaneous abortion, especially during the second trimester of pregnancy; the tertiary stage of syphilis is not associated with fetal wastage. Because the primary and secondary stages of syphilis generally last for less than six months, the

effects of the disease on spontaneous abortion tend to be relatively short-lived. On the other hand, infection leads to a life-long immune response which provides the basis for the serological diagnosis of previous syphilis infection, although in wet tropical areas where diseases such as yaws or pinta are present, there may be a cross-reaction with the serological test for syphilis which can confuse the interpretation of serological surveys (WHO, 1975). In a study of three Francophone African communities, Retel-Laurentin (1979) reported an association between the frequency of retrospectively reported spontaneous abortion and the prevalence of positive serological reactions to syphilis. However, these observations may have been confounded by cross-reactions with yaws, and the association between the prevalence of abortion and the prevalence of serology by age is not entirely consistent. Romaniuk (1968) reported a correlation between the prevalence of positive serological tests and low birth rates in Zaire. However, there was no information on other causes of infertility in this population, and it is possible that the prevalence of positive serology reflected the prevalence of venereal disease in general. Thus there is no direct evidence linking syphilis with a demographically significant increased prevalence of spontaneous abortion, although such a link may be relevant to problems of infertility in small populations.

It is thought that acute malarial infection may be associated with an increased risk of spontaneous abortion, both because of the anemia, haemolytic crisis, and fever associated with infection, and because of placental parasitisation in the case of Plasmodium falciparum infections. Clinical investigations show an association between placental parasitisation and a low birth weight of infants, and such intrauterine growth retardation increases the risk of fetal loss or stillbirth (Gray, 1979a). Also, in the Solomon Islands, the incidence of low birth weight was correlated with the prevalence of endemic malaria prior to the introduction of malaria control; moreover, after the interruption of malaria transmissions, there was a marked decline in the frequency of low-birth-weight infants (MacGregor and Avery, 1974). There is therefore circumstantial evidence to suggest that malaria infection impairs fetal nutrition, which may increase the likelihood of fetal wastage.

There have been no surveys directly linking the prevalence of malaria to the prevalence of fetal loss in a population. However, Pampana (1954) observed that the control of malaria was associated with increased fertility in some, but not all countries which had eradication programs during the 1950s. Prior to malaria control in Sri Lanka, there was a deficit of births conceived during the peak malarial season in the endemic areas of the island. After the control campaign, the distribution of births became more uniform throughout the year, and the birth rate increased in the malarious areas (Newman, 1970). This may indicate either an excess of spontaneous abortions among early pregnancies conceived during the season of peak transmission, or the debilitating effects of malaria causing a reduction in the frequency of intercourse. Although it is impossible to assess the effects of malaria on fertility, even if the disease

only leads to a modest increase in the risk of fetal wastage, it can be so prevalent and affect such large populations that it could have a subtle, but substantial demographic impact.

The effects of maternal nutrition on the outcome of a pregnancy are difficult to assess. Maternal malnutrition is associated with fetal growth retardation and low birth weight, which may be related to an increased risk of perinatal death (Lechtig et al., 1975). However, there is no direct evidence associating maternal malnutrition with an increased risk of fetal wastage in the first and second trimesters of pregnancy. Studies of populations under famine conditions yield equivocal results. There was a reported doubling of stillbirths during the seige of Leningrad in 1942; on the other hand, there was no indication of a rise in fetal wastage during the Dutch famine of 1944-45 or the Bangladesh famine of 1974-75 (Mosley, 1979). Gopalan and Naidu (1972) reported that, among poorly nourished Indian women, 30 percent of pregnancies terminated in fetal loss. Retel-Laurentin (1979) also reported relatively high levels of fetal wastage among populations in the Central African Republic and Upper Volta. However, since these populations also had a high prevalence of syphilis, one cannot assess the possible contribution of poor nutrition to the fetal wastage. Thus poor maternal nutrition probably does not account for demographically significant increases in the risk of spontaneous abortion during the first two trimesters of pregnancy; however, it may lead to intrauterine growth retardation, with an associated increased risk of infant mortality. Early infant loss could lead in turn to short birth intervals, which may have significant effects on fertility.

PROPOSITIONS

1. Maternal nutrition per se is unlikely to be a critical factor determining the length of postpartum amenorrhea in most populations, although it could be of some importance to a minority of very poorly nourished women.

2. Any severe illness can cause a failure of lactation; however, this is unlikely to have important demographic effects.

3. Data suggest that the effects of moderate malnutrition on fecundability are not significant. Severe malnutrition can have a marked negative effect on fertility.

4. Seasonal variations in birth rates are associated with variations in a number of environmental influences on fecundability. These include various cultural influences, as well as the effects of peak agricultural work periods on maternal nutrition and breastmilk supplies. The prevalence of specific diseases, such as malaria, may also influence the seasonality of births.

5. There is strong evidence that demographically significant levels of infertility are associated with a high prevalence of pelvic inflammatory disease (PID), and that sexually transmitted diseases, especially gonorrhea, are the major causal agents. This is almost certainly the cause of the high prevalence of sterility observed in scattered populations, especially in Africa. Research is needed to

define clearly the prevalence of primary and secondary sterility; to elucidate its causes, especially the natural history of PID; to develop strategies for preventing and treating sterility in less developed countries; and to evaluate the demographic impact of control programs.

6. There is an association between nutritional status and age at menarche; however, delayed menarche and prolonged adolescent subfertility are likely to have only a small effect on total fertility. The data on the relationship between nutritional status and age at menopause are less consistent; moreover, changes in the age at menopause are unlikely to have a marked effect on total fertility since reproduction at later ages contributes so little to completed family size.

7. Three main conditions could have a significant demographic effect on the risk of spontaneous abortion: venereal syphilis, malaria, and malnutrition.

7.1. There is no direct evidence linking syphilis with a demographically significant increased prevalence of spontaneous abortion, although such a link may be relevant to problems of infertility in small populations.

7.2. It is impossible to directly assess the effects of malaria on fertility; however, even if the disease only leads to a modest increase in the risk of fetal wastage, it can reach such a high prevalence that it could have a subtle, but substantial demographic impact.

7.3. Poor maternal nutrition probably does not account for demographically significant increases in the risk of spontaneous abortion; however, it may lead to intrauterine growth retardation, and thus to an increased risk of infant mortality. This could in turn lead to short birth intervals with significant effects on fertility.

8. With the exception of PID, health and nutrition have not been shown to have a significant direct demographic effect on fertility among large populations in the developing world. They probably do have a significant effect among hunter-gatherers or agricultural populations living at subsistence levels, and among those subject to severe morbidity or malnutrition.

NOTES

1. Age, parity, education, and husband's absence were held constant in a multiple regression model.
2. The median age of menopause varies from 49.8 to 51.4 in Caucasian women in modern developed-country populations.

BIBLIOGRAPHY

Arya, O. P., S. R. Taber, and H. Nsanze (1980) Gonorrhea and female infertility in rural Uganda. American Journal of Obstetrics and Gynecology 138:929-932.

Barrett, J. C., and J. Marshall (1969) The risk of conception on different days of the menstrual cycle. Population Studies 23:455.

Becker, S. (1980) Seasonality of Fertility in Matlab, Bangladesh. Unpublished paper. International Centre for Diarrheal Disease Research, Dacca, Bangladesh.

Bernard, R. P., R. V. Bhatt, D. M. Potts, and A. P. Rao (1978) Seasonality of birth in India. Journal of Biosocial Science 10:409.

Billewicz, W. Z. (1979) The timing of postpartum menstruation and breastfeeding: A simple formula. Journal of Biosocial Science 2: 141-151.

Billewicz, W. Z., H. M. Fellowes, and C. A. Hytten (1976) Comments on the critical metabolic mass and the age of menarch. Annals of Human Biology 3:51-59.

Bongaarts, J. (1980) Does malnutrition affect fecundability? A summary of the evidence. Science 208:564-569.

Bongaarts, J., and H. Delgado (1979) Effects of nutritional status on fertility in rural Guatemala. In J. Menken and H. Leridon, eds., Natural Fertility. Liege: Ordina Editions.

Buchanan, P. (1975) Breastfeeding: Aid to infant health and fertility control. Population Reports Series Journal 4:49-69.

Carael, M. (1978) Relations between birth intervals and nutrition in three Central African populations (Zaire). Pp. 365-384 in W. H. Mosley, ed., Nutrition and Human Reproduction. New York: Plenum Press.

Chandra, R. K., and P. M. Newberne (1977) Nutrition Immunity and Infection. Mechanisms of Interactions. New York: Plenum Press.

Chang, K. S. F., S. T. Chan, W. D. Low, and C. K. Ng (1963) Climate and conception rates in Hong Kong. Human Biology 35:367-375.

Chavez, A., and C. Martinez (1973) Nutrition and development of infants from poor rural areas. III: Maternal nutrition and its consequences on fertility. Nutritional Reports International 7:1-8.

Chen, L. C., S. Ahmed, M. Gesche, and W. H. Mosley (1974) A prospective study of birth interval dynamics in rural Bangladesh. Population Studies 28:277.

Chowdhury, A. K. M. A. (1978) Effect of maternal nutrition on fertility in rural Bangladesh. Pp. 401-409 in W. H. Mosley, ed., Nutrition and Human Reproduction. New York: Plenum Press.

Chowdhury, A. K. M. A., and L. Chen (1977) The Dynamics of Contemporary Famine. Mimeo. The Ford Foundation, Dacca.

Cowgill, U. M. (1966) The season of birth in man: Contemporary situations with special reference to Europe and southern hemisphere. Ecology 47:614

Dreizen, S. C., C. N. Spirakis, and R. E. Stone (1967) A comparison of skeletal growth and maturation in undernourished and well-nourished girls before and after menarche. Journal of Pediatrics 70:256-263.

Dyson, T., and N. Cook (1979) Season of births and deaths in developing countries. In Proceedings of Conference on Seasonal Dimensions to Rural Poverty. Brighton, England: University of Sussex.

French, F. E., and J. M. Bierman (1962) Probabilities of fetal mortality. Public Health Reports 77:835-847.

Frisch, R. E. (1975) Demographic implications of the biological determinants of female fecundity. Social Biology 22:17-22.

Frisch, R. E. (1978) Population, food intake and fertility. Science 199:22-30.

Frisch, R. E., and J. W. McArthur (1974) Menstrual cycles: Fatness as a determinant of minimum weight for height necessary for their maintenance or onset. Science 185:949-951.

Gopalan, C., and A. N. Naidu (1972) Nutrition and fertility. Lancet 2:1077-1079.

Gray, R. H. (1976) The menopause: Epidemiological and demographic consideration. Pp. 25-40 in R. J. Deard, ed., The Menopause. A Guide to Current Research and Practice. Lancaster, Pa.: MTP Press.

Gray, R. H. (1979a) Biological factors other than nutrition and lactation which may influence natural fertility. In J. Menken and H. Leridon, eds., Natural Fertility. Liege: Ordina Editions.

Gray, R. H. (1979b) Biological and social interactions in the determinantion of late fertility. Journal of Biosocial Science Supplement 6:97-106.

Griffith, H. B. (1963) Gonorrhea and fertility in Uganda. Eugenics Review 55:103-108.

Holmes, K. K., D. A. Eschenback, and J. S. Knapp (1980) Salpingitis: An overview of etiology amd epidemiology. American Journal of Obstetrics and Gynecology 138:893-900.

Hook, E. B. (1976) Estimate of maternal age-specific risks of a Down's Syndrome birth in women 34-41. Lancet 2:33-44.

Hosken, F. P. (1979) The Hosken Report: Genital and Sexual Mutilation of Females, 2nd ed. Lexington, Mass.: Women's International Network News.

Howie, P. W., A. S. McNeilly, M. J. Houston, A. Cook, and H. Boyle (1981) The effect of supplementary food on suckling patterns and ovarian activity during lactation. British Medical Journal 283:757-759.

Huffman, S. L., A. K. M. A. Chowdhury, V. J. Charraborty, and W. H. Mosley (1978) Nutrition and postpartum amenorrhea in rural Bangladesh. Population Studies 32:251-260.

Huffman, S. L., A. K. M. A. Chowdhury, and Z. M. Sykes (1980) Lactation and fertility in rural Bangladesh. Population Studies 34:337-347.

Jelliffe, D. B., and E. F. P. Jelliffe (1978) Human Milk in the Modern World, Psychosocial, Nutritional and Economic Significance. Oxford, Eng.: Oxford University Press.

Keys, A. B., J. Brozek, A. Henschel, O. Michelsen, and H. L. Taylor (1950) The Biology of Human Starvation. Minneapolis, Minn.: University of Minnesota Press.

Knodel, J. (1979) The influence of child mortality in a natural fertility setting: An analysis of German villages. Pp. 273-284 in H. Leridon and J. Menken, eds., Natural Fertility. Liege: Ordina Editions.

Kochar, M. (1980) Etiology of pelvic infections treated by the gynecologic service of the Kasturba Hospital, Delhi, India. American Journal of Obstetrics and Gynecology 138:872-874.

Lechtig, A., J. P. Habicht, H. Delgado, R. E. Klein, C. Yarbrough, and R. Martorel (1975) Effect of food supplementation during pregnancy on birth weight. Pediatrics 56:508-520.

Leridon, H. (1977) Human Fertility: The Basic Components. Chicago: University of Chicago Press.

Leridon, H., E. Zucher, and M. Cazenave (1970) Fecondite et Famille in Martinique. Institut national d'etudes demographiques, Cahier 56. Paris: Presses Universitaires de France.

Lunn, P. G., A. M. Prentice, S. Austin, and R. G. Whitehead (1980) Influence of maternal diet on plasma: Prolactin levels during lactation. Lancet 1:623-625.

Lunn, P. G., M. Watkinson, A. M. Prentice, P. Morrell, S. Austin, and R. G. Whitehead (1981) Maternal nutrition and lactational amenorrhoea. Lancet 1:1428-1429.

MacGregor, J. D., and J. G. Avery (1974) Malaria transmission and fetal growth. British Medical Journal 3:433-436.

MacMahon, B., and J. Worchester (1966) Age at Menopause: United States 1960-61. U.S. Vital and Health Statistics Monographs Series II, No. 19. Washington, D.C.: U.S. Government Printing Office.

Mardh, P. A. (1980) An overview of infectious agents of salpingitis, their biology and recent advances in methods of detection. American Journal Obstetrics and Gynecology 138:933-951.

McNeilly, A. S. (1979) Effects of lactation on fertility. British Medical Bulletin 35:151-154.

Menken, J., and J. Bongaarts (1978) Reproductive models in the study of nutrition-fertility interrelationships. Pp. 261-311 in W. H. Mosley, ed., Nutrition and Human Reproduction. New York: Plenum Press.

Miller, J. F., F. Williamson, J. Glue, Y. B. Gordon, J. G. Grudzinskas, and A. Sykes (1980) Fetal loss after implantation: A prospective study. Lancet 2:554-556

Mosley, W. H. (1979) The effects of nutrition on natural fertility. In J. Menken and H. Leridon, eds., Natural Fertility. Liege: Ordina Editions.

Muir, D. G., and M. A. Belsey (1980) Pelvic inflammatory disease and its consequences in the developing world. American Journal of Obstetrics and Gynecology 138:913-928.

Newman, P. (1970) Malaria control and population growth. Journal of Development Studies 6:133-158.

New Scientist (1980) Editorial: Diet supplements lead to more mouths to feed. New Scientist 1:193.

Osteria, T. S. (1978) Variations of fertility with breastfeeding and contraception in urban Philippine women: Implications for a nutrition program. Pp. 498-509 in W. H. Mosley, ed., Nutrition and Human Reproduction. New York: Plenum Press.

Pampana, E. J. (1954) The effect of malaria control on birth and death rates. Pp. 498-509 in Proceedings of the World Population Conference, Rome, 1954, Vol. 1. New York: United Nations.

Paul, A. A., E. M. Muller, and R. G. Whitehead (1979) The quantitative effects of maternal dietary energy intake on pregnancy and lactation in rural Gambian women. Transactions of the Royal Society of Tropical Medicine and Hygiene 73:686-692.

Retel-Laurentin, A. (1979) Some components of natural fertility in two African populations with low fertility. Pp. 371-396 in J. Menken and H. Leridon, eds., Natural Fertility. Liege: Ordina Editions.

Ring, A., and R. F. R. Scragg (1973) A demographic and social study of fertility in rural New Guinea. Journal of Biosocial Science 5:89-121.

Romaniuk, A. (1968) Infertility in tropical Africa. Pp. 214-241 in J. C. Caldwell and C. Okonjo, eds., The Population of Tropical Africa. New York: Population Council.

Rushwan, H. (1980) Etiologic factors in pelvic inflammatory disease in Sudanese women. American Journal of Obstetrics and Gynecology 138:877-879.

Schlesselman, J. J. (1979) How does one assess the risk of abnormalities from human in vitro fertilization. American Journal of Obstetrics and Gynecology 135:135-148.

Schwartz, P., P. D. M. MacDonald, and V. Heuchel (1980) Fecundability, coital frequency and the viability of ova. Population Studies 34:397-400.

Scragg, R. F. R. (1957) Depopulation in New Ireland: A Study of Demography and Fertility. Territority of Papua and New Guinea Health Monograph.

Scragg, R. F. R. (1973) Menopause and Reproductive Life Span in Rural New Guinea. Paper presented at the Annual Symposium of the Papua/New Guinea Medical Society, Port Moresby.

Simpson-Hebert, M., and B. M. Gray (1981) Female Genital Operations: Do they Effect Fertility. Paper presented at the Society for Applied Anthropology Meeting, Edinburgh, Scotland.

Stein, Z., and M. Susser (1978) Famine and fertility. Pp. 123-145 in W. H. Mosley, ed., Nutrition and Human Reproduction. New York: Plenum Press.

Tanner, J. M. (1968) Earlier maturation in man. Scientific American 218:21-27.

Tekse, K. (1968) A Study of Fertility in Jamaica. Demography and Vital Statistics Section, Department of Statistics, Jamaica.

Trussell, J. (1978) Menarche and fatness: Re-examination of the critical body composition hypothesis. Science 200:1506-1509.

Tyson, J. E., and A. Perez (1978) The maintenance of infecundity in postpartum women. Pp. 11-27 in W. H. Mosley, ed., Nutrition and Human Reproduction. New York: Plenum Press.

Van Ginneken, J. K. (1977) The change of conception during lactation. Journal of Biosocial Science Supplement 4:41-54. (Also in A. S. Parkes, A. M. Tomson, M. Pots, and M. A. Herbertson, eds., Fertility Regulation during Human Lactation. Cambridge, Eng.: Galton Foundation.)

Voranger, J. (1953) Influence de la meteorologic et de la mortalite sur les naissances. Population 1:93.

Westrom, L. (1980) Incidence, prevalence and trends of acute pelvic inflammatory disease and its consequences in industrial countries. American Journal of Obstetrics and Gynecology 138:880-892.

Whitehead, R. G., M. G. M. Rowland, M. Hutton, A. M. Prentice, E. Muller, and A. Paul (1978) Factors influencing lactation performance in rural Gambian mothers. Lancet 2:178-181.

World Health Organization (1975) The Epidemiology of Infertility. Technical Report Series 582. Geneva: WHO.

Chapter 6

THE IMPACT OF SOCIOCULTURAL FACTORS ON BREASTFEEDING AND SEXUAL BEHAVIOR

Moni Nag

Natural fertility is based on a number of components. These include, for example, sterility, involuntary abstinence, menarche, menopause, and intrauterine mortality. However, three components of natural fertility--breastfeeding, voluntary abstinence (especially postpartum), and frequency of coitus--share two characteristics which make them the focus of this paper. First, they account for much more of the variation in natural fertility among developing countries than do other components. Second, unlike other components, they are strongly influenced by sociocultural factors. Existing knowledge on how such factors influence each of these three natural fertility components is reviewed below.

BREASTFEEDING

The primary purpose of breastfeeding in all societies is infant nourishment. However, it has been established that another consequence is fertility reduction (Simpson-Hebert and Huffman, 1981). There is evidence that this consequence is known in some societies (DaVanzo, 1980; Habicht and Klein, 1972; Wyon and Gordon, 1971:142; Yaukey, 1961:55), although it has not been determined how widespread this knowledge is, or how it may influence the practice of breastfeeding. It can be noted, however, that the practice is declining in many societies, and that in the absence of contraceptives, this trend is likely to promote fertility (Bongaarts, in these volumes).

Several parameters of breastfeeding affect fertility: (1) total duration of breastfeeding, whether full or partial; (2) duration of full or unsupplemented breastfeeding; and (3) frequency, intensity, and duration of suckling and the interval between sucklings. Since the available literature focuses mainly on the first of these--total duration of breastfeeding--that parameter will be the basis of the following discussion.

The subsections below review a number of sociocultural determinants of breastfeeding: education, urbanization, income, women's work, the availability of powdered milk and modern health services, and other cultural factors. The choice of these particular

determinants was based partly on the availability of data, and partly on the hypothesis that the duration of breastfeeding depends upon three main factors: (1) the perceptions of parents and the community about what is good for a child's welfare, (2) the availability of modern breastmilk substitutes and the parents' ability to buy them, and (3) the convenience of breastfeeding for the mother. These three factors are in turn dependent on a number of other considerations. Perceptions of what is good for a child's welfare are affected by the diffusion of new ideas, mainly through education, urban residence, advertisements for powdered milk, and modern health services. The availability of modern breastmilk substitutes also depends considerably on rural or urban residence, particularly in less developed countries, and the extent to which parents can afford these substitutes is determined by their income. Finally, the convenience of breastfeeding largely depends upon the nature and location of the work mothers do, as well as the sense of modesty that may prevent them from exposing their breasts. Thus although other sociocultural factors affect the duration of breastfeeding, those detailed below are believed to be most central.

Education

A number of recent surveys in less developed countries have indicated a negative relationship between education and breastfeeding: the duration of breastfeeding tends to go down as the education of mothers increases. Estimates of mean duration of breastfeeding for mothers with three different educational levels have been made by Jain and Bongaarts (1981) from World Fertility Survey (WFS) data collected around 1976 in eight countries (see Table 1). For each country in this table, mothers with no education have a longer mean duration of breastfeeding than the grand mean, whereas those with secondary or higher education have a shorter mean duration. The difference between those with no education and those with only primary education is generally less than that between those with primary education and those with secondary or higher education. Thus the negative effect of education on breastfeeding is stronger above the primary level. Jain and Bongarts also demonstrated that the education effect is independent of other factors. In a multiple regression analysis, the negative effect of education on breastfeeding was still significant when mother's age, parity, place of residence, workplace of mother, father's occupation, and contraceptive use were controlled.

Though not strictly comparable to the data in Table 1, the WFS data for Thailand, Korea, and Malaysia show a similar association between duration of breastfeeding and educational levels (Knodel and Debavalya, 1980:364; Korea, NBS-KIFP, 1977:129; Chander et al., 1977:166). Similar findings resulted from surveys conducted in the following countries: Taiwan (Jain et al., 1970:255-259; Millman 1981), Algeria (Tabutin, 1973), Nigeria (Lucas, 1977), Ghana (Greiner et al., 1979:33), and several African countries (Cantrelle et al., 1978:187-192).

TABLE 1 Mean Duration of Breastfeeding (in Months) by Education of Mother and Place of Residence in Eight Less Developed Countries

			Education of Mother			Residence	
Country	Mean Duration	Number of Women	None	Primary	Secondary and Higher	Rural	Urban
Bangladesh	2660	23.6	24.0	23.4	16.9	24.4	20.9
Indonesia	4064	19.0	20.5	18.6	10.7	21.4	13.8
Sri Lanka	3399	15.7	17.3	17.2	13.0	16.7	12.8
Jordan	1521	12.5	14.2	10.8	6.5	15.4	11.2
Peru	2711	11.7	15.5	11.3	5.6	15.5	8.5
Guyana	1276	10.0	14.3	10.4	7.4	11.2	7.4
Colombia	1537	8.6	11.7	8.7	4.7	10.7	7.5
Panama	1556	8.3	14.3	9.8	4.3	11.0	5.8

Source: Estimated from World Fertility Survey data by Jain and Bongaarts (1981:87).

A recent Malaysian survey (Butz and DaVanzo, 1981) illustrates the effect of education. Malaysian mothers with no schooling breastfed an average of 12.7 months, as compared with 11.4 months for mothers with up to four years of schooling and 11.1 months for those with five to eight years of schooling. Above eight years of schooling, breastfeeding fell dramatically, averaging between 5.1 and 5.5 months. The Malaysian case seems to be complicated, however, by ethnic variations. Highly educated Chinese women are less likely to breastfeed, and the difference in duration of breastfeeding between the more and less educated among them is only three months. For Indians, the mother's schooling only affects the initiation of breastfeeding. For Malays, education only affects length of total breastfeeding; however, the difference between highly and less educated women is large--over five months.

One study of the way education affects the duration of breastfeeding is based on data obtained from a sample of 1218 women from metropolitan Lagos in Nigeria (Lesthaeghe et al., 1981:157-168). The average duration of breastfeeding for women with no education is 5.1 months longer than the overall sample average (11.0 months), while the average for those with secondary education is 5.5 months shorter. Only one-third of the total effect of education on breastfeeding is found to be attributable to mechanisms related to job incompatibility, Westernization, or use of contraception; about one-half of the original difference between the education categories remains after adjusting for the separate effects of several economic, cultural, ethnic, and religious variables. The authors of this study hypothesize that schooling removes children from the socializing influence of kinship groups for significant amounts of time, thus blocking the transfer of traditional norms, values, and beliefs. This hypothesis deserves to be tested in various societies.

In the late 1970s, the World Health Organization (WHO) sponsored breastfeeding surveys in a few countries (WHO, 1979). These surveys enhance our understanding of the effects of education on breastfeeding by indicating some differences between less developed and developed countries (see Table 2). This table shows that, in both India and the Philippines, the percentage of mothers breastfeeding children 6 to 8 months old tends to decrease with higher levels of maternal education. However, this is not true for Sweden, where mothers with more education breastfeed their children for longer periods than do those with less. It is generally known that highly educated mothers in developed countries have recently become more conscious of the advantages of breastfeeding than those with lower education. On the other hand, the data available for the United States show a pattern somewhat different from that of Sweden. According to the results obtained from the 1965 National Fertility Survey of the United States, the percentage of mothers who breastfed their first child decreased from 74 to 44 when maternal education increased from 0-6 years to 12 years; the percentage increased again up to 54 and 60 with corresponding maternal education of 13-15 years and 16 years or more, respectively (Hirschman and Sweet, 1974:49).[1] Another sample survey conducted in 1973 showed a sharp decline in breastfeeding during the

TABLE 2 Percentage of Children 6-8 Months Old Being Breastfed in Three Countries, by Education of Mother

Country and Group	Education of Mother		
	Primary	Secondary	University
India			
Urban, middle income	89.7 (29)	72.2 (108)	--
Urban, economically advantaged	--	62.7 (51)	38.5 (65)
Philippines			
Rural	86.9 (84)	70.0 (30)	--
Urban poor	56.6 (53)	49.2 (61)	--
Sweden	17.5 (40)	23.5 (85)	37.5 (24)

Note: Figures in parenthesis indicate number of cases; dash indicates no data available.

Source: World Health Organization survey data.

intervening period among women with low educational levels and increases among college graduates (Hirschman and Sweet, 1981:49). Thus, in the United States, the curvilinear pattern for incidence of breastfeeding by education has changed from a U-shaped pattern in the 1960s to a J-shaped one in the 1970s.

In summary, the available survey data from less developed countries show that, in general, educated mothers breastfeed for a shorter period than uneducated mothers. However, the data do not as consistently identify the critical level of education at which duration of breastfeeding begins to decline significantly. Similarly, the mechanisms by which education affect duration of breastfeeding are undetermined. Some mechanisms have been postulated; in Africa, for example, the modernizing influence of schools seems to be an important mechanism. However, specific mechanisms and how they operate remain subjects requiring further study. Finally, in developed countries, the relationship between education and breastfeeding is different from that in less developed countries. At least during recent years, highly educated mothers in developed countries have been breastfeeding

more than those with less education, apparently because they are more aware of the advantages of breastfeeding.

Urbanization

In Table 1, it can be seen that the mean duration of breastfeeding is lower in the urban than in the rural sector for each of the eight less developed countries surveyed, although the range of variation is smaller than that for different educational levels. A multiple regression analysis shows that the effect of urbanization is significant when other demographic and social factors are controlled (Jain and Bongaarts, 1981). The WFS data available for Thailand, Korea, and Malaysia also demonstrate this conclusion (Knodel and Debavalya, 1980:362; Korea, NBS-KIFP, 1977:129; Chander et al., 1977:167).

Similar results were found in Taiwan, Nigeria, and the Philippines. In Taiwan, Jain et al. (1970:255-259) found that the mean duration of breastfeeding in villages, small towns, small cities, and large cities was 17.7, 15.6, 14.1, and 13.9 months, respectively. In Nigeria, for every educational level, the mean duration was higher in the rural west than among the richer class in the city of Ibadan, or among the Yoruba and non-Yoruba ethnic groups in the city of Lagos. Contrary to expectation, however, the mean duration among mothers with primary and secondary education was lower in rural Western Nigeria than among the poorer class in the city of Ibadan (Lucas, 1977). The Philippine data collected by WHO show that the percentage of mothers breastfeeding children six to eight months old was higher in rural areas than among the urban poor, irrespective of maternal educational levels (see Table 2).

Knodel and Debavalya (1980:370) have analyzed some survey data from Thailand to investigate whether birth in or contact with urban areas has any effect on breastfeeding. Their results show that women born in rural areas but currently living in urban areas breastfeed more than native urban women, although the difference is not large, especially after adjusting for region and education. Moreover, rural-born urban women breastfeed considerably less than those currently living in rural areas. Finally, those rural women who previously lived in urban areas or who make frequent visits to urban centers breastfeed somewhat less than other rural women.

The Malaysian survey shows that the rural-urban differential in breastfeeding is higher now than it was twenty years ago, and that it varies with different ethnic groups (Butz and DaVanzo, 1981). When other social and demographic factors are controlled, the proportion of breastfed rural Chinese and Indian infants born after 1960 is significantly higher than that of their urban counterparts; no such relationship is found for Malays or for births generally before 1960. The proportion of breastfed babies has fallen in both urban and rural Malaysian areas in the last 20 years. Although the urban decline is slightly greater, urbanization does not seem to be the main force behind this overall decline.

To summarize, available survey data show that, in less developed countries, urbanization generally has a negative effect on the duration of breastfeeding. This may be due in large part to higher educational and employment opportunities for women in urban areas, as well as greater use of breastmilk substitutes. Finally, urbanization does not seem to be as great an influence as education on the decline of breastfeeding in less developed countries.

Women's Work

There are several dimensions of women's work which may affect their breastfeeding pattern: type of work (e.g., wage-nonwage, farm-nonfarm), place of work, and relationship with employer. For example, the inconvenience of breastfeeding for women employed outside the home is generally accepted as a major factor in the recent decline of the practice, particularly in urban areas of less developed countries (Jelliffe, 1962), although empirical data to verify such assumptions are rare.

The degree to which women contribute to household subsistence varies considerably in nonindustrial societies. To see whether this variation is related to breastfeeding, Nerlove (1974) did a cross-cultural test. This test was based on 83 nonindustrial societies for which pertinent data on infant feeding practices and women's participation in subsistence activities (agriculture, hunting, fishing, and animal husbandry) were available. Nerlove found that women who begin supplementary infant feeding early participate more in subsistence activities than those who do so later.[2]

In the World Fertility Survey, women were classified according to whether they had or had not worked since marriage. Those who had were further classified according to four work places: family farm, other farm, at home, and away from home. Jain and Bongaarts (1981) have estimated deviations from the grand mean of duration of breastfeeding for these four categories and for nonworking women in the eight countries mentioned above. The results--adjusted for age, parity, education, place of residence, and husband's occupation--indicate that work status or place of work has very little effect on the duration of breastfeeding. This finding is confirmed by multiple regression analysis; however, Jain and Bongaarts are not sure whether this lack of significant association is real or attributable to different interpretations of "work" and "place of work" in the various countries.

In Malaysia, several aspects of women's work are found to affect breastfeeding patterns; however, as was seen with educational levels and rural-urban residence, this relationship varies among different ethnic groups (Butz and DaVanzo, 1981). Among the Chinese, women earning high wages are significantly less likely to initiate breastfeeding, and their average periods of total and full breastfeeding are also likely to be significantly shorter. In contrast, Indian and Malay women do not appear to adjust their breastfeeding patterns to changes in their wages. However, it is found that for all three ethnic groups, when wages are controlled,

women who have recently worked in a nonagricultural occupation tend to breastfeed less--primarily because they completely wean their children at an earlier age. Conversely, although there are some variations among the three ethnic groups, women with a recent history of agricultural work are generally much more likely to breastfeed and to delay complete weaning. It might be expected that breastfeeding would be easier in a field than in a factory or office. Nevertheless, it is intriguing to find that women working in agriculture breastfeed not only more than women doing nonagricultural work, but also more than nonworking women. It appears that agricultural work itself, for some unknown reason, increases the incidence and duration of breastfeeding. These results should be interpreted with caution, however, since they were obtained without controlling for mother's education, age, and other relevant variables.

Surveys conducted in Thailand yield results which compare in some ways to those of the Malaysian survey (Knodel and Debavalya, 1980:366-370). Thai women engaged in nonagricultural work, whether for wages or not, breastfeed least; women working on farms, especially family farms, breastfeed most; and nonworking women are intermediate. In Thailand, as in Malaysia, agricultural work itself seems to increase the duration of breastfeeding, although these data for Thailand are less consistent. Wage earning, whether in rural or urban areas, does not significantly affect the breastfeeding patterns of Thai women. Women earning wages for agricultural work are characterized by average or above-average breastfeeding. Although there is generally a negative association between women's wage-earning nonagricultural work and breastfeeding in both rural and urban areas, this association becomes quite weak when adjustment is made for education and region.

In the city of Manila in the Philippines, Osteria (1978:420) found a significant difference between employed and not-employed women. Among women under 30 years of age, the median duration of breastfeeding was 11.4 months for the not-employed and 3.3 months for the employed. However, this difference may be due to the effects of education or social class, which are not controlled, rather than women's work. Data collected in another survey conducted in the rural areas of the Philippines show that full breastfeeding generally tends to decrease as the distance of women's work places from their homes increases (Popkin and Solon, 1976).

In the 1965 U.S. Fertility Survey, it was found that, among housewives who had not worked since marriage, the proportion who breastfed their first baby was no higher than that among wives who had worked as white-collar, service, or farm workers at one time or another since marriage (Hirschman and Sweet, 1974:50). The incidence of breastfeeding was lower among mothers in clerical and blue-collar occupations than among housewives and women in other occupations; this pattern seemed to hold within most educational categories, but cannot be assessed within various ethnic and other categories from the available data.

Although existing data do suggest that several aspects of women's work affect breastfeeding behavior, the relationships indicated are

not simple and consistent. After carefully reviewing the existing literature, Van Esterik and Greiner (1981) have concluded that the role of maternal employment in the decline of breastfeeding has often been exaggerated. They have asked about reasons for not initiating breastfeeding, for choosing bottlefeeding, or for weaning, and found that work is very seldom cited. On the other hand, employment in nonagricultural work outside the home does generally constrain the opportunity to breastfeed. Even if the total duration of breastfeeding is as long as that of other women, intervals between sucklings are likely to be longer, and there is good evidence that the latter is itself a key variable affecting fertility (Konner and Worthman, 1980).[3]

Income

In a few surveys conducted in Thailand between 1969 and 1973, interviewers were asked to categorize the socioeconomic status of each household as very poor, poor, average, or well-off. Among urban women, there was a consistent inverse association between breastfeeding and socioeconomic status both before and after adjusting for region of residence, regardless of the indices employed (Knodel and Debavalya, 1980:365-366). This relationship was considerably weaker and less consistent among rural women. An index called the material possession score was also calculated for each household according to the modern durables and other items it owned. Among urban women, the association between this score and breastfeeding was not quite as consistent as it was for socioeconomic status; however, women in the most materially wealthy households clearly breastfed much less than those in the least wealthy households. As with socioeconomic status, this association was less consistent and less pronounced among rural women. It should be noted that the variation in socioeconomic status and material possession score was less in rural than in urban areas.

In the WFS study of Malaysia, it was found that women whose husbands' income was higher were less likely to breastfeed (Chander et al., 1977:166). The mean duration of breastfeeding among mothers in the lowest income group (Malaysian $100 or less per month) was 9.7 months, as against 3.4 months for those in the highest income group (Malaysian $500 or more). In their Malaysian survey, Butz and DaVanzo (1981) also found a significant negative association between household income and both initiation and total length of breastfeeding. These negative associations have become stronger over time, particularly for initiation of breastfeeding. Among the poorer and richer mothers of the city of Ibadan (Lucas, 1977), there is a large difference in the mean duration of breastfeeding: the poorer mothers breastfed for an average of 20.3 months, while the richer women averaged only 8.1 months. This difference held for each educational level of mothers, although it was less for illiterate mothers than for those with primary and secondary education.

The available data from less developed countries indicate that

women from higher-income households generally breastfeed less than those from lower-income households. This relationship seems to hold more for rural than urban women and more for the illiterate than the literate. It should be noted, however, that not enough regression analysis has been done to assess the effect of income on breastfeeding when education and other variables are controlled.

Availability of Powdered Milk and Modern Health Services

As noted above, the empirical data indicate that breastfeeding generally declines with education, urbanization, women's nonfarm wage work, and higher household income. Precisely how these socioeconomic factors influence breastfeeding is not known; they may have common underlying features, but these cannot be clearly identified from the available literature. It is known that these socioeconomic factors are often related to the process of modernization as well as to each other. Two other factors commonly related to both the decline of breastfeeding and the process of modernization are the introduction of powdered milk as an infant food and the availability of modern health services.

Over the last few decades, commercial manufacturers of baby milk powder have been carrying out aggressive media campaigns in many less developed countries to popularize their products. These campaigns, together with the convenience of bottlefeeding, initially attracted women of higher socioeconomic status in urban areas. In turn, the prestige value of this newly acquired behavior helped popularize it among urban poor and rural women. Examples of this change abound in the current literature on breastfeeding (see Greiner, 1979:67; Morgan, 1971:110). The WHO (1979) survey report states that in Nigeria, Guatemala, and the Philippines, commercial firms often distribute powdered milk samples and feeding bottles in hospital maternity wards. In Guatemala, breastfeeding was less common among mothers who received such gifts. In the Philippines, however, although a high proportion of economically advantaged mothers receiving such gifts did practice bottlefeeding, this result was not seen among rural mothers.

Until very recently, breastfeeding was generally discouraged by medical practitioners in Western countries for various reasons. In most less developed countries, modern health services are based on the Western model and are often reported to directly or indirectly discourage breastfeeding. For example, recent surveys in Thailand revealed a negative association between use of modern health services for delivery and the practice of breastfeeding, especially in urban areas (Knodel and Debavalya, 1980:375). Associated factors included separation of mother and infant immediately after birth, the negative attitude of staff towards breastfeeding, exposure to wall posters advertising infant food, and visits by so-called milk-nurses representing the infant food industry.

It is, however, difficult to generalize about this association between modern health services and breastfeeding behavior in less developed countries. Some reports indicate that they also tend to

encourage breastfeeding. In Malaysia, for example, the initiation of breastfeeding is significantly lower among women who give birth at private maternity clinics than it is among others; however, the proximity of mothers to family planning institutions is closely related to greater initiation of breastfeeding and longer full breastfeeding. The effect is particularly strong in the integrated clinics, which are explicitly responsible for pediatric care in addition to family planning. Butz and DaVanzo (1981) think that something in the operations and procedures of most of these Malaysian clinics may encourage mothers to breastfeed.

Other Cultural Factors

Available data indicate that breastfeeding is influenced by the socioeconomic factors of education, urbanization, women's work, income, and availability of powdered milk and modern health services. A few studies on breastfeeding have also included in their scope the effects of such demographic factors as mother's age, parity, and contraceptive use. However, the multiple regression analyses done according to these factors indicate that they do not account for most of the variation in duration of breastfeeding among different countries, regions, and ethnic and religious groups (Jain and Bongaarts, 1981; Lesthaeghe et al., 1981:158-164).[4] There are obviously other determinants of breastfeeding which are not easily identified and measured. Some of these may be classified as cultural factors and are discussed below.

It is well established that women need psychological and social support in breastfeeding, and that, in nonindustrial societies, such support usually depends on the structure of the family or community (Raphael, 1979:30-32).[5] In an extended family, a mother or mother-in-law is often available to provide the needed support; if not, a traditional midwife or an elderly kinswomen living in the community may serve the same purpose. In Malaysia, mothers who live in the same house with their parents, in-laws, or other adult relatives are more likely than other women to initiate breastfeeding (Butz and DaVanzo, 1981). This positive effect of the presence of relatives seems to have been nonexistent before 1960, when breastfeeding was more common; apparently, only when the practice began to decline did the presence of supportive adults make a difference.

Sometimes, psychological support may come from the performance of special rituals by members of the extended family. For example, in rural northern India, the sister-in-law symbolically washes the breast of the parturient mother with buttermilk and grass (Anand and Rao, 1962). In some parts of India, the local medicine man works out a charm over the mother to promote lactation and recites the following prayer: "May four oceans, full of milk, constantly abide in both your breasts. . . . Drinking of the milk whose sap is the sap of immortal life divine, may your boy gain long life, as do the gods by feeding on the beverage of immortality" (Zimmer, 1948:107).

The perception of female breasts as symbols of sexual attraction and physical beauty varies among societies and among segments of the same society. In some societies, there is a belief that breastfeeding may cause the breasts to sag. Such a belief is an important factor inhibiting women from breastfeeding in Western societies, where upright and firm female breasts are generally considered erotic and aesthetic (Berg, 1973:99; Harrell, 1981:806). Similarly, such inhibitions are not uncommon among Westernized women in urban areas of less developed countries.

Another cultural influence on breastfeeding is women's modesty about exposing their breasts in the presence of others (Harrell, 1981:806-809). Breastfeeding is likely to be more common where women are not pressured to cover their breasts in public, as in tropical areas. In a cross-cultural study of 190 societies (mostly nonliterate), Ford and Beach (1951:47) found that in most, the bare bosom was consistent with ideals of feminine modesty. Nobody knows how many such societies exist in the world today, but in the rural areas of many less developed countries, it is not uncommon to see women exposing their breasts to feed their infants, even in the presence of strangers. In urban areas, however, this is rare. This growing sense of modesty about female breasts restricts the practice of breastfeeding to private circumstances; it also makes it less likely that young girls will be psychologically oriented towards breastfeeding by observation and imitation.

Margaret Mead (1949) has tried to relate breastfeeding behavior among a few tribes of the Pacific region to patterns of parent-child relationships and general cultural attitudes. She postulates three kinds of mother-child relationships: complementary, symmetrical, and reciprocal. Although all three types may be found in the same society, cultural variations may cause one or the other to be emphasized. This is illustrated by the Arapesh, Mundugumor, and Manus tribes.

The Arapesh of New Guinea emphasized the complementary relationship: the mother was expected to give, and the child was expected to receive. Breastfeeding was considered a highly pleasurable experience for children, and they were allowed to have it as frequently and for as long as they liked. One main theme observed in Arapesh culture was nurturance; both men and women dedicated themselves to the constant care and attention of both their gardens and their children (Mead, 1935:37-43). Among the Mundugumor, an aggressive New Guinea tribe whose culture was disintegrating at the time of Mead's visit, sexuality was assaulting rather than sensual; love-making between men and women was like fighting. Here, the mother-child relationship was symmetrical: mothers breastfed children only when their crying became unbearable, which the children quickly learnt how to accomplish (Mead, 1935:195-196). The reciprocal type of mother-child relationship was emphasized by the Manus tribe living in the Admiralty Islands near New Guinea. Children among this tribe were considered the property of the husband's lineage. If the child were a girl, she would be exchanged for goods at the time of betrothal, while a boy would contribute to the wealth and food supply of the lineage.

The husband wanted the wife to nurse the child, but he wanted control over it as early as possible. Thus, only during the first year of a child's life did a close relationship exist between mother and child; as a result, the mother always welcomed birth so that she could have a baby of her own for a time. Among the Manus, the child received the mother's milk, and society received the child (Mead, 1930:64-65). Although it is difficult to say whether Mead's hypothesis has any general validity or not, her findings offer intriguing indications of the relationships between cultural and breastfeeding patterns.

VOLUNTARY ABSTINENCE

There are four types of postmarital voluntary abstinence: (1) postpartum abstinence; (2) terminal abstinence (after a certain stage of a couple's life cycle); (3) abstinence connected with menstruation; and (4) abstinence for special reasons (pregnancy, ceremonials, war, etc.). Among these, the latter two have no significant effect on natural fertility (Nag, 1962:77-85). Terminal abstinence is of some import in a limited number of societies, and is therefore discussed briefly below. This section focuses, however, on postpartum abstinence, which has by far the greatest effect on natural fertility.

Terminal Abstinence

Existing knowledge about terminal abstinence is very poor. In some societies, particularly in India and Africa, women are discouraged from having children once their own sons and daughters begin to conceive (Ware, 1979:76-91). Because Indian women who become pregnant at this stage of their life cycle are often ridiculed (Mandelbaum, 1974; Nag, 1967:162; United Nations, 1961:133-137), they may try to avoid pregnancy by terminal abstinence. Caldwell and Caldwell (1977:200) found terminal abstinence quite common among the Yoruba of Nigeria, although there was a declining trend in its practice. Among women 40 to 44 years old, two-thirds of farmers' wives were practicing terminal abstinence, and one-third of the wives of professional and white-collar workers. Over one-half of the women with no schooling were practicing terminal abstinence, as compared to one-third of the wives of professional and white collar workers. Over one-half of the women with no schooling were abstaining, and one-third in each of the other educational categories. It can therefore be seen that the practice of terminal abstinence among the Yoruba is associated with educational and occupational status.

Postpartum Abstinence

Data obtained from 41 nonindustrial societies show a significant negative association between postpartum abstinence and fertility levels (Nag, 1962:77-81).[6] However, since the societies in which

postpartum abstinence is more prolonged are also characterized by a longer duration of breastfeeding, it is not possible to separate the effects of these two practices on fertility. Generally, in less developed countries, postpartum abstinence is practiced for a shorter period than is breastfeeding; thus the effects of the former are likely to be lesser than those of the latter. There are, however, exceptions.

For example, Caldwell and Caldwell (1977:197) think that the fertility level of most sub-Saharan African societies is reduced not by postpartum amenorrhea extended by prolonged breastfeeding, but by prolonged abstinence exceeding the duration of breastfeeding. In Nigerian surveys conducted during 1973-75, they found that, among both urban and rural Yoruba respondents, over one-half abstained for almost 6 months longer and another one-fifth for 12 months longer than the total duration of breastfeeding. In metropolitan Lagos, the median duration of postpartum abstinence is longer than that of amenorrhea by more than 100 percent in each educational level (Lesthaeghe et al., 1981:151). In an Indonesian village studied during 1967-71, Hull (1975:263-271) found that the mean duration of breastfeeding was over 16 months, whereas that of postpartum abstinence was over 23 months. Since amenorrhea does not usually last as long as breastfeeding, it may be presumed from the available evidence for Nigeria and Indonesia that among some groups in other less developed countries, the average period of postpartum abstinence is longer than that of postpartum amenorrhea. In such groups, the practice of postpartum abstinence may have a more negative effect on fertility than breastfeeding.

Although postpartum abstinence can affect fertility negatively, it is rarely practiced for the purpose of limiting the ultimate number of children. In this sense, it is not a conscious fertility control measure. On the other hand, postpartum abstinence is practiced in some societies to prolong birth intervals for health reasons. In this sense, it _is_ a fertility control measure and should thus perhaps not be considered strictly as a "natural" fertility variable, although the intended and actual end result of the practice is to maximize the number of surviving children per mother.

Caldwell and Caldwell (1977:198) found that 82 percent of the Yoruba Nigerian respondents (87 percent in rural areas) justified their last period of postpartum abstinence on grounds of birth spacing for health reasons. Over four-fifths of all respondents gave priority to the health of the child, while the rest quoted the mother's health. Although the Yoruba are keenly aware of the nutritional dangers to children born too close together, they also believe that postpartum sexual relations are harmful to the child's health because semen poisons breastmilk. This concept exists in some other societies as well (Nag, 1962:189-190). In an Indonesian village studied by Singarimbun and Manning (1976:177), 40 percent of the women were found to think that coitus is harmful to the breastfeeding child's health through its effect on the quality and quantity of milk; 17 percent felt abstinence was necessary in order to achieve a more satisfactory birth interval.

There are many societies in which postpartum abstinence has a

traditional normative aspect. In an ethnographic review of 862 societies (mostly noncontemporary), Murdock (1967) found that this normative aspect was mentioned for 309 societies, 302 of which approve of the practice. A random sample of 172 of these 309 societies shows that the longest durations are found in Africa, particularly in sub-Saharan Africa (Saucier, 1972:243): whereas 34 percent of societies in all geographic regions have a norm of postpartum abstinence of over a year, the corresponding figure for sub-Saharan Africa is 58 percent.[7]

In a comprehensive analysis of postpartum abstinence in sub-Saharan Africa, Schoenmaeckers et al. (1981) conclude that its current distribution within the region is related to the degree of its erosion in various populations. They hypothesize that this erosion is greatest in eastern and southern African populations, the Laoustrine group, and Northern Sahelian societies, and lowest in West African populations (with the exception of the Akan). According to them, the impact of very early Islamization, intensive Christianization, and the use of coitus interruptus as an acceptable alternative childspacing method have had the greatest effect on this general decline of the practice.

Data on the way variables related to modernization affect postpartum abstinence are available for only a few African societies. The following variables have usually been considered: education, use of modern contraceptives, urbanization, religion, marriage type (polygyny and monogamy), and ethnicity.

Among these variables, the first two--education and use of contraceptives--have the greatest effect on postpartum abstinence. In metropolitan Lagos, the average duration of this practice among women with no education is 5 to 6 months longer than the overall sample average (13.6 months), while the duration for those with secondary education is 6.4 months shorter (Lesthaeghe et al., 1981:160-161). The education factor explains 25 percent of the variance in the duration of postpartum abstinence before adjusting for age, religion, job incompatibility, sex segregation, and use of contraception, and 18 percent after. Adjusting for the use of contraception has the greatest effect; evidently, more educated women use more contraceptives and hence have less need to use long postpartum abstinence as a childspacing technique. Education and use of contraception are also found to be the major factors influencing postpartum abstinence among the Yoruba in the Nigerian city of Ibadan (Caldwell and Caldwell, 1981:186-187). Before adjusting for age, religion, occupation, and marriage type, the difference between the most and least traditional categories is about 12 months for both education and use of contraceptives; after adjusting, these differences are reduced, but are still over six months for both variables.

The independent effects of urbanization and religion on postpartum abstinence do not seem to be as great as those of education and use of contraceptives. The average periods of abstinence in Nigeria in Ibadan and among the rural Yoruba are 18 and 25 months, respectively; when education is controlled, the difference is reduced to about four

months on the average (Caldwell and Caldwell, 1977:207; 1981:186). After adjusting for a few key variables, only minimal differences are found in average duration of postpartum abstinence between Muslims and Christians in Ibadan (Caldwell and Caldwell, 1981:186), Muslims and non-Muslims in greater Lagos (Lesthaeghe et al., 1981:160), and Christians and non-Christians among the rural Yoruba (Orubuloye, 1981:232).

One aspect of the sexual relationship between husband and wife which has a significant effect on postpartum abstinence is the custom of polygynous marriage, particularly in African societies. Postpartum abstinence is more strictly observed by the polygynous sections of a society than by the monogamous sections (Talbot, 1926:378-387; Krzwicki, 1934:204; Dorjahn, 1958:364). It is reasoned that this is because a polygynously married husband can have sexual relations with his other wives when one of them is in her postpartum period. In African societies, the restriction generally applies only to the mother; there are other societies (e.g., in Indonesia) in which husbands are also expected to abstain during the postpartum period of their wives.[8] In general, it can be hypothesized that societies with a high incidence of polygyny will generally practice prolonged postpartum abstinence. Statistical tests with cross-cultural data tend to support this association (Nag, 1962:80; Saucier, 1972:244).[9] However, in contemporary Africa, there does not seem to be much difference in the practice among polygynously and monogamously married women. It has been found that, after adjusting for age, education, use of contraceptives, religion, and occupation, there is little difference in the average duration of abstinence between the polygynously and monogamously married women in Ibadan (Caldwell and Caldwell, 1981:186).

Most of the variation in the duration of postpartum abstinence found among different ethnic groups in African countries cannot be explained by the factors discussed above. In Ghana, for example, most of the considerable differences among ethnic groups remain after adjusting for age, education, use of contraception, and occupation (Gaisie, 1981:248). Obviously, other factors affect the duration of postpartum abstinence as practiced by different ethnic groups.

In an attempt to identify the various elements of social organization associated with prolonged postpartum abstinence, Saucier (1972) tested 24 hypotheses on a random sample of 172 societies drawn from Murdock's (1967) "Ethnographic Atlas." The following variables were found to contribute significantly to a long postpartum taboo: extensive agriculture (as opposed to intensive agriculture), male supervision of female labor in gathering (as opposed to gathering done exclusively by women), bridewealth and sister-exchange, polygyny, unilineal kin groups, localized kin groups, primogeniture and ultimogeniture, hereditary headmanship at the community level, customary genital mutilation, otiose high god, duolateral cross-cousin marriage, segregation of adolescent boys, and physical isolation of the wife from her husband and the rest of the household. Saucier suggests that a long period of postpartum abstinence imposes a heavy burden on women, and that the successful maintenance of the practice

requires a community organization in which elders are in firm control and married women are considered outsiders. Although he has proposed some causal links among these variables, such links are mostly speculative in nature. Schoenmaeckers et al. (1981) have found that Saucier's variables are of limited value in discriminating among various African societies; however, they are useful in discriminating between African and non-African societies.

FREQUENCY OF COITUS

The fertile period within women's ovulatory cycle is quite short. There is evidence to suggest that the fertile lifetime of the male sperm ranges from 28 to 48 hours, and that of the female ovum from 12 to 24 hours (Bongaarts, in these volumes). Hence, in the absence of contraception, variation in the frequency of coitus can be expected to have a corresponding effect on the probability of conception. Under several simplifying assumptions, Tietze and Potter (1962:693) have estimated that the probability of conception increases about one and one-half times with an increase in average coital frequency per ovulatory cycle from 6 to 12. Barrett and Marshall (1969) have found that the probability of conception increases when coital frequency in the 6-day period around the time of ovulation increases from 1 to 3, but decreases when the frequency increases to 4. There are also empirical studies demonstrating an inverse relationship between delayed conception and reported coital frequency, up to a certain limit (Nag, 1972:232-233).

Within a society, coital frequency varies considerably among different age groups. For example, in a sample of married non-Sheikh Muslim women of West Bengal (India) interviewed in 1960, it was found that the mean coital frequencies per week were 2.7 for the age group 25-29 and 0.8 for the age group 40-44 (Nag 1972:235). In the virtual absence of any contraception among non-Sheikh Muslims, this variation in the frequency of coitus among different age groups is likely to accentuate the skew in the age-distribution of fertility.

The question arises whether there is enough variation in mean coital frequency among sociocultural groups to account for a significant fertility differential. There are two contradictory views on this question. According to Davis and Blake (1956), there is no reliable evidence that the mean frequency of coitus for comparable age groups varies significantly from one society to another, and "certainly none which indicates that this is a significant factor in inter-societal variations in fertility." The contrary and perhaps more common view is that one major reason for high fertility in less developed countries is that most of the population, being poor, can afford little other recreation besides sex, and thus has a relatively high frequency of coitus. This view, although unsupported by empirical data, is held by some eminent statesmen and demographers (Nag, 1972:233).

Some anthropologists, interested in the sexual behavior of the people they study, provide a few references to coital frequency.

These data, however, generally suffer from very serious weaknesses: (1) the age differential is very often ignored; (2) figures on frequency per week are often ambiguous because it is not clear whether they refer to every week or exclude those weeks when coitus is not possible or forbidden; and (3) the methods of selecting the sample and of collecting data are very often defective. For example, in a cross-cultural study of nonindustrial, particularly tribal, societies based on anthropological literature, Ford and Beach (1951:78) concluded that "in most of those societies on which information is available, every adult normally engages in heterosexual intercourse once daily or nightly during the period when coitus is permitted." However, the studies on which this statement is based have most probably given frequency figures for individuals who are more sexually active than others. It is difficult to rely on statements such as "the Aranda of Australia have intercourse as often as three or four times nightly, sleeping between each sex act," or "for Chagga men it is reported that intercourse ten times a night is not unusual" (Ford and Beach, 1951:78-79). There are, however, a few anthropological studies which provide reasonably reliable data on frequency of coitus and give some indications of the sociocultural factors affecting it. Two examples will be given below: (1) the Yapese living in the Yap islands of western Micronesia, investigated in 1948-49 (Hunt et al., 1949; Hunt et al., 1954; Schneider, 1955); and (2) the Bengali Hindu and Muslim groups of rural West Bengal, investigated in 1960 (Nag, 1967; Nag, 1972).

The fertility level among the Yapese was quite low in comparison to that of other nonindustrial societies (Nag, 1962:31). In the 1940s, their crude birth rate varied from 26 to 31. One of the main reasons for this low fertility rate was perhaps the Yapese's low frequency of coitus. Of the 16 persons (presumably men) interviewed by anthropological investigators, only two had had coitus in the previous week, and only another two had had coitus in the week before that. According to the investigators, it is likely that these figures were so low because the Yapese were reluctant to admit that they had copulated "too much," which among them was a cause for ridicule. However, the fact that "too much" copulation was defined by Yapese men as over two to three times per month is a good indication that coital frequency among them was quite low. Even in their premarital and extramarital affairs, Yapese men and women emphasized not the sexual relationship, but Platonic love. Among the factors responsible for low frequency of coitus among the Yapese, foremost was the men's anxiety about becoming weak by engaging too frequently in intercourse and being ridiculed as a result. One man said that even if his wife wanted to have intercourse frequently, he would not comply and if necessary, would go over to the men's house to sleep. Another man arrived at an understanding with his prospective wife that he would not have frequent intercourse because he was weak and sickly. Any man who could not do hard work was likely to be teased for having coitus too frequently. The perception of a link between excessive intercourse and loss of strength, and the shame attached to this, had been prevalent in Yapese culture for a long time.

TABLE 3 Mean Coital Frequency per Week of Married Women by Age Group in Selected Samples

Age Group[a]	Bengali Hindus	Bengali Sheikh Muslims	Bengali Non-Sheikh Muslims	American Whites	American National Sample, 1965	British
10-14	0.4(5)	0.3(3)	0.4(37)	--	--	--
15-19	1.5(45)	1.7(29)	2.3(93)	3.7(578)	2.7(203)	2.5(133)
20-24	1.9(45)	2.4(44)	2.6(104)	3.0(1654)	2.1(835)	2.1(521)
25-29	1.8(30)	2.4(46)	2.7(77)	2.6(1663)	1.9(828)	1.7(457)
30-34	1.1(16)	1.8(27)	2.1(45)	2.3(1247)	1.7(913)	1.3(186)
35-39	0.7(13)	1.4(25)	1.5(35)	2.0(852)	1.5(878)	1.4(78)
40-44	0.2(11)	1.0(25)	0.8(16)	1.7(500)	1.3(946)	--
45+	0.3(7)	0.4(8)	0.4(25)	1.3(431)	--	--

Note: Figures in parentheses indicate number of women in the sample.

[a]Actual age groupings for the American Whites sample are 16-20, 21-25, 26-30, etc.; the first age group for the American national sample and the British sample is "less than 20"; the last age group for the British sample is "35 or more."

Sources: Bengali groups: Nag (1972); American Whites: Kinsey et al. (1953); American National sample: Westoff (1974); British sample: Cartwright (1976).

Coital frequency data for two Bengali Muslim groups (one Sheikh, one non-Sheikh) and one Bengali Hindu group living in three villages of West Bengal were collected in 1960. A total sample of 811 married women living with their husbands was asked about the frequency of coitus during the last normal week (normal in the sense that it did not include restricted days related to menstruation or any other occasion for prolonged voluntary or involuntary abstinence). It should be noted that the Sheikh Muslims are of a higher economic status than the non-Sheikh Muslims and the Hindus. The coital frequency data of these three groups, along with those of one British and two American samples, are presented in Table 3.[10]

There is no evidence from these data that the frequency of coitus is higher in less developed than in developed countries; there is also no evidence to the contrary. The frequency of coitus is higher in the American White sample (Kinsey et al., 1953:394) than in the three Bengali samples for all age groups; however, the frequencies are lower in the British sample (Cartwright, 1976:88) than in the Bengali non-Sheikh Muslim sample for all age groups except 15-19 years. The frequencies in the 1965 U.S. National Fertility Studies sample (Westoff 1974:137) are lower than those in the American White sample of Kinsey et al., partly because the reference period for the former was four weeks (which included the menstrual period), while that for the latter (as well as for other samples) was only one week. There is a general decline in frequency of coitus with age in all the samples; however, for reasons difficult to guess, the maximum frequency in the three Bengali samples is found in the age groups 20-24 or 25-29 years, while in the American and British samples, it is in the age group below 20 years.

There is some evidence in the U.S. to indicate that poorer people have a higher average frequency of coitus than richer. In a very small sample of American White patients (who underwent a specific surgical operation), Pearl (1925:199-204) found that the average frequencies per month among "farmers," "merchants and bankers," and "professional men" were 12.6, 10.8, and 8.8, respectively. He concluded that higher income (assuming a positive correlation between income and occupational status) provided more avenues for recreation, more varied intellectual interests, and wider outlets for nervous energy, all of which may tend towards less frequent sexual activity. Kinsey et al. (1953:354) only partially corroborated Pearl's results. There is also partial corroboration of Pearl's results in the Bengali samples. The frequency of coitus among the Sheikh Muslims, a relatively wealthy group, is lower than that among the non-Sheikh Muslims for almost all age groups. However, there are also examples which contradict Pearl's results. The Bengali Hindus, who are poorer than the Sheikh Muslims, have lower frequencies than the latter for almost all age groups. Similarly, data obtained from the 1970 U.S. National Fertility Studies showed that coital frequency was greater among women with more education and among employed women who worked primarily because of career motivation rather than for remuneration (Westoff 1974:141). Hence it is difficult to make any generalization about the relationship between frequency of coitus and socioeconomic

status.

The fact that Hindus have lower frequencies of coitus than other groups in Table 3 reflects some differences in cultural attitudes towards sex. There is a widespread belief among the Hindus of India that semen is a great source of strength for men, and that coitus therefore causes loss of strength. The Hindus of a northern Indian village are reported to believe that "it takes forty days, and forty drops of blood, to make one drop of semen" and that "a man who possesses a store of such good semen becomes a super-man" (Carstairs, 1967:83-86). The Hindu epic Mahabharata describes how Princes Vicitravirya and Vyushitacva fell victim to consumption and early death because of their overindulgence in sex. Hindu scriptures and philosophy emphasize moderation in sex because a man can supposedly gain not only physical but also moral strength by conserving his semen. Islam, in contrast, holds that the pleasures of the flesh are a god-given virtue and hence places less emphasis on moderation in sex (Kirk, 1966:570). Many branches of Christianity also no longer impute any special virtue to moderation in sex among married couples, although Catholicism demands total celibacy among monks and nuns. Such religious differences in attitudes toward sex are likely to affect the frequency of coitus.

Data collected from the three Bengali samples indicate that a couple's family type may affect its frequency of coitus. It has been found that for each age group of women, the mean frequency of coitus per week in extended families is consistently less than that in nuclear families (Nag, 1967:163). There are two likely reasons for this difference. First, the frequency of coitus may be affected by the degree of privacy available in the household. Lack of privacy is usually greater in the extended phase of the family than in its nuclear phase, since additional rooms are often not added when the family becomes extended. Second, traditional taboos against coitus (for example, those among the Hindus related to various phases of the moon or sun) are likely to be observed more strictly by women living in extended households with their in-laws than by those living in nuclear households.

The frequency of coitus is also likely to be affected by the type of marriage. The average frequency for women married polygynously is likely to be lower than that for women married monogamously, while that of women married polyandrously is likely to be higher. There are, however, no empirical data to verify these hypotheses.

PROPOSITIONS

The following propositions are derived from the preceding discussion of the sociocultural determinants of breastfeeding, postpartum abstinence, and frequency of coitus.

1. In less developed countries, education is the most important factor influencing the practice of breastfeeding. There is a monotonic negative association between education and the duration of breastfeeding, although the extent to which duration declines at

different educational levels is not uniform among different countries. On the other hand, in contemporary developed countries, added education at higher levels tends to have a positive effect on breastfeeding, at least in recent years; however, the effect of added education at lower levels shows no consistency.

2. There are large rural-urban differences in the practice of breastfeeding in less developed countries. Perhaps most of these differences can be explained by the higher educational and employment opportunities for women and the greater use of breastmilk substitutes in urban areas.

3. There is no simple, straightforward relationship between women's work and breastfeeding. Women employed outside the home in nonagricultural work are generally found to breastfeed less than others, while those employed in agricultural work--whether on their own or others' farms--seem to breastfeed more than nonworking women. Agricultural work itself, for some unknown reason, may increase the likelihood and duration of breastfeeding.

4. One of the main reasons for the decline of breastfeeding in less developed countries is the introduction of powdered milk and feeding bottles. The role of modern health practices in promoting this decline varies among different countries.

5. Most of the variations in breastfeeding among the regional, ethnic, and religious groups within a country cannot be explained by differing individual socioeconomic and demographic characteristics. Apparently, other psychological and cultural factors which are not easily identified and measured must be considered. These include the following: psychological support to the parturient mother, affected by family or community structures; beliefs and rituals related to the importance of breastmilk to the child; the concept of female breasts as a symbol of sexual attraction, rather than a symbol of nutritional as well as emotional nourishment for babies; a sense of modesty about exposing female breasts; and the nature of the mother-child relationship as affected by other aspects of culture.

6. The period of amenorrhea (mostly affected by breastfeeding) is generally longer than the period of postpartum abstinence in less developed countries. However, there are some societies, particularly in sub-Saharan Africa, in which the duration of abstinence is longer and in which the practice may therefore delay conception.

7. In African countries, education and use of contraceptives are the most important factors responsible for the recent decline in postpartum abstinence. Urbanization, reduced polygyny, and other aspects of modernization do not seem to have much independent effect; ethnic differences in postpartum abstinence remain largely unexplained.

8. There are examples of societies in which the average frequency of coitus is low enough to contribute to lower fertility.

9. The frequency of coitus generally declines with age; however, the maximum average frequency among married couples seems to occur in the age group below 20 years in developed countries, and in the next higher age groups in less developed countries.

10. Although there is no consistent relationship between socioeconomic status and frequency of coitus, differences in attitudes

toward sex can explain at least some of the variations in frequency of coitus among religious groups.

11. Type of family and type of marriage (see Burch, in these volumes) are variables which may affect the frequency of coitus.

NOTES

1. The critical level of education for black mothers was 13 to 15 years and not 12 years.
2. Women who start supplementary feeding before one month contribute an average of 38 percent to subsistence activities, while women who start after one month contribute an average of 27 percent. The difference is statistically significant (Nerlove, 1974:210). However, the data compiled from Human Relations Area Files are of greatly varying quality, and the tests based on them should be considered with due reservation. No separate estimates have been made for different types of subsistence activities. Women engaged in animal husbandry are likely to breastfeed more than those engaged in agriculture and hunting.
3. In a study of the !Kung hunter-gatherers, it has been found that highly frequent nursing is a significant factor in mothers' low fertility. Maternal gonadal function is apparently suppressed by a timing-dependent effect of breast stimulation (Konner and Worthman, 1980).
4. Evidence of unexplained variation in the duration of breastfeeding is also available for the following: different regions of Thailand (Knodel and Debavalya, 1980:363); ethnic groups in Malaysia (Butz and DaVanzo, 1981); ethnic groups in Kenya (Mosley et al., 1980); ethnic groups in Ghana (Gaisie, 1981:247); different regions and religious groups in the United States (Hirschman and Sweet, 1974:47-48); and different provinces in early twentieth-century southern Germany (Knodel and van de Walle, 1967:117).
5. The person who functions to "mother the mother" is designated by Raphael (1966) as a doula, a Greek word used about a hundred years ago to describe the woman who came to a home and assisted a newly delivered mother. According to Raphael, support structures vary among different cultures; when such support is unavailable, the mother is unlikely to be capable of the let-down reflex, that is to eject the milk, even if it is sufficient. Apparent insufficiency is a major reason women in developing as well as developed regions give for stopping breastfeeding. Besides the lack of an adequate support structure, insufficient milk may be reported because of illness of either the mother or the infant, because of improper feeding techniques, or because of personal preferences (McCann et al., 1981).
6. The data used for this analysis have weaknesses; thus the association, though statistically significant, should be interpreted with due reservation.

7. The anthropological literature usually refers to this practice as a taboo. This usage, implying sanctions often unrelated to rational decision, may not be appropriate for all societies. The responses of Yoruba women cited above indicate that they make a rational decision to follow the practice that goes beyond societal sanctions in its favor. The mean duration of the practice stated in the anthropological literature is mostly a normative estimate based on the information gathered from only a few key informants. The stated duration of postpartum abstinence tends to shorten as the point of reference becomes more recent, creating a problem of comparability. For these and other reasons discussed by Schoenmaeckers et al., (1981), the distributions of the practice obtained from Saucier's sample are suggestive rather than conclusive.
8. In Indonesia, sexual self-denial by both men and women is generally considered beneficial (Singarimbun and Manning, 1976:174).
9. The data used for these tests have the same weaknesses as those mentioned in footnotes 2 and 7.
10. The Bengali data were collected in 1960 by Uma Guha, an anthropologist who lived in the study area for more than a year and had developed a good rapport with all the village women before asking them questions about sexual matters. The American White data pertain to a sample of married women interviewed between 1938 and 1950 by Kinsey and his colleagues at the Institute of Sex Research, Indiana University. The women were asked about their average coital frequency in each five-year period of their married history; consequently, these data are liable to be affected more by memory than the Bengali data. The data for the American national sample were collected in the 1965 National Fertility study directed by Charles F. Westoff and Norman B. Ryder. Women were asked how many times they had had intercourse during the past four weeks. The British study was done in 25 local authority areas in England and Wales between March and August, 1973. In this study, women were asked how many times they had had intercourse in the past seven days. While these data sets are undoubtedly not very accurate and not strictly comparable, they have been used in this paper for lack of better ones.

BIBLIOGRAPHY

Anand, D., and A. Rama Rao (1962) Feeding practices of infants and toddlers in Najafgarh area. Indian Journal of Medicine 11:172-181.

Barret, J. C., and J. Marshall (1969) The risk of conception on different days of the menstrual cycle. Population Studies 23:455-461.

Berg, A. (1973) Nutrition, development, and population growth. Population Bulletin 29(1).

Butz, W. P., and J. DaVanzo (1981) Determinants of Breastfeeding and Weaning Patterns in Malaysia. Prepared for the Agency for International Development, WD-995-1-AID. Rand Corporation, Santa Monica, Calif.

Caldwell, J. C., and P. Caldwell (1977) The role of marital sexual abstinence in determining fertility: A study of the Yoruba in Nigeria. Population Studies 31:193-217.

Caldwell, J. C., and P. Caldwell (1981) Cause and sequence in the reduction of postnatal abstinence in Ibadan City, Nigeria. In H. J. Page and R. Lesthaeghe, eds., Child-Spacing in Tropical Africa: Traditions and Change. New York: Academic Press.

Cantrelle, P., B. Ferry, and J. Mondot (1978) Relationship between fertility and mortality in tropical Africa. In. S. Preston, ed., The Effects of Infant and Child Mortality on Fertility. New York: Academic Press.

Carstairs, G. M. (1967) The Twice-Born. Bloomington, Ind.: Indiana University Press, Midland Book.

Cartwright, A. (1976) How Many Children? London: Routledge and Kegan Paul.

Chander, R., V. T. Palan, N. L. Aziz, and T. B. Ann (1977) Malaysian Fertility and Family Survey, 1974. First Country Report, World Fertility Survey. Kuala Lumpur: Malaysian Department of Statistics.

DaVanzo, J. (1980) The Role of Breastfeeding in Population Growth: A Conceptual Model, Brief Review of Evidence, and Suggestions for Future Research. Unpublished manuscript. Rand Corporation, Santa Monica, Calif.

DaVanzo, J., and W. P. Butz (1978) Influences on Fertility and Infant Mortality in Developing Countries: The Case of Malaysia. Prepared for the Agency for International Development, N-1166-AID. Rand Corporation, Santa Monica, Calif.

Davis, K., and J. Blake (1956) Social structure and fertility: An analytical framework. Economic Development and Cultural Change 4:211-235.

Dorjahn, V. R. (1958) Fertility, polygyny, and their interrelations in Temne society. American Anthropologist 60:838-859.

Ford, C. S., and F. A. Beach (1951) Patterns of Sexual Behavior. New York: Harper and Row Publishers.

Gaisie, S. K. (1981) Child-spacing patterns and fertility differentials in Ghana. In H. J. Page and R. Lesthaeghe, eds., Child-Spacing in Tropical Africa: Traditions and Change. New York: Academic Press.

Greiner, T. H. (1979) Breastfeeding in decline: Perspectives of the causes. In D. B. Jelliffe, E. F. P. Jelliffe, F. T. Sai, and P. Senanayake, eds., Lactation, Fertility and the Working Woman. London: International Planned Parenthood Federation.

Greiner, T. H., S. Almroth, and M. C. Latham (1979) The Economic Value of Breastfeeding. Cornell International Nutrition Monograph Series No. 6. Ithaca, N.Y.: Division of Nutritional Sciences, Cornell University.

Habicht, J.-P., and R. Klein (1972) Possible Factors Affecting Acceptability of Fertility Regulation Methods in Four Guatemalan Villages. Paper presented at the World Health Organization Task Force Symposium on Contraceptive Acceptability, Geneva.

Harrell, B. B. (1981) Lactation and menstruation in cultural perspective. American Anthropologist 83:796-823.

Hirschman, C., and J. A. Sweet (1974) Social background and breastfeeding among American mothers. Social Biology 21:39-57.

Hull, T., and V. Hull (1977) The relations of economic class and fertility: An analysis of some Indonesian data. Population Studies 31:43-58.

Hull, V. (1975) Fertility, Socioeconomic Status, and the Position of Women in a Javanese Village. Unpublished Ph.D. dissertation. Australian National University, Canberra, Australia.

Hunt, E. E. Jr., N. R. Kidder, D. M. Schneider, and W. D. Stevens (1949) The Micronesians of Yap and Their Depopulation. Mimeographed report to the Pacific Science Board, National Research Council, from the Peabody Museum, Harvard University, Cambridge, Mass.

Hunt, E. E. Jr., N. R. Kidder, and D. M. Schneider (1954) The depopulation of Yap. Human Biology 26:20-51.

Jain, A. K., and J. Bongaarts (1981) Breastfeeding: Patterns, correlates, and fertility effects. Studies in Family Planning 12:79-99.

Jain, A. K., and T. H. Sun (1972) Inter-relationship between socio-demographic factors, lactation and postpartum amenorrhea. Demography India 1(1):78-91.

Jain, A. K., T. C. Hsu, R. Freedman, and M. C. Chang (1970) Demographic aspects of lactation and postpartum amenorrhea. Demography 7:255-271.

Jelliffe, D. B. (1962) Culture, social change and infant feeding: Current trends in tropical regions. American Journal of Clinical Nutrition 10:19-45.

Kinsey, A. C., W. B. Pomeroy, C. E. Martin, and P. H. Gebhard (1953) Sexual Behavior in the Human Female. Philadelphia: W. B. Saunders.

Kirk, D. (1966) Factors affecting Moslem natality. In B. Berelson et al., eds., Family Planning and Population Programs. Chicago: University of Chicago Press.

Knodel, J., and N. Debavalya (1980) Breastfeeding in Thailand: Trends and differentials: 1969-79. Studies in Family Planning 11:355-377.

Knodel, J., and E. van de Walle (1967) Breastfeeding, fertility and infant mortality: An analysis of some early German data. Population Studies 21:109-131.

Konner, M., and C. Worthman (1980) Nursing frequency, gonadal function, and birth spacing among Kung hunter-gatherers. Science 207:788-791.

Korea, NBOS-KIFP (National Bureau of Statistics of Economic Planning Board and Korean Institute for Family Planning) (1977) The Korean National Fertility Survey, 1974. First Country Report, World Fertility Survey. Seoul: National Bureau of Statistics of the Economic Planning Board.

Krzwicki, L. (1934) Primitive Society and its Vital Statistics. London: Macmillan.

Lesthaeghe, R., H. J. Page, and O. Adegobla (1981) Child-spacing and fertility in Lagos. In H. J. Page and R. Lesthaeghe, eds., Child-Spacing in Tropical Africa: Traditions and Change. New York: Academic Press.

Lucas, D. W. (1977) Urban and rural fertility in southern Nigeria. In L. Ruzicka, ed., The Economic and Social Supports for High Fertility. Proceedings of the conference held in Canberra, November 1976. Canberra: Australian National University.

Mandelbaum, D. (1974) Human Fertility in India: Social Components and Policy Perspectives. Berkeley: University of California Press.

McCann, M., L. S. Liskin, P. I. Piotrow, W. Rinehart, and G. Fox (1981) Breast-Feeding, Fertility and Family Planning Program. Population Reports (Family Planning Programs), Series J., No. 24. Baltimore, Md.: The Johns Hopkins University.

Mead, M. (1930) (Edition 1968) Growing Up in New Guinea. New York: Dell Publishing Company.

Mead, M. (1935) (Edition 1963) Sex and Temperament. New York: William Morrow and Company.

Mead, M. (1949) Male and Female. New York: Dell Publishing Company.

Millman, S. (1981) Breastfeeding in Taiwan: Trends and Differentials, 1966-1980. Paper presented at the annual meeting of the Population Association of America, Washington, D.C.

Morgan, R. W. (1971) Traditional contraceptive techniques in Nigeria. In P. Cantrelle et al., eds., Population in African Development, Vol. 2. Dolhain, Belgium: Ordina Editions. (A publication of the International Union for the Scientific Study of Population.)

Mosley, H. W., L. H. Werner, and S. Becker (1981) The Dynamics of Birth Spacing and Marital Fertility in Kenya. Paper prepared for the Conference of the International Union for the Scientific Study of Population, Manila.

Murdock, G. P. (1967) Ethnographic atlas: A summary. Ethnology 6:109-236.

Nag, M. (1962) Factors Affecting Human Fertility in Nonindustrial Societies: A Cross-Cultural Study. Yale University Publications in Anthropology No. 66. New Haven, Conn.: Yale University Press.

Nag, M. (1967) Family type and fertility. Pp. 160-163 in Proceedings of the Second World Population Conference, New York, 1965, Vol. 2. New York: United Nations.

Nag, M. (1972) Sex, culture, and human fertility: India and the United States. Current Anthropology 13:231-237.

Nag, M. (1980) How modernization can also increase fertility. Current Anthropology 21:571-587.

Nerlove, S. B. (1974) Women's workload and infant feeding practices: A relationship with demograhic implications. Ethnology 13:207-214.

Orubuloye, I. O. (1981) Child-spacing among rural Yoruba women. Ekiti and Ibadan division in Nigeria. In H. J. Page and R. Lesthaeghe, eds., Child-Spacing in Tropical Africa: Traditions and Change. New York: Academic Press.

Osteria, T. S. (1978) Variations in fertility with breastfeeding practice and contraception in urban Philippine women: Implications for a nutrition program. In W. H. Mosley, ed., Nutrition and Human Reproduction. New York and London: Plenum Press.

Pearl, R. (1925) The Biology of Population Growth. New York: Alfred A. Knopf.

Popkin, B. M., and F. S. Solon (1976) Income, time, the working mother and child nurture. Journal of Tropical Pediatrics and Environmental Child Health 22:156-166.

Raphael, D. (1966) The Lactation-Suckling Process in the Matrix of Supportive Care. Unpublished Ph.D. dissertation, Microfilm No. 69-15, 580. Columbia University, New York.

Raphael, D. (1979) Social myths and economic realities about breastfeeding. In D. Raphael, ed., Breastfeeding and Food Policy in a Hungry World. New York: Academic Press.

Saucier, J.-F. (1972) Correlates of the long postpartum taboo: A cross-cultural study. Current Anthropology 13:238-249.

Schneider, D. M. (1955) Abortion and depopulation on a Pacific island. In B. D. Paul, ed., Health, Culture and Community. New York: Russell Sage.

Schoenmaeckers, R., I. H. Shah, R. Lesthaeghe, and O. Tambashe (1981) The child-spacing tradition and the postpartum taboo in tropical Africa: Anthropological evidence. In H. J. Page and R. Lesthaeghe, eds., Childspacing in Tropical Africa, Tradition and Change. New York: Academic Press.

Simpson-Hebert, M., and S. L. Huffman (1981) The contraceptive effect of breastfeeding. Studies in Family Planning 12:125-131.

Singarimbun, M., and C. Manning (1976) Breastfeeding, amenorrhea, and abstinence in a Javanese village: A case study of Mogolama. Studies in Family Planning 7:175-179.

Tabutin, D. (1973) Quelques donnes sur l'allaitement en Algerie du Nord. Population 6:1177-1186.

Talbot, P. A. (1926) The Peoples of Southern Nigeria. London: Oxford University Press.

Tietze, C., and R. G. Potter (1962) Statistical evaluation of the rhythm method. American Journal of Obstetrics and Gynecology 84:692-698.

United Nations (1961) The Mysore Population Study. Population Studies No. 34. New York: United Nations.

Van Esterick, P., and T. Greiner (1981) Breastfeeding and women's work: Constraints and opportunities. Studies in Family Planning 12:186-197.

Ware, H. (1979) Social influences on fertility at later ages of reproduction. In A. S. Parkes, M. A. Herbertson, and J. Cole, eds., Fertility in Middle Age. Cambridge, Eng.: Galton Foundation.

Westoff, C. F. (1974) Coital frequency and contraception. Family Planning Perspectives 6:136-141.

World Health Organization (1979) Preliminary Report of the WHO Collaborative Study on Breastfeeding. MCH/79.3. Geneva: WHO.

Wyon, J. B., and J. E. Gordon (1971) The Khanna Study: Population Problems in Rural Punjab. Cambridge, Mass.: Harvard University Press.

Yaukey, D. (1961) Fertility Differences in a Modernizing Country: A Study of Lebanese Couples. Princeton, N.J.: Princeton University Press.

Zimmer, H. R. (1948) Hindu Medicine. Baltimore, Md.: The Johns Hopkins University Press.

Chapter 7

CHILD SURVIVAL: LEVELS, TRENDS, AND DETERMINANTS

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This paper reviews the literature on recent levels, trends, and determinants of child survival in developing countries. The term "child" includes infants (under 1 year) and children (1-4 years); "survival" refers to the period between birth and age 5. Child survival is a critical issue because it plays an obvious role in the supply of surviving offspring. In moderate- and high-mortality populations, childhood deaths may constitute half of all deaths, and differences in levels of child survival between developing and developed countries are very marked, more so than for any other age group (Gordon and Ingalls, 1967; Gwatkin, 1978; Preston and Nelson, 1974; Preston, 1976).

Any overview of child survival in developing countries faces a number of problems. First, the disciplines, literature, and issues involved are broad and complex, thereby hampering concise summary; the present review is therefore necessarily selective. Second, mortality data are scarce and unreliable in many parts of the developing world, and this is particularly the case in high-mortality regions (United Nations, 1963, 1973a, 1973b, 1979, 1980, 1981a, 1981b). Since high-quality vital registration systems are rare in the developing world, life expectancy and childhood mortality may often be computed only through indirect estimation techniques (Brass, 1975; Hill and Trussell, 1977). Third, mortality levels and trends vary among and within regions and countries, and some trends are of recent origin. It is therefore difficult to apply generalizations to particular situations. Finally, the causes of historical mortality decline in the developing (and developed) world remain largely unexplained and controversial (Fredericksen, 1961; McDermott, 1976; McKeown, 1976; Notestein, 1953; Preston, 1980; Preston, 1976; Stolnitz, 1955); multiple independent variables are involved, and there may be a collinear relationship and interaction among many of them. (See the Appendix for a discussion of research needs in the area of child mortality.)

With these limitations in mind, this paper first reviews childhood mortality levels, trends, and patterns in the major developing regions of the world. Next, a conceptual framework is presented that

TABLE 1 Levels and Changes in Life Expectancy at Birth in Major World Regions, 1950-55 and 1970-75

Major Regions	Period				
	1950-55	1955-60	1960-65	1965-70	1970-75
World	47.0	50.2	52.6	54.4	56.1
More Developed Regions	64.3	67.3	68.7	69.4	70.4
Less Developed Regions	42.5	45.8	48.7	51.3	53.3
Africa	37.6	39.9	42.2	44.5	46.5
Latin America	52.0	55.0	57.3	59.4	61.3
Asia	43.3	46.9	50.4	53.4	56.0

Major Regions	Average Annual Change			
	1950-55 to 1955-60	1955-60 to 1960-65	1960-65 to 1965-70	1965-70 to 1970-75
World	0.64	0.48	0.36	0.34
More Developed Regions	0.60	0.28	0.14	0.20
Less Developed Regions	0.66	0.58	0.52	0.40
Africa	0.46	0.46	0.46	0.40
Latin America	0.60	0.46	0.42	0.38
Asia	0.72	0.70	0.60	0.52

Source: United Nations (1979:28-30).

delineates the proximate variables through which all childhood mortality determinants must operate at the individual level. These variables include paternal factors, nutrition and diet, infections and infestations, and childcare factors. All socioeconomic factors necessarily operate through these four basic mechanisms to influence child mortality. Finally, the paper reviews current hypotheses regarding the impact of mortality control policies and health intervention programs on childhood mortality.

LEVELS, TRENDS, AND PATTERNS

As noted above, it is difficult to generalize about mortality levels and trends in the developing world because of data quality; however, some broad patterns may be discerned (Gwatkin, 1978; Notestein, 1953; Preston, 1980; Stolnitz, 1955; United Nations, 1963, 1973a, 1973b, 1979, 1980, 1981a, 1981b).[1] From fluctuating but high levels in the nineteenth century, mortality began to decline in the early twentieth century. Over the first half of this century, mortality declined at unprecedented rates. Although exceptions exist, declines have slowed in the past two decades, with some of these slowdowns perhaps occurring at younger life expectancies than those of comparable slowdowns in the developed countries. Today, mortality levels and trends in the developing world are characterized by wide divergence within and among regions and countries.

Table 1 summarizes the estimated levels of life expectancy at birth and average changes from 1950-55 through 1970-75 for the world, the developed and developing regions, and the three major regions of the developing world (United Nations, 1980). Table 2 presents the crude death rate, life expectancy at birth, and infant mortality rate for 56 developing countries for which relatively reliable estimates exist (United Nations, 1981a). For most of the developing world, life expectancy at birth averaged approximately 30 years at the turn of the century, reaching the 50s by 1970 (Stolnitz, 1955; Stolnitz, 1956). By 1980, life expectancy averaged about 55 years in the developing world. Unlike the developed countries, where mortality declines began in the early nineteenth century, the developing regions did not gain in life expectancy until after World War I, and in some cases not until after World War II (Notestein, 1953; Omran, 1971). In 1935-39, life expectancy in Africa averaged 30 years, in Asia 30 years, and in Latin America 40 years. By 1965-69, these life expectancies had increased to 43, 50, and 60 years, respectively (Preston, 1980). Unprecedented rates of decline were witnessed in all developing regions, with the possible exception of sub-Saharan Africa, where data are either unavailable or unreliable (Davis, 1956). In diverse countries such as Sri Lanka, Malaysia, Mexico, and probably China, the rate of gain in life expectancy may have exceeded one year annually (Gwatkin, 1978). The absolute gains in age-specific death rates were greatest in children under 5 and adults over 40; the greatest proportionate gains in age-specific rates were observed among older children (Preston, 1980).

Perceptible in the 1960s and confirmed in the 1970s, slowdowns in these unprecedented rates of mortality decline were noted in all major developing regions (Gwatkin, 1980; Gwatkin, 1978; United Nations, 1963, 1973a, 1973b, 1979, 1980, 1981a, 1981b). In Asia, the slackening was most marked in South Asia, particularly India, Bangladesh, Sri Lanka, and Pakistan. In Africa, the slowdown was noted in Egypt, the only country for which reliable data are available. Even sharper slowdowns were noted in El Salvador, Guatemala, Mexico, and Venezuela in Latin America.

The current mortality situation in the developing world is

TABLE 2 Crude Death Rate (per 1,000 population), Infant Mortality Rate (per 1,000 live births), and Life Expectancy at Birth (years) for Selected Developing Countries with Relatively Reliable Estimates[a]

Region and Country	CDR	IMR	e_0
Africa			
Algeria	14	127	55
Cameroon	20	157	44
Egypt	11	90	--
Ethiopia	20-26	155-200	36-44
Ghana	17	115	49
Kenya	14	83	53
Malawi	27-28	--	--
Mauritius	7	34	63
Morocco	15	162	51
Nigeria	21	--	41
Reunion	6	18	--
Senegal	20-22	--	--
South Africa	13	93-101	57
Sudan	19	141	45
Tanzania	16-18	120-130	45-49
Tunisia	8	--	--
Asia			
Afghanistan	28-32	217-235	35-39
Bangladesh	20	153	46
Hong Kong	5	12	73
India	16	122	47
Indonesia	16	114	46
Iran	12	125	57
Israel	7	18	72
Korea, Rep. of	8	38	63
Kuwait	5	39	68
Malaysia (Peninsular)	6	32	--
Nepal	21	133	43
Pakistan	18	142	--
Philippines	11	62	61
Singapore	5	12	69
Sri Lanka	7	53	64
Thailand	8-10	62	59
Turkey	12	125	57

TABLE 2 (continued)

Region and Country	CDR	IMR	e_0
Latin America			
Argentina	9	45	66
Bolivia	20	168	47
Brazil	9	84	60
Chile	7	61	62
Colombia	9	77	59
Costa Rica	4	28	69
Cuba	6	25	70
Dominican Republic	13	96	55
Ecuador	14	115	61
El Salvador	12	105	57
Guadeloupe	6	21	--
Guatemala	13	76	53
Guyana	7	--	--
Haiti	19	150	46
Honduras	15	127	52
Jamaica	6	20	67
Martinique	7	19	--
Mexico	6	70	61
Peru	13	141	55
Puerto Rico	6	20	72
Trinidad and Tobago	6	29	67
Uruguay	10	46	69
Venezuela	6	45	65

[a]Latest data available since 1970.

Source: United Nations (1981a).

characterized by wide divergence (Dyson, 1977; Gordon and Ingalls, 1967). Although overall developing world life expectancy averages about 55 years, the figure for the rapidly developing economies of Taiwan, Hong Kong, and Singapore approximates 70 years. Many countries of sub-Saharan Africa, in contrast, lag far behind, often with life expectancies in the 40s and possibly in the 30s. In the Middle East, economically oil-rich countries display the paradox of high per capita income in juxtaposition with moderate levels of mortality. In Latin America, the level of mortality approaches that of developed countries, but with notable exceptions such as Haiti (Mata, 1978). In some selected subnational regions, there have been tentative signs that mortality may have increased recently rather than declined.

There is also a pattern of diversity within developing countries (Haines and Every, 1978; Jelliffe and Jelliffe, 1978; Somoza, 1980). Although few generalizations hold for all situations, rural mortality is usually higher than urban (Dyson, 1977). This contrasts with higher urban than rural mortality in developed countries during a comparable period in their mortality decline (United Nations, 1981b). Female life expectancy is usually higher than that of males, except in South Asia and among high-mortality populations (D'Souza and Chen, 1980; World Bank, 1980). Substantial mortality differentials may exist among different geographic, ecologic, and economic regions within a country, with economically advanced regions usually exhibiting lower mortality than disadvantaged regions.

Some aspects of child mortality are relatively constant among and within different countries and regions. In virtually all developing countries, mortality risk in the childhood years is highest immediately after birth, and declines rapidly thereafter (Cantrelle and Leridon, 1971; Chen et al., 1980b; Chowdhury and Chen, 1977; Gordon and Ingalls, 1967; Preston and Nelson, 1974). In some countries, a secondary peak has been observed in the weaning years during the hazardous transition from breastfeeding to supplemental foods (Cantrelle and Leridon, 1971). As a general rule, about half of all deaths up to age 5 take place during the first year, and about half to two-thirds of all infant deaths take place during the first month. During the postneonatal period, mortality risk declines and continues to do so into the second and third years of life. By the fourth and fifth years, mortality rates are manyfold lower, approaching the rates of the 5-9 age group.

There are generally three direct causes of most childhood mortality: infections, protein-calorie malnutrition, and trauma (Berggren and Berggren, 1971; Bryant, 1969; Chen et al., 1980b; Dyson, 1977; Gordon and Ingalls, 1967; Preston et al., 1972). Significant infections include neonatal tetanus, diarrhea, respiratory infections, measles, and tuberculosis. Protein-calorie malnutrition is often an underlying cause, and trauma assumes particular significance during birth. Although various classification systems have been employed to determine the relative contribution of these causes, the definitions used are imprecise and not mutually exclusive (International Classification of Diseases, 1948). Methodologies used to obtain cause-of-death data are often unreliable and poorly standardized. Moreover, the interactive nature of health processes, such as the synergy between infection and malnutrition, makes it difficult to attribute death to any single cause.

CONCEPTUAL FRAMEWORK

Although there is scientific consensus on the unprecedented rates of mortality decline, and even on the more recent slowdowns in the developing world, the factors responsible for these levels and trends remain elusive. One way to conceptualize the relative contribution of different independent variables to childhood mortality is through a

framework that delineates the major proximate (direct) variables at the individual level. One such framework is shown in Figure 1. Simplified for the sake of clarity, this framework identifies the major milestones in child maturation from birth to survival at age 5. The childhood mortality rate is one indicator of progress. Other useful health status indicators are birth weight, morbidity, and physical growth and development (nutritional status) (Gordon and Ingalls, 1967; Sterky and Mellander, 1978).

Survival over the course of the maturation process is hypothesized to be influenced by at least four sets of proximate determinants (Puffer and Serrano, 1973).[2] The first is parental factors, including age and parity, the interval between births, and maternal nutritional status (Heady et al., 1955; Preston, 1976; Swenson, 1975). These factors affect the mother's biological resources for providing adequate nutrition to the fetus during pregnancy and to the infant during breastfeeding, and may also affect the quality and time of childcare throughout the maturation process. The second set includes diet and feeding variables (Chen et al., 1980a; Kielmann and McCord, 1978; Sommer and Lowenstein, 1975). The mother's diet during pregnancy and lactation would be expected to influence the nutrition of the fetus and child (Lechtig et al., 1975; Jelliffe and Jelliffe, 1978). Since breastmilk alone cannot provide complete nutrition beyond 4-6 months, continuation of breastfeeding and the timeliness, adequacy, and pattern of supplementation assume significance until the child is able to consume a regular diet. A third set of variables is infections and infestations, which may affect the child both during pregnancy and in the first five years. Maternal infection during pregnancy is believed to contribute to low birth weight and high neonatal mortality risk (Braun et al., 1971). During the first five years of life, the child inevitably will experience many infections, the most significant of which involve the respiratory and gastrointestinal tracts. These infections are major causes of child mortality (Chen et al., 1980b; International Classification of Diseases, 1948; Morley, 1973; World Health Organization, 1977), and have been shown to interact with malnutrition (Scrimshaw et al., 1968). The last set of variables is childcare, particularly health care service availability and childcare behavior in response to illness. With the power of modern medical technologies, many common childhood illnesses in developing countries can be successfully treated.[3]

Several aspects of this framework deserve attention. The four major determinants or mechanisms represented are fundamental to the way socioeconomic factors operate to affect child mortality. In other words, socioeconomic variables such as education do not <u>directly</u> influence mortality, but must operate on mortality by influencing one or more of the proximate variables (e.g., better maternal diet, breastfeeding, proper weaning practices, more effective utilization of health services). Second is the concept of multiple risk factors and health processes acting simultaneously upon an individual child (Mosley, 1980a, 1980b; Wyon and Gordon, 1971). All four major proximate determinants in the framework interact simultaneously to

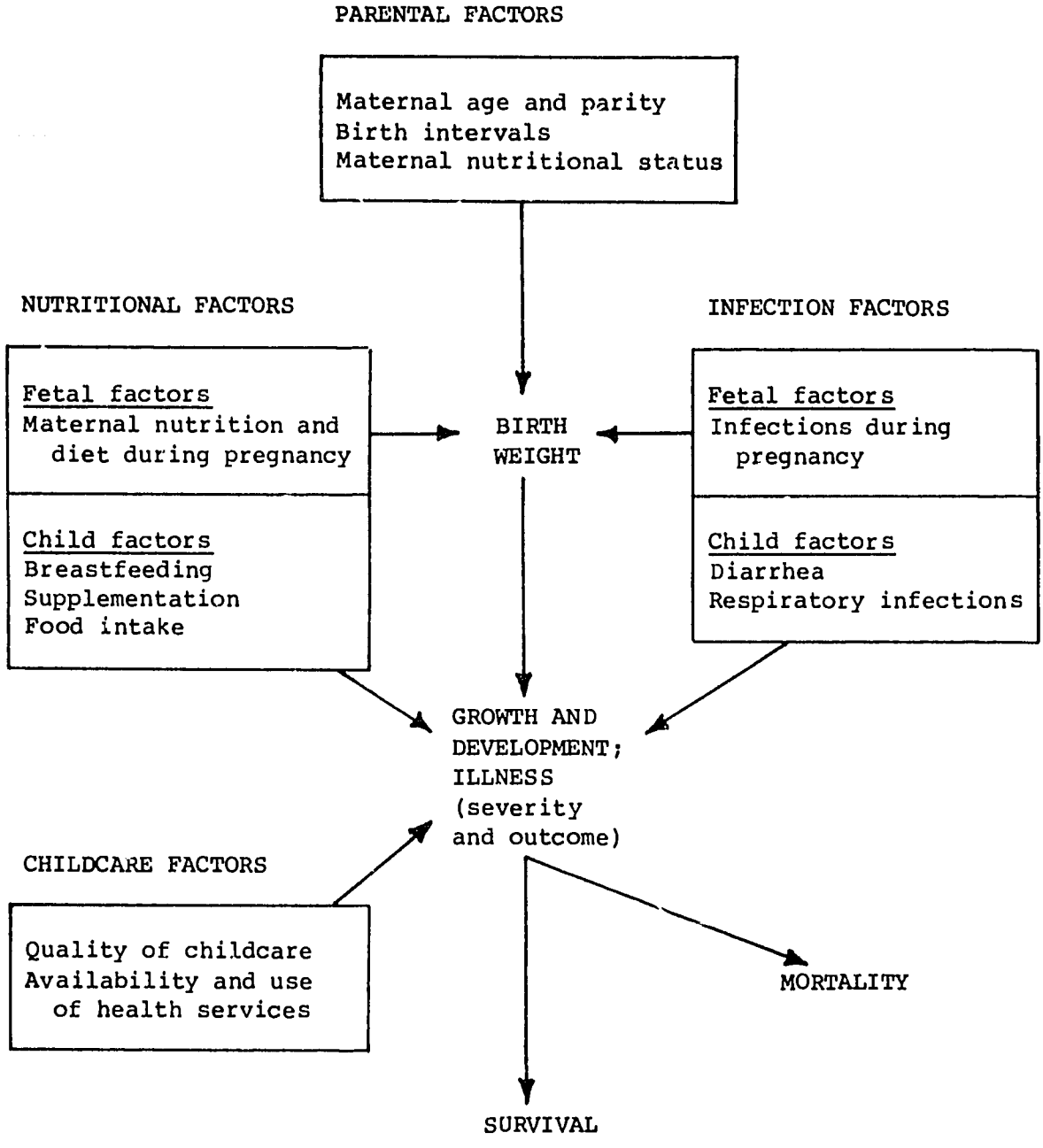

FIGURE 1 The Proximate Determinants of Child Mortality

cause mortality, as illustrated by the relationships between maternal and child nutritional status, and between nutrition and infection. A third noteworthy aspect of the framework is the distributive characteristics it implies. For example, aggregate amounts of income and food available at the national or family levels may disguise marked variations among communities, families, or individuals (Chen et al., 1979). Malnutrition, disease, and high mortality therefore may coexist where overall resources are sufficient, or even plentiful, if the distribution of those resources is skewed. A fourth aspect is the dimension of time. Risk factors and health processes vary in significance as the child matures. For example, maternal stature is likely to be more significant for the birth event than for later child mortality. The aging process itself gives a child immunity from many pathogenic organisms, while simultaneously introducing new risks such as seasonal infections (measles) or year-to-year epidemics (smallpox). Finally, it is worth reiterating that socioeconomic and environmental determinants at the family, community, and national levels operate through the proximate variables at the individual level. Income, for example, should improve family purchasing power and thus enhance the quality and quantity of maternal and child diets; income should also lead to better housing, clothing, and water and sanitation facilities, reducing the risk of infection, as well as to more effective use of health care services. These mechanisms, of course, are simply hypotheses. In reality, many remain undocumented, and the presumed links may not operate in the direction and with the magnitude postulated.

Parental Factors

An extensive literature exists on the relationship between maternal age and parity and the risk of infant and child mortality (Chase, 1972; Heady et al., 1955; National Center for Health Statistics, 1972; Puffer and Serrano, 1973, 1975; Wray, 1971; Yerushalmy et al., 1940). Since maternal age and parity are associated, studies have examined and usually confirmed their independent effects. The evidence shows that childbearing at very young (under 17) and very old (over 35) ages enhances mortality risk. Similarly, parity appears to affect childhood mortality: the risk associated with the first birth is high, declining during the second and third births, and usually monotonically rising thereafter. Although most studies emphasize the effects of age and parity on perinatal and infant mortality, age and parity effects have been observed during the second year of life as well. Indirect evidence suggests that children at highest risk are those of young, high-parity mothers who would also have experienced shorter birth intervals.

The literature on the association between childhood mortality and birth intervals has been inconclusive because of definitional and conceptual problems (Eastman, 1944; Fredrick and Adelstein, 1973; Holly et al., 1969; Swenson, 1975; Wolfers and Scrimshaw, 1973;

Woodbury, 1925; Yerushalmy, 1945). An index child (except the first and last) both closes a preceding interval and initiates a succeeding one. Most of the literature reports the mortality risk of an index child according to the preceding interval; with some exceptions, very brief preceding intervals (less than 12 months) are associated with high mortality risk. In several studies, effects on infant mortality have been observed to follow a monotonic declining pattern with intervals up to four years. However, these studies cannot be generalized, since birth interval effects could vary across population groups; for example, brief preceding intervals, unless very brief, may not have any deleterious effects among well-nourished populations. One difficulty with some of these studies is that prematurity (brief gestation, rather than low birth weight for normal gestation), which carries high mortality risk, is by definition associated with briefer preceding intervals. Most studies do not differentiate among birth intervals according to gestational length. Moreover, as suggested above, most studies fail to examine the effect of the succeeding interval on the index child. It could be hypothesized that brief succeeding intervals adversely affect the index child by prematurely interrupting breastfeeding, reducing food supplementation, and compromising childcare time. Finally, there may be correlations between the length of the preceding and succeeding intervals: some women may be biologically and socially more likely to have brief intervals between all births; thus, to examine the effect of the preceding interval would require controlling the length of the subsequent interval, and vice versa.

Another factor associated with high infant mortality risk is maternal nutritional status (Antonov, 1947; Committee on Maternal Nutrition/Food and Nutrition Board, 1970; Habicht et al., 1976; Smith, 1947). For example, short maternal stature has been shown to be inversely associated with higher proportions of low-birth-weight infants and neonatal mortality (Baird, 1965). Clinical studies suggest that maternal height is related to pelvic size, and thus with difficulty of labor, incidence of birth trauma, and still-birth rates (Baird, 1965). Initial pregnancy weight and weight gain during pregnancy may also be associated inversely with infant mortality, although the evidence for this is less conclusive (Committee on Maternal Nutrition/Food and Nutrition Board, 1970). It may be noted further that maternal nutritional status is related biologically to age and parity, as well as to birth intervals.

Maternal factors are the direct mediators of the effects of unfavorable fertility patterns on child mortality. Childbearing at very young or old ages, at the first or high parities (4 and over), and at excessively brief preceding or subsequent intervals will carry a high risk of child mortality. These effects are mediated in turn biologically, through compromised maternal nutritional status during pregnancy and lactation; they are also mediated socially and economically, through compromised childcare quality and economic capacity to meet the family's consumption requirements. Furthermore, it becomes evident that these unfavorable fertility patterns, while generating more live births, may not be most efficient for producing

the maximal number of surviving offspring, since that number represents the net effect of an interaction between fertility and mortality (Butz and Habicht, 1976; Butz and DaVanzo, 1978; Mosley, 1977; Schultz, 1976; World Bank, 1980).[4]

Finally, it may be noted that birth weight operates in two ways: as an indicator of many parental risk factors (maternal infection, maternal height, maternal initial pregnancy weight and weight gain during pregnancy, and length of preceding birth interval); and as an independent determinant of infant mortality, since low birth weight itself is associated with reduced nutrient reserves for withstanding postbirth hazards (Braun et al., 1971; Habicht et al., 1976; Lechtig et al., 1975; Puffer and Serrano, 1975; Sterky and Mellander, 1978). Measuring birth weight is thus an efficient way to assess the health status of infant populations, and to identify high-risk populations or individuals for intervention programs.

Nutritional and Diet Factors

Nutrition is a complex subject: there are multiple nutrients (calories, protein, minerals, vitamins); these nutrients interact; and their biological requirements are uncertain and controversial (Waterlow, 1972). Moreover, nutritional status may be defined by several indicators, including dietary intake, anthropometry, clinical signs, biochemical tests, and functional performance indicators, and the congruence between these indicators is unknown. Nevertheless, there appears to be little controversy that dietary and feeding practices are important determinants of child survival (Bengoa, 1970). As noted above, maternal diet and nutritional status during pregnancy affect fetal growth and birth weight; maternal food supplementation during pregnancy has been shown to reduce the proportion of low-birth-weight infants and neonatal mortality (Lechtig et al., 1975).

After birth, breastfeeding is the optimal form of infant nutrition. Use of breastmilk alone in the first 4-6 months provides unique advantages: nutrient adequacy, sterility, immunization against infections, antiallergenic properties, psychological bonding, and low cost (Beaver, 1973; Chandra, 1978; Jelliffe and Jelliffe, 1978). Furthermore, breastfeeding stimulates the hormone prolactin, which acts to delay the return of menses, thereby prolonging postpartum amenorrhea and the interval to the subsequent birth (Chen et al., 1974; Bongaarts, in these volumes; Jain et al., 1970). In most traditional rural societies, extended breastfeeding is nearly universal (Cantrelle and Leridon, 1971; Jelliffe and Jelliffe, 1978). Recently, there has been an unfortunate trend in many urban areas of developing countries for poor mothers to abandon breastfeeding (Cunningham, 1977; Knodel and van de Walle, 1967; Plank and Milanesi, 1973). This may have contributed to higher than necessary infant mortality rates.[5] Comparative studies of infant mortality rates between fully breastfed and artificially fed infants have demonstrated markedly higher mortality levels amongst the latter group, ranging

from six-fold in historical European populations to modest differences in contemporary low-mortality populations (Knodel and van de Walle, 1967; Knodel, 1977). Artificial formulae are often mixed with contaminated water in contaminated bottles, introducing orally transmitted fecal infections. The formulae may be diluted because of prohibitive cost, thereby reducing the child's net nutrient intake.

Although breastmilk may continue to supply as much as three-fourths of the child's protein needs in the second half of the first year, and significant dietary proteins and calories into the second year, the adequacy and timeliness of food supplementation becomes critical for optimal child nutrition after six months (Jelliffe and Jelliffe, 1978). Eventually, the child must be completely weaned and shifted to a regular adult diet. This transition is hazardous for a child in developing countries. Like the use of breastmilk substitutes, the preparation, cooking, handling, and feeding of traditional weaning foods frequently operate to promote infectious disease transmission (Black et al., 1981; Rowland et al., 1977).

Another noteworthy dimension of nutrition and diet is suggested by recent studies from several rural areas of Africa and Asia showing that there may be marked seasonal effects on food and nutrition (Chambers et al., 1981). Overall food surplus and scarcity cycles are typical of agrarian societies, particularly in single-crop agricultural regions. Moreover, there are seasonal fluctuations of agricultural field work, food processing, and other agriculturally related employment. In many societies, women are central to much of this work, and the resultant time and energy demands on mothers have obvious potential consequences for the quality of childcare and maternal nutrition and health. Seasonal dimensions of childhood mortality are also affected by seasonal patterns of birth and infectious disease, as well as changing access to transportation to and from health facilities.

Finally, the most important antecedent of dietary adequacy is sufficient family food availability, a variable dependent upon family income. Availability is further influenced, however, by food preferences and taboos, as well as the way the food is processed, prepared, cooked, and distributed within the family. The quantity, quality, adequacy, timeliness, and character of the dietary intake of both mother and child throughout the course of the child's maturation may affect the child's nutritional status and thus the risk of childhood mortality.

Infections and Infestations

Parasitic diseases are highly prevalent in the developing world; however, infestations are excluded from this paper because, perhaps with the exception of malaria, they are generally responsible not for mortality, but for morbidity (Walsh and Warren, 1979). In contrast, bacterial and viral infections cause both morbidity and mortality and are the major direct causes of childhood death in moderate- and

high-mortality populations (Evans, 1976; Walsh and Warren, 1979). Comparative analyses of cause of death among various populations suggest that if infections were entirely eliminated, life expectancy at birth in developing countries would be very similar to that in developed countries (Preston et al., 1972; Preston and Nelson, 1974; Preston, 1976).

Maternal infection, it is hypothesized, is one cause of low birth weight and high infant mortality (Mata, 1978). Mycoplasma infections of the genital-urinary tract among pregnant women, for example, have been shown to be associated with greater likelihood of low birth weight (Braun et al., 1971); preliminary evidence suggests that treatment of these infections during the third trimester of pregnancy can reduce the proportion of low-birth-weight infants. After birth, however, a child cannot avoid infections, the most significant of which involve the gastrointestinal and respiratory tracts. The most common infectious causes of childhood deaths are diarrheal dieases (due to shigella and E. coli bacteria and rotavirus); respiratory diseases (such as pertussis, diptheria, tuberculosis, and bacterial and viral pneumonias); and other infections (such as measles) (Walsh and Warren, 1979).

The incidence of infectious disease ultimately resulting in death is influenced by several factors. First is exposure to a communicable pathogen, which may be transmitted via several routes, the most common being fecal-oral and respiratory-respiratory--the former usually through ingestion of contaminated water and food, the latter through person-to-person airborne exposure (Saunders and Warford, 1976). Exposure is determined by a variety of environmental and behavioral variables, such as housing, crowding, water, sanitation, personal and household hygiene, and childcare practices. Another important factor is the susceptibility of the host. The human host possesses a variety of specific and nonspecific defense systems against infectious agents, and the severity or intensity of infection is determined by interaction between the invading pathogen and these defense systems (Chandra, 1978). The final outcome of an infection depends upon the virulence of the invading pathogen, the host defense system, and health behavior in response to illness.

Childcare Factors

Given the power of modern knowledge and medical technology, many deaths due to infectious diseases and malnutrition may be either prevented (e.g., immunizations) or treated successfully with curative services (e.g., antibiotics and nutritional rehabilitation). Childcare factors thus assume importance in determining mortality risk. Childcare practices influence exposure to transmittable infections (through air, water, food), and effective utilization of health care services can greatly influence the ultimate mortality outcome. There is little information on the factors that determine these behavioral practices, not all of which are determined by the mother herself, since in many societies older women establish

behavioral patterns relating to childcare. However, maternal education, the work and time demands on the mother, and cultural beliefs and practices are believed to be important determinants of such practices.

It is worth reiterating at this point that the proximate variables determining childhood mortality interact in a way that is still inadequately documented, poorly understood, and probably variable cross-culturally. Rarely do parental factors, diet and nutrition, infections, and health behavior in response to illness operate in isolation. Some infections, such as the diarrheal diseases, have been shown to compromise nutritional status through mechanisms that are both behavioral (reduction of food intake and cessation of breastfeeding) and biological (malabsorption, fever, catabolic wastage, and direct nutrient loss) (Hoyle et al., 1980; Martorell et al., 1975; Mata, 1978; Rowland et al., 1977; Scrimshaw et al., 1968). Conversely, malnutrition may compromise host defense systems, resulting in increased infectious disease incidence, prevalence, severity, and case-fatality (Scrimshaw et al., 1968). These processes also have intergenerational effects, since the surviving but compromised children of today are the reproducers of the future. It is generally accepted, although the evidence is incomplete and mixed, that infections and malnutrition operate synergistically, with a net effect greater than the sum of the two combined (Scrimshaw et al., 1968; Chandra and Newberne, 1977).

SOCIOECONOMIC DETERMINANTS

Among the socioeconomic variables, education has recently received increased attention because of its inverse relationship to childhood mortality, as well as the magnitude of its presumed effect (Caldwell, 1979; Chen et al., 1981; Hull and Hull, 1977; Janowitz, 1976). In a review of 24 cross-regional, cross-national, and cross-individual studies, the relationship between education (maternal and paternal) and childhood mortality was noted to be remarkably consistent (Cochrane et al., 1980).[6] Maternal education, in particular, was noted to be an extremely important determinant of child survival. This relationship was maintained even after controlling for income and several other key variables. Several hypotheses have been advanced to explain this association. Maternal education, it is postulated, inculcates modern health knowledge, beliefs, and practices; improves the effectiveness of health behavior (feeding practices and childcare are two examples); and changes the mother's role within the family, enabling her to take the necessary measures to promote child health, including effective use of modern health services. Even with comparable incomes, households with educated mothers may spend proportionately more on food or health services or may use their resources more effectively; available household food may be used more efficiently and distributed more equitably, promoting the child's nutritional status (Caldwell, 1979; Chen et al., 1981).

One problem with such hypotheses is their failure to identify and

quantify changes in the more proximate determinants of childhood mortality. To fortify these hypotheses, it would be important to determine which, if any, of the proximate variables are affected, in which direction, and with what magnitude. Meanwhile, caution should be exercised in deciding whether changes in maternal education per se would result automatically in improved child survival. Like many others, these studies often face a further problem of preselection and lack of population comparability: by definition, better-educated women are not strictly comparable to less-educated women, irrespective of efforts made to control for other confounding variables. It should be recognized that it may be virtually impossible to isolate any single variable such as maternal education; that variable is usually associated with other unmeasured differences that may lead to consumption patterns more beneficial to child health and nutrition, such as later marriage, fewer births at younger ages, enhanced roles within and beyond the household, different work patterns of women, and possibly even different sources of family income.

It may also be noted that maternal education is associated with a host of other socioeconomic variables, including occupation (maternal and paternal), paternal education, and income which, at least at the individual level, usually demonstrate the same inverse relationship with mortality, although the magnitude of their effects may vary (Antonovsty, 1967; Carvalho and Wood, 1978; Chao, 1979; D'Souza et al., 1980; Hull and Hull, 1977; Rodgers, 1979; Shir, 1975; Singh, 1979; Titmuss, 1943; World Health Organization, 1980). Religious, ethnic, and racial backgrounds also correlate with childhood mortality, the direction of the differences depending upon the particular context.

In most developing countries, male child mortality exceeds female mortality. In the neonatal period, this is true among all populations, presumably because of biological factors affecting high male risk. Recent studies have documented the converse among older children (greater than one month of age) in Bangladesh and India, and this may also be true elsewhere (Chen et al., 1981). Among rural children in South Asia, female may exceed male mortality by as much as 50 percent in the postneonatal period, extending into the 1-4, 5-9, and 15-44 age groups. This distinctly unusual pattern has been attributed to preferential health and nutritional treatment of male children and relative neglect of female children (see Scrimshaw, in these volumes).

MORTALITY CONTROL POLICIES AND PROGRAMS

There is no consensus on the fundamental causes of improved child mortality, historical and contemporary, in the developing world. Many scientists favor the "social action-technological change" explanation of mortality decline, which argues that modern knowledge and powerful new technologies have been substantially responsible for mortality decline (Durand, 1967; Notestein, 1953; Preston, 1980; Stolnitz, 1955, 1956). Other scientists, conversely, have often attributed the

decline to socioeconomic modernization (Fredericksen, 1961; Panikar, 1975). It is not sufficient to compromise and conclude that both played a role, since decision making and resource allocation depend upon quantifying the relative contribution of each.

Before examining previous attempts to quantify the causes of historical mortality decline, it is worth asserting a priori that both social policies applying modern technologies and socioeconomic modernization can profoundly affect child survival. The role of the latter is evident from the conceptual framework presented above. Improved food production, storage and transportation, and distribution between and within families can play an obvious role in improving nutrition (Chen et al., 1979). Similarly, as noted above, it is not difficult to understand how higher real income expended for housing, food, clothing, water, sanitation, transportation, and medical services could have a beneficial effect on child mortality. Social policies and modern medical technologies, if widely applied, can also have profound effects. Twenty years ago, a "technologic misfit" was postulated between available technologies and the triad of malnutrition-respiratory-diarrheal diseases, the major causes of childhood mortality in poverty settings (Bryant, 1969; McDermott, 1966, 1976). Today, highly effective vaccines are available to prevent some of the common childhood infections, including tetanus, measles, diphtheria, pertussis, polio, and perhaps tuberculosis (Chao, 1979; Mahieu et al., 1978; Voorhoeve et al., 1978; Walsh and Warren, 1979; World Health Organization, 1978). Antibiotics may be life-saving in the treatment of bacterial pneumonia, and effective chemotherapeutic agents are available to treat tuberculosis successfully (World Health Organization, 1974). Replacement of fluid losses during diarrhea with glucose-electrolyte fluid has been shown to avert much diarrheal mortality (Kielmann and McCord, 1977; Nalin et al., 1970). Although resistance may develop, powerful insecticides are available to control the vectors responsible for several of the tropical diseases, most importantly malaria (Meegama, 1967; Newman, 1965). Indeed, a recent review of 10 pilot health programs confirmed that childhood mortality in poverty settings could be reduced by half within several years through the widespread application of these technologies (Gwatkin et al., 1979).

What then happened historically in the developing world? Traditionally, the factors posited as responsible for the mortality decline have been classified as political, social, sanitary, and medical (Notestein, 1953; Stolnitz, 1955, 1956). While perhaps useful from a disciplinary perspective, this approach does not specify the factors clearly enough to permit quantification. Another classification, dividing the factors responsible into income, knowledge (including technology), social action, and natural factors, has similar drawbacks (Durand, 1967). A major attempt at quantification compared gains in life expectancy resulting from increases in "private standards of living" (income, food, housing, clothing, transportation, water, medical services) to those resulting from "structural change" due to social policy and technical improvements (public policy and modern health-related technologies)

(Preston, 1980). Through cross-national regression of per capita income, literacy, and calorie consumption with life expectancy in 36 countries in 1940, this analysis projected anticipated life expectancy gains if the 1940 relationship had been maintained in 1970. These projected gains were then compared with actual 1970 life expectancy levels. The study concluded that much less than half of the mortality decline in the developing world could be attributed to increases in the private standard of living, with the remainder attributable to social action and modern technology. It should be noted, however, that since improved standards of living are themselves a product of technological change, the two cannot be totally separated. Moreover, it must be remembered that there have been many cases of mortality decline in the absence of explicit public policies or programs aimed specifically at reducing mortality, and that the early mortality decline in developed countries has often been attributed to modernization associated with improved agriculture, food distribution, and nutrition (McKeown and Brown, 1955; McKeown and Record, 1962; McKeown, 1976; see also Gray, 1974).

The conceptual framework presented above suggests the complexity of mortality improvements in developing countries. Although explicit policies and programs based on modern health technologies can have significant impacts on child mortality, the framework suggests that technical approaches alone cannot effect major, long-term mortality declines. Several of the primary determinants of child survival are intergenerational in character (maternal factors), suggesting that long-range gains involve intergenerational improvements. Nutritional status and dietary adequacy, a crucial proximate determinant, are highly sensitive to socioeconomic development, which influences the purchasing power necessary to obtain adequate food supplies. Moreover, the concept of interacting multiple risk and health processes suggests that mortality decline cannot be attributed to any single technological intervention. Finally, the reverse interdependence is also underscored by the framework; for example, although increased income may provide the necessary conditions for mortality decline, it may be insufficient if breastfeeding is not practiced, if food is improperly distributed within families, and if modern technology is not applied to prevent and treat the major childhood infections. In conclusion, it is important to view child mortality as the result of a complex interaction between many factors, rather than focusing on a single set of determinants.

APPENDIX: SOME RESEARCH NEEDS

The twentieth century has witnessed some of the most dramatic mortality patterns in human history; these patterns also show wide diversity. Nevertheless, in contrast to fertility, mortality in developing countries has been a relatively neglected area of demographic research in recent decades. The link between mortality, socioeconomic development, and public policies and programs is obvious--but poorly studied and understood. Mortality, like

fertility, is a complex phenomenon involving social, economic, political, cultural, environmental, and biological forces, all varying according to specific circumstances. The interrelationships and interactions between these variables is poorly understood, and controversy continues over the relative importance and role of each. Moreover, mortality simply reflects the ultimate negative consequence of ill health in a society; the much larger issue of malnutrition and disease has attracted the attention of the medical sciences, but not sufficiently of the social sciences. The scope for creative work, and the need, is obvious. Productive advances will probably require the cooperation of both the biological and social sciences.

Below is a preliminary, though not comprehensive, list of some research needs in the study of childhood mortality in developing countries. Six major categories are included:

1. Levels and Trends
2. Historical Studies
3. Analytical and Conceptual Studies
4. Empirical Field Studies
5. Socioeconomic Change and Development
6. Public Policies and Programs

Studies in all of these major areas are needed. However, area 6 deserves high priority in light of major public efforts now underway to reduce childhood mortality in developing countries. On the other hand, this should not obscure the need for longer-range fundamental studies, including analytical work (3) aimed at developing quantitative and qualitative conceptual frameworks and models for studying mortality and the potential impact of various policies and interventions. This work would in turn require empirical studies in the field of the proximate determinants of mortality (4), building upon available knowledge.

Although important in its own right, demographic work delineating levels, trends, and patterns of mortality (1) is accorded medium priority, except where data are grossly inadequate (e.g., sub-Saharan Africa). Methodological development of indirect estimation techniques, similarly useful, would have parallel priority. Finally, also of medium priority, historical work on the causes and consequences of mortality decline in developed and developing nations (2) would be useful, since an understanding of the past gives us insight into the future.

Preliminary List of Possible Research Needs in Childhood Mortality

1. <u>Levels and Trends</u>
   a. Methodological development of demographic estimation techniques
   b. Measurement in high-mortality regions where data may be deficient (e.g., sub-Saharan Africa)
   c. Case studies of unusual mortality-development situations (e.g., Sri Lanka, Brazil)

d. Subnational studies identifying high-risk regions and groups--class, geography, ecology
e. Mortality patterns among migrants (rural-urban and international)

2. Historical Studies
   a. Determinants and patterns of mortality decline in developed countries
   b. Country- or region-specific studies of determinants of mortality decline in developing countries
   c. Consequences of mortality decline in both developed and developing countries
   d. Role of modern technology in short- and long-term mortality change
   e. Experience with public policies and programs relating to mortality change
   f. Special studies on the role of breastfeeding, infections, settlement patterns, economic factors, occupation and work roles, and food and nutrition in mortality change
3. Analytical and Conceptual Studies
   a. Quantitative models of mortality patterns, structure, and change
   b. Proximate determinants of mortality, with particular focus on their interactions and biosocial relationships
   c. Multiple risk and process models and methodologies
   d. Use of empirical data to confirm the appropriateness and predictive capabilities of abstract models as applied to developing countries
   e. Studies focused on major diseases and nutritional processes with a significant impact on mortality
4. Empirical Field Studies
   a. Field studies of the major childhood infections and parasitic diseases, delineating attack rates, prevalence, clinical spectra, and case-fatality rates (prospective methodology preferred)
   b. Epidemiological studies of malnutrition, focusing on protein-calorie intake, the congruence of various indicators, the progression from severe malnutrition to mortality, functional consequences, the relationship of feeding practices to growth, and the impact of various infections on growth and vice versa (prospective methodology preferred)
   c. Studies of breastfeeding, with particular focus on its dual fertility/mortality effects and mortality consequences
   d. Delineation of factors related to disease exposure and transmission and their interruption
   e. Studies of the interaction among the proximate variables, quantifying the direction and magnitude of various effects, with the aim of understanding major links
   f. Development of a methodology for measuring morbidity and identifying major causes of death

5. Socioeconomic Change and Development
   a. Macro studies across countries and regions, quantifying the correlates of mortality
   b. Micro-individual studies of the socioeconomic correlates of mortality
   c. In-depth, quantitative intrafamily observational studies of household health behavior
   d. Studies combining fertility and mortality measurements (as the dependent variable) to examine the simultaneous impact of independent socioeconomic variables
   e. Identification of population subgroups experiencing different stages of the mortality transition
   f. Clarification of the avenues (i.e., proximate determinants) through which socioeconomic variables affect mortality
6. Public Policies and Programs
   a. Impact of single technological interventions--methodologies and problems
   b. Synergistic or antagonistic relationships between multiple technological interventions versus single interventions
   c. Effect of development policies (food, population, agriculture, rural development, women) on mortality structure and change
   d. Mortality change within the context of different forms of socioeconomic development
   e. Evaluative tools for program process and impact assessment
   f. Health care effectiveness, acceptability, efficiency, cost, hazards, and utilization patterns

NOTES

1. Childhood mortality constitutes a very substantial proportion of all deaths in developing countries and accounts for the major differences in life expectancy at birth between developing and developed countries. Therefore, this section on levels and trends focuses primarily on life expectancy rather than on childhood mortality per se.
2. Survival within this framework relates only to childhood mortality and not to fetal wastage. The latter may be influenced by the proximate determinants noted here, but field measurement of early fetal loss is methodologically difficult.
3. Health services are conceptualized here as curative, although they obviously provide preventive care (e.g., immunizations) as well. This distinction, while important, does not affect the major principles of the framework.
4. The reverse effect of childhood mortality on fertility is treated in another chapter (Heer, in these volumes).
5. Although the role of premature abandonment of breastfeeding in higher-than-necessary infant mortality is well established, it should be recognized that major gains in infant survival occurred when breastfeeding was simultaneously declining in many populations. The explanation for this probably lies in the

multiple determinants of infant mortality.

6. In 4 of the 24 cases, the direction of the relationship was mixed, however, and in 2 cases higher education was actually associated with increased childhood mortality.

BIBLIOGRAPHY

Antonov, A. (1947) Children born during the siege of Leningrad in 1942. Journal of Pediatrics 30:250.

Antonovsty, A. (1967) Social class, life expectancy, and overall mortality. Milbank Memorial Fund Quarterly 45:31-73.

Arriaga, E. E., and J. J. Davis (1969) The pattern of mortality change in Latin America. Demography 6:223-242.

Baird, D. (1965) Variation in fertility associated with changes in health status. In Public Health and Population Change. Pittsburgh, Pa.: University of Pittsburgh Press.

Beaver, M. W. (1973) Population, infant mortality and milk. Population Studies 27:243-254.

Behm, H. (1979) Socio-Economic Determinants of Mortality in Latin America. Paper presented at the meeting on Socio-Economic Determinants and Components of Mortality, International Union for the Scientific Study of Population, Mexico City.

Bengoa, J. M. (1970) Recent trends in the public health aspects of protein-calorie malnutrition. WHO Chronicle 24:552.

Berggren, W. L., and G. M. Berggren (1971) Changing incidence of fatal tetanus of the newborn. American Journal of Tropical Medicine and Hygiene 20:491-494.

Black, R. E., I. Huq, M. H. Merson, and A. R. H. A. Alim (1981) Incidence and severity of rotavirus and Escheridria Coli diarrhoea in rural Bangladesh. Lancet 1:141-143.

Brass, W. (1975) Methods for Estimating Fertility and Mortality from Limited and Defective Data. Laboratories for Population Statistics, Carolina Population Center. Chapel Hill, N.C.: University of North Carolina.

Braun, P., Y. H. Lee, J. O. Klein, S. M. Marsy, T. A. Klein, D. Charles, P. Levy, and E. H. Kass (1971) Birth weight and genital mycoplasmas in pregnancy. New England Journal of Medicine 284:167-171.

Bryant, J. (1969) Health and the Developing World. Ithaca, N.Y.: Cornell University Press.

Butz, W. P., and J. DaVanzo (1978) Contraception, Breastfeeding and Birthspacing in Malaysia: A Model of Decision-Making Subject to Economic and Biological Constraints. Rand Corporation. Paper prepared for the meeting of the Econometric Society, Chicago.

Butz, W. P., and J. P. Habicht (1976) The effect of nutrition and health on fertility: Hypothesis, evidence and intervention. In R. Ridker, ed., Population and Development: The Search for Selective Interventions. Baltimore, Md.: The Johns Hopkins University Press.

Caldwell, J. C. (1979) Education as a factor in mortality decline. An examination of Nigeria data. Population Studies 33:395-413.

Calloway, D. H. (1980) Functional Consequences of Malnutrition. Paper prepared for the Workshop on Interaction of Parasite Diseases and Malnutrition, Bellagio, Italy.

Cantrelle, P., and H. Leridon (1971) Breastfeeding, mortality in childhood, and fertility in a rural zone of Senegal. Population Studies 25:505-533.

Carvalho, J. A. M. de, and C. H. Wood (1978) Mortality, income distribution, and rural-urban residence in Brazil. Population and Development Review 4:405-420.

Chambers, R., R. Longhurst, and A. Pacey, eds. (1981) Seasonal Dimensions to Rural Poverty. London: Frances Pinter.

Chandra, R. K. (1978) Immunological aspects of human milk. Nutrition Reviews 36:265-272.

Chandra, R. K., and P. M. Newberne (1977) Nutrition, Immunity, and Infection: Mechanisms of Interactions. New York: Plenum Press.

Chao, D. N. W. (1979) Income, Human Capital, and Life Expectancy. Paper presented at the annual meeting of the Population Association of America, Philadelphia.

Chase, H. C. (1972) A Comparison of Neonatal Mortality from Two Cohort Studies. USPHS 1000, Series 20, No. 13. Washington, D.C.: U.S. Health Services and Mental Health Administration.

Chen, L. C., S. Ahmed, M. C. Gesche, and W. H. Mosley (1974) A prospective study of birth interval dynamics in rural Bangladesh. Population Studies 28:277-297.

Chen, L. C., A. K. M. A. Chowdhury, and S. L. Huffman (1979) Seasonal dimensions of energy-protein malnutrition in rural Bangladesh: The role of agriculture, dietary practices, and infection. Ecology of Food and Nutrition 8:175-187.

Chen, L. C., A. K. M. A. Chowdhury, and S. L. Huffman (1980a) Anthropometric assessment of energy-protein malnutrition and subsequent risk of mortality among preschool children. American Journal of Clinical Nutrition 33:1836-1845.

Chen, L. C., M. Rahman, and A. M. Sarder (1980b) Epidemiology and causes of death among children in a rural area of Bangladesh. International Journal of Epidemiology 9:25-33.

Chen, L. C., E. Huq, and S. D'Souza (1981) Sex bias in the family allocation of food and health care in rural Bangladesh. Population and Development Review 7:55-70.

Chowdhury, A. K. M. A., and L. C. Chen (1977) The interaction of nutrition, infection, and mortality during recent food crises in Bangladesh. Food Research Institute Studies 16:2.

Cochrane, S. H., D. J. O'Hara, and J. Leslie (1980) The Effects of Education on Health. World Bank Staff Working Paper No. 405. The World Bank, Washington, D.C.

Committee on Maternal Nutrition/Food and Nutrition Board, National Research Council (1970) Maternal Nutrition and the Course of Pregnancy. Washington, D.C.: National Academy of Sciences.

Cunningham, A. S. (1977) Mortality in breastfed and artificially fed infants. Journal of Pediatrics 90:727-977.

DaVanzo, J., and W. P. Butz (1978) Influences on Fertility and Infant Mortality in Developing Countries: The Case of Malaysia. N-1166-AID. Rand Corporation, Santa Monica, Calif.

Davis, K. (1956) The amazing decline of mortality in underdeveloped areas. American Economics Review 46:305-318.

D'Souza, S., and L. C. Chen (1980) Sex differentials of mortality in rural Bangladesh. Population and Development Review 6:257-270.

D'Souza, S., A. Bhuiya, and M. Rahman (1980) Socio-Economic Differentials in Mortality in a Rural Area of Bangladesh. Paper presented at WHO/ESCAP Meeting on Asian Mortality, Manila.

Durand, J. R. (1967) A long-range view of world population growth. Annals of the American Academy of Arts and Sciences 369:1-8.

Dyson, T. (1977) Levels, trends, differentials and causes of child mortality: A survey. World Health Organization. Statistics Bulletin 3:282-309.

Early, J. (1970) The structure and change of mortality in a Maya community. Milbank Memorial Fund Quarterly 48:179-201.

Eastman, N. J. (1944) The effect of the interval between births on maternal and fetal outlook. American Journal of Obstetrics and Gynecology 48:445-466.

Evans, A. S., ed. (1976) Viral Infections of Humans: Epidemiology and Control. New York: Plenum Medical.

Fredericksen, H. (1961) Determinants and consequences of mortality trends in Ceylon. Public Health Reports 76:659-663.

Fredrick, J., and F. Adelstein (1973) Influence of pregnancy spacing on outcome of pregnancy. British Medical Journal 4:753-756.

French, J. G. (1967) Relationship of morbidity to the feeding patterns of Navajo children from birth through twenty-four months. American Journal of Clinical Nutrition 20:375-385.

Gordon, J. E., and J. Ingalls (1967) The second year death rate in less developed countries. American Journal of Medical Science 254:121.

Gray, R. H. (1974) Decline of mortality in Ceylon and the demographic effects of malaria control. Population Studies 29:205-229.

Gwatkin, D. R. (1978) The End of an Era: A Review of the Literature and Data Concerning Third World Mortality Trends. Washington, D.C.: Overseas Development Council.

Gwatkin, D. R. (1980) Infant and Child Mortality in the Developing World 1980-2000. Washington, D.C.: Overseas Development Council.

Gwatkin, D. R., J. R. Wilcox, and J. D. Wray (1979) Can Health and Nutrition Interventions Make a Difference? Monograph No. 13. Washington, D.C.: Overseas Development Council.

Habicht, J. P., A. Lechtig, C. Yarbrough, and R. E. Klein (1976) Maternal nutrition, birth weight, and infant mortality. In K. Elliot and J. Knight, eds., Size at Birth. Ciba Foundation Symposium 27. Amsterdam: Associated Scientific Publishers.

Haines, M. R., and R. C. Every (1978) Patterns of Differential Mortality During Infancy and Early Childhood in Developing Nations with Examples from Costa Rica. Paper presented at the annual meeting of the Population Association of America, Atlanta.

Heady, J. A., C. Daley, and J. N. Morris (1955) Social and biological factors in infant mortality. II. Variations of mortality with mother's age and parity. Lancet 1:395-397.

Hill, K., and J. Trussell (1977) Further developments in indirect mortality estimation. Population Studies 31:313-334.

Holly, W. L., A. L. Rosenbaum, and J. A. Churchill (1969) Effect of rapid succession of pregnancy. Pp. 41-44 in Perinatal Factors Affecting Human Development. Scientific Publication No. 185. Washington, D.C.: Pan American Health Organization.

Hoyle, B., M. Yunnus, and L. C. Chen (1980) Breastfeeding and food intake among children with acute diarrheal disease. American Journal of Clinical Nutrition 33.

Hull, T., and V. Hull (1977) The relation of economic class and fertility: An analysis of some Indonesian data. Population Studies 31:73-87.

International Classification of Diseases (1948) Bulletin of the World Health Organization, Supplement No. 1.

Jain, A. K., T. C. Hsu, R. Freedman, and M. C. Chang (1970) Demographic aspects of lactation and postpartum amenorrhea. Demography 7:255-271.

Janowitz, B. (1976) An analysis of the impact of education on family size. Demography 13:189-198.

Jelliffe, D. B., and E. F. P. Jelliffe (1978) Human Milk in the Modern World. Oxford, Eng.: Oxford University Press.

Kielmann, A. A., and C. McCord (1977) Home treatment of childhood diarrhea in Punjab villages. Journal of Tropical Pediatric Environmental Child Health 23:197.

Kielmann, A. A., and C. McCord (1978) Weight-for-age as an index of risk for children. Lancet 1:1247-1250.

Knodel, J. (1977) Breastfeeding and population growth. Science 198:1111-1115.

Knodel, J., and E. van de Walle (1967) Breastfeeding, fertility and infant mortality: An analysis of some early German data. Population Studies 21:109-131.

Lechtig, A., J. P. Habicht, H. Delgado, R. E. Klein, C. Yarbrough, and R. Martorell (1975) Effect of food supplementation during pregnancy on birthweight. Pediatrics 56:508-520.

Mahieu, J. M., A. S. Muller, A. M. Voorhoeve, and H. Dikken (1978) Pertussis in a rural area of Kenya: Epidemiology and a preliminary report on a vaccine trial. Bulletin of the World Health Organization 56:773.

Martorell, R., J. P. Habicht, C. Yarbrough, A. Lechtig, R. E. Klein, and K. A. Western (1975) Acute morbidity and physical growth in rural Guatemalan children. American Journal of Diseases of Children 129:1296.

Mata, L. J. (1978) The Children of Santa Maria Cauque: A Perspective Field Study of Health and Growth. Cambridge, Mass.: Massachusetts Institute of Technology Press.

McDermott, W. (1966) Modern medicine and the demographic-disease pattern of early traditional societies: A technological misfit. Journal of Medical Education 41(Supplement):138-162.

McDermott, W. (1976) Demography, culture, and economies and the evolutionary stages of medicine. In W. G. Smillie, ed., Public Health: Its Promise for the Future. New York: Arno Press.

McKeown, T. (1976) The Modern Rise of Population. New York: Academic Press.

McKeown, T., and R. G. Brown (1955) Medical evidence related to English population changes in the eighteenth century. Population Studies 9:119-141.

McKeown, T., and R. G. Record (1962) Reasons for the decline of mortality in England and Wales during the 19th century. Population Studies 16:94-122.

Meegama, S. A. (1967) Malaria eradication and its effect on mortality levels. Population Studies 26:207-238.

Morley, D. (1973) Pediatric Priorities in the Developing World. London: Butterworth.

Mosley, W. H., ed. (1977) Nutrition and Human Reproduction. New York: Plenum Press.

Mosley, W. H. (1980a) Biological Contamination of the Environment by Man. Paper presented at the International Union for the Scientific Study of Population Seminar on Biological and Social Aspects of Mortality and Length of Life, Fuiggi, Terme, Italy.

Mosley, W. H. (1980b) Social Determinants of Infant and Childhood Mortality: Some Considerations for an Analytical Framework. A discussion paper for a working group meeting organized by the Population Council, Cairo.

Nalin, D. R., R. A. Cash, and A. S. M. M. Rahman (1970) Oral (or nasogastric) maintenance therapy for cholera patients in all age groups. Bulletin of World Health Organization 43:361.

National Center for Health Statistics (1972) A Study of Infant Mortality from Linked Records: Comparison of Neonatal Mortality from Two Cohort Studies in the United States. Vital and Health Statistics, Series 20, No. 13. Washington, D.C.: U.S. Department of Health, Education, and Welfare.

Newman, P. (1965) Malaria Eradication and Population Growth: With Special Reference to Ceylon and British Guiana. Research Series No. 10, Bureau of Public Health Economics, School of Public Health. Ann Arbor, Mich.: University of Michigan.

Notestein, F. W. (1953) Economic problems of population change. Pp. 15-31 in Proceedings of the Eighth International Conference on Agricultural Economics. London: Oxford University Press.

Omran, A. R. (1971) The epidemiologic transition: A theory of the epidemiology of population change. Milbank Memorial Fund Quarterly 49:509-538.

Pan American Health Organization (1974) Health Conditions in the Americas, 1969-72. Scientific Publication No. 287. Washington, D.C.: Pan American Health Organization.

Panikar, P. G. K. (1975) Fall in mortality rates in Kerala: An explanatory hypothesis. Economic and Political Weekly Nov. 22: 1811-1818.

Plank, S. J., and M. L. Milanesi (1973) Infant feeding and infant mortality in rural Chile. Bulletin of the World Health Organization 48:203-210.

Preston, S. H. (1976) Mortality Patterns in National Populations with Special Reference to Recorded Causes of Death. New York: Academic Press.

Preston, S. H. (1980) Causes and consequences of mortality declines in less developed countries during the twentieth century. In R. A. Easterlin, ed., Population and Economic Change in Developing Countries. Chicago: University of Chicago Press.

Preston, S. H., and V. E. Nelson (1974) Structure and change in causes of death: An international summary. Population Studies 28:19-51.

Preston, S. H., N. Keyfitz, and R. Schoen (1972) Causes of Death: Life Tables for National Populations. New York: Seminar Press.

Puffer, R. R., and C. V. Serrano (1973) Patterns of Mortality in Childhood. Scientific Publication No. 262. Washington, D.C.: Pan American Health Organization.

Puffer, R. R., and C. V. Serrano (1975) Birthweight, Maternal Age, and Birth Order: Three Important Determinants in Infant Mortality. Scientific Publication No. 294. Washington, D.C.: Pan American Health Organization.

Rodgers, G. B. (1979) Income and inequality as determinants of mortality: An international cross-section analysis. Population Studies 33:343-351.

Rowland, M. G. M., T. J. Cole, and R. G. Whitehead (1977) A quantitative study into the role of infection in determining nutritional status in Gambian children. British Journal of Nutrition 37:441-450.

Saunders, R. J., and J. J. Warford (1976) Village Water Supply: Economics and Policy in the Developing World. Baltimore, Md.: The Johns Hopkins University Press.

Schultz, T. P. (1976) Interrelationships between mortality and fertility. Pp. 239-289 in R. G. Ridker, ed., Population and Development: The Search for Selective Interventions. Baltimore, Md.: The John Hopkins University Press.

Scrimshaw, N. S., C. F. Taylor, and J. E. Gordon (1968) Interactions of Nutrition and Infection. Monograph Series No. 57. Geneva: World Health Organization.

Shir, E. H. (1975) Economic and social correlates of infant mortality: A cross-sectional and longitudinal analysis of 63 selected countries. Social Biology 22:315-325.

Singh, K. P. (1979) Child mortality, social status and fertility in India. Social Biology 21:385-388.

Smith, C. (1947) Effect of maternal undernutrition upon new-born infants in Holland, 1944-45. Journal of Pediatrics 30,

Sommer, A., and M. S. Lowenstein (1975) Nutritional status and mortality: A prospective evaluation of the QUAK stick. American Journal of Clinical Nutrition 28:287-292.

Somoza, J. L. (1980) Illustrative Analysis: Infant and Child Mortality in Colombia. Scientific Report No. 10. London: World Fertility Survey.

Sterky, G., and L. Mellander (1978) Birth-Weight Distribution--An Indicator of Social Development. Report from a SAREC/WHO Workshop, SAREC, Uppsala.

Stolnitz, G. J. (1955) A century of international mortality trends: I. Population Studies 9:24-55.

Stolnitz, G. J. (1956) A century of international mortality trends: II. Population Studies 10:17-46.

Swenson, I. (1975) Expected reductions in fetal and infant mortality by prolonged pregnancy spacing in rural Bangladesh. Bangladesh Development Studies 2:1-16.

Titmuss, R. M. (1943) Birth, Poverty and Wealth: A Study of Infant Mortality. London: Hamish Hamilton Medical Books.

United Nations (1963) Population Bulletin of the United Nations No. 6, 1962, with Special Reference to the Situation and Recent Trends of Mortality in the World. Department of Economic and Social Affairs. New York: United Nations.

United Nations (1973a) The Determinants and Consequences of Population Trends: New Summary of Findings on Interaction of Demographic, Economic and Social Factors. New York: United Nations.

United Nations (1973b) World Population Prospects as Assessed in 1958. ST/SOA/Series A/53. Population Studies No. 53. Department of Economic and Social Affairs. New York: United Nations.

United Nations (1979) Demographic Estimates and Projections for the World, Regions, and Countries as Assessed in 1978, Provisional Report. Population Division, Department of International Social and Economic Affairs. New York: United Nations.

United Nations (1980) World Population and Its Age-Sex Composition by Country, 1950-2000: Demographic Estimation and Projection as Assessed in 1978. Population Division, Department of International Economic and Social Affairs. New York: United Nations.

United Nations (1981a) Levels and Trends in Mortality Since 1950. Sales No. 81.XIII.3. New York: United Nations.

United Nations (1981b) World Population Trends and Policies: 1981 Monitoring Report. New York: United Nations.

Voorhoeve, A. M., A. S. Muller, J. W. J. Schulpen, W. Mannetje, and M. Van Rens (1978) The epidemiology of pertussis. Tropical Geographical Medicine 20:125.

Walsh, J. A., and K. S. Warren (1979) Selective primary health care: An interim strategy for disease control in developing countries. New England Journal of Medicine 301:967-974.

Waterlow, J. C. (1972) Classification and definition of protein-calorie malnutrition. British Medical Journal 3:566.

Wolfers, D., and S. Scrimshaw (1975) Child survival and intervals between pregnancies in Guayaquil, Ecuador. Population Studies 29:479-496.

Woodbury, R. M. (1925) Causal Factors in Infant Mortality. Children's Bureau, USDL Publication No. 142. Washington, D.C.: U.S. Department of Labor.

World Bank (1980) World Development Report. Washington, D.C.: World Bank.

World Health Organization (1974) Expert Committee on Tuberculosis. WHO Technical Report Series No. 552. Geneva: WHO.

World Health Organization (1977) World Health Statistics Annual. Volume II: Infectious Diseases: Cases and Deaths. Geneva: WHO.

World Health Organization (1978) Primary Health Care: A Joint Report by WHO/UNICEF of the International Conference on Primary Health Care. Alma Ata, USSR. Geneva: WHO.

World Health Organization (1980) The inequality of death: Assessing socio-economic influences on mortality. World Health Organization Chronicle 34:9-15.

Wray, J. (1971) Population pressure on families: Family size and child spacing. Pp. 403-461 in Rapid Population Growth. Baltimore, Md.: The Johns Hopkins University Press.

Wray, J. D. (1981) Feeding and survival: Historical and contemporary studies of infant morbidity and mortality. In D. B. Jelliffe and E. F. P. Jelliffe, eds., Advances in International Maternal and Child Health. Oxford, Eng.: Oxford University Press.

Wrigley, E. A. (1969) Population and History. New York: McGraw-Hill.

Wyon, J. B., and J. E. Gordon (1971) The Khanna Study. Cambridge, Mass.: Harvard University Press.

Yerushalmy, J. (1945) On the interval between successive births and its effect on survival of infants: I. An indirect method of study. Human Biology 17:65-1061.

Yerushalmy, J., C. E. Palmer, and M. Kramer (1940) Studies in childbirth mortality: Age and parity as factors in puerperal fatality. Public Health Reports 55:1010-1027.

Chapter 8

THE DEMAND FOR CHILDREN: A CRITICAL ESSAY

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INTRODUCTION

These volumes reviews factors affecting fertility in developing countries according to three broad categories: demand, supply, and regulation. Until 25 years ago, the focus of demographic transition theory was on trends in the demand for children, either ignoring or explicitly rejecting as irrelevant supply and regulation; the imputed role of mortality decline was an important exception. More recently, studies of natural fertility and its variations and of access to modern contraceptives have helped us to explain apparently deviant cases of rising fertility and to address important issues of the timing and pace of fertility change. Nevertheless, the demand for children must still remain at the heart of most explanations of fertility change in response to modernization, particularly over the longer run.

The present overview of factors influencing the demand for children focuses not on particular theories but on empirical research. Of course, this distinction can be difficult to maintain, since at least rudimentary theoretical notions are needed to interpret empirical results; however, the grander unifying theories have been avoided. Nonetheless, economic theories of fertility are used as a frame for the discussion. This should not limit the literature covered, since most studies fall naturally into some part of this scheme.

The structure of this essay is as follows. It begins with a discussion of the concept and measurement of demand, followed by an examination of the major classes of influence on demand. First among these are the direct economic costs and benefits of children, an area sufficiently studied to allow the issues to be laid out in a fairly straightforward manner. Second are opportunity costs, which are more difficult to assess and may also have less relevance for fertility in less developed countries (LDCs). Third are tastes or personal preferences for children, as well as related concepts such as norms and values; though this is an important set of variables that may be linked to many significant differentials in demand, existing work in this area is quite inadequate. Fourth, the effects of income and wealth on demand are considered. Finally, on the assumption that

demand for children is not fixed at the beginning of the marriage but can change, the question of how childbearing experience can modify demand is addressed.

THE CONCEPT OF DEMAND

The concept of demand for children refers to a decision maker's views on alternate family-building outcomes, abstracting from attitudes toward the family-building process, including such areas as intercourse, contraception, and breastfeeding. Although these views about outcomes can sometimes be conveniently summarized by a single number--the desired number of surviving children--other dimensions will often also be relevant, such as timing, spacing, gender, and so on. Demand for children reflects the desire for children per se, as well as for things to which children are instrumentally related, such as economic benefits they may bring. This concept of demand will still be relevant even if couples make firm decisions only about incremental births, and not (except ultimately) about the total number.

This concept raises many conceptual and substantive questions, some of which are addressed below. It should be noted at the outset that the concepts of demand and supply, as used here, are only loosely related to the economic concepts; in this respect the nomenclature may be misleading. "Demand" does not reflect the cost of regulation and therefore does not refer to the couple's actual choice of family size; "supply" likewise excludes parity-specific family limitation Thus there is no reason to expect "demand" and "supply" as used here to be anywhere near equality.

Is "Demand" A Meaningful Concept in LDCs?

Does an LDC couple formulate a desired family size? Do they consider whether they would like to have another child? Or, more generally, do they develop a sense of what sizes are too large or too small, based on their individual circumstances or the sociocultural context? If so, then the concept of demand is directly applicable. If not, then one might want to speak of "latent demand," the number of surviving children people would choose if they were to address the issue. One could then speak of demand for children and its effects whether or not this concept was meaningful to the decision makers themselves; at times this will be an analytical convenience.

Existing indirect empirical evidence suggests that the demand for children, as represented by family-size desires, is a sensible concept in many LDC populations. Where some control of fertility is possible, most respondents are able to answer questions about these desires and typically can also give a variety of justifications for their responses (McClelland, in these volumes; see also Pullum, in these volumes). Where fertility control is not widely available or may not

even be considered, the situation is more ambiguous, and the concept of latent demand might be required.

Measurement of Demand

Whether demand can actually be measured or must remain a useful but entirely abstract concept is another issue. Surveys contain many apparently relevant questions about a respondent's "ideal," "expected," "preferred," or "desired" family size. If such questions are to measure demand adequately, the respondent must in answering consider all her particular household circumstances (that is, not answer as if resources were unlimited), and not consider her feelings about the measures necessary (contraception, abortion, abstinence, prolonged breastfeeding) to attain this desired family size. Beyond this issue there are others, such as whether the respondent means births or surviving children, how important gender preferences are, and so on. These are discussed by McClelland (in these volumes), who reaches the conclusion that the evidence, though circumstantial, favors the validity of these measures.

Does Demand Affect Behavior?

It is a quite different issue whether the demand for children, <u>if</u> formulated, has any effect on people's behavior. For various reasons, it might not. The number wanted might exceed the supply, or people might simply want as many as possible, as has been argued for pretransition societies by Easterlin (1975), Caldwell (in these volumes), and others. Purposive regulation of fertility might be unthinkable, or extremely difficult, unpleasant, or subject to censure; in such circumstances also, the concept of demand might be meaningful but behaviorally irrelevant (see Coale, 1973).

It is known that surveyed attitudes toward subsequent births are good but not perfect predictors of future births, at least in the short run, for those developed countries (the U.S.) and LDCs (Taiwan and Thailand) in which longitudinal tests have been done (see McClelland, in these volumes). It is also known that family-size desires often show a meaningful though small relation to fertility control behaviors (e.g., Palmore and Concepcion, 1981). Little is known, however, about the circumstances that strengthen or weaken such relationships, and it remains possibile that demand is behaviorally irrelevant under certain conditions.

Evidence for the impact of demand is sometimes drawn from relationships between particular social characteristics, presumably linked to demand, and fertility. Such evidence is often questionable because the linkages could reflect instead the operation of supply factors or fertility regulation costs. Nevertheless, such evidence is cited at some points in this paper because no other relevant data are available.

Whose Demand?

It might also be asked whose demand is being discussed, since it is not clear who the effective decision makers are in a given developing society. It has sometimes been argued that the interests of grandparents favor higher fertility than do those of parents; those of husbands favor higher fertility than do those of wives; and those of children favor the lowest fertility of all. A change in the decision-making unit or in the weight given the interests of those affected might alter the effective demand for children, even without other social, cultural, or economic changes (Caldwell, in these volumes). The chapters on fertility decision making in these volumes (by Hollerbach and by Beckman) discuss this issue further, but it should be kept in mind in assessing demand.

Surviving Children and Mortality Effects

The focus on demand for surviving children rather than on demand for births is logically tidy, and reflects the reasonable assumption that couples' family-building plans more directly involve choices among alternate family sizes than among alternate numbers of births. However, what this focus implies about the relation between mortality and fertility needs to be discussed. One implication is that, given constant demand, individual fertility should be inversely proportional to perceived child survival probabilities. In fact, empirical studies suggest a rather weaker and more complex relation (Preston, 1978; Heer, in these volumes). Part of the reason is that demand is not constant: the costs of any target number of surviving children are affected by mortality levels, and parents may also attempt to overcompensate for perceived mortality risks. Such effects on demand are discussed in a later section.

Modernization and Demand

Modernization (or development, which might be considered equivalent in some senses) covers a broad range of transformations in sociocultural systems; these include reductions in the functions of the family and kinship groups, improvements in technology and changes in labor relations, and increases in the effectiveness of administrative systems that provide, among other things, education and medical care (e.g., McNicoll, 1979). The pattern and pace of these transformations may differ significantly across societies, as may many characteristics of the ultimately "modern" society that results in each case. However, for purposes of this paper, distinctions will not be made among different patterns of or approaches to modernization; more elaborate treatment is reserved for a later chapter (Easterlin, in these volumes).

There are two broad interpretations of the effect of modernization on fertility. First, modernization may make latent demand effective;

in Coale's (1973) terms, family size comes within the calculus of choice. This could result from the diffusion of an idea, with no change in the material or sociocultural context. Second, modernization may ultimately, if not immediately, reduce the demand for children; this argument has been the core of transition theory, and is also the thrust of new economic theories of fertility and of Caldwell's theory. (Lindert [in these volumes] suggests that the initial effect of modernization may be to increase the demand for children, although this effect is soon reversed.) The distinction between these two views may be sharply drawn by calling them transition to demand for children and transition in demand for children; both views have adherents.

Modernization may also affect the supply of children or the costs of regulating fertility. These two possibilities are discussed elsewhere in these volumes; however, one variant of the latter must be mentioned here. The view is quite widespread that the introduction of a family planning program may itself precipitate a decline in the demand for children (e.g., Knodel and van de Walle, 1979). A possible interpretation is that people's latent demand becomes effective when control becomes feasible.

The following sections examine factors potentially affecting demand. This does not reflect a prejudgement that demand universally exists or is always behaviorally relevant, nor that the transition is a transition in demand. It is assumed, however, that at some stage in the transition, probably fairly early, change in demand becomes a key factor, if it has not been so all along.

DIRECT COSTS AND BENEFITS OF CHILDREN

Changes in the economic value of children to their parents during the course of modernization constitute a key element in many theories of the fertility transition; however, the subject is controversial, and there are many unresolved issues. The subsections below first review the question of children's economic value as it has traditionally been posed: balancing the consumption of children against their labor services, are they typically net consumers or net producers in LDCs? Lindert's convenient "relative price" index is then used to summarize information on costs and benefits, and changes in that index with development are discussed. Next, the anthropological critique of the preceding views is considered, followed by a review of attitudinal data. Finally, an attempt is made to distill what is known.

Are Children Net Contributors in LDCs?

Significance of the Question

If children have costs and yield satisfactions other than the narrowly economic--that is, if they are valued not only for their labor services (as Willis [1981] argues they must be), or if they have costs

other than what they consume--then the question of whether they have positive value to households as economic assets is not of central importance. (Their value to society depends on additional considerations that cannot be detailed here.) More important is the question of how their economic value, whether positive or negative, varies across cultures, institutional settings, and socioeconomic classes, as well as with the availability of agricultural land and other inputs complementary to labor and the state of technology, and how this value changes in different modernizing societies. These variations in the "price" of children, which may help explain fertility differentials and trends, are more important than particular levels. Nevertheless, some theories of fertility, such as Caldwell's (1976), attach particular importance to whether the economic value of children is positive or negative, and view other factors as secondary. Therefore, the question of the sign of children's asset value may not be irrelevant.

The Evidence

From the point of view of the parents, is the average or the incremental child in peasant agriculture an economic asset? In considering this question, attention may first be restricted to the material consumption of a child compared to the value of the labor services it provides through the age of leaving home.

Until the late 1970s, the main source of information on which to base an assessment was census and survey data on labor force participation; detailed time-use studies had not been conducted in LDCs, and neither had child consumption studies. After a careful review and synthesis of the information then available, Mueller (1976) concluded that "children have a negative value in peasant agriculture" (assuming a zero discount rate and taking mortality into account); at the same time, Mueller called attention to the "glaring inadequacy of pertinent data." More recently, a growing number of painstaking time-use studies have been conducted, particularly in Asia, and these have begun to greatly enrich our picture of what children actually contribute under a variety of circumstances (Nag et al., 1978; Cain, 1977; Evenson et al., 1980; Binswanger et al., 1980; Caldwell et al., 1981; etc.). Unfortunately these studies have not yet distinguished among the contributions of children with different numbers and characteristics of siblings (but see Caldwell et al., 1981), so that the present discussion must be cast largely in terms of the average rather than the incremental child. Furthermore, the value of children's activities varies widely with the local situation (see Potter, in these volumes; Cain, 1982). Nonetheless, some generalizations are possible.

Cain's (1977) finding that the average child in one particular Bangladesh village is a net asset represents the high end for productive work by male children (with the possible exception of slave children; see Lindert, 1980). Cain (1982) has recently pointed out that discounting at any positive rate would render this result less

clear; consideration of child mortality and of other consumption besides food would likewise reduce the net value. Lower labor contributions from children were reported for other rural Bangladesh areas by Khuda (1980) and Caldwell et al. (1981); the latter study also shows much lower contributions in Dacca. Compared to Cain's sample of Bangladesh boys, Nepalese boys in one sample put in slightly fewer hours of productive work (Nag et al., 1978), a sample of Javanese boys many fewer hours (Nag et al., 1978), and samples of Filipino and Sri Lankan boys still fewer hours (Evenson et al., 1980; Tilakaratne, 1978).

The studies reviewed by Mueller, as well as Cain's Bangladesh village survey, find that, excluding housework, the total labor supply of boys up to age 21 is four or five times as great as that of girls. Furthermore, this sex difference in "productive work" is exacerbated by the fact that Bangladesh girls typically leave the household at an earlier age than boys do, often before their most productive childhood years. Cain also finds that, if housework is included, boys and girls supply roughly equal numbers of hours. Here again, however, this Bangladesh case represents an extreme. Other recent studies show girls putting in about the same or slightly more hours of directly productive work, and considerably more hours when household maintenance work is added. Through age 19 in Nepal, for instance, girls put in 9 percent more directly productive work hours; if household maintenance is considered, they put in 25 percent more. In Java, the time inputs are about equal for directly productive work; however, counting household maintenance, girls work 41 percent longer (Nag et al., 1978). Boys and girls together contribute the greatest number of work hours, for outside and home production combined, in Bangladesh and Nepal (though in Nepal, it should be noted, adults work substantially longer hours).

From this review, it can be concluded that, under the most favorable conditions, the net expected value of an average birth, through the time the child leaves home, is roughly zero or perhaps slightly positive (with no discounting). More typically, it appears that the average child is a substantial net drain on household resources. This conclusion appears roughly consistent with Cain (1982). It would be reinforced if the urban sectors in LDCs were also considered. Going a step farther and discounting the expected future net flows from children, using a positive discount rate, it becomes even more likely that the result will be a negative economic value for children.

These calculations do not take into account subsequent transfers to the parents, including old age support, but the average value of such transfers may well be typically small, their real significance lying instead in their importance as insurance against the risk of extreme adversity (Cain, 1981, 1982; but see Vlassoff and Vlassoff, 1980). Since other forms of insurance or alternative investment opportunities (other than ownership of land) are often unavailable in peasant settings, it is very difficult to assess this service of children; more will be said about this later.

Another issue is the time costs of children. Although these will

be considered again below, it may be noted here that each additional child not only supplies labor after a certain age, but also requires labor for childcare, additional food preparation, and so on; whether this labor comes from the parents or from siblings, it nonetheless has some economic value (and this is true whether or not it affects supply of labor to farm work or to the labor market generally). There is disagreement about the magnitude of such costs (Caldwell, in these volumes; Lindert, in these volumes). In the calculations reviewed for the present study, this issue is addressed only by implicitly assuming that the net supply of housework time by the average child has zero value; this assumption is crude at best.

Development and the Relative Cost of Children

If only the sign of the net value of children is of concern, then the choice of a price deflator for the net value is irrelevant; it cannot alter the sign. However, if changes in the magnitude of the net value are also of concern, then the price deflator does matter. For the case in which the incremental child would be a net economic drain (after appropriate discounting), Lindert (in these volumes) has proposed that the correct deflator is the cost of the activities the parents would engage in if they did not have the incremental child in question. In fact, families with fewer children (but the same income) tend to consume more luxury goods and fewer staples. Thus a child appears more costly when luxuries are relatively cheap and readily available compared to staples, even if the asset value (here assumed negative) is no different. This argument parallels sociological views on the effects of exposure to consumer durables, as discussed in the section on tastes below. When the asset value of an incremental child is positive, a different procedure is required (Lindert, 1980).

In fact, the price of luxuries is one of the two important elements in the index; the other is the price of time--that is, the wage rate or the productivity of time in nonwage activities. In rural LDC settings, children will typically be net suppliers of time to the household (Lindert, in these volumes; Caldwell, in these volumes). In settings where wages are generally high, the net value of children will be greater (less negative or more positive), even though the cost of time spent on them by other family members also rises. Thus Lindert's analysis reverses, for LDC settings, the basic assumption of the original microeconomic fertility theories (Mincer, 1963; Becker, 1960; Willis, 1974) that children are relatively time-intensive in more developed countries (MDCs).

It seems quite plausible that the appropriate discount rate for children's expected net costs and contributions should rise in the course of development as alternative investments become more readily available and more acceptable, due to the spread of financial insitutions, the introduction of new agricultural technologies requiring capital outlays, and so on (Mueller, 1975). One would expect that this rise in the discount rate would reduce the value of children. Thus calculations based on data in Cain (1977), but

allowing for child mortality, show that the discounted value of a child at birth (through age 15 for females and 22 for males) drops from +28 to -4 (in terms of years of adult male consumption) as the annual discount rate rises from -0.1 to +0.1, passing through 0 at a discount rate of about 0.0. If Mueller's figures are used instead, the value rises from -8 to -2 when the discount rate rises from -0.1 to +0.1. It appears, therefore, that a rising discount rate in the course of development could have either a postive or a negative effect on the demand for children. However, if children have a positive asset value, it can be said that increases in the discount rate will definitely reduce it.

In the course of economic development, the relative cost measure first falls (that is, children's net value rises) as wage rates rise. Then, as various influences of development reduce child labor services and render women's work less compatible with childcare (Lindert, in these volumes; Caldwell, in these volumes; Standing, in these volumes), children cease to be net suppliers of labor. From that point on, higher wages render the relative and absolute costs of children greater, and the Mincer-Becker-Willis model becomes more appropriate. This increase in relative cost is reinforced by the declining price of luxuries relative to staples as development proceeds, and perhaps by an increase in women's wage rates relative to children's as women's skill levels increase.

This relative-cost framework is useful for organizing and summarizing relevant research findings; however, it has not yet been used for detailed examination of regional and temporal variations in the costs of children, except in the U.S. (see Lindert, 1978).

Mortality Change and the Net Value of Children

Improved survival will unambiguously increase the net value of an incremental surviving child (making it more positive or less negative) since it reduces the number of births, and therefore the costs, necessary to acquire that child. However, the effect of improved survival on the net value of an incremental birth--as opposed to a surviving child--is unclear. In the special case of constant returns to and a positive net value for surviving children, improved survival makes the value of a birth more positive or less negative. More generally, however, its likely effect is to reduce the net value of births, because of diminishing returns to surviving children as consumer goods, in household and "productive" work, and in their various other roles, such as old age security. Moreover, since mortality reductions in effect raise the return to investments in children (although see Preston [1980], who argues that this effect is very small) and reduce the risk, lower mortality could also induce increases in expenditures per child while reducing the demand for numbers of surviving children (O'Hara, 1976). Additionally, any induced investments in children would affect their later fertility as adults.

Costs and Benefits from a Different Perspective

The power and appeal of the net value and relative cost calculations is their ability to aggregate the values of many different activities of children, occuring at different times, into a single number. This cannot be done without strong assumptions, however, assumptions which may be appropriate only in countries where well-developed markets allow households, through trade, to equate the values of all activites at the margin. Where labor markets and financial markets are absent or unacceptable, these assumptions may well be inappropriate. Furthermore, children provide other services--physical security, insurance against risk, old age support--which might cost relatively little if provided by efficient institutions (which, for example, would provide a positive rate of return on investments for old age retirement), but might be extremely valuable in the absence of such alternatives. Caldwell (in these volumes) points out various such difficulties with net value calculations in pretransition societies. With some reinterpretation and elaboration, these may be summarized as follows.

Age-Sex Aggregation of Labor

One assumption made is that the labor of different age and sex groups is highly substitutable, although differentially efficient, and can therefore be aggregated with appropriate weights (for example, observed wage rates) into a single quantity: labor. Although this may often be correct so far as the technology of some kinds of production is concerned, it may nonetheless be incorrect for present purposes because of rigid cultural definitions of what work is appropriate for each age and sex. There may be a very high psychic cost to adults when, through want of child labor, they must do work they consider too menial, too public, or inappropriate for other reasons. The calculations cannot take this into account without observation of the wage necessary to induce adults to do children's work.

Temporal Aggregation

Given few or no acceptable alternative investments with positive rates of return, it is difficult to place a monetary value on the future services, such as old age support, that parents may expect children to provide. It may also be that alternative means of provision for old age do exist but are not perceived, or are not acceptable for cultural reasons. The lack of acceptable investment opportunities might well mean that the appropriate discount rate for temporal aggregation should be negative; parents may be willing to pay several consumption units now for each unit to be received in the distant future. This may in turn make the "present value" of children positive. In addition, children may be viewed as providing ritualistic services to

parents long after the parents' deaths. How are these to be taken into account?

Aggregation Over Risk

The cost of commercial insurance against risk would provide a reasonable value for similar services provided by children, and its availability would keep that value relatively low. However, when children are the only form of insurance, the value of that service may be very high, and there is no obvious way to ascertain it.

Other Child Services

In some contexts, children are a source of political power and physical security. Again, however, it is difficult to impute values to such services.

The Decision Maker

Fertility decisions may be made by the husband or by a member of the older generation who also controls the allocation of resources within the family. The costs of childbearing and rearing may be largely borne by others, such as the grandmother or older siblings. The allocation of consumption within the household may be highly unequal. Under these circumstances, it may be difficult to measure, or even to understand, the costs and benefits to the decision maker of additional children. Moreover, changes in the locus of decision making within the family may come about through modernization, and, even without material changes, these may lead to a change in fertility; in particular, more egalitarian husband-wife relations may be conducive to lower fertility, as the costs to the mother become more heavily weighted in decision making. New contraceptive technology that makes it possible for women to control their fertility unilaterally may have similar effects. This point receives fuller consideration in a later chapter (Beckman, in these volumes).

These criticisms of the conventional cost-benefit calculus, though the evidence supporting them so far is at best fragmentary and diffuse, make it impossible to reject the assertions that children in many LDC settings are in fact substantial net assets and that a decision maker viewing children purely instrumentally would therefore have as many children as supply constraints would allow.

Institutional Sources of Variation in Costs and Benefits

The net cost of children, whether positive or negative, may differ and change for many reasons in addition to the development-induced increases in the productivity of labor, rises in the discount rate,

and declines in mortality discussed earlier. Some of these reasons are briefly discussed below.

It was stressed earlier that the value attached to children as insurance against risk or as investments in old age security would depend strongly on whether acceptable and trustworthy alternatives were available. The introduction of government-backed pension systems or commercial insurance schemes could therefore reduce the value of children. There has been considerable speculation on these matters (Willis, 1980, 1981; Cain, 1982), but almost no empirical work (Hammer, 1981, and Cain, 1981 are exceptions).

Other aspects of the institutional setting are also potentially important (Potter, in these volumes; McNicoll, 1980). In the absence of a labor market, smaller farms should quickly encounter low returns to incremental labor, and have less opportunity than households with larger plots to employ children productively in agriculture. Cain (1977) finds, for instance, that boys are considerably more valuable to landowners, particularly the wealthier ones; boys remain in these households for several more years, and the work they do appears to be more productive (see also Vlassoff, 1979). (This does not imply, however, that children of independent subsistence farmers are less likely to work: limits on land may simply mean that work will be spread among a greater number, as Tienda [1979] argues.) Complementarity between land and child labor may account for the frequently observed positive association of farm size and fertility (Mueller and Short, in these volumes), although other explanations, including supply-side ones, are also possible. With well-developed labor markets, however, such diminishing returns do not occur. The presence of handicrafts or putting-out activities might likewise sustain the demand for child labor.

Occasionally, the allocation of land to households increases with the family labor supply, and this would also raise the value of children (Potter, in these volumes; Chayanov, 1966).

In some cultures, women are not supposed to do field work in agriculture; such restrictions on the supply of adult labor presumably raise the value of child labor, and thus encourage fertility.

Children's potential labor contribution is generally lower in urban areas (e.g., Caldwell et al., 1981; Arnold et al., 1975), with the greatly diminished significance of household enterprises and increased opportunities for education. However, children may still be important as added workers, particularly when parents are inadequately employed or place little emphasis on education (e.g., Tienda, 1979).

A change in expectations about contributions from children may alter their economic value, even without change in the objective economic circumstances. Some of the contributions discussed above depend on an implicit intergenerational bargain: children provide labor or security for their parents, and in turn expect the same from their own children. This bargain may break down because of a change in parents' control over assets that children expect to inherit (Anderson, 1971; Chudacoff and Hareven, 1978), social legislation requiring children to attend school (which should also increase child costs; Branson, 1968), extensive migration breaking the ties between

generations, or changes in values leading to greater individualism. Caldwell (1976; in these volumes) sees this as a fundamental change in family morality, precipitated by Westernization of values, often through the spread of Western-style education.

The balance of costs and benefits of a child to the family also depends to some degree on the extent to which the family is able to pass on to a wider group some of the costs of the incremental child. Centrally financed health and education programs defray some costs. Large labor markets are also a means of diluting child costs, because they enable the society as a whole to bear virtually all the increased pressure on resources (land and capital) due to the child, particularly when it matures to working age. On the other hand, when some small local organization bears these costs through responsibility for providing jobs, health care, and education, the household will be less successful in passing these costs along unnoticed. In such circumstances, the local organization may seek to intervene in household fertility decision making through social pressure or outright coercion. Changes leading to the creation or strengthening of such small local groups are sometimes said to be important in the fertility reductions in China and Indonesia (McNicoll, 1980).

Attitudinal Data on Economic Costs and Benefits

So far the value of children has been considered from the perspective of time-use studies. The conclusion was that, in the context of effective markets for labor, insurance, and financial assets, the economic value of children is in most cases negative once mortality, discounting at a nonnegative rate, and time costs are introduced. It is obvious that these assumptions often do not hold for rural areas in pretransition LDCs. It is another matter, however, to determine whether the context is sufficiently different to reverse the conclusions; no available data permit us to answer this question.

An appealing alternative approach, under these circumstances, is to ask the couples themselves. Not only are they in a position (at least in principle) to weigh the different aspects of costs and benefits and to take due account of their own expectations, but it is arguably their own perceptions of net value that potentially influence their fertility.

Attitudinal surveys of the value of children indicate that, in each of the high-fertility LDCs studied to date, many couples view instrumental contributions as a main reason for having children (Fawcett, in these volumes; Bulatao, 1979a). General financial and practical assistance from children, as well as expected help in old age, are among the most frequently cited advantages of children, rivaled only, in some cases, by concern with preserving the family name or line. Expected household help is cited by somewhat fewer respondents. By contrast, very few respondents in MDCs cite any economic advantages to children; instead, they focus on the companionship children provide, their fitting into personal development goals, and their enhancing the marital bond. Within both

LDCs and MDCs, economic contributions are more salient in rural than in urban areas. These surveys also show that direct financial costs are the predominant disadvantage attached to having children in LDCs. In MDCs, these costs still have some salience, but are clearly overshadowed by the opportunity costs of children.

That children are perceived to be of great economic significance in LDCs is clear from these data, but whether they are a net asset or a net drain is not. Low levels of income may partly explain the sensitivity to economic costs and benefits; both are cited more often by lower-class than by middle-class respondents (Fawcett, in these volumes). In contrast to U.S. couples, who may pay lip service to such issues in fertility decisions but are financially able to focus on other considerations (Thornton and Kim, 1980), couples in LDCs, particularly in the lower classes, may perforce be governed by economic factors. On the other hand, this perceived dominance of economic factors is not absolute; there is typically at least some additional concern with psychosocial costs and benefits.

One limited piece of attitudinal evidence that children are a net drain comes from a survey of Western and Lagos states in Nigeria that investigated children's work and parents' costs and added this queston: "Do you think that the money spent on children (all children under 18 years of age) is more than the value of their earnings and productive work or is less? That is, do you think children make parents financially better off or worse off?" It is notable that 86 percent said that the money spent on children is greater (Australian National University, 1974:56-57). The majority did feel, however, that out-of-school youth aged 15 to 18, but not other youth, contributed more than was spent on them. Whether this result is typical is not known. For MDCs the situation is somewhat clearer: since perceived high opportunity costs are not balanced by more than marginal economic contributions, children are more likely to be, from the attitudinal evidence, a net drain.

Evidence on the Relation of Fertility to Net Economic Value

It may seem self-evident that, if one can meaningfully speak of demand for children, such demand must be responsive to variations in their net economic value. This need not be so, however, since normative prescriptions or tastes could overwhelm other influences, or Caldwell's (1976) view could be correct--that the positive-negative distinction dominates, and variations in magnitude on either side of zero are of minimal importance. There are three kinds of evidence on the connection between actual or desired fertility and the economic value of children: anthropological evidence, analysis of attitudinal survey data, and analysis of measured economic data.

The anthropological evidence is difficult to assess, consisting as it often does of descriptions of cultural patterns and practices and weak inferences about their effects on fertility (see, e.g., the studies in Caldwell, 1977). In the same vein are studies like Herrin's (1979), which notes the effects of rural electrification on

child costs and therefore on fertility decline in southern Philippines, and Cain's (1981), on the fertility effects of differences in the value of children as risk insurance between areas of Bangladesh and India. These studies seldom systematically exclude alternative explanations for the fertility patterns noted; in addition, each cultural area covered is only a single observation, so that these studies, no matter how well done, can only be suggestive.

Among individual-level attitudinal studies, several have found that greater emphasis on economic returns from children is related to preference for larger families (Mueller, 1972; Arnold et al., 1975; Han et al., 1977); these studies show, too, that greater perceived economic costs are related to smaller family-size goals. Whether net costs are positive or negative, their level seems to make a difference in these studies. The findings are not conclusive, however, partly because of the possibility that fertility goals may themselves affect perceptions of costs and benefits, which are then ex post rationalizations.

The third type of evidence involves attempts to measure children's wage rates. Rosenzweig and Evenson (1977) have shown that children's wages have a significant positive effect on fertility across Indian districts; Rosenzweig (1978) has demonstrated the same effect across Philippine provinces.

There are bits of evidence, therefore, that child costs and benefits do affect demand and actual fertility, though the effects on fertility might be explained instead by supply or regulation cost factors. Much remains to be learned about whether or under what circumstances specific benefits, costs, or the balance between them is critical.

OPPORTUNITY COSTS OF HAVING CHILDREN

Among the costs of children borne by parents, the opportunity costs of time spent in childbearing and childrearing, which have already been included in the relative costs measure, deserve separate attention. Survey reports indicate a range of activities foregone by parents in MDCs--social activities, travel, work, hobbies, study, shopping--as well as a general feeling many have of being tied down by children and unable to attend to their own desires (Fawcett, in these volumes). The lost time, valued either in hours lost or in monetary terms (assuming a value can be placed on a person's time) is discussed below. The topics considered are how time costs vary, how they relate to modernization, and how they affect the demand for children. Most of the relevant research concerns women's work; although parents may more often mention other restrictions imposed by having children, work restrictions have proven easier to study.

Regardless of time costs, different people will have stronger or weaker preferences for the various activities that compete with childbearing. Such variations in taste are not discussed here, but in the succeeding section.

Variation in Time Costs

Detailed calculations of the time inputs children receive, such as those of Lindert (1978) and many others for the U.S., are generally not available for LDCs. It is likely, nevertheless, that the bulk of these costs are borne by the mother in most societies; it also seems probable that younger children and lower-parity children, particularly the first-born, have greater time costs. From the effects of having children on women's work time, some of the factors that produce variation in time costs can be inferred; some of these affect the number of hours spent in childrearing, whereas others affect the value of this time. The discussion that follows draws on Standing's (in these volumes) treatment of fertility and women's work.

One source of variation seems to be the household's standards for desirable and acceptable time inputs into children: higher standards increase time costs. U.S. studies suggest that more-educated women put more time into the care they give each child (Leibowitz, 1974; Hill and Stafford, 1974), involving themselves more in such activities as playing with, reading to, talking with, and teaching children (Hill and Stafford, 1980). Though the generality of such findings may be questioned (Lindert, 1978; Gronau, 1976), it is reasonable to believe that views on acceptable levels of parental time inputs vary considerably in LDCs.

Time costs will be lower where cheaper alternatives to parental care are available and acceptable: where relatives can help with childcare, where low-cost domestic labor can be hired, or where older children are not in school and can look after younger ones (Standing, in these volumes). Although each of these alternatives may have some cost, in rural LDC settings it is typically less than the cost of parental care.

Time costs will be higher where female job opportunities are less compatible with child care (Stycos and Weller, 1967). Such job characteristics as the location of work away from home, nonagricultural work, urban as opposed to rural jobs, wage employment, and modern-sector jobs have each been linked in some studies to lower fertility, and by inference to higher time costs. In every case, however, there is also some contrary evidence (Standing, 1978; in these volumes), and methodological and other difficulties impede firm conclusions.

Time costs will be lower where intrafamily substitutions for female labor are possible, particularly where children can take over farm work.

Time costs will be higher for women who seek other rewards in work besides the additional income. Pinelli (1971) found, for instance, that Italian women who worked in order to be independent or out of interest in the job had lower fertility. The desire for social mobility may operate as an additional reward (Tien, 1967). A Tunisian study (Suzman et al., 1976) seems to confirm this importance of rewards other than income by finding a relation between job satisfaction and lower fertility. This effect may partly account for the lower fertility sometimes observed among women in high-status and

career jobs.

Time costs should depend partly on the value of a woman's time. For women who work or consider working, higher market wages imply higher opportunity costs for time spent with children. For women who have no plans to work, it is the value of time in competing nonchild activities in the home that matters. In either case, higher education will presumably contribute to a higher value of time.

In addition to the income they give up while raising children, women also forfeit the chance to develop their "human capital" and consequently can expect lower wages should they return to work later (Mincer and Polacheck, 1974). This "interruption cost" may seem more important among more educated career women, but may also be significant in a labor-surplus economy where finding a new job is difficult. The converse of the interruption effect is the effect of early and continued employment. This builds commitment to work, and may be said to increase the rewards--monetary and in some cases also nonmonetary--for staying in the labor market, thereby raising the time costs of childbearing.

Although having more and better opportunities for employment should increase the wife's time costs, it should be noted that such opportunities could also affect fertility in the opposite direction by adding to potential income, allowing the household to afford more children. It is commonly believed, primarily on the basis of work on U.S. fertility, that this positive income effect of higher female wages is dominated by the negative price effect, but this need not always be so. It is also possible that some women work because, as a result of their higher fertility, they have more children to help support, which would further complicate the linkage.

Besides the time costs from foregone labor, both parents may incur costs from foregone leisure. Studies in the Philippines and Botswana indicate that the reductions in women's leisure time (as distinct from housework time) are in fact greater than those in work time, which appears unaffected by children in some analyses (Standing, in these volumes). Husbands, too, incur reductions in leisure time because additional children induce them to work longer hours (e.g., Boulier, 1977; Cramer, 1980 [U.S. data]). However, little work has been done on determining the importance of such lost leisure time and balancing it against the increased income from moonlighting husbands.

Lost leisure time should be more valuable where leisure opportunities are more numerous and less expensive. Where children are one's only entertainment, leisure time costs should be light; where one can afford and can choose from a variety of other uses of leisure, many of which are incompatible with children's participation, time costs should be heavy.

It is suggested, therefore, that the time costs from foregone labor increase under the following conditions: with higher standards for acceptable time inputs into children; where alternatives to parental care are expensive or unavailable; when female jobs are incompatible with childcare; where substitutes for female labor are expensive or unavailable; with women who expect more psychic satisfaction from work; where female wages are higher; and when

interruption costs are greater and work commitment has developed. The time costs of foregone leisure, which increase with the availability and inexpensiveness of consumption activities, must be added to these.

Modernization and Time Costs

Most of the factors related to variations in time costs would operate to increase these costs in the course of modernization if family size were constant. Standards for time inputs into children probably rise (this is discussed further in the next section). Substitutes for parental care disappear or become more costly as families shrink. As the workforce shifts out of agriculture, female occupations generally become less compatible with childcare, although increased compatibility is possible in rare cases, as when modern businesses provide child-related benefits. Substitution of child labor for female labor becomes less feasible for several reasons, including the increasing need for education. A growing minority of women may find work psychically rewarding as they move into professional and administrative jobs. Wages rise, increasing the incentive to work. (What direction interruption costs take, however, is not clear).

Although the path of time costs from lost work is clear, the direction taken by the costs of foregone leisure time is indeterminate. From the rise in the value of a person's time and from increases in leisure opportunities with modernization, one might assume that such costs rise. However, increased productivity also permits greater flexibility in the work time required to support a household and in the time needed for housework. Women can afford to take proportionally more time for childrearing away from market work rather than away from leisure, as contrasts between U.S. and LDC time-use studies suggest they do (e.g., Hill and Stafford, 1980; Boulier, 1977).

These arguments for rising work time costs (though not necessarily leisure time costs) assume that number of children does not decline and that some absolute measure of time costs is used. Considered relative to "full" incomes, time costs follow an indeterminate path; considered relative to direct costs, they probably rise. Declining family sizes may reduce total time costs, but incremental time costs may rise because of the increasing proportion of high-cost low-parity children.

Time Costs and the Demand for Children

Many studies suggest that higher potential wages for women lead to lower fertility in MDCs (see the summary table in Schultz, 1974:288-289). The evidence for LDCs, however, is equivocal: there is supportive evidence for Chile (DaVanzo, 1972), for instance; only partial support for Colombia (Schultz, 1981:176); and reverse findings for Puerto Rico (McCabe and Rosenzweig, 1976), where higher female wage rates actually increase family size.

Such findings, as well as many conflicting ones about the relationship between female labor force participation and fertility in LDCs (Standing, in these volumes), may be interpreted in several ways. McCabe and Rosenzweig find that higher wage rates also increase the amount of work performed by Puerto Rican women, suggesting that, instead of giving up children, they give up leisure time. Higher wages may also make it possible for them to afford larger families. Where many women work out of economic necessity, often in low-wage jobs, they may have no choice but to bear the added time costs. Developed-country studies indicate that the short-run impact of fertility on wife's employment overshadows any effect in the opposite direction (Smith-Lovin and Tickamyer, 1978; Cramer, 1980); adjusting fertility downward may not be an option for these women.

Parental time costs of children are low or nonexistent in LDCs in comparison with MDCs, and it is arguable that their effect on demand is therefore minimal. Demand would then be more likely to depend on other factors: direct costs and benefits, or tastes for children, or household incomes. With institutional changes associated with modernization, time costs may become increasingly important in determining demand.

TASTES FOR CHILDREN

If variations in the relative price of children (discussed above) and in the capacity of households to afford them (discussed below) could be set aside, would desires for children still vary? It seems likely they would, from the considerable variation in fertility desires across religious and linguistic boundaries, across cultures, across societies at different levels of socioeconomic development, and even, possibly, across personality types. Objective economic circumstances by themselves do not dictate the number of children a household demands. Personal preferences, apart from prices and incomes, must also be taken into account, and are discussed here as tastes for children.

The discussion below first considers how the concept is interpreted and what evidence of tastes for children is available. Two approaches to identifying tastes are then examined.

Conceptual Problems

The economist's term "tastes" is used here because it permits a more precise reference to one particular component of the demand for children. As will be argued, alternate terms like "norms" and "values" have a more diffuse reference.

An economist's conception of tastes is a ranking of the satisfactions attached to each possible combination of quantities of different goods, including children and their attributes. This conception, although analytically convenient, has an important

drawback: it makes tastes nearly impossible to measure directly. Some economists therefore disavow variations in tastes, preferring to account for any apparent variations by ingenious extensions of the concepts of prices and incomes (Stigler and Becker, 1977). Most economists, however, rather than treating tastes as invariant, instead treat them as a residual category, consigned to other disciplines for study. Consequently, there is little solid evidence about tastes for children in the economic literature, although some, such as Easterlin (1968) and Freedman (1975), have worked on the problem.

Other disciplines, however, provide little more evidence. One might expect that evidence about tastes would emerge from work on fertility desires ("desired," "ideal," and "expected" family size), fertility norms, or values and disvalues of children. In each case, however, the evidence is unsatisfactory. There are two basic problems with the determination of tastes. First, the material constraints and incentives influencing choice are not held constant, and so one seldom can tell whether variations are due to such factors or to tastes. Second, although comparisons among alternatives are crucial in assessing tastes, work in these areas often assesses what people think about children without comparison with competing sources of satisfaction.

Studies of fertility desires, as McClelland argues in these volumes, provide measures not of tastes by themselves but of demand for children, reflecting the interaction of tastes with constraints. In some cases, it may be possible to argue that demand variations in fact reflect taste variations: where fertility desires differ between religious groups in similar economic circumstances, for instance, taste variations may well be responsible. However, many other cases are considerably more ambiguous. For example, whether any portion of educational differentials in fertility choices would remain if price and income differentials were removed is very difficult to tell. Also, as noted above, measures of children desired are seldom accompanied by measures of other goods desired; a large ideal family size could in fact represent weak tastes for children if nonchild consumption aspirations were also very strong.

Because students of fertility norms generally rely on measures of family-size desires (Mason, in these volumes), their studies are subject to the same reservations. Theoretical discussions of norms highlight the belief that tastes are not purely individual, but are socially patterned. One might argue that, if norms were ever properly measured, they would be shown to compel particular fertility behavior regardless of the economic consequences. Apart from the hypothetical nature of this argument, however, norms in their formation may have some economic underpinning, and economic consequences are likely to affect receptivity to norms or to lead to their reformulation.

Psychosocial studies of the value of children escape the first but not the second basic problem. It is possible, in rough fashion, to separate the psychosocial from the economic values and disvalues of children. A number of psychosocial values influence parents' tastes for children: the desire for companionship, or the need to love and

be loved by children; the idea that children are essential to a family's happiness; the play, fun, and distraction that children provide; the desire to continue the family name or line; the need for comfort and care in old age; the search for a sense of achievement or power from having children; the desire to strengthen the marital bond; the idea that children provide fulfillment, improve character, provide incentive to succeed, and allow one to attain goals vicariously; and the desire to fulfill religious or social obligations or to attain adult status through having children. Psychosocial disvalues of children affecting tastes are somewhat more difficult to distinguish because most disvalues appear to have both an economic and a psychosocial dimension (for example, "feeling tied down"); however, such disvalues as the emotional tensions of childrearing and the marital strains that result may be primarily psychosocial. These values and disvalues vary in significance across cultures and social classes, in many cases becoming more prominent as economic factors decline in salience (Fawcett, in these volumes).

However, as noted above, values and disvalues of children are usually assessed without reference to the values attached to competing goods. If one took these psychosocial values of children as representing tastes, one would be drawn to the unusual conclusion that tastes for children are stronger in urban areas and in more developed countries (Fawcett, in these volumes; Bulatao, 1979a). The reverse is more likely to be true, but this cannot be shown without simultaneous assessment of competing goods.

There is, then, very little solid evidence about tastes for children in any of the disciplines concerned with fertility. With only a few exceptions, economists have abandoned the concept to others, who have followed lines of research that bear only tangentially on tastes. The work on fertility desires, fertility norms, and values and disvalues of children is reviewed in these volumes (by McClelland and by Pullum, by Mason, and by Fawcett, respectively); however, little direct information about tastes can be drawn from this literature.

What might be inferred, faute de mieux, is illustrated by considering two approaches: the comparison of fertility desires across ethnic groups and the study of aspirations for material goods.

Ethnic Variation in Tastes

Fertility has been found to vary across ethnic boundaries in many, if not most, pluralistic societies, whether these boundaries involve religion, language, race, or nationality. While some differentials may be narrowing (United Nations, 1973), others have shown considerable persistence. For instance, three religious communities have long been distinctive across countries: Moslems have very high fertility, Catholics are higher than their national counterparts, and Jews have low fertility. These differences have been remarkably consistent over time (Berelson, 1978, and studies cited therein).

Fertility differentials of this sort could reflect a number of factors besides tastes: differences in supply factors, in fertility regulation costs, in incomes, and in the prices of children and other goods. Differentials specifically in fertility desires, however, are unlikely to involve the first two of these factors, and multivariate analysis of desires might serve roughly to control income and price effects. Though there are few such studies in LDCs, one set of studies confirms that ethnicity--whether defined by language or by national origins--strongly influences fertility desires in each of five Southeast Asian countries even when factors like income and education are controlled (Suparlan and Sigit, 1980; Aziz et al., 1980; Alfonso et al., 1980; Chang et al., 1980; Prasithrathsint et al., 1980). In each study, the effect of ethnicity on desired family size was of the same order and in some cases larger than the effects of education and income in multiple classification analyses. A separate study of World Fertility Survey data also shows that, in Sri Lanka, "the most important predictors of desired family size, after actual family size and life-cycle position have been included, are region, religion, and ethnic group" (Pullum, 1980:18). One might infer the operation of distinctive ethnic tastes for children in these countries.

Such inferences might be reinforced if it were possible to identify characteristics of each ethnic group that might reasonably be expected to affect tastes for children. Cultural or subcultural values and beliefs are often adduced to explain differences in demand (see LeVine and Scrimshaw, in these volumes). It is argued in regard to the Nanyang Chinese, for instance, that their sense of lineage makes children, particularly males, important, although this value is balanced by pragmatism and economic dynamism (Taeuber, 1965) and the marginal immigrant status of these communities (Caldwell, 1963). Economic striving could affect tastes for children by tilting the balance toward other competing goods, as is discussed in the next section. Marginal status, on the other hand, has been elaborated into a more general explanation for the differential fertility of minority groups (Goldscheider and Uhlenberg, 1969), though this explanation also involves greater economic striving (e.g., Hagen, 1962).

Religious values and beliefs (referred to by some as the religion's "particularized theology") have often been used to explain fertility differentials. Many of these beliefs may operate through factors other than tastes: the low position of women in Islam, for instance, may operate mainly through time costs, and the absence in Islam of any ethic of sexual asceticism operates on the supply side of fertility. One belief that would in principle affect fertility through tastes is the religious injunction to increase and multiply. However, this belief is common to several religions and therefore does not help in accounting for specific tastes.

Although one can argue that ethnic factors produce changes in tastes for children, these factors are often inadequately conceptualized, and reliable evidence of the operation of specific factors is lacking.

Material Aspirations and Tastes

One might also search for evidence on tastes in differing aspirations for material goods. Goods aspirations (or consumption aspirations) can be understood as equivalent to the ambition to acquire consumer goods and services of various types, including not only durables but also such things as education and health. Aspirations may involve goods parents desire for themselves or those they desire for their children. In either case, higher goods aspirations would imply, ceteris paribus, weaker tastes for numbers of children. Work on aspirations does not escape the two basic problems discussed earlier: varying goods aspirations may simply reflect price or income differentials, and goods aspirations need to be assessed against childbearing aspirations. In addition, most of the relevant work on goods aspirations does not attempt to assess aspirations directly, but rather uses them as an explanatory concept. There is so far no really adequate solution to these problems, as is discussed below.

That goods aspirations vary seems fairly evident from cross-national survey data (e.g., Cantril, 1965). The rise in aspirations with modernization is particularly notable: in contrast with traditional societies in which each individual's status is well-defined and relatively fixed (e.g., Davis, 1963; Foster, 1965; Rogers and Svenning, 1969), modern societies encourage aspirations for higher standards of living and for the social rank that material possessions confer. Rising aspirations as a factor discouraging larger families have been noted in the European experience (Dumont, 1890; Banks, 1954; Jolles, 1957, as cited in Andorka, 1978; Demeny, 1968) and in work on the United States (Lindert, 1978), Taiwan (Freedman, 1975), and Cuba (Diaz-Briquets and Hollerbach, forthcoming). Rising aspirations also seem behind the increasing prominence in more modern settings, among disvalues of having children, of the feeling that children restrict a parent's other activities (Bulatao, 1979a).

Do rising aspirations reflect changes in tastes or in constraints and incentives? Both are probably at work. The increasing availability of consumer goods in local shops or through travel or other forms of interchange with urban centers, their falling real prices, and rising incomes that allow more investment in children and more expenditures for luxuries all encourage the growth of aspirations. Aspirations can also rise, however, without any change in the level of living. As Lerner (1963:331) notes, "aspirations are more easily aroused than satisfied," given the increasing power of the mass media in LDCs (see also Rogers and Svenning, 1969). Aspirations can also be aroused by political events, sometimes unintentionally but more often deliberately (e.g., Hollerbach and Diaz-Briquets, 1982).

One interpretation of this process is that influences like the media and political campaigns essentially reduce the information cost of particular products, and therefore affect their true price to the household (Stigler and Becker, 1977). Alternatively, the process might be viewed as the removal of a rationing constraint, which should reduce the income elasticities of demand for all other

noncomplementary goods, including children (Edlefsen, 1980). Still a third interpretation is that change in aspirations in fact reflects, to some degree, change in basic preferences between children and other goods.

In principle, some light might be shed on these alternate interpretations through an understanding of how aspirations are formed. However, systematic theorizing about this process is relatively limited. One argument, propounded by Easterlin (1968, 1973), is that material aspirations develop in adolescents from the level of living provided in their parents' households and remain largely stable in later life; material aspirations are one element--actual incomes are another--partly shaped by the behavior of the parental generation. Although Easterlin provides some evidence on the relationship between parents' income and children's fertility in the United States, the links he assumes between parents' income and children's material aspirations and between material aspirations and subsequent fertility are largely speculative.

Lindert has reformulated Easterlin's argument in an interesting way, seeing aspirations for child-related goods as the main element producing changes in tastes. In what he considers their order of importance, Lindert (1978:68) lists five possible influences on desired child inputs:

1. The pattern of family time and commodity inputs into the couple as they are growing up
2. The child-unrelated activities enjoyed by the parents of the young couple
3. The social inputs into them (such as public educational expenditures)
4. The pattern of current family expenditures and time use in the group with which the young couple compares itself
5. The number of the couple's siblings.

To the first factor, the inputs one received as a child, Lindert assigns the major influence on preferred inputs per child. Other authors put the emphasis elsewhere, particularly on the fourth item in the list, the influence of contemporaneous reference groups (e.g., Freedman, 1963; Leibenstein, 1975; Turchi, 1975).

Can the effect of goods aspirations--and therefore, presumably, of tastes--on the demand for children and on fertility be demonstrated? Some attempts to do this have been made, but they are mainly indirect and rest on a variety of assumptions. Freedman (1975) found that ownership of modern consumer durables, consumption of recreational services, and aspirations for additional goods and services were related to lower ideal family sizes and more frequent use of contraception in a Taiwanese sample. Analyzing a sample of countries in which the value of children had been studied, Bulatao (1979a) found that greater concern about the restrictions children impose on parents was associated with lower fertility. Of course, these findings could also reflect price and income variations. To represent inputs received as a child, Lindert (1978) used per capita income for place

of origin, and found that this had a consistently negative effect on fertility in regressions with U.S. census data. More direct attempts than these to assess aspirations and their effects would seem indicated.

In summary, there is a variety of evidence about tastes for children, indicating that tastes may have an important and powerful effect on fertility demand. However, most of this evidence is flawed and subject to alternative interpretations.

INCOME, WEALTH, AND FERTILITY

Income and wealth--that is to say, economic resources--have a prominent role in the framework for the present study. In many aspects of economic behavior, and certainly in consumption, income plays a key role theoretically as well as empirically; income change is also one of the defining features of economic development. Consequently, a strong a priori case can be made for carefully considering the relation of income to fertility; unlike other household characteristics like education and urban residence (discussed by Cochrane in these volumes), income presumably affects demand directly, and not solely through changing prices or tastes. Whether considering income is in fact important and useful in this context is an empirical question to which the discussion will eventually turn, once some conceptual and theoretical issues have been considered.

Theoretical Issues

The Concept of a "Pure" Income Effect

Economists view choice as an optimizing procedure, given tastes or preferences, prices, and income or wealth. A "pure" income effect is observed when income changes, while all prices and tastes remain unchanged. This is a very abstract concept, at least in relation to children, since changes in income typically and more or less automatically induce changes in prices and perhaps in tastes. These induced changes, which may be referred to as indirect effects of income on fertility, are frequently of paramount interest. However, for economists, the pure income effect retains a peculiar fascination out of proportion to any empirical substance. Some of the indirect effects of income change will be noted later in this section.

The Net Value of Children and the Effect of Income

Suppose that, as seems likely, children have a negative net asset value, but that couples nevertheless bear them because they provide satisfactions and services other than as producers. Then higher income would permit couples to have more children despite their

expense, and the apparatus of consumer choice would lead us to expect a positive effect of income on the demand for children (under certain additional assumptions; see, e.g., Becker and Lewis, 1973). Suppose, on the other hand, that children are net assets (as Caldwell, in these volumes, argues is true in LDCs), and that this is true for incremental children at all parities. Then presumably everyone would like to have as many as possible. The constraints in such circumstances, it might be argued, would not involve income but the health of older siblings and of the mother, and perhaps emotional costs to the parents or others. However, given limitations on borrowing for investment, income should still have a direct effect on demand because it takes years for children to repay their costs. Investment theory rather than consumption theory would be relevant (Willis, 1980; Tabarrah, 1980). The theoretical expectation that income exerts a causal influence on the demand for children does not depend on whether children are net assets or net consumers.

Indirect Effects of Income

The indirect effects of income change on fertility, enumerated below, are predominantly negative, running counter to the direct effect.

Demand for Child "Quality" As income rises, couples may choose to require less labor from their children, to give them more education, or to provide them more consumption. These changes, if they apply to incremental children as well as to those already born, increase the direct cost of children. This is a kind of automatic increase in the price of children as income rises, and its effects have received intense theoretical scrutiny (Willis, 1974; Becker and Lewis, 1973; DeTray, 1972); other disciplines have also given a good deal of attention to this phenomenon in different theoretical contexts. This effect can make the observed relation of demand to income negative even if the pure effect is positive. Empirical evidence for LDCs is mixed but generally supportive (Mueller and Short, in these volumes).

Substitutes for Child Services As income rises, alternative means of old age support and insurance against risk may become available (Mueller and Short, in these volumes; Potter, in these volumes). This is particularly true at the macro level, but it may also be true for households, through declining information costs or a rising surplus to invest, for example.

Female Labor Supply In many settings, women do not work outside the home if their husband's income permits it; that is, "wife-not-working" is a consumption good complementary with childrearing with positive income elasticity (Mueller and Short, in these volumes). This relationship will tend to reduce the cost of children as income rises. This positive effect on fertility, however, may be balanced by the rising value of the wife's time.

Exposure to New Ideas and Commodities Radios, newspapers, and travel have positive income elasticities. Therefore, as household income rises, there is likely to be increased exposure to other new consumption goods and perhaps to new pressures to consume (Freedman, 1976). The net result may be viewed as a change in tastes which reduces demand for children (Mueller and Short, in these volumes), though it could also be viewed as a reduction in information costs of other goods. In either case, demand for children would decline.

Other Complications

Both the direct and indirect effects discussed above are independent of the source of income. However, some sources, particularly the value of the wife's time (as a component of wife's income), exercise price effects on demand as well. These effects should be kept in mind throughout this section. A second complication is that income may affect fertility through supply or regulation for a multitude of reasons: nutrition, breastfeeding, infant and child mortality, knowledge about contraception, and so on. A third complication, in any empirical study, is the possibility that fertility may be affecting income, rather than the reverse.

Empirical Findings

Most of the studies examined by Mueller and Short (in these volumes) rely on actual fertility as a proxy for demand, while controlling for a varying list of other independent variables capturing to different degrees the indirect effects of income. These studies are reviewed below.

Macro Studies

No consistent pattern emerges from the 22 cross-national or cross-regional studies reviewed by Mueller and Short. Income coefficients are mostly insignificant; among those significant, however, most signs are negative.

Micro Studies

From the 17 household studies reviewed by Mueller and Short, a clear pattern emerges of positive income effects in rural areas and negative effects in urban areas; this generally holds both within a single sample and across studies, some of which look only at rural or urban areas. Less consistently, the review suggests that fertility may be related positively to income at low income levels, and negatively at higher levels.

Landholdings and Fertility

Mueller and Short reviewed 13 studies that included a measure of land availability such as farm size. Some of these were aggregate cross-regional (but within-country) studies; others were at the individual farm level. A striking consistency was found: in almost all studies, there was a significant positive relation of fertility to farm size. The other variables included ranged widely; in particular, the positive relationship held in those studies which included wife's age at marriage, suggesting that marital fertility and landholding were related.

This finding is consistent with the more tentative generalization that, in rural areas, income is positively associated with fertility. This positive association may indicate that the pure income effect on the demand for children is strong enough, or the (predominantly negative) indirect effects are weak enough, so that the net effect, with or without the statistical controls introduced, is positive. Indirect effects might be weaker in these settings because there are fewer opportunities for investing in child quality, and the relation between income and exposure to modernizing influences might be weaker. Another possibility, however, is that the economic value of children is greater (more positive or less negative) when the family has more land, since the productivity of a given amount of labor would be higher. This would help explain a higher demand for children, but no longer as an income effect.

Fertility, Land, and Pretransition Equilibrium

Assume for the moment what is far from proven: that size of landholding or the land available per person causally influences fertility in a positive direction in many rural LDC settings, whether through demand, supply, or costs of regulation. This, then, would be one mechanism through which a pretransition demographic equilibrium might be established: with technology stable, population growth would depress size of holding until fertility fell to replacement level (perhaps meeting a rising level of mortality). This kind of hypothesis has not been explored directly in these volumes: the primary focus here has been on the response of fertility to the disequilibrating forces of modernization, and it is not clear that speculation about pretransition homeostasis would shed light on this.

Nonetheless, it should also be noted that there are certain quasi-empirical puzzles that only this kind of fundamentally Malthusian hypothesis appears able to resolve. Though there is very little hard evidence about the pretransition demography of LDCs, it is generally believed that, prior to roughly the mid-twentieth century, most LDC populations had very low rates of natural increase, and consequently very similar crude birth and death rates (discounting the effects of migration). Although reliable empirical evidence is typically lacking, careful studies of early twentieth-century India and rural China (Barclay et al., 1976) and of preindustrial Europe

confirm this view.

In these volumes, many influences on fertility are discussed, including the impact of mortality; however, there is nothing in the discussion to suggest that the aggregation of all these influences should leave fertility and mortality, at least for large populations, quite close to one another and intrinsic growth rates close to unity. That this may have been the case despite substantial differences in mortality (for example, between Western Europe on the one hand and India and China on the other) suggests that constraints on population size and growth may have been important, and the fertility-landholding relation is at least consistent with this hypothesis.

Fertility and Income Distribution

A number of authors have pointed out that, if the relation of fertility to income is nonlinear at the individual level, then changes in the distribution of income to individuals, without changing the mean income, should cause changes in fertility. This would presumably be true whether the income-fertility relation were due to demand, supply, or costs of regulation. The effect of a more equal distribution depends on the shape of the nonlinearity: if the fertility-income curve is convex upward (second derivative negative), equality increases fertility; if it is concave upward (second derivative positive), it diminishes fertility. The second case is usually considered the relevant one.

There is no apparent behavioral content to this argument; it follows directly from aggregation identities. There is, however, a strong implicit assumption that households would move along the same fertility-income curve if they received windfall transfers. This is questionable since the fertility-income curve reflects the direct and indirect effects of income from many sources, including human capital (Boulier, 1982). It is also possible that, aside from this aggregation effect, inequality per se affects fertility for a variety of hypothesized reasons.

Empirical studies of fertility and inequality are plagued by methodological problems and poor data, and they give quite inconsistent results. There is, however, a very tentative suggestion that greater equality may be associated with higher fertility in countries at low income levels, and with lower fertility in those with higher income levels (Mueller and Short, in these volumes).

CHILDBEARING EXPERIENCE AND THE DEMAND FOR CHILDREN

It has been assumed here, for convenience, that the demand for children can be represented by some target number of surviving children. This section considers the possibility that this target is not constant, but is modified during the reproductive period.

Since children are usually acquired one by one, couples can base their childbearing intentions on previous outcomes, and on their

cumulative knowledge and experience. An unintended birth or one sooner or later than expected, the loss of a child, or the birth of an infant of the "wrong" sex might trigger reformulation of plans. Other factors not discussed here may alter childbearing intentions. The factors influencing demand may change in ways not always foreseen: time costs decline with parity, income rises and falls over the life cycle, employment may unexpectedly become available. Economic cycles and social trends may affect cohorts in different stages of family building. The family cycle itself may have an effect: as they approach a particular age or attain some station in life, couples may decide that childbearing is no longer appropriate. Since these matters are treated elsewhere (Namboodiri, in these volumes; see also Ryder, in these volumes), the present discussion is confined to questions of how fertility outcomes themselves modify demand.

Rationalization of Unintended Births

The number of children women want is generally found to be strongly correlated with the number they already have (Pullum, in these volumes). This association may be due partly to women attaining their desires; it may also be due, however, to a common reluctance to label any child as unwanted.

Proper probing can usually determine whether a given birth was intended (e.g., Miller, 1974). Measures of ideal family size seldom incorporate such probes, and thus may be biased because of rationalization. In principle, rationalization could be either upward (for unintended births) or downward (among the involuntarily childless), though the latter has seldom been noted in the demographic literature (Veevers, 1979) and is less likely in LDCs. The extent of rationalization depends on the proportion of births that are unintended. Pullum (in these volumes) observes that women in LDCs married more than ten years typically have had at least one such birth (see Westoff, 1981), suggesting that demand could be substantially affected.

Does rationalization imply a change in the demand for children? This would be the case if ideal family-size measures were taken to represent demand. An alternate interpretation, however, is that demand is more properly represented by stated intentions before childbearing than by later reactions to outcomes. Fertility intentions do appear to have some predictive power, particularly if the uncertainty sometimes attached to intentions is taken into account (McClelland, in these volumes; Morgan, 1981); in this interpretation, rationalization might be said not to affect demand at all, merely to create a measurement problem.

Timing of Births

If a conception takes place earlier or later than intended, parents may bear added costs, and their demand for children could in principle

be affected. However, there is little empirical evidence on this, except for the first birth. It may be hypothesized that women who first give birth at a younger age have subsequent children more rapidly and end up with larger families, but the evidence for this "early pregnancy treadmill" effect is mainly from developed countries (Bulatao and Fawcett, 1981).

One possible explanation is self-selection: more fecund women, those who initially desire larger families, or those who are less efficient at contracepting, may start childbearing sooner. However, some U.S. evidence indicates that this cannot be the complete explanation (Card and Wise, 1978). An alternate explanation is that unplanned early childbearing interrupts a couple's life plans, forcing them to settle for less education and lower-level jobs, or keeping the wife from working, thus reducing the opportunity costs of children. The lost income would partly balance this; however, as noted earlier, the evidence for the effect of income on fertility is inconclusive because of contradictory direct and indirect effects. Early childbearing could therefore substantially increase demand, whereas an unintended delay in childbearing or greater spacing between children could eventually decrease demand for children. Evidence on these points for LDCs is still lacking, however.

Effects of Child Loss

The death of a child could affect demand for surviving children because of the loss of resources spent on the child or because it reduces perceptions of survival probabilities. Such reduced perceptions may lead a couple to have additional births in an attempt to attain their original desired number, an effect that operates not through demand but through supply. However, lower perceived survival may also increase the perceived costs of attaining any particular surviving family size, and thus could reduce demand.

Furthermore, lower survival probabilities are (at least mathematically) associated with greater variance in the proportion surviving, which may lead risk-averse couples to choose a larger expected number of surviving children (Heer and Smith, 1969). (Whether one regards this as an effect on demand or supply appears rather arbitrary.) This "insurance" effect requires two qualifications. First, where demand is very high, particularly where it exceeds natural fertility levels, or where fertility regulation is seldom practiced, no effect may be evident. (Heer [in these volumes] elaborates on these arguments.) Second, whatever the effect of perceptions of mortality, it is unclear whether they are greatly changed by personal loss. One study of Greek immigrants to Australia illustrates this point: fears about child loss were rooted in high mortality levels in Greek villages, rather than the migrants' current situations (Callan, 1980).

If there is some effect on perceptions, and if the insurance effect does apply, it should mean a desire for more births than previously; losing a child also means, however, some lost investment

of time, money, and emotional energy, and for this reason could lead to lower demand. The evidence favors the latter effect. In comparison with couples who have not lost a child, couples who have done so desire 0.1 to 0.6 more additional children (depending partly on the particular study and on the sex of the child), but this falls short of replacing the lost child (Heer and Wu, 1975, 1978; Rizk et al., 1980; see also Shin et al., 1981). The net effect of child loss, therefore, appears to be a slight decline in demand for surviving children (although there is an increase in demand for births). As with the insurance effect, this effect should be weaker where demand exceeds natural fertility and where the practice of fertility regulation is uncommon (Heer, in these volumes).

Gender Preferences and Family Composition

A rough measure of gender preference from the World Fertility Survey indicates that, across LDCs, the desire for having a balance between sons and daughters is most common; a stronger desire for sons does appear in some countries, notably in Chinese-influenced cultures, in South Asia, and in Muslim countries, though there are variations and exceptions (Pullum, in these volumes). More refined measures (Coombs et al., 1975), available for a smaller set of countries, confirm the importance of the desire for balance in some countries, and the desire for sons in others.

Since a couple cannot, as of now, control the sex of their offspring, their family composition may not be in line with their gender preferences. Their demand for children may then be affected, depending on two factors: their perception of the likelihood of having sons as opposed to having daughters, and the value they assign to alternate family compositions (McClelland, in these volumes). Perceptions are affected by childbearing experience, but are not always veridical. Some couples fall into the "gambler's fallacy," believing, for instance, that after a string of daughters a son is more likely (McClelland and Hackenberg, 1978). The opposite expectation (which may be well founded; see, e.g., Welch, 1974), that after several daughters another daughter is more probable, has also been observed. Where the couple perceives a greater likelihood of a more favorable outcome, demand may be increased. The costs of an additional child not being of the sex desired must also be assessed. If these costs are high, demand may even be reduced. For example, a couple that initially wants three boys and three girls may decide, after four straight daughters, not to risk having a fifth daughter and to stop childbearing (Widmer et al., 1981).

So far, there is little evidence that gender preferences and achieved family composition together affect demand in the manner discussed here (McClelland, in these volumes). Most studies of gender preference assess couples' desires but fail to take into account their expectations about the sex of subsequent children and their evaluations of alternative outcomes.

Gender preference may become more critical in demand as families

shrink; on the other hand, the risks of ending up with an unfavorable family composition may be greater. Public campaigns to reduce gender preference and to change the relative advantages of sons and daughters in Singapore and China testify to the public belief that gender preference does increase demand. This need not be so universally, however, nor at every stage of the fertility transition.

SUMMARY AND CONCLUSIONS

The demand for children, as the term has been used in this paper, refers to the number of surviving children a couple or household wants to have, regardless of how many they are capable of having and what difficulties they may have in controlling fertility. This concept of demand is meaningful to the majority of couples in LDCs, who are generally able to cite some realistic number and provide verbal justification for their choice.

Components of Demand

This analysis of demand in LDCs has considered the direct economic costs and benefits of children, their opportunity costs, tastes for children, and the effects of income and wealth.

Direct economic costs and benefits are highly salient in LDCs, as attitudinal studies show. Painstaking time-use studies over the last decade have begun to give us a better picture of what children actually contribute, and, combined with information on costs, allow rough estimates of the net costs parents face. One must take into account the survival chances for each birth and apply an appropriate discount rate; when this is done, parents in most settings appear to face a net economic loss from having children.

This loss is greater when children provide less labor, less security for old age, or less insurance against risk. This is the situation when less land is available; in a surplus as opposed to a deficit labor situation; in urban areas, where household production is less likely; where alternate institutions provide more cost-effective support for old age or insurance against risk; and where children are unable or unwilling to contribute to their parents. The loss is also greater where raising children involves greater costs, and where these costs are internalized in the household or small community, rather than being passed on to the society at large. Important factors leading to higher costs include the desire for higher child quality and the economic factors affecting prices of food, clothing, education, health, and housing.

Time costs appear to be of less consequence than direct costs in LDCs. Children in LDCs are often net suppliers of time, rather than net consumers as in MDCs. Compatibility between childrearing and work on the farm reduces time costs in agricultural settings. The availability and acceptability of parental surrogates also reduces time costs.

However, some cultural and institutional features of LDCs could alter the balance between benefits and costs. The net value of children could be positive if they provide an irreplaceable source of labor (because some jobs are culturally appropriate only for children, or because of limited labor markets), if they constitute the only possible investment for old age or insurance against risk, if they provide other instrumental services (like physical protection or political support) that are difficult to evaluate economically, or if their costs are assessed by some member of the household who can extract more benefits or avoid some of the costs. However, evidence is insufficient on whether these conditions apply, and, if they do, about their exact implications.

Adding together direct economic benefits and costs, as well as some estimate of time costs, and taking the ratio of this algebraic sum to the costs of alternative activities to having children (all appropriately discounted) gives a useful measure of the relative costs of children. Given the data requirements, this measure has not so far been applied to LDCs. It would be an appropriate way to combine the economic factors discussed to assess their total impact on demand.

In principle, whether children are net assets or net consumers, higher income or greater wealth should enable a couple to better afford them and therefore to have more. Income, however, also has indirect effects on demand that work in the other direction: it increases the price of children because desired quality rises, it makes substitutes for child services more accessible, it may increase aspirations for competing material goods. These effects are difficult to separate out, and, perhaps as a consequence, the evidence for the effect of income on demand is inconclusive. It is interesting nevertheless that fertility is often positively associated with size of landholding, and perhaps with rural incomes generally.

In addition to economic costs and benefits, tastes or personal preferences for children have to be taken into account. The evidence for the importance of tastes is inferential, since no direct attempts have been made to measure them. Variations in parents' reports of the psychosocial values and disvalues provided by children imply considerable variability in tastes; the sources of this variability, however, remain obscure. Tastes seem to vary across religious, linguistic, and other ethnic boundaries; whether they vary similarly across social classes is difficult to determine. Tastes are also affected by desires or aspirations for other competing material goods.

Apart from these components of demand, the possibility was considered that childbearing experience itself may have some feedback effect on demand. There are four ways this might happen: unintended births may later be rationalized and considered as wanted; unplanned early childbearing may close off alternative career possibilities and produce higher demand; child loss may affect demand; and having a son when a daughter is desired, or vice versa, may alter demand. Each of these effects seems likely to produce higher rather than lower demand.

Modernization and Demand

Modernization radically alters the demand for children. Whether couples seriously consider the number of children they want in pretransition societies is difficult to say; if they do not, modernization leads them to do so, making demand effective. Over the long term, modernization also brings down demand. In countries that have gone through the major part of the demographic transition, trends in family-size desires, which reflect demand, indicate declines from large numbers until two children becomes the modal family-size goal.

Each of the components of demand plays some role in this decline, though not all of the effects are in the same direction. Children's economic contributions fall off considerably in modernizing societies, as education gains in importance, as the tasks children do become obsolete or unnecessary, as the labor force shifts out of agriculture, as children are replaced by other institutions in providing security against risk or old age, and as greater social mobility and weaker family ties reduce dependence on children.

The direct costs of children rise in monetary terms. Rising costs in a modernizing society may be partly retarded by increasing survival chances, which reduce the cost per surviving child, but this is offset by other factors like the increased need for education. The effect of rising costs on demand is hard to see, however, since full incomes are also rising at the same time. There does in fact seem to be less concern about direct costs in later stages of development, possibly because of the improved financial situaton of the typical household.

Time costs become heavier with modernization: substitutes for parental care disappear, jobs become less compatible with childbearing, and the value of parental time rises. Time costs may begin to have a significant effect in the later stages of modernization.

The effect of rising incomes is not clear, since they are offset by rising costs and by various indirect effects, mainly negative, on demand.

Tastes may change against children and in favor of other material goods, including those necessary for better child quality. Other factors in tastes, however, such as those based on ethnic differences, may remain largely unaffected.

These components together produce a decline in demand with modernization, though this decline need not be smooth nor equally spread across all sectors of a society. One hypothesis, in fact, is that, early in modernization, before children's labor contribution is much reduced, demand rises slightly as the value of time rises. The specific time path that each component follows, and the ways in which they interrelate, are issues on which little work has been done.

BIBLIOGRAPHY

Alfonso, A. B., L. L. Layo, and R. A. Bulatao (1980) Culture and Fertility: The Case of the Philippines. Research Notes and Discussions Paper No. 20. Singapore: Institute of Southeast Asian Studies.

Anderson, M. (1971) Family Structure in Nineteenth Century Lancashire. London: Cambridge University Press.

Andorka, R. (1978) Determinants of Fertility in Advanced Societies. New York: The Free Press.

Arnold, F., R. A. Bulatao, C. Buripakdi, B. J. Chung, J. T. Fawcett, T. Iritani, S. J Lee, and T.-S. Wu (1975) The Value of Children, A Cross-National Study: Introduction and Comparative Analysis, Vol. 1. Honolulu: East-West Population Institute.

Australian National University, Demography Department (1974) The Changing African Family, Nigerian Segment-Project 2: The Value of Children. Mimeo. Canberra.

Aziz, N. L., et al. (1980) Culture and Fertility: The Case of Malaysia. Research Notes and Discussions Paper No. 19. Singapore: Institute of Southeast Asian Studies.

Banks, J. A. (1954) Prosperity and Parenthood. London: Routledge and Kegan Paul Limited.

Barclay, G., A. Coale, M. Stoto, and J. Trussell (1976) A reassessment of the demography of traditional rural China. Population Index 42:606-635.

Becker, G. S. (1960) An economic analysis of fertility. Pp. 209-231 in Universities-National Bureau Committee for Economic Research, Demographic and Economic Change in Developed Countries. Conference Series 11. Princeton, N.J.: Princeton University Press.

Becker, G. S., and H. G. Lewis (1973) On the interaction between the quantity and quality of children. Journal of Political Economy 81(2, part 2):S279-S288.

Berelson, B. (1978) Ethnicity and fertility: What and so what. Pp. 78-118 in M. Himmelfarb and V. Baras, eds., Zero Population Growth--For Whom? Differential Fertility and Minority Group Survival. Westport, Conn.: Greenwood Press, Inc.

Binswanger, H. P., R. E. Evenson, C. A. Florencio, and B. N. F. White, eds. (1980) Rural Household Studies in Asia. Singapore: Singapore University Press.

Boulier, B. (1977) Children and household economic activity in Laguna, Philippines. Journal of Philippine Development 4:195-222.

Boulier, B. (1982) Income redistribution and fertility decline: A skeptical view. Population and Development Review, forthcoming.

Branson, W. H. (1968) Social legislation and the birth rate in nineteenth century Britain. Western Economic Journal 6:134-144.

Bulatao, R. A. (1979a) On the Nature of the Transition in the Value of Children. Paper No. 60-A. Honolulu: East-West Population Institute.

Bulatao, R. A. (1979b) Further Evidence of the Transition in the Value of Children. Paper No. 60-B. Honolulu: East-West Population Institute.

Bulatao, R. A. (1982) The transition in the value of children and the fertility transition. Pp. 95-122 in C. Hohn and B. Mackensen, eds., Determinants of Fertility Trends: Theories Re-examined. Liege: Ordina Editions.

Bulatao, R. A., and J. T. Fawcett (1981) Dynamic perspectives in the study of fertility decision-making: Successive decisions within a fertility career. Pp. 433-449 in International Population Conference, Manila 1981, Vol. 1. Liege: International Union for the Scientific Study of Population.

Cain, M. (1977) The economic activities of children in a village in Bangladesh. Population and Development Review 3:201-227.

Cain, M. (1978) The household life cycle and economic mobility in rural Bangladesh. Population and Development Review 4:421-438.

Cain, M. (1981) Risk and insurance: Perspectives on fertility and agrarian change in India and Bangladesh. Population and Development Review 7:435-474.

Cain, M. (1982) Perspectives on family and fertility in developing countries. Population Studies 36:159-176.

Caldwell, J. C. (1963) The demographic background. Pp. 59-92 in T. H. Silcock and E. K. Fisk, eds., The Political Economy of Independent Malaya. Singapore: Eastern Universities Press.

Caldwell, J. C. (1976) Toward a restatement of demographic transition theory. Population and Development Review 2:321-366.

Caldwell, J. C., A. K. M. Jalaluddin, P. Caldwell, and W. Cosford (1981) The control of activity in Bangladesh. Paper prepared for the Seminar on Individuals and Families and Income Distribution, East-West Population Institute, Honolulu.

Callan, V. J. (1980) The Value of Children to Australian, Greek, and Italian Parents in Sydney. Paper No. 60-C. Honolulu: East-West Population Institute.

Cantril, H. (1965) The Pattern of Human Concerns. New Brunswick, N.J.: Rutgers University Press.

Card, J. J., and L. L. Wise (1978) Teenage mothers and teenage fathers: The impact of early childbearing on the parents' personal and professional lives. Family Planning Perspectives 10:199-205.

Chang C.-T., Ong, J. H., and P. S. J. Chen (1980) Culture and Fertility: The Case of Singapore. Research Notes and Discussions Paper No. 21. Singapore: Institute of Southeast Asian Studies.

Chayanov, A. V. (1966) The theory of non-capitalist economic systems. In D. Thorner et al., eds., The Theory of Peasant Economy. Homewood, Ill.: Irwin.

Chudacoff, H. P., and T. K. Hareven (1978) Family transitions into old age. Pp. 217-243 in T. K. Hareven, ed., Transitions: The Family and the Life Course in Historical Perspective. New York: Academic Press.

Coale, A. (1973) The demographic transition. Pp. 53-72 in International Population Conference, Liege 1973, Vol 1. Liege: International Union for the Scientific Study of Population.

Coombs, C. H., L. C. Coombs, and G. H. McClelland (1975) Preference scales for number and sex of children. Population Studies 29:273-298.

Cramer, J. C. (1980) Fertility and female employment. American Sociological Review 45:167-190.

DaVanzo, J. (1972) The Determinants of Family Formation in Chile, 1960: An Econometric Study of Female Labor Force Participation, Marriage, and Fertility Decisions. A report prepared for the Agency for International Development. Santa Monica, Calif.: Rand Corporation.

Davis, K. (1963) The theory of change and response in modern demographic history. Population Index 29:345-366.

Demeny, P. (1968) Farly fertility decline in Austria-Hungary: A lesson in demographic transition. Daedalus Spring:502-522.

DeTray, D. N. (1972) The Interaction between Parent Investment in Children and Family Size: An Economic Analysis. R-1003-RF. Santa Monica, Calif.: Rand Corporation.

Dumont, A. (1890) Depopulation et Civilisation: Etudes Demographiques. Paris: Lecroisner et Babe.

Easterlin, R. A. (1968) Population, Labor Force, and Long Swings in Economic Growth: The American Experience. New York: National Bureau of Economic Research and Columbia University Press.

Easterlin, R. A. (1973) Relative economic status and the American fertility swing. Pp. 170-223 in E. B. Sheldon, ed., Family Economic Behavior: Problems and Prospects. Philadelphia: J. B. Lippincott Company.

Easterlin, R. A. (1975) An economic framework for fertility analysis. Studies in Family Planning 6:54-63.

Edlefsen, L. E. (1980) The Quantity/Quality Trade-off: The Price of Children and the Effect of Income on Fertility. Unpublished manuscript. Department of Economics, University of Washington, Seattle.

Evenson, R. E., B. M. Popkin, and E. K. Quizon (1980) Nutrition, work, and demographic behavior in rural Philippine households: A synopsis of several Laguna household studies. Pp. 289-366 in H. P. Binswanger et al., eds., Rural Household Studies in Asia. Singapore: Singapore University Press.

Foster, G. M. (1965) Peasant society and the image of limited good. American Anthropologist 67(2).

Freedman, D. (1963) The relation of economic status to fertility. American Economic Review 53:414-426.

Freedman, D. (1975) Consumption of modern goods and services and its relation to fertility: A study in Taiwan. Journal of Development Studies 12:95-117.

Freedman, D. (1976) Mass media and modern consumer goods: Their suitability for policy interventions to decrease fertility. Pp. 356-386 in R. G. Ridker, ed., Population and Development: The Search for Selective Interventions. Baltimore, Md.: The Johns Hopkins University Press.

Goldscheider, C., and P. R. Uhlenberg (1969) Minority group status and fertility. American Journal of Sociology 74:361-373.

Gronau, R. (1976) The allocation of time of Israeli women. Journal of Political Economy 84:S201-S220.

Gustavus, S. O. (1973) The family size preferences of young people: A replication and longitudinal follow-up study. Studies in Family Planning 4:335-342.

Gustavus, S. O., and C. B. Nam (1970) The formation and stability of ideal family size among young people. Demography 7:43-51.

Hagen, E. E. (1962) On the Theory of Social Change: How Economic Growth Begins. Howewood, Ill.: Dorsey Press.

Hammer, J. S. (1981) Children and Savings in Less Developed Countries. Discussion Paper 81-27. Department of Economics, University of California, San Diego.

Han, D. W., C. K. Cheong, and K. C. Ahn, eds. (1977) Reducing Problem Groups in Family Planning IE & C Program. Seoul: Korean Institute for Family Planning.

Heer, D. M., and D. O. Smith (1969) Mortality level, desired family size and population increase: Further variations on a basic model. Demography 6:141-149.

Heer, D. M., and H. Y. Wu (1975) The effect of infant and child mortality and preference for sons upon fertility and family planning behavior and attitudes in Taiwan. In J. F. Kantner and S. McCaffrey, eds., Population and Development in Southeast Asia. Lexington, Mass.: Lexington Books.

Heer, D. M., and H. Y. Wu (1978) Effects in rural Taiwan and urban Morocco: Combining individual and aggregate data. In S. H. Preston, ed., The Effects of Infant and Child Mortality on Fertility. New York: Academic Press.

Hermalin, A. I., R. Freedman, T. H. Sun, and M. C. Chang (1979) Do intentions predict fertility? The experience in Taiwan, 1967-74. Studies in Family Planning 10:75-95.

Herrin, A. (1979) Rural electrification and fertility change in the southern Philippines. Population and Development Review 5:61-86.

Hill, C. R., and F. P. Stafford (1974) Allocation of time to pre-school children and educational opportunity. Journal of Human Resources 9:323-343.

Hill, C. R., and F. P. Stafford (1980) Parental care of children: Time diary estimates of quantity, predictability, and variety. Journal of Human Resources 15:219-239.

Hollerbach, P., and S. Diaz-Briquets (1982) Fertility Determinants in Cuba. Washington, D.C.: National Academy Press.

Jolles, H. M. (1957) Wien: Eine Stadt ohne Nachwuchs. Assen: Van Gorcum.

Khuda, B.-e- (1980) Time Allocation Among People in Rural Bangladesh. Development Research and Action Programme Publications No. 101. Bergen, Norway: The Chr. Michelsen Institute.

Knodel J., and E. van de Walle (1979) Lessons from the past: Policy implications of historical fertility studies. Population and Development Review 5:217-245.

Leibenstein, H. (1975) The economic theory of fertility decline. Quarterly Journal of Economics 89:1-31.

Leibowitz, A. (1974) Education and home production. American Economic Review 64:243-250.

Lerner, D. (1963) Toward a communication theory of modernization. In L. W. Pye, ed., Communications and Political Development. Princeton, N.J.: Princeton University Press.

Lindert, P. H. (1978) Fertility and Scarcity in America. Princeton, N.J.: Princeton University Press.

Lindert, P. H. (1980) Child costs and economic development. Pp. 5-79 in R. A. Easterlin, ed., Population and Economic Change in Developing Countries. Chicago: National Bureau of Economic Research.

McCabe, J. L., and M. R. Rosenzweig (1976) Female labor force participation, occupational choice, and fertility in developing countries. Journal of Development Economics 3:141-160.

McClelland, G. (1979) Determining the impact of sex preference on fertility: A consideration of parity progression ratio, dominance, and stopping rule measures. Demography 16:377-388.

McClelland, G., and B. H. Hackenberg (1978) Subjective probabilities for sex of next child: U.S. college students and Philippine villagers. Journal of Population 1:132-147.

McNicoll, G. (1979) The demography of post-peasant society. Pp. 135-146 in Economic and Demographic Change: Issues for the 1980's. Liege: International Union for the Scientific Study of Population.

McNicoll, G. (1980) Institutional determinants of fertility change. Population and Development Review 6:441-462.

Miller, W. B. (1974) Relationships between the intendedness of contraception and the wantedness of pregnancy. Journal of Nervous Mental Disorders 159:396-406.

Mincer, J. (1963) Market prices, opportunity costs, and income effects. In C. Christ et al., eds., Measurement in Economics: Studies in Mathematical Economics and Econometrics in Memory of Yehuda Grunfeld. Stanford, Calif.: Stanford University Press.

Mincer, J., and S. Polacheck (1974) Family investments in human capital: Earnings of women. Journal of Political Economy 82:S76-S108.

Morgan, S. P. (1981) Intention and uncertainty at later stages of childbearing: The United States, 1965 and 1970. Demography 18:267-285.

Mueller, E. (1972) Economic motives for family limitation: A study conducted in Taiwan. Population Studies 27:383-403.

Mueller, E. (1975) The impact of agricultural change on demographic development in the Third World. Pp. 307-344 in L. Tabah, ed., Population Growth and Economic Development in the Third World. Liege: Ordina Editions.

Mueller, E. (1976) The economic value of children in peasant society. In R. G. Ridker, ed., Population and Development: The Search for Selective Interventions. Baltimore, Md.: The Johns Hopkins University Press.

Nag, M., B. N. F. White, and R. C. Peet (1978) An anthropological approach to the study of the economic value of children in Java and Nepal. Current Anthropology 19:293-306.

O'Hara, D. J. (1976) Microeconomic aspects of the demographic transition. Journal of Political Economy 83:1203-1216.

Palmore, J. A., and M. B. Concepcion (1981) Desired family size and contraceptive use: An 11-country comparison. International Family Planning Perspectives 7:37-40.

Pinelli, A. (1971) Female labour and fertility in relationship to contrasting social and economic conditions. Human Relations 24:603-610.

Pohlman, E., and S. Rao (1969) Children's family size preferences and their reasons. Journal of Family Welfare (India) 15(3):54-66.

Prasithrathsint, S., L. Dhiravegin, and C. Siripirom (1980) Culture and Fertility: The Case of Thailand. Research Notes and Discussions Paper No. 22. Singapore: Institute of Southeast Asian Studies.

Preston, S. H. (1978) Introduction. In S. H. Preston, ed., The Effects of Infant and Child Mortality on Fertility. New York: Academic Press.

Preston, S. H. (1980) Causes and consequences of mortality declines in less developed countries during the twentieth century. Pp. 289-360 in R. A. Easterlin, ed., Population and Economic Change in Developing Countries. Chicago: University of Chicago Press.

Pullum, T. W. (1980) Illustrative Analysis: Fertility Preferences in Sri Lanka. Scientific Reports No. 9. London: World Fertility Survey.

Rizk, I. A., C. S. Stokes, and M. R. Nelson (1980) The Influence of Individual and Community-Level Child Mortality on Fertility in Egypt. Paper presented at the annual meeting of the Population Association of America, Denver.

Rogers, E. M., and L. Svenning (1969) Modernization Among Peasants: The Impact of Communication. New York: Holt, Rinehart and Winston.

Rosenzweig, M. R. (1978) The value of children's time, family size and non-household child activities in a developing country: Evidence from household data. Pp. 331-347 in J. L. Simon, ed, Research in Population Economics, Vol. 1. Greenwich, Conn.: JAI Press.

Rosenzweig, M. R., and R. Evenson (1977) Fertility, schooling, and the economic contribution of children in rural India: An econometric analysis. Econometrica 45:1065-1080.

Schultz, T. P. (1974) Birth rate changes over space and time: A study of Taiwan. Pp. 255-291 in T. W. Schultz, ed., Economics of the Family: Marriage, Children, and Human Capital. Chicago: University of Chicago Press.

Schultz, T. P. (1980) An economic interpretation of the decline in fertility in a rapidly developing country: Consequences of planning. In R. A. Easterlin, ed., Population and Economic Change in Developing Countries. Chicago: University of Chicago Press.

Schultz, T. P. (1981) Economics of Population. Reading, Mass.: Addison-Wesley Publishing Company.

Shin, E. H., T. H. Kwon, and H. Y. Lee (1981) Determinants of fertility differentials in Korea. Sociology and Social Research 65:211-225.

Smith, R. M. (1981) The Nuclear Family and Low Fertility: A Spurious Correlation? Paper presented at the Seminar on Family Types and Fertility in Less Developed Countries, Sao Paulo.

Smith-Lovin, L., and A. R. Tickamyer (1978) Labor force participation, fertility behavior, and sex role attitudes. American Sociological Review 43:541-556.

Standing, G. (1978) Labour Force Participation and Development. Geneva: International Labour Office.

Stigler, G. J., and G. S. Becker (1977) De gustibus non est disputandum. American Economic Review 67:76-90.

Stycos, J. M., and R. Weller (1967) Female working roles and fertility. Demography 4:210-217.

Suparlan, P., and H. Sigit (1980) Culture and Fertility: The Case of Indonesia. Research Notes and Discussions Paper No. 18. Singapore: Institute of Southeast Asian Studies.

Suzman, R., K. A. Miller, and M. Charrad (1976) Employment effects of fertility control in Tunisia. In Recent Empirical Findings on Fertility: Korea, Nigeria, Tunisia, Venezuela, Philippines. Interdisciplinary Communications Programme. Monograph Series No. 7. Washington, D.C.: Smithsonian Institution.

Tabarrah, R. (1980) Comment on "The Decline of Fertility in a Rapidly Developing Country." Pp. 277-282 in R. A. Easterlin, ed., Population and Economic Change in Developing Countries. Chicago: University of Chicago Press.

Taeuber, I. B. (1965) Policies, programs, and the decline of birth rates: China and the Chinese population of East Asia. In M. Muramatsu and P. A. Harper, eds., Population Dynamics. Baltimore, Md.: The Johns Hopkins University Press.

Thornton, A., and J. Kim (1980) Perceived impact of financial considerations on childbearing in the United States. Pp. 351-363 in J. L. Simon, ed., Research in Population Economics, Vol. 2. Greenwich, Conn.: JAI Press.

Tien, H. Y. (1967) Mobility, non-familial activity and fertility. Demography 4:218-227.

Tienda, M. (1979) Economic activity of children in Peru: Labor force behavior in rural and urban contexts. Rural Sociology 44:370-391.

Tilakaratne, M. W. (1978) Economic change, social differentiation, and fertility: Aluthgana. Pp. 186-197 in G. Hawthorn, ed., Population and Development. London: Frank Cass.

Turchi, B. (1975) The Demand for Children in the United States. Cambridge, Mass.: Ballinger Press.

United Nations (1973) The Determinants and Consequences of Population Trends, Vol. 1. Department of Economic and Social Affairs. New York: United Nations.

Veevers, J. E. (1979) Voluntary childlessness: A review of issues and evidence. Marriage and Family Review 2:1-26.

Vlassoff, M. (1979) Labor demand and economic utility of children: A case study in rural India. Population Studies 33:415-428.

Vlassoff, M., and C. Vlassoff (1980) Old age security and the utility of children in rural India. Population Studies 34:487-499.

Welch, F. (1974) Sex of Children: Prior Uncertainty and Subsequent Fertility Behavior. Santa Monica, Calif.: Rand Corporation.

Westoff, C. F. (1981) Unwanted fertility in six developing countries. International Family Planning Perspectives 7:43-52.

Westoff, C. F., and R. H. Potvin (1966) Higher education, religion, and women's family size orientations. American Sociological Review 31:489-496.

Westoff, C. F., and N. B. Ryder (1977) The predictive validity of reproductive intentions. Demography 14:431-453.

Widmer, K. R., G. H. McClelland, and C. A. Nickerson (1981) Determining the impact of sex preferences on fertility: A demonstration study. Demography 18:27-37.

Willis, R. J. (1974) Economic theory of fertility behavior. Pp. 25-75 in T. W. Schultz, ed., Economics of the Family: Marriage, Children, and Human Capital. Chicago: University of Chicago Press.

Willis, R. J. (1980) The old age security hypothesis and population growth. Pp. 43-69 in T. K. Burch, ed., Demographic Behavior: Interdisciplinary Perspectives on Decision-Making. AAAS Selected Symposium 45. Boulder, Colo.: Westview Press, Inc.

Willis, R. J. (1981) The direction of intergenerational transfers and demographic transition: The Caldwell hypothesis reexamined. Population and Development Review 8(Supplement):207-234.

Chapter 9

FAMILY-SIZE DESIRES AS MEASURES OF DEMAND

Gary H. McClelland*

Demand for children is generally taken as corresponding roughly to what survey respondents report as "desired family size." Essentially, it is seen as the number of children parents would have if there were no subjective or economic problems involved in regulating fertility. (Easterlin, 1978:82). The purpose of the present paper is to evaluate this claim, reviewing the evidence on whether measures of family-size desires actually measure demand for children as defined by Easterlin. Specifically, the paper will do the following:

1. define demand for children using the microeconomic model of fertility developed in Easterlin (1978);
2. extend the microeconomic model by considering fertility decisions and demand as the result of a conditional decision process;
3. describe four ways in which family-size desires have been measured; and
4. define five criteria that measures of demand for children must satisfy, and assess how well these criteria are met by measures of family-size desires.

In addition, two appendices treat the following:

a. gender preferences, their measurement, and their relation to demand and behavior; and
b. levels and trends in family-size desires in developing countries.

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A MICROECONOMIC MODEL OF DEMAND

According to decision-making, microeconomic, and consumer choice models, demand for children results from a psychological weighing of the benefits and costs associated with having different numbers of children. This view is illustrated by the comments of two economists who have applied economic principles to the study of fertility:

> Demand for children is based on the household's balancing of its subjective tastes against externally determined constraints of price and income in a way that maximizes its satisfaction (Easterlin, 1978:61, emphasis added).

> . . . economists would argue that it is not tastes and preferences for children per se, or the absolute values placed on them, that are crucial to analyzing fertility choices, but rather the relative preferences for children versus other consumption activities. In other words, we must inquire into the trade-offs in satisfactions to parents conferred by children as opposed to such items as consumer goods and services and leisure (Espenshade, 1977:47).

The microeconomic model presumes that couples would have as many children as they could if doing so were costless in terms of money, time, foregone opportunities, etc. That is, children are assumed to be a "normal good." In reality, of course, due to the constraints of income and time, and the costs of children and other needs and wants, couples must give up certain economic goods and psychological satisfactions (e.g., high-quality housing, money in a savings account) to have children. In turn, children presumably provide both economic and psychological benefits to the household. These ideas are formalized in Figure 1. The abscissa represents the different numbers of children a couple might wish to have, while the ordinate represents alternative benefits, referred to as "other benefits" in the following discussion. Each point in the space thus represents a different combination of children and other benefits. Under the above assumptions, the most desirable point is one infinitely far from the origin on both axes, representing maximum quantities of both children and other benefits.

Resource constraints are represented in Figure 1 by the negatively sloped diagonal line, usually called the budget constraint line. The point where this line crosses the abscissa depicts the maximum number of children the couple could have by giving up all other benefits; conversely, the point where it crosses the ordinate depicts the quantity of other benefits they could have if they were to have no children. The negative slope of the constraint line indicates that the couple must give up one good--either children or other benefits--to obtain more of the other. Combinations of other benefits and children above the budget constraint line are not obtainable due to conflicts between prices and available resources. For example, in Figure 1 the maximum feasible amount of other benefits with three

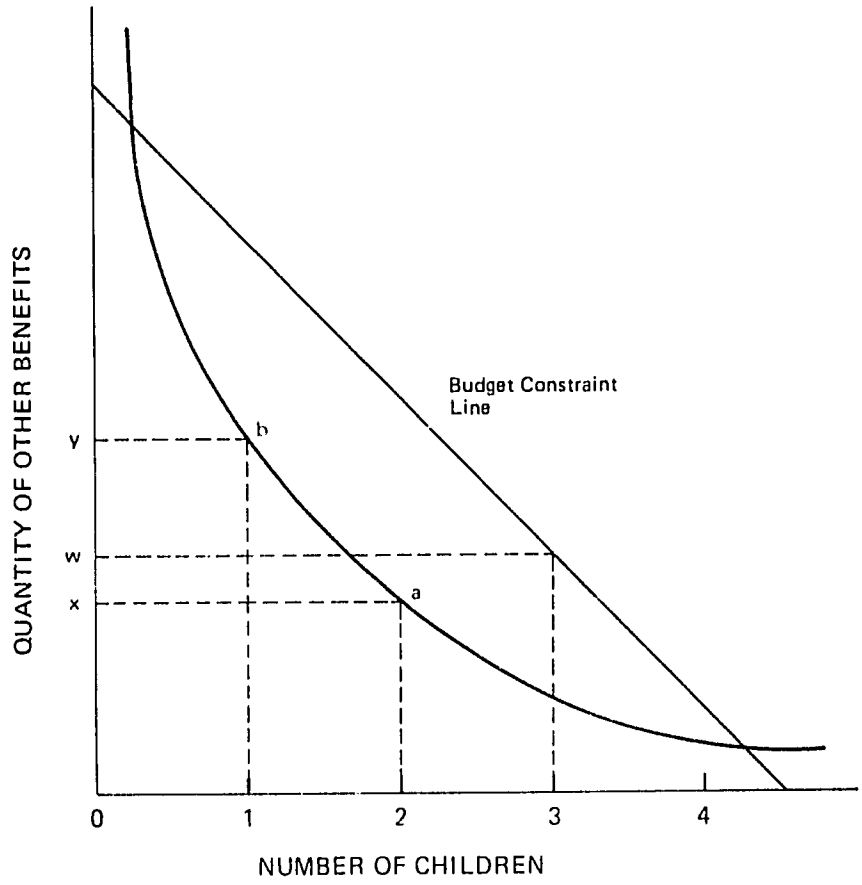

FIGURE 1 Components of the Microeconomic Model of Demand for Children

children is w. Combinations of other benefits and children below the budget constraint line are suboptimal because the couple would not obtain all the satisfaction or utility that they could afford. The closer a given combination of children and other benefits is to the origin, the less desirable it is.

Different couples--not only across cultural groups but also within--are likely to differ in the degree to which they are willing to give up economic goods and psychological satisfactions in order to have children. A couple's relative preferences for children versus other benefits can be represented by a set of <u>indifference curves</u>, one of which is shown in Figure 1. These curves are defined so that the couple is indifferent among all combinations of other benefits and given numbers of children falling on the same curve. For example, the hypothetical couple whose preferences are shown in the figure is indifferent between "amount x of other benefits and two children" and "amount y of other benefits and one child" because the corresponding intersections with the budget constraint (points a and b, respectively) fall on the same indifference curve. The entire set of curves thus describes the tradeoffs the couple is willing to make.

Each indifference curve represents a different degree of total satisfaction or "utility," with curves farther from the origin representing greater amounts of utility. The best attainable combination of other benefits and children is represented by the point that is both on the budget constraint line and on the indifference curve farthest from the origin. In theory, this point will be the intersection between the budget constraint line and the indifference curve that is just tangent to that line. However, due to the discreteness of children, this may not be a realizable point; for example, the intersection might be at 2.3 children. In this case, then, the best attainable combination is the point where the constraint line and the indifference curve furthest from the origin intersect at a realizable combination--at a whole number of children. Thus, even though the set of indifference curves is in theory infinitely large or dense, in practice only those that cross the budget constraint line at a point representing a whole number of children are relevant. The set of interest thus includes one curve for each family size-budget constraint intersection, up to the maximum family size possible under the budget constraint.

The concept of best attainable combination or ideal point is illustrated in Figure 2, which depicts a complete set of indifference curves for a hypothetical couple. The curves have been given labels corresponding to the amount of total utility (expressed in an arbitrary metric) that each point on the curve would yield the couple. For example, point d2 represents the combination of one child and amount x of other benefits; the utility for that combination would be 0.4 because d2 falls on the curve with utility 0.4. Point d4 is less preferred than d2 because d4 is on a utility curve that passes closer to the origin than the curve for d2. The best attainable combination for this couple is point d1; this point, then, represents the couple's demand. That is, given the couple's preferences (desired tradeoffs between children and other possible uses of time and money) and resource limitations, they would obtain maximum utility by having two children and amount w of other benefits.

Demand may, of course, vary across couples, as well as across cultures and nations. According to the microeconomic model depicted in Figures 1 and 2, this variation has two sources: (a) differences in budget constraints, and (b) differences in preferences. Two couples could have identical preferences (i.e., the same indifference curves representing tradeoffs between children and other benefits) but still have widely varying demand for children because of differences in their budget constraints. Similarly, couples with the same budget constraints could have varying demands for children due to differences in preferences.

The Easterlin (1978) model of demand ignores a couple's ability to obtain their demanded number of children. In particular, physical ability to produce children and ability to limit reproduction are not considered. These abilities are uncertain, with high variance over couples. Hence, it is useful to ask what outcome would be second most preferred, again given the budget constraint, if for some reason the optimal number of children were not attainable. For the hypothetical

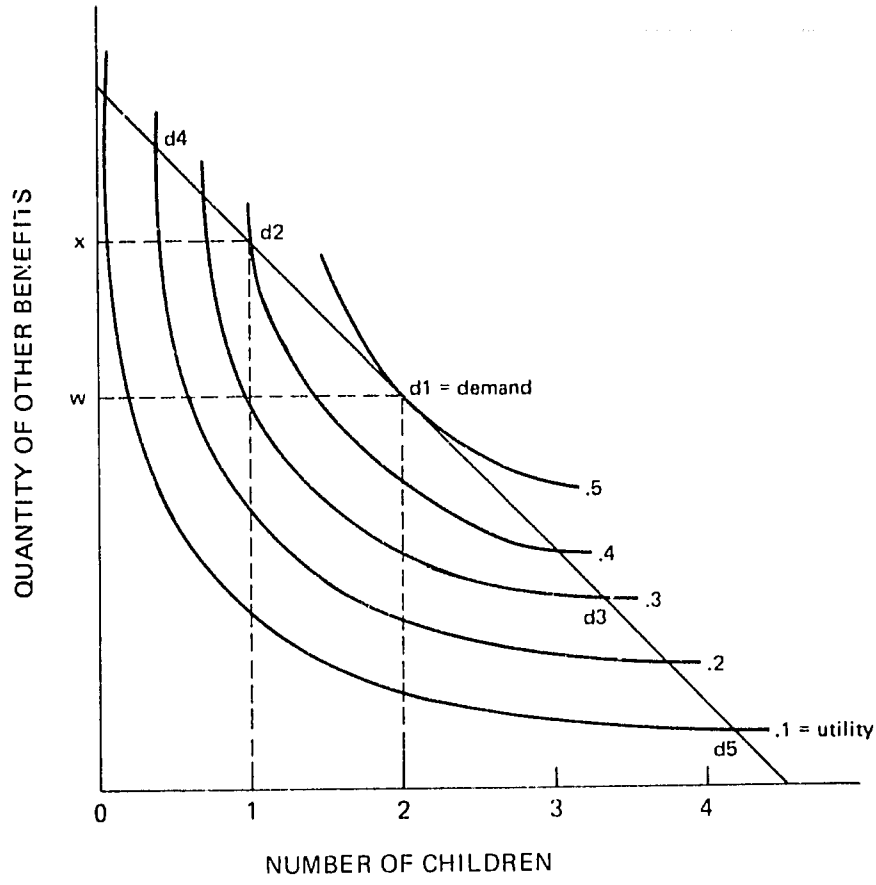

FIGURE 2 The Microeconomic Model of Demand for Children

couple in Figure 2, that point is simply the intersection of the budget line with the indifference curve second furthest from the origin; this point is labeled d2. If the couple were unable for biological reasons to have two children, their optimal number, and had to settle for one child, then even though they would be able to acquire more other benefits (amount x vs. w), they would achieve a lower total utility (0.4 instead of 0.5). The difference or distance between the indifference curves for d1 and d2 indicates the strength of the demand for two children over one child, or the loss in utility that the couple would suffer if they had to settle for the combination at d2 because of limited reproductive ability. (If the number of children at d2 were greater than that at d1, then the difference represents the disutility of having to settle for d2 because of the costs of fertility limitation.) The other intersections (d3, d4, etc.) along the budget constraint line are similarly ordered in utility.

This ordering and the utilities of the indifference curves on which the intersections are located produce the curve depicted in Figure 3, which represents the maximum utility attainable as a

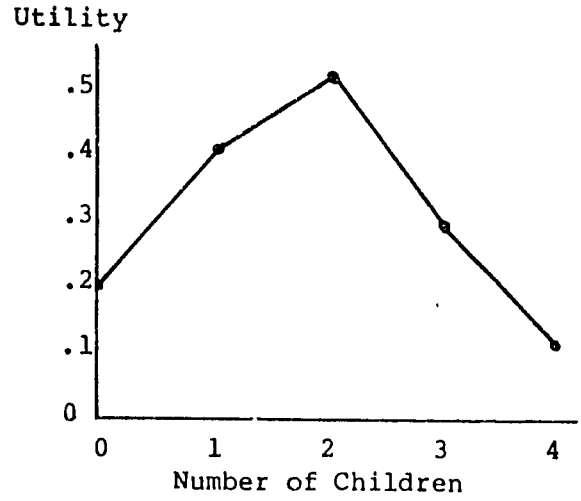

FIGURE 3 Maximum Utility Function for Children

function of the number of children. This curve is an example of a single-peaked preference function, in which utility decreases monotonically for both more and less children than the ideal number. Similar functions across number of children are described by Coombs et al. (1975), Pullum (1980), and Terhune and Kaufman (1973), among others. The maximum utility function will be single-peaked if the indifference curves are concave upward, implying a decreasing marginal rate of substitution between children and other benefits. This is the pattern that should be observed if couples prefer, as most seem to do, some of both goods.

In summary, the model in Figures 1 and 2 illustrates five important concepts that will be useful in examining measures of family-size desires: preferences, the way in which children and other benefits are balanced against each other, represented by the indifference curves; budget constraints, the limits imposed by the relation between prices and available resources (including income), represented by the negatively sloping line; demand, the optimal combination of children and other benefits, given preferences and budget constraints; utility, the amount of total satisfaction associated with any combination of children and other benefits; and maximum utility function, the curve relating utility to number of children with a budget constraint imposed, as illustrated in Figure 3. The discussion below extends this concept of demand by examining it as the result of a conditional decision process.

DEMAND AS A CONDITIONAL DECISION PROCESS

When the microeconomic model of demand described above is used, it is generally assumed that, once a couple's demand for children has been determined by their preferences and budget constraints, it will remain constant (Becker, 1960; Easterlin, 1978; Willis, 1973; and many

others). In particular, it is often assumed that, before childbearing begins, a couple can accurately foresee the costs and benefits of children and other goods, as well as limits on their income and other resources, and that their preferences are stable. These assumptions, rarely realistic, are made for convenience to permit analysis of data collected for other purposes or to make the mathematical analysis tractable (e.g., Razin, 1980), rather than for theoretical reasons. It is usually more appropriate to view demand as the result of a dynamic process, a series of decisions (Bulatao, 1981; Freedman and Coombs, 1966a, 1966b; Kyriazis, 1979; Mishler and Westoff, 1955; Namboodiri, 1972, 1980, in these volumes; Pullum, 1980; Rosenzweig, 1976; and many others). In this view, demand for children varies with changes in the couple's tastes and preferences (e.g., they may find that they do not enjoy children as much as they thought they would), expectations about future income, and subjective estimates of the relative costs of children. As R. Lee (1980:206) has noted,

> . . . a couple's desired family size at any point in their reproductive life can only be based on their forecast of the future socioeconomic climate and their own future experiences; there is no reason to expect couples to be more successful in such forecasts than sociologists or economists, and fertility plans will frequently be revised with the benefit of new experience.

The experiences of childbearing and childraising themselves are especially likely to change preferences and expectations, thereby changing demand (Namboodiri, 1972).

Changes in demand are easily represented within the framework of the microeconomic model. A change in preferences would be depicted by a variation in the set of indifference curves, and consequently in demand. Changes in prices or income, including a more costly than expected previous child, would cause a variation in the location of the budget constraint line, and again consequently in demand. The possible sources of change for couples over time are the same as those discussed above for variations across couples and cultures.

The idea of fertility demand as a conditional decision process extends the microeconomic model by emphasizing the couple's subjective beliefs as a filter through which budget constraints and relative costs influence demand. The role of experience in molding these beliefs is also emphasized. Thus a couple's demand for children is at any time conditional upon a number of expectations about future events, and demand is continually revised as these expectations are either realized or revised (see also Pullum, in these volumes).

MEASURES OF DESIRED FAMILY SIZE

Given this theoretical model of demand, it is important to ask how well demand is actually measured by stated family-size desires. First, it is useful to examine briefly the four basic types of questions used in surveys to measure desired family size: "how many

more," "over again," ordering, and projective.

When the respondent is asked how many more children are wanted, desired family size is computed simply by adding that number to the respondent's number of living children. For example, in the Value of Children (VOC)[1] studies, desired family size was defined as current family size plus the respondent's answer to the question "If you could have just what you want, how many more children would you like to have?" Sometimes such a question is preceded or replaced by one asking if any more children are desired in the future; for purposes of this review, these questions will be included in the how-many-more category.

"Over again" questions ask the respondent to state the number of children desired if childbearing were to begin over again. For example, the World Fertility Surveys (WFS) ask, "If you could choose exactly the number of children to have in your whole life, how many would that be?" (United Nations, 1981). Sometimes a set of conditions is specified under which the hypothetical over-again question is to be answered (e.g., "knowing that things would turn out just about the way they have for you and your husband" [Freedman et al., 1980]).

The third type of question, ordering, also uses the over-again format, but asks respondents to give their most desired family size and to order other family sizes. For example, Coombs (1974; see also Goldberg and Coombs, 1963) asked respondents:

> If you could start life over again, knowing that things would turn out just about the way they have for you and your husband, what number of children would you choose if you could have just the number you want by the time you finish? . . . If you couldn't have [number chosen in last question] would you rather have [lower number] or [higher number]?

As another example, Coombs et al. (1975) asked respondents to rank order the 16 family compositions formed by all possible combinations of zero to three boys and zero to three girls. An index of desired family size (IN--"number bias") was then assigned, ranging from one to seven based on the respondent's ordering of the four compositions with equal numbers of boys and girls--(0 boys, 0 girls), (1, 1), (2, 2), and (3, 3). For example, the family size ordering 2406 was assigned IN3, a moderate family-size bias, and 4620 was assigned IN6, a large family-size bias. Other ordering procedures have been used by Coxon (1974) and Rodgers and Young (1981); sometimes the respondent actually makes pair comparisons from which the ordering is later constructed for either the individual (Goldberg and Coombs, 1963; Myers and Roberts, 1968) or the aggregate (Balakrishna and Reddy, 1971; Koch et al., 1975).

Projective questions ask about a generalized ideal, norm, or typical family size rather than about the respondent's desires per se. When these questions are used as measures of the individual's family-size desires, it is presumed that those desires will be projected onto or at least bias the respondent's judgment of the

normative or typical family size. For example, Gallup surveys have asked "What do you consider the ideal size of a family--a husband, wife, and how many children?" (Blake and Del Pinal, 1979). The VOC studies asked respondents to indicate what size families they would consider small and large, the presumption being that the larger the desired size, the greater the numbers in both responses.

FAMILY-SIZE DESIRES AS MEASURES OF DEMAND

This section considers whether the measures of desired family size discussed above actually measure demand for children. First, five criteria that must be satisfied by any measure of demand are defined; then the extent to which various family-size desire measures meet these criteria is examined. The five criteria are first listed, then discussed in detail in the subsections below.

1. A successful measure of demand must have face validity, bearing a logical or theoretical relationship to either the standard or the extended microeconomic model of demand described above.
2. It must assess or reflect some stable characteristic of the responding couple or individual.
3. It must not measure preferences, norms, or economic constraints on family size, but their product--demand; however, it should be loosely related to the preferences, prices, and budget constraints that determine demand.
4. It should reflect neither the couple's perception of limits on physical supply of children, nor the costs of limiting fertility.
5. It must bear a relationship to fertility behavior.

Face Validity

Measures of family-size desires have face validity as measures of demand only if they are logically or theoretically related to either the standard or the extended microeconomic model presented above. From the perspective of the standard model, over-again questions ask about the correct quantity: number of children demanded over a lifetime. Even more congruent with this model are those over-again questions which remind respondents to consider constraints by specifying conditions (e.g., "things being pretty much as they were" [Bulatao and Arnold, 1977]). There are, however, theoretical problems with such measures of demand. Even though respondents are asked to report their demand for children as if they were at the beginning of childbearing, they will in fact be at many different stages in the childbearing sequence. As a consequence, respondents who already have children may well have different and, presumably, better expectations about the costs and benefits of children, lifetime income, and other resources.

According to the standard model, computing desired family size from current family size and answers to how-many-more questions should give the same estimate as the over-again questions if there are no changes in expectations or preferences with experience. However, when desired family size is viewed as the result of a conditional decision process in which expectations and preferences change with experience, responses to over-again and how-many-more questions need not be identical or even related. For example, a woman with four children might decide that, if she were able to start over again knowing what she now knows about the costs and benefits of a large family, she would rather have a career and a smaller family; hence, she might respond "two" to an over-again question. However, if she believes that her current large family, her age, her lack of education, etc. now preclude a career, she might logically conclude that her happiness derives from her role as mother; hence, she might say she wants to have more children even though her current family size exceeds the desired size she stated in the over-again context. Conversely, a woman who opted for a career and no or few children may have found that career less satisfying than expected and want, but be unable to realize, a large family; hence, she might say she wants no more children because of her present circumstances even though her current family size falls short of the desired size assessed by an over-again question. The degree to which over-again and how-many-more responses are related empirically is examined in the concluding section of this paper.

Thus, as measures of demand for additional children given the present situation, how-many-more questions have face validity; however, they do not have face validity as measures of lifetime demand in the context of the standard microeconomic model. Simple questions asking if any more children are desired have an additional face validity problem because they do not indicate the actual quantity demanded, only whether or not that demand is greater than zero.

Ordering questions have similar face validity problems because they use the same context as the over-again questions, though they also ask the respondent for second, third, etc. choices. An important advantage of the ordering measure introduced by Coombs et al. (1975) is that it controls for at least one important condition over which the family has no influence that might affect subsequent demand--gender composition (see Appendix A). Thus, whereas a response of "three" to a standard over-again question might really mean "two boys and one girl," the IN measure is logically independent of gender preferences. Of course, gender composition is but one of many conditions that could affect demand in a conditional decision process.

Ordering questions attempt to measure the entire maximum utility function for children (see Figure 3), rather than the demand point (d1) alone. Thus the IN index is a summary measure describing the shape of the maximum utility function, and is not expressed in the units in which children can actually be demanded. For example, IN6 does not mean a family-size desire for six children, but denotes the ordering 4620. This can present a problem when the ideal point is the only demand component of interest. Orderings resulting from a scaling

of paired comparison data (e.g., Koch et al., 1975, Myers and Roberts, 1968) do not have this problem because a specific scale value or utility is assigned to each family size. However, these scaling techniques introduce another face validity problem because aggregate data are employed even though demand pertains to and may well vary across individual households or couples.

Projective measures have an uncertain link to the concepts of desired family size and demand. For example, a woman who believes that her family is wealthy relative to other families in her community might respond with an answer that bears no relationship to her own demand for children. Although she might project her own demand onto that for a typical family, there is certainly no assurance that she will, nor any logical reason why she should. The link between demand and the respondent's subjective definition of small and large families is even more tenuous. Thus, although projective measures might serve other useful purposes (e.g., as measures of norms [see Mason, in these volumes]), they will not be considered further in this paper because of their lack of face validity as measures of either desired family size or demand.

A problem with the face validity of all measures of desired family size concerns the issue of whose demand is being measured. The microeconomic model is meant to apply to the household as the decision-making unit because it is the household that will produce and pay for the children and consume the other goods and services. However, questions about desired family size in any of the forms discussed above are usually directed not to the household, but to either the husband or the wife. Unfortunately, several studies that have interviewed husbands and wives separately have found disagreement (e.g., Coombs and Fernandez, 1978; Knodel and Prachaubmoh, 1976; Pebley et al., 1980; Vinokur-Kaplan, 1977; Westoff, 1981). For example, in the 1977 WFS data for Thailand, only 40 percent of husbands gave the same desired family size (in response to an over-again question) as their wives (Westoff, 1981). Without a better understanding of the process by which the family-size desires of each spouse and perhaps other relatives in the extended family are combined through negotiation or power into the joint household decision (Bagozzi and Van Loo, 1978, 1980; Beckman, 1978, 1979, in these volumes; Downs, 1977; Hollerbach, 1980, in these volumes; Namboodiri, 1972; Hull, in these volumes), it is difficult to ascertain whether measures of one spouse's family-size desires are valid measures of household demand.

A weak argument can be made that the family-size desires of the wife, the spouse who is usually interviewed, do reflect the demand of the household. In this view, it is appropriate to interview the wife because she will produce the children, and the desires of her spouse and any other significant household members can be incorporated into her estimate of the costs and benefits of various numbers of children. Thus, if wife and husband desire different family sizes, the psychological costs of this disagreement and his unhappiness will be accounted for in her response. Wind (1976) provides an example of a model and data incorporating the husband's preferences into the

wife's utility function in a nonfertility context; the Fishbein (1980) model also has a mechanism for incorporating the desires of one spouse into the utility function of the other. Although this argument carries some plausibility, the face validity of all the current measures of family-size desires suffers on the issue of measuring household versus individual demand.

Assessment of Stable Respondent Characteristics

Of the many types of evidence that might bear on this criterion for measures of family-size desire, two will be considered here: whether respondents have thought about desired family size and whether the measures are reliable.

Have Respondents Thought About Desired Family Size?

Respondents who have thought about the number of children they would like to have should readily give reasonable answers to family-size desire questions. The evidence on this point is mixed. On the one hand, for a few WFS surveys, many women refused to answer over-again questions because they believed their family size would be decided by God or fate. For example, in Bangladesh approximately one-third of all currently married women surveyed in 1975 gave a nonnumerical answer or were unable to give any answer at all (United Nations, 1981). In a 1971 Nigerian survey, almost half of the women living in rural areas said it was up to God in response to a how-many-more question (Farooq et al., 1977). On the other hand, in most surveys respondents asked their ideal or desired family size usually have very little difficulty in providing an answer. The proportion refusing to answer because such matters are to be decided by God or fate has not often been as large as survey researchers once feared it might be (e.g., Knodel and Prachuabmoh, 1973). In contrast to the Bangladesh example, a similar WFS survey in Korea found only three women out of 5,000 unable or unwilling to give a numerical response to a question about desired family size. In many surveys, even those individuals who refuse to respond initially often have a ready answer when asked the number of children they hope God will send them (Ware, 1974).

Coombs (1976) suggests that nonresponse to questions about desired family size may occur when those who are indifferent among several possible family sizes are forced to give only one response. Coombs found that nonresponse was not a significant problem when she used an ordering technique in Korea, Malaysia, the Philippines, Taiwan, and Hungary. Ahmed (1981) reports a similar result for Bangladesh: 96 percent of the respondents were able to complete the ordering procedure, in contrast to the high nonresponse rate in the WFS survey of Bangladesh noted above.

These mixed results should not be surprising. In many of these cultures, controlling the supply of children has either been impossible (due to proscriptions against or unavailability of

contraceptives) or extremely costly (e.g., due to abstinence, criticism from friends and family, or the economic cost of contraceptives). Therefore, many people have not thought about how many children they would like to have, but have adapted to whatever number they have gotten. Under such circumstances, neither decision-making models nor concepts of demand should be expected to apply (see Hull, in these volumes). However, as means for controlling fertility become more widely available and acceptable, couples are confronted with meaningful decisions about how many children to have. More recent studies in countries where contraception has become increasingly available and acceptable conclude that respondents are indeed giving considerable thought to how many children they would like to have (see, e.g., Bulatao and Arnold, 1977).

Are the Measures Reliable?

According to both the standard and extended microeconomic models, perfect reliability should not be expected of demand measures, for two reasons. First, if there is an appreciable time delay between the first and second assessments of family-size desires, there may be changes in the expectations and beliefs upon which demand is conditional; if so, then there is little reason to expect the two assessments to give precisely the same result. On the other hand, it would be surprising if everyone's beliefs changed between the two assessments. Thus, on the whole, there ought to be a substantial but not perfect correlation between the two assessments. Second, the maximum utility function for children might be relatively flat near the ideal number of children (Freedman and Takeshita, 1969; Pullum, 1980; Terhune and Kaufman, 1973); that is, the best attainable indifference curve might intersect the budget constraint at or very near two or more family sizes. For example, if a respondent were largely indifferent to whether she had four or five children, she might say "four" at one time and "five" at another even though her demand might remain constant. Thus, family-size desire measures do not necessarily reflect unreliability or instability of demand per se, or inadequacies of the measures.

As Knodel and Piampiti (1977) note, there do not seem to be many good test-retest studies of the reliability of family-size desire measures. Existing studies are beset by such problems as very small sample sizes (e.g., in Mukherjee [1975] the consistency indices for measures of family-size desires are based on only 73 cases, and there was 41 percent attrition between the two interviews); specialized samples (e.g., Brackbill's [1974] data were from Canadian college students); and long intervals between interviews (e.g., the interval for Knodel and Piampiti [1977] was three years). In one of the better studies, MacDonald et al. (1978) assessed the test-retest reliability of selected questions on the WFS survey in Indonesia. Almost 46 percent of the respondents who were reinterviewed after approximately four months gave a different response to an over-again question about desired family size, yielding a Kappa consistency index of only 0.43.

However, 82 percent of the respondents gave a family size on the second interview that was within one of the desired size stated on the original interview. The product-moment correlation between the two responses was 0.89, indicating that the responses were far from unrelated; in fact, the degree of correspondence seems quite high given the above theoretical concerns about calculating the reliability of family-size desire measures. MacDonald et al. concluded on the basis of reconciliation interviews that beliefs and expectations had changed for many of those respondents whose desired family sizes changed, a result consistent with the conditional decision process model.

In general, the reliabilities are significantly higher than chance: not as high as one would like for good psychometric work, but probably as high as one could expect given the theoretical problems inherent in assessing the test-retest reliability of a construct that can reasonably change between interviews. The reliabilities of attitudinal questions are almost always below those for factual questions such as age and number of pregnancies; however, the reliabilities of measures of family-size desires usually are the highest among the attitude measures.

Do Family-Size Desire Measures Reflect Preferences, Norms, or Economic Constraints Rather Than Demand?

To argue that a given measure assesses a particular construct, it is necessary to show that it is not measuring some related construct. It has sometimes been suggested that family-size desire measures really assess only preferences without concern for resource constraints, or that they reflect only social norms or economic constraints.

Demand or Preference?

If fertility survey respondents were asked how much money or how many consumer goods they would like to have, they would probably always indicate a preference for more money and goods. Similarly, if children are indeed a normal good (as assumed above) and if responses to questions about desired family size measure only unconstrained preferences, one would expect those responses to indicate desires for virtually unbounded numbers of children. To the contrary, responses to such questions generally fall below what is probably the natural supply of children, indicating that family-size desires reflect preferences constrained by considerations of available resources. For example, a majority of the women with four living children in 15 WFS country surveys report that they do not want any more children; the range is from 52 percent in Malysia to 92 percent in Korea (United Nations, 1981). If desire for more children were strictly a "preference" as defined above, the proportion desiring no more children would be near zero.

Further evidence that desired family size is really demand comes

from studies asking respondents to give their second, third, etc. choices for desired family size. In these studies, respondents normally produce single-peaked response functions that are identical to the maximum utility functions (Figure 3) expected by the theory outlined above (Ahmed, 1981; Coombs et al., 1975; Coombs, 1976). There are competing theories for explaining these single-peaked functions (e.g., Coombs and Avrunin, 1977; Aschenbrenner, 1981), so that the existence of these response functions is not conclusive; however, it is certainly encouraging that they are not inconsistent with a microeconomic model of demand. Such results would be unlikely if respondents were not at least implicitly weighing the costs and benefits associated with having children. Hence, questions about desired family size probably measure demand rather than unconstrained preferences.

Demand or Norms?

Norms can be defined as shared expectations about how persons in particular statuses and situations should behave, usually reinforced by negative sanctions imposed on those who deviate and by positive sanctions granted to those who conform (Mason, in these volumes). By this definition, norms should affect demand by changing the relative prices of children and other benefits that are reflected by the slope of the budget constraint line in Figure 2. That is, both the economic and psychological costs of deviating from the norm are added to the other costs for those numbers of children not consistent with the norm (Crook, 1978; Mason, in these volumes; Namboodiri, 1979, 1980; Robinson and Harbison, 1980). Again, it should be remembered that the effective variable ought to be the person's beliefs about the norm rather than the norm itself.

Even though the microeconomic model allows for the influence of norms on demand, there would be no need for the elaborate theoretical structure of the demand model if family-size desire measures reflected norms alone. One type of evidence that demand is more than just norms would be data indicating that respondents had a desired family size different from what they themselves believed to be the norm. Some of the VOC studies provide such data. These studies asked, "When you think of a small family, how many chidren would be in it?" (Arnold et al., 1975:171), with a similar question for a "large family." It seems reasonable to speculate that answers to these questions represent the respondent's beliefs about family sizes that are just below and just above the normative family size. If so, then many respondents in several of the countries included in the VOC studies gave desired family sizes that deviated from their own beliefs about the norm. For example, in Taiwan, 55 percent of the respondents desired what they considered to be a "small" family (Wu, 1977); in Hawaii, this figure was 44 percent (Arnold and Fawcett, 1975); in Korea, it was 42 percent (Lee and Kim, 1979).

Additional evidence that desired family-size measures reflect more

than norms comes from the fact that respondents' estimates of family-size norms are more homogeneous than their stated family-size desires. That is, if there is relative agreement about the normative family size but divergence in desired family size, the increased variability must be due to factors in the model of demand other than norms: income constraints, preference differences, price differences. Namboodiri (1972) reports pilot data indicating very little variation for "ideal number of children for the average American family" as a function of either family income or husband's education, but extensive variation across those two demographic variables for an over-again question. Similarly, in the VOC studies (see especially Table 3.2 in Arnold et al., 1975), the range of means across socioeconomic groups for how-many-more and over-again questions is slightly but consistently larger than that for a normative question ("About how many children do you think a typical couple in this community has by the time they stop having children?", Arnold et al., 1975:179). Furthermore, with the exception of the Philippines, standard deviations for the how-many-more and over-again questions are larger than those for the normative question. The most striking example is Japan, where there is remarkable agreement, even across socioeconomic groups, that the "typical" family size is 2.6 (standard deviation of 0.5), but substantial disagreement with respect to desired family size (standard deviations <u>within</u> socioeconomic groups of up to 1.4). Given such data, it would be difficult to argue that family-size desires reflect only norms, although norms may of course influence demand in the manner described above.

Demand or Economic Constraints?

If the desire for children reflected only economic constraints--that is, if all couples wanted as many children as they could afford--and there were no across-couple differences in the relative price of children versus other benefits, then family-size desires ought to be an increasing function of income. However, most studies have found a negative or zero correlation between family income and family-size desires. For example, Coombs and Sun (1978) report that IN indices decreased (i.e., moved toward a small family bias) as husband's income increased. Blake and Del Pinal (1979) concluded that family income had little effect on desired family size after other sociodemographic variables were controlled. Education is sometimes used as a proxy variable for family income, and it too has a negative relationship with family-size desires (e.g., see Chang et al., 1981; Farooq et al., 1977). Of course, it should not be inferred from these studies that higher income or more education causes lower family-size desires because many other variables also change with increases in income and education. The point is that a model for demand for children must include more than budget constraints alone.

Do the Components Relate to Demand?

The above arguments suggest that family-size desires do not reflect just preferences, norms, or economic constraints. However, if measures of family-size desires are to be considered as measures of demand, then changes in these factors should result in changes in demand. That is, all else being equal, an increase in the preference for children relative to other benefits ought to increase demand, a decrease in the family-size norm ought to decrease demand, and an increase in income ought to increase demand. The problem in testing such assertions is finding situations in which there is a change in one of these components while all else remains equal. For example, early studies attempting to test economic models of fertility expected to find a positive relationship between income and fertility. However, an increase in income does more than change the budget constraint line in Figure 2; for example, increases in income are often associated with increased education, which in turn might be associated with a change in the relative price of children (e.g., educated parents might want children of a higher "quality,"[2] so that raising and educating them might become more expensive). Thus, it is not inconsistent with the model of demand for income to increase yet for demand to decease.

One solution to this quandary of keeping everything else equal is to ask respondents how many children they would want if their income were to increase. In a small pilot study, Namboodiri and Pope asked the following question:

> Some people say that if they had plenty of money they would have planned this thing or that thing different. If you had all the money you want, how many children would you choose to have, knowing that you could have exactly the number you would want? (Namboodiri, 1972:195).

Consistent with the microeconomic model of demand, desired family size (measured by an over-again question) increased by 1.2 children. Furthermore, the greatest increases in desired family size were for the lower-income groups for whom income was presumably a larger constraint on feasible family sizes. However, the VOC studies found a very different result. Respondents were asked the following two questions:

--Suppose your family income increased, to double what it is now, would that affect the number of children you want?
--Suppose the government decided to provide free education for all children, up to and including college. Would that affect the number of children you want? (Arnold et al., 1975:171).

Both questions could be construed as asking respondents how their demand for children would change if their budget constraints were eased. In virtually all socioeconomic groups in all VOC countries except Thailand, less than 20 percent of the respondents said that

their desired family size would increase (Arnold et al., 1975:96). Although this is disconcerting, it is not fatal for a microeconomic model of demand: it is logically possible that a doubling of income might not move the budget constraint line far enough to change demand. Moreover, respondents asked to imagine a doubled income might also imagine the increased costs of maintaining the lifestyle that would be expected of people with such incomes; if so, they might not believe that they would be able to afford more children even with a doubled income. Interestingly, Ware (1974) reports for Nigeria a similar lack of change with a hypothetical income increase, but a substantial decrease in desired family size with a hypothetical income decrease.

In contrast to the above result for the VOC surveys, other studies (e.g., Morgan, 1972; Srinivasan et al., 1978), as well as the VOC studies themselves (Arnold et al, 1975:78-81), find that respondents overwhelmingly cite economic or other costs as the reasons for not wanting more than their desired number of children. Even in cultures with very high fertility and strong pronatalist norms, most individuals perceive a point at which "enough is enough," when they cannot "afford" any additional children (see the WFS results discussed above in the section on "Demand or preference"). For those few groups for whom desired family size seems unbounded, it appears that the economic benefits of children are believed to exceed their economic costs. For example, Lucas and Ukaegbu (1977) report that a majority of their respondents from the Ngwa Ibo of Nigeria agreed that couples who have many children are <u>richer</u> than those with few children. Note that this result contrasts sharply with the finding in the VOC studies that fewer than 15 percent of the couples in any country or group thought a family with more children would be better off economically.

Do Family-Size Desire Measures Assess Demand Independent of Natural Supply and Fertility-Limitation Costs?

In the Easterlin (1975, 1978) model used as a framework for this discussion, reproductive ability and fertility-limitation costs are treated as determinants of fertility separate from demand. Demand is then "the number of surviving children parents would want if fertility regulation were costless" (Easterlin, 1975:55). The household's motivation to limit fertility is determined by the relationship between its demand for a certain number of children and "natural fertility"-- the number of children that the household would have or, more properly, believe they would have if their fertility were unregulated. If the number demanded exceeds the natural supply, there is "excess demand," and even costless contraception would not be used; conversely, if the number demanded is less than the believed natural supply, there is "excess supply," and an increasing need for fertility limitation as a function of the difference between demanded and natural supply. Fertility limitation would presumably be used if its disutility were less than the utility lost by having the naturally supplied number of children instead of the number demanded.

If measures of family-size desires do indeed measure demand independent of limits on natural supply, then variations in supply across populations should be unrelated to variations in demand. A major factor influencing supply of children is child mortality. Thus, family-size desires ought to pertain to demand for surviving children rather than demand for births. This implies that family-size desires should not vary with the respondent's experience with or expectations about child mortality. There is some evidence that family-size desires are indeed consistent with this aspect of the Easterlin model. For example, WFS data for Colombia (United Nations, 1981) show that, for women with a given number of surviving children, the proportion wanting no more children is not necessarily greater for those who have experienced a child death than for those who have not. As would be expected, desire to cease childbearing does vary as a function of child mortality experience for given levels of children ever born: those who lost a child want to replace it to achieve their desired family size; however, that desired size itself does not increase. Other indirect evidence comes from anthropological studies. Scrimshaw (1978) notes that, in many countries with high infant mortality, children are not considered to be "people" until they are a year or two old. Where this is the case, expectations about infant mortality should be unlikely to influence responses to family-size desire questions.

On the other hand, the VOC studies, which asked respondents to give reasons for not wanting more children than their stated desire, provide indirect evidence that family-size desires are sometimes adjusted upward to allow for possible child mortality. For example, "anxiety about infant mortality" was one of the five most frequently cited reasons for wanting a larger family size among the rural groups in five countries; the proportion of respondents citing this reason ranged from 11 percent in Taiwan to 25 percent in Thailand and 28 percent in Japan. Similarly, Bulatao (1979a) reports that, in a second round of VOC studies using more representative samples, concern about mortality risks was frequently cited by respondents as a reason for not wanting an only child--41 percent in Turkey, 33 percent in Thailand, but none in Korea, Singapore, and the United States. Therefore, the issue of whether family-size desires are independent of concerns about the natural supply of children is unclear, largely because few studies have addressed the issue directly. Further research on this issue is certainly warranted.

In a parallel fashion, if measures of family-size desires assess demand independent of fertility-limitation costs, then among those countries and socioeconomic groups for which fertility limitation is unavailable or extremely costly, expected family size should exceed desired size. In contrast, where fertility limitation is readily available and relatively inexpensive, desired should be equal to or greater than expected family size, and those expecting fewer children than desired should be predominantly those with supply problems such as infertility. If over-again questions are taken as measures of desired family size and how-many-more questions as measures of expected or intended size, this is in fact the pattern observed. For

example, in the VOC studies (Arnold et al., 1975:30-31), mean responses to how-many-more questions exceed those for over-again questions in developing countries and poorer groups (Korea, Taiwan, the Philippines, Thailand, and the Filipinos in Hawaii), but the reverse is true for developed countries (Japan). For the 1970 and 1975 National Fertility Studies in the United States, mean intended family size is consistently below mean desired family size (Ryder, 1981). If one accepts the premise that fertility limitation was relatively more expensive for blacks than for whites in the U.S. in 1965, then the pattern even obtains within the United States: Ryder and Westoff (1969) report that desires exceeded intentions for whites, while the reverse was true for blacks. Although there are some exceptions to this general pattern (e.g., Ware, 1974, for Nigeria), the aggregate results as a whole provide weak, indirect evidence that many respondents state family-size desires independently of their concerns about their ability to either produce children or limit fertility. Further evidence that family-size desires are independent of fertility limitation costs comes from VOC studies asking respondents in an open-ended format to give their reasons for not wanting fewer than their desired number of children; the costs of fertility control were almost never given as a reason. Thus, although this issue deserves much more investigation, measures of family-size desires again seem consistent with the Easterlin model of demand for children.

Are Family-Size Desire Measures Related to Fertility Behavior?

According to the microeconomic model, demand for children--plus limits on natural fertility and costs of fertility limitation--determines fertility behavior. If standard survey measures of family-size desires measure demand, then, they should relate to subsequent fertility. Researchers have investigated the relationship between family-size desire measures and three types of fertility behavior: (a) total family size; (b) fertility in various time periods; and (c) fertility-related behaviors such as use of contraception and induced abortion. This section also considers whether any relationships found between fertility behavior and family-size desire measures are merely the result of rationalization or post hoc justification of actual family size.

Total Family Size

Only the classical microeconomic model of fertility, with its assumption that a decision about lifetime consumption is made before the birth of any children, requires a strong relationship between demand and actual fertility. Although a strong relationship is also consistent with the conditional decision process model, so, too, is a weak or even nonexistent relationship, if couples do indeed substantially revise their preferences and/or expectations about costs

and income as they gain experience. Even the Easterlin model does not postulate a perfect relationship between demand and behavior, because of the effects of fertility limitation costs and limits on supply. For example, actual fertility might substantially exceed desired family size because of very high costs of fertility limitation; similarly, low fecundity might prevent some couples from having as many children as they would want. The data relating family-size desire measures to behavior must be examined with these caveats in mind.

The best data bearing on this issue are from prospective, longitudinal studies in which respondents were asked before childbearing to state their desired family size. Such studies typically yield very good to excellent aggregate predictions of completed family size and much less precise predictions for individual fertility. For example, Westoff et al. (1957) found less than a five percent error at the aggregate level over 20 years. Bumpass and Westoff (1969) found that, although average completed family size was essentially equal to the average number desired at the time of the first interview, only 41 percent of the women had exactly the number of children they said they desired, and 14 percent had two more or two fewer than their stated desire. For the Westoff et al. (1957) sample, correlations between preferences and actual family size range from 0.45 for couples who had planned their childbearing to only 0.19 for those who had not.

Coombs (1974) reports that an index describing the respondent's entire ordering of family sizes performed significantly better than an over-again question and standard demographic variables in predicting individual fertility over 15 years for a sample of women in Detroit. For the women just married at the time of the first interview, the ordering index explained an additional 10 percent of the variance in completed fertility after statistical adjustments for first preference, expected family size, income, education, and religion. However, the total variance explained was still only about 25 percent.

Period Fertility

A different type of fertility behavior is period fertility--whether or how many children are born over periods of two to five years. Many studies have compared responses to desire-for-more questions with subsequent fertility over such periods. One would expect somewhat better predictions for these studies than for the prospective studies discussed above because the predictions are over shorter intervals, leaving less time for changes in preferences or expectations. On the other hand, period fertility may be more subject than total fertility to short-term variations in economic conditions. For example, a couple might postpone an intended child if economic conditions changed six months or a year after the first interview, thereby decreasing the observed correlation between desire-for-more questions and fertility.

Moreover, five years is certainly sufficient time for preferences and expectations to change; for example, within that period a couple might develop entirely different expectations about lifetime income. Thus, a perfect relationship between desire-for-more and period fertility is not predicted by the conditional decision model.

Consistent with the preceding theoretical considerations, many studies have reported good but far from perfect predictions of period fertility from desire-for-more questions. For example, Westoff and Ryder (1977) report that, in their five-year follow-up to the 1970 National Fertility Study, respondents' estimates of the certainty of their intention to have more children had a higher correlation (0.60) with actual period fertility than any other variable, although the correlations for some demographic variables such as marriage duration (-0.55), parity (-0.40), and length of open interval (-0.42) were almost as high. Still, the fertility behavior of 21 percent of the respondents was inconsistent with the intentions they had stated in the first interview. Congruent with the conditional decision process model, Westoff and Ryder (1977:449) suggest that the inconsistencies occurred because "respondents failed to anticipate the extent to which the times would be unpropitious for childbearing." Similarly, Freedman et al. (1975) found that, for Taiwan, a measure of intentions was a much more important predictor of fertility in the next three years than any sociodemographic variable. Finally, Coombs (1979) reports that, for Taiwan, the IN ordering index, even after controlling for standard sociodemographic correlates of fertility, was an important predictor of fertility four years later.

Fertility-Related Behaviors

If family-size desires should relate to fertility, then they should also relate to such associated behaviors as use of contraception and induced abortion. However, because fertility-limiting behaviors have costs, the Easterlin microeconomic model would not predict a perfect relationship. Further confounding the interpretation of this relationship is the fact that there are reasons for regulating fertility (e.g., child spacing) other than limiting total family size.

For 11 WFS countries, Palmore and Concepcion (1981) report a meaningful but small relationship between the desire for additional children and current contraceptive use. In Taiwan, contraceptive use, duration of use, and induced abortion rates all varied appropriately with the desire for more children in the four years after the desire was measured. For example, two years later, the induced abortion rate per 1,000 pregnancies was 24.6 for those desiring more chidren versus 236.0 for those saying they wanted no more children. Also in Taiwan, Hermalin et al. (1979) found that desire for additional children was the most important predictor (relative to marriage duration, education, parity, etc.) of contraceptive use ($r = 0.48$). Kar (1978) obtained similar results for Venezuela.

Summary for Family-Size Desires and Behavior

There are definite, statistically significant relationships between measures of family-size desires and actual behavior. Although these relationships generally do not account for large proportions of the variance in behavior (25 percent seems to be the usual maximum), they are generally stronger than the relationships yielded by other predictors, including sociodemographic variables. Family-size desire measures appear better able to predict period fertility than total fertility.

Rationalization

Some researchers have suggested that the relationship between fertility behavior and family-size desires may be the result of rationalization, or post hoc justification of actual family size (e.g., Easterlin, 1973; Kiesler, 1977, Kruegel, 1975). Rationalization cannot affect initial family-size desires in studies that assess desires before childbearing begins; the positive association found in such studies, as discussed above, indicates that measures of family-size desire reflect more than just rationalization. Also, it seems unlikely that rationalization could affect responses to how-many-more questions. Thus, rationalization is a potential problem only when respondents who already have children are asked over-again questions, a procedure that, as noted above, has face validity problems. However, although rationalization undoubtedly has some effect on responses to over-again questions, it cannot be the sole determinant of those responses. If it were, the proportion of respondents desiring a number of children less than their current family size should be negligible, and this is not the case. For example, the CELADE and CFSC (1972) study of Latin American fertility concludes that excess fertility (i.e., fertility higher than the over-again response) was as high as two or three children per family in seven major cities. Similarly, Knodel and Prachuabmoh (1973) found that the vast majority of their respondents preferred a family size different from the number of living children they had at the time of the interview.

The fact that desired family size often covaries with actual family size (United Nations, 1981; Pullum, 1980) is sometimes taken as evidence that desired size is adjusted upward with fertility. However, there is an important confound that clouds such an interpretation. If fertility desires are generally declining, then older cohorts will have both higher family-size desires and higher fertility than younger cohorts, even if individual family-size desires remain relatively constant. This is in fact the pattern reported by Jejeebhoy (1981) for Taiwan.

In summary, it would take very sophisticated studies to estimate accurately the proportion of variance in responses to over-again questions attributable to rationalization; Pullum (1980, 1981) discusses the difficulties involved in such an assessment. However,

there is ample evidence that family-size desires are considerably more than just rationalization.

CONCLUSIONS

The above review found no evidence to preclude considering measures of family-size desires as measures of demand. It did reveal some problems with this view, such as the VOC responses to an over-again question in which family-size desires did not increase appreciably when respondents were asked to imagine a doubled income or free education for all their children. Other implications of the Easterlin model, including the independence of demand for children from considerations of supply or the costs of fertility limitation, could not be rejected. On the whole, there seems to be a large body of evidence, although often circumstantial, that measures of family-size desires do indeed behave as one would expect measures of demand to behave.

This conclusion does not mean that all measures of family-size desires are equally good as measures of demand. Projective measures were rejected because they lacked a logical link to either the standard or extended microeconomic models of demand. For respondents who already have children, over-again questions have less face validity as measures of demand than do how-many-more questions. It is interesting to consider whether this is a practical or theoretical problem. Palmore and Concepcion (in press) and Shah and Palmore (1979) used data from 11 WFS surveys to examine the consistency between over-again questions and the stated desire for additional children. For example, a respondent was considered consistent if her actual fertility was less than her over-again response and if she wanted more children. Only in Bangladesh and Panama were fewer than 80 percent of the respondents consistent. In Taiwan (Hermalin et al., 1979), consistency ranged from 87 to 90 percent. Palmore and Concepcion's explanation (in press:5) of the inconsistencies is in keeping with the previous discussion of face validity problems for over-again measures:

> Most of the inconsistent responses were from women whose ideal family sizes exceeded their actual but still wanted no more children. Presumably . . . some of these women were older or had other life circumstances (current economic problems, marital difficulties, and the like) which could lead to the realization that they did not want additional children now but, if they had life to live over again, would have wanted more.

Palmore and Concepcion (in press), Freedman et al., (1975), and Hermalin et al. (1979) all found how-many-more questions to be slightly better predictors of contraceptive use than whether or not actual fertility was greater or less than the individual's over-again response. Thus, both theory and data suggest that how-many-more formats are better than over-again questions as measures of

family-size desires.

One potential problem with the microeconomic model of demand, and a major reason why so little evidence refuting it was found, is that the model is so flexible. For any seemingly incongruous result, it is usually possible to suggest costs, benefits, or resource expectations that might have been considered by the respondent and that would make the data consistent with the model. Indeed, some researchers seem to take the position that the model is ipso facto correct, so that the empirical problem is simply to find the relevant costs, benefits, and resource constraints that people consider when making fertility decisions. A number of instances of the flexibility of the demand model were noted or suggested in this paper. For example, relatively low test-retest reliabilities were attributed to between-interview changes in respondent expectations about costs, income, and general economic conditions, or to flat utility functions in the neighborhood of the most desired family size. As another example, the failure of desired family size to increase in response to questions with the condition "what if your income were to double" was plausibly attributed to a change in the standard of living that the respondent believed she would be required to maintain if doubled income moved her to a higher socioeconomic group. Such potential attributions are easy to suggest in the absence of data. Thus, to examine fully the relationship between family-size desire measures and the microeconomic model of demand, additional research is clearly required to check the validity of these alternative explanations. For example, future studies of the test-retest reliability of family-size desire measures ought also to examine whether changes in other variables such as expected family resources, expected costs, and subjective values of children are consistent at the level of the individual with the observed changes in family-size desires. Similarly, attempts should be made to measure family-size utility functions to determine if indeed they are relatively flat for many respondents. Even with studies specifically designed to investigate alternative theoretical explanations, however, it is hard to imagine a single, critical study capable of demonstrating that measures of family-size desires can not be considered measures of demand. Thus, although the equivalence of the two constructs is far from proven, it is not unreasonable to treat measures of family-size desires as measures of demand.

APPENDICES

Appendix A: Gender Preferences

There are important reasons for considering gender preferences when discussing measures of family-size desires. For example, a woman who tells an interviewer that she would most like to have three children may really mean that she wants two boys and one girl. If her first three children are girls and she decides to have a fourth child, her behavior can not then be said to be inconsistent with her originally stated family-size desire. This appendix considers the relationship

of gende. preferences to family-size desires and fertility behavior within the context of the demand and conditional decision process models presented in earlier sections of this paper.

Gender is only one of many variable qualities or characteristics of children; others include strength, ability as a farm laborer, ability to support parents in their old age, intelligence, and health (Ben-Porath and Welch, 1972, 1976, 1980). Implicit in the concept of demand for a given quantity of some commodity is the assumption that one item substitutes perfectly for another of the same item. In the context of demand for children, this means that each child, regardless of its characteristics, should count equally in satisfying the family's demand for children. It is quite clear, however, that some variable characteristics of children are differentially valued by parents. If gender is such a characteristic, then children of the less valued gender might not satisfy the household's demand for children, and the desired family size might be adjusted upward. Differential valuation of child traits raises a critical problem in the microeconomic model of children as a consumption good because the household has much less control over the desired attributes of children than, say, those of consumer durables (Ben-Porath and Welch, 1972). In particular, parents currently have no effective control over gender (Rinehart, 1975), although they might be able to alter the probabilities slightly (Guerrero, 1974, 1975).

Various measures of gender desires can be examined in the context of the standard and extended models. Five different measures of gender desire are considered: parity progression ratios; over-again, ordering, and stopping rule questions; and projective measures. (For a more detailed consideration of these techniques, see McClelland [in press] and Williamson [1976].)

Parity Progression Ratios

One of the most popular ways of measuring of gender desires is the parity progression ratio method, in which progression ratios for either intended or actual fertility are examined as a function of existing family gender composition. For example, using data from the 1968-69 National Impact Survey in Pakistan, Khan and Sirageldin (1977) analyzed the desire for additional children as a function of the number of boys and girls in the current family while controlling for other factors thought to influence desire for more children (e.g., wife's age). They found that women with few boys were much more likely to want additional children. For example, the proportion intending to progress to a higher parity was only about 20 percent for women with four boys and no girls, but about 60 percent for those with no boys and four girls. Other studies analyzing intended parity progression ratios as a function of current gender composition include Cutright et al. (1974), Prachuabmoh et al. (1974), and Stinner and Mader (1975). Actual parity progression ratios conditional upon gender have been analyzed by Bumpass and Westoff (1970), Freedman and Coombs (1974), Knodel and De Vos (1980), Pakrasi and Halder (1971),

and Repetto (1972), among many others.

McClelland (1979a), however, argues that there are at least three important flaws in inferring gender preferences from intended or actual parity progression ratios. First, parity progression ratio measures must be based on aggregate data, so that any heterogeneity in gender preferences would mask the true impact of those preferences on fertility and intentions. As Ben-Porath and Welch (1980:397) note, ". . . even if the relationship [between gender preferences and behavior] were strong for individual couples, it would be blurred if there is variation across couples in the nature of sex bias." There is ample evidence that gender preferences are indeed heterogeneous (e.g., Coombs, 1976).

Second, according to the model of demand, preferences are only one component of gender desires. Even if children with different traits, including gender, are substitutable with respect to preference, those traits might still affect demand if children with them have differential costs (Ben-Porath and Welch, 1976, 1980, McClelland, 1979a, in press). For example, a child who is very ill as an infant but eventually recovers might be just as valued in the long run as a child who is always well, but the costs of caring for that child might lower the family's budget constraint line so that their total demand for children would also be lowered. For gender, examples of differential costs would be dowries for girls and the need to provide boys with a parcel of land at adulthood. Without controlling for all other components of demand, it is impossible to infer preferences for any child characteristic from aggregate data on fertility and fertility intentions. In particular, preferences can be inferred only if there are no differential costs. For example, if it were observed that families with at least one handicapped child had lower intended or actual parity progression ratios, it would not be reasonable to infer that handicapped children were preferred. In fact, this is the same logic used to infer gender preferences from parity progression ratios. In the handicapped case and quite possibly in the gender case, there are presumably differential costs that prevent couples from acting on their preferences. Thus Repetto (1972) speculated that the reason families with a higher proportion of sons were <u>more</u> likely to have additional children in Morocco and Bangladesh was that the greater productivity of the sons (i.e., they cost less) enabled the family to afford more children.

Third, uncertain fertility decisions involving child traits with differential costs or preferences may be affected as much by beliefs as by those costs and preferences. A couple with a handicapped child may fear that another child would also be handicapped, and so not wish to have any more children. Similarly, some couples whose children are all of one gender may believe that they can only produce that gender and so not wish to have any more children even though they are unhappy with their family's current gender composition (Goodman, 1961; Ben-Porath and Welch, 1976). McClelland and Hackenberg (1978) report for both the United States and the Philippines that the majority of their respondents had incorrect beliefs about how the probability of a boy on the next birth varies as a function of the existing gender

composition of the family. For example, in the Philippines, 78 percent believed in the "gamblers' fallacy"--the idea that the next birth would likely be a girl if existing children were predominantly boys. Further, those respondents whose preferences and subjective probabilities matched (e.g., respondents who wanted a girl and believed, based on the current family composition, that a girl was more likely for the next birth) were more likely to intend to have additional children than those whose preferences and subjective probabilities were opposing.

In summary, heterogeneous gender preferences, differential costs of children by gender, and incorrect beliefs about what determines gender can all act to dilute the observed effect of gender preferences on fertility behaviors and intentions. Because of these limitations, plus others discussed by De Tray (1980), it is possible for gender preferences to exist, to be quite strong, and to have major effects on fertility, and yet for parity progression ratios to show only minor differentials as a function of family gender composition.

There are many variations on the parity progression ratio technique, all of which use essentially the same logic as that questioned above. These include comparison of observed and expected unisex sibships (e.g., Rife and Snyder, 1937; Myers, 1949), comparison of the sex ratio of last borns to the overall sex ratio (e.g., Winston, 1931, 1932), and comparison of the length of birth intervals as a function of the gender of the preceding birth (e.g., Ben-Porath and Welch, 1976; De Tray, 1980; Westoff et al., 1961). The strengths and weaknesses of such measures are discussed in detail in McClelland (in press).

Over-Again Questions

Another common technique for measuring gender desires is to follow a standard over-again question with one asking the preferred gender composition for the respondent's desired family size. For example, the VOC studies (Arnold et al., 1975:170) asked, "Of these [number given in response to over-again question] children, how many boys and how many girls would you like, if you could have just what you want?" This technique has the same problems as all over-again questions, as discussed in the body of this paper. Also, without information as to whether gender-composition desires are a function of preferences or of beliefs about differential costs, it is impossible to predict on the basis of preferred gender composition what couples will do if they do not achieve that composition within their desired family size. Thus, the link between these measures of gender-composition desires and decision-making theory, including the concept of demand, is weak.

Ordering Measures

Partly in an attempt to overcome some of the limitations of over-again questions that ask only about the most desired gender composition,

Coombs et al. (1975) introduced ordering measures for both family-size and gender desires. Again, the advantages and disadvantages of ordering measures discussed in the body of this paper pertain here as well. One advantage of this approach is that it incorporates a model, based on conjoint measurement, that allows gender desires to be assessed independently of family-size desires, and vice-versa. Coombs et al. found that gender-composition desires could not be modeled either as an additive combination of a desire for boys and a desire for girls or as a preference for a minimum number of either gender. Rather, composition desires are an additive function of family-size desires and desires for gender differences (boys minus girls).[3]

Stopping Rules

McClelland (1979a) has suggested a stopping rule measure for gender preferences that considers explicitly the conditional nature of the decision process. Respondents are asked a series of questions such as, "If you already had 1 boy and 3 girls, would you want to have another child?" That is, respondents are asked a how-many-more question in the context of an explicitly stated condition--a given family gender composition. This procedure also accounts for the respondent's subjective probabilities, and permits determination of whether family-size desires are conditional upon gender composition. Using this measure, Widmer et al. (1981) found two effects of gender preferences on desired family size: some respondents adjust their desired family size upwards if the most desired gender composition is not achieved, while others adjust their desires downward when faced with a less than optimal gender composition. The existence of downward adjustments suggests that the effect of gender composition on desired family-size operates not only through preferences, but also through differential costs, as suggested above.

If family-size desires are conditional upon gender (or anything else, for that matter), then the correlation between a single prospective statement of desired or intended family size and actual fertility will be substantially less than perfect. Using a stopping rule measure, McClelland (1979b) found that, even if his respondents followed their intended stopping rules without deviation, only 66 percent of the sample would be expected to have exactly the number of children they most desire; because of the conditionality of family-size desires on gender, the maximum possible correlation between their first-choice family size and actual fertility would be 0.78. Considering that gender is undoubtedly only one of many factors upon which family-size desires are conditional, the correlations between desires and behavior reported in that paper seem about as high as can be expected.

Projective Measures

Finally, a variety of projective techniques have been used to assess gender preferences. For example, Williamson et al. (1976) asked college students to write autobiographies as if it were their eightieth birthday. They then coded these autobiographies for mentions of family size and gender composition. Another common method is to follow a question about ideal family size for a "typical" family or "a couple like yourselves" with a question asking how many of the children should be boys and how many girls (e.g., Pebley et al., 1980). Again, although these projective measures may serve other useful purposes, their link to the concept of demand is tenuous.

Appendix B: Levels and Trends of Desired Family Size and Gender Preferences

Numerous studies have reported data on desired family size and/or gender preferences; obviously, not all of those studies can be considered here. Instead, this section will focus on a few representative studies having a reasonable basis for comparability. This subset includes studies using the same or similar methods in either (a) comparable samples in different countries or (b) the same or comparable samples at different times within one country.

Cross-Country Comparisons

The most ambitious attempt to provide comparable data for desired family size and other fertility-related variables is the World Fertility Survey (WFS). Table B1 presents selected family-size desire and gender preference measures for 15 WFS countries (from United Nations, 1981). Results for five measures derived from over-again questions are listed: mean desired family size for respondents with no children and for respondents under age 20, mean number desired for the whole sample, sample mean standardized to a common age distribution across countries, and sample mean standardized to a common distribution of living children across countries. Among the many WFS measures, the first two listed in Table B1 come closest to representing prospective family-size desires. As was argued in this paper, prospective desires provide the greatest theoretical match between over-again responses and demand for children. The last two measures in the over-again category have been included to permit more meaningful comparisons across countries that vary in their age and parity distributions. Results from three measures derived from how-many-more or desire-for-more questions are also listed in Table B1: proportion of respondents with three children wanting no more, proportion of total respondents wanting no more, and estimated median family size at which 50 percent of the respondents want no more.

Two measures of gender-composition desires, based on parity progression ratios for how-many-more questions, are also listed in

TABLE B1 World Fertility Survey Data on Family Size and Gender Composition Desires, 15 Countries

Index and Sample	Country														
	Bangladesh	Colombia	Costa Rica	Dominican Republic	Fiji	Indonesia	Republic of Korea	Malaysia	Mexico	Nepal	Panama	Pakistan	Peru	Sri Lanka	Thailand
Mean desired family size, if starting over															
R's with no children	3.5	2.6	2.8	3.6	2.6	2.9	2.6	3.7	3.3	3.5	3.1	3.9	3.3	2.5	3.0
R's under age 20	3.7	2.7	u	3.4	u	3.3	2.8	3.9	3.8	3.6	u	4.1	3.1	2.6	2.9
All R's	4.1	4.1	4.7	4.8	4.2	4.2	3.2	4.4	4.5	4.0	4.3	4.2	3.8	3.8	3.7
All R's, age standardized	4.3	4.1	4.7	4.9	4.3	4.3	3.1	4.3	4.5	4.0	4.3	4.2	3.8	3.7	3.7
All R's, parity standardized	4.2	4.0	4.7	4.7	4.1	4.5	3.2	4.3	4.4	4.2	4.2	4.2	3.8	3.8	3.7
Proportion wanting no more children															
R's with 3 children	u	65%	59%	54%	49%	45%	86%	31%	53%	39%	73%	48%	62%	73%	64%
All R's	u	61%	52%	45%	50%	39%	72%	43%	57%	30%	63%	49%	61%	61%	57%
Median parity with 50% wanting no more	u	1.9	2.6	2.8	3.1	3.4	1.7	3.9	2.7	3.6	2.3	3.1	2.1	2.0	2.2
Parity progression ratios, R's with three living children (based on desire-for-more questions)[a]															
Son-desire ratio	u	1.0	1.2	1.7	2.3	0.9	2.0	4.4	1.0	4.2	1.3	6.4	1.0	1.6	1.4
Balance-desire ratio	u	6.0	5.2	2.4	2.1	5.9	4.3	2.7	4.8	1.4	1.9	1.5	7.9	1.8	2.0

Note: u indicates unavailable.

[a]Underscored parity progression ratios are for R's with three or more children; ratios with no underscore are for those with exactly three.

Source: United Nations (1981).

Table B1. Both pertain to women with three living children because progressions from family size three are more likely to show an effect of gender than are those from sizes one and two, while adequate tabulations and sample sizes are not available for family sizes larger than three. Son desires are assessed by the first ratio: (proportion of women with three boys and no girls who want no more children)/(proportion with no boys and three girls who want no more). For example, the ratio of 2.0 for Korea means that, of the women with three children, those with all boys were twice as likely as those with all girls to want no more children. The desire for balanced gender composition is assessed by the second ratio: (proportion of women with one boy and two girls who want to have a boy as their fourth child)/(proportion of women with two boys and one girl who want to have a boy as their fourth child). For example, the ratio of 6.0 for Columbia means that women with three children for whom another boy would produce perfect gender balance were six times as likely to prefer a boy for their next child as were those for whom a girl would produce perfect balance. It is theoretically possible for both a desire for sons and a desire for balance, as defined by these measures, to exist in a given population. Both measures should be interpreted with extreme caution. As suggested in the discussion of parity progression ratio measures in Appendix A, low ratios do not necessarily imply the absence of gender effects on family-size desires; although high ratios do imply the existence of such effects, they may seriously underestimate the true degree to which gender-composition desires influence fertility intentions. As a final caution, the two gender-composition ratios are not directly comparable because they are based on different portions of the samples; thus, for example, a larger value for the balance-desire ratio should not be taken as evidence that balance preferences have a greater effect than son preferences on fertility desires.

All of the family-size desire measures in Table B1 reveal a desire for large family sizes. Although the desires of women without children--those women who are most affected by current conditions and will have the most impact on population growth--are consistently less than those for the undivided samples, even their desired family sizes are far above replacement levels of fertility. Desire for sons has the greatest effect on desire for more children in Asian countries, except Indonesia; there is remarkably little effect for most of the Latin American countries. Although the son-desire and balance-desire ratios are independent theoretically, they are inversely related empirically, and the Latin American nations and Indonesia have both lower son-desire ratios and higher balance-desire ratios. However, balance desires are not unimportant even in those Asian countries with high son-desire ratios.

Additional cross-country comparisons come from the VOC studies, which used a common core questionnaire in each of six countries. The data provide two measures of desired family size: the total number of children now wanted (number of living children plus response to a how-many-more question) and desired family size as measured by an over-again question. Table B2 (from Table 3.2 of Arnold et al., 1975)

TABLE B2 Value of Children Studies Data on Children Now Wanted (from How-many-more Questions) and Desired Family Size (from Over-again Questions): Six Countries

Country and SES Group	Children Now Wanted		Desired Family Size	
	Mean	Standard Deviation	Mean	Standard Deviation
Korea				
Urban middle	2.8	0.8	2.7	0.7
Urban lower	3.0	1.0	2.9	0.9
Rural	4.1	1.2	3.4	1.1
Taiwan				
Urban middle	2.7	1.0	2.4	0.8
Urban lower	3.2	1.1	3.1	1.1
Rural	3.4	1.2	3.2	0.9
Japan				
Urban middle	3.0	1.4	3.1	1.0
Urban lower	2.7	1.1	3.2	1.4
Rural	2.6	0.9	2.9	0.8
U.S. (Hawaii)				
Japanese				
Urban middle	3.0	1.2	3.1	1.2
Urban lower	2.7	1.0	3.1	1.2
Caucasian				
Urban middle	2.7	1.2	2.7	1.2
Urban lower	3.3	1.5	3.0	1.2
Filipino				
Urban lower	3.6	1.6	3.4	1.4
Rural	3.7	1.5	3.8	1.4
Philippines				
Urban middle	3.8	1.6	3.7	1.4
Urban lower	3.9	1.7	3.7	1.6
Rural	4.4	1.7	4.3	1.4
Thailand				
Urban middle	3.0	1.2	2.9	1.1
Urban lower	3.4	1.5	3.1	1.6
Rural	3.8	1.5	3.4	1.6

Source: Arnold et al. (1975:Table 3.2).

presents means and standard deviations on these two ratios for the various countries and socioeconomic groups included in the VOC studies. In all countries and groups, mean demand, as represented by desired family size, is above replacement levels but well below what the natural supply of children would probably be. Considering the limited possible ranges of responses (zero to ten or so), the standard deviations are relatively large (greater than 1.0 in almost every instance and as high as 1.6), indicating considerable individual differences in desired family size even within countries and socioeconomic groups.

A final set of cross-country data comes from studies using the IN and IS indices introduced by Coombs et al. (1975). These indices have now been used in a number of countries, although the samples have sometimes not been as large or as representative as those for the WFS surveys reported above. The IN index measures desire for total family size, with larger IN values representing a bias toward larger family sizes; the IS index measures gender-composition desires, with larger IS values representing desire for an excess of boys. Table B3 presents the distributions of IN and IS for seven countries (Ahmed, 1981; Coombs, 1976, 1977; Coombs and Sun, 1978; Chang et al. 1981). As was the case with the VOC data, the heterogeneity within each country is striking, particularly with respect to family-size desires. The main consistency among the developing countries (the Philippines, Korea, Malaysia, Pakistan, Taiwan) is that there are very few instances of low IN values (i.e., very few respondents have a bias for small families). For gender preferences, there is much less consistency: while the distributions of IS values for Korea, Malaysia, Pakistan, and Taiwan show a strong desire for an excess of boys in the family composition, the distribution for the Philippines reveals a greater frequency of preference for girls and for balance than in any of the other countries, including the United States and Hungary.

Within-Country Comparisons

Time-series data on family-size desires within a single country provide information about trends in the demand for children. One of the best such time series, and the only one to be discussed here, is for Taiwan (Chang et al., 1981; Freedman et al., 1974; Sun et al., 1978). Table B4 presents selected measures identical or similar to those in Table B1 for six different surveys in Taiwan from 1965 to 1980; Table B3 lists levels of IN and IS for the three most recent surveys. The parity progression ratios listed in Table B4 are slightly different from those defined above for the WFS data. The first desire-for-sons ratio, based on respondents with two living children who want no more, is calculated as (proportion with two sons who want no more children)/(proportion with no sons who want no more); the second desire-for-sons ratio is the result of a similar calculation for respondents with three living children. The balance-desire ratio is defined as (proportion of respondents with two

TABLE B3 Percentage Distributions of Family Size and Gender Composition Indices IN and IS: Seven Countries

		Family Size Bias, IN							Gender Composition Bias, IS						
		Small						Large	Girl			Balance			Boy
Country	Year	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Philippines	1974	0	3	4	36	31	15	12	5	8	24	33	20	7	3
Republic of Korea	1974	0	1	3	33	39	20	4	0	1	0	4	41	49	5
Malaysia	1974	0	0	0	22	34	25	18	2	3	9	19	37	26	5
Hungary	1974	1	20	30	38	7	3	1	3	7	12	19	29	38	3
U.S.	1973	5	21	20	25	17	7	5	3	8	21	19	29	15	5
Pakistan	1975			3[a]	15	25	17	40			3[a]	5	18	39	36
Taiwan	1973	0	5	7	28	36	22	2	0	0	1	11	54	32	2
Taiwan	1976		5[b]	7	30	40	17[c]				2[a]	6	60	31	1
Taiwan	1980		9[b]	19	34	26	12[c]				2[a]	18	61	18	1

[a]Scores of 3 or less.
[b]Scores of 2 or less.
[c]Scores of 6 or more.

Sources: for the Philippines, Korea, Malaysia, and Hungary: Coombs (1976); for the U.S.: Coombs (1977); for Pakistan: Ahmed (1981); for Taiwan 1973: Coombs and Sun (1978); and for Taiwan 1976 and 1980: Chang, Freedman, and Sun (1981).

TABLE B4 Family Size and Gender Composition Desires, Taiwan, 1965-80

Index and Sample	Year 1965	1967	1970	1973	1976	1980
Mean desired family size, if starting over						
R's with no children	3.7	3.4	3.2	2.6	2.5	2.4
R's age 22-24	3.7	3.6	3.6	3.0	2.7	2.6
All R's	4.0	3.8	3.8	3.2	2.9	2.8
Proportion wanting no more children						
R's with 3 children	50%	55%	64%	81%	92%	93%
All R's	57%	56%	61%	70%	74%	73%
Median parity with 50% wanting no more	3.0	2.8	2.6	1.9	1.7	1.6
Parity progression ratios (based on desire-for-more questions)						
Son-desire ratio, R's at parity 2	2.4	3.9	7.4	2.2	1.3	2.0
Son-desire ratio, R's at parity 3	4.9	8.6	6.6	2.4	2.2	1.6
Balance-desire ratio	1.2	1.2	1.3	1.1	1.1	1.2

Source: Chang et al. (1981).

children of the opposite gender who want no more children)/(proportion of those with two children of the same gender who want no more). All of the cautions discussed above for parity progression ratios apply to these measures as well.

Most of the measures of family-size desires show a similar pattern over time: moderate decreases from 1965 to 1970, larger decreases from 1970 to 1976, and little or no change from 1976 to 1980. Interestingly, while over-again measures of desired family size appear to have leveled off, the IN index (see Table B3) shows a substantial shift towards a smaller family-size bias between 1976 and 1980. That means that, although the most-desired family size has not decreased recently, the second choice for many respondents has shifted from above to below the most-desired size. Future data from Taiwan could

provide an interesting comparison of the usefulness of the ordering-based measure and over-again measures of family-size desires because the former predicts that the fertility decline in Taiwan is likely to continue, while the latter predicts that it will level off.

Taiwanese gender-composition desires have also changed over time, although not to the same extent as family-size desires. For example, the proportion of respondents with IS6 and 7, or strong boy biases, dropped between 1973 and 1980, while the proportion with IS5, or moderate boy bias, rose slightly. However, the proportion with IS1 to 4, or balance and girl biases, remained under 20 percent throughout this period. Although the IN and IS indices provide independent measures of family-size and gender-composition desires, parity progression ratio measures of gender composition effects are not independent of changes in desired family size. The pattern shown by the two son-desire ratios between 1965 and 1980, an increase followed by a decrease, is probably a result of three factors. First, desires for large family sizes in the early surveys artificially depressed the son-desire ratios: virtually all respondents with two and three children, regardless of current family gender composition, wanted more children, forcing the ratio toward one. When this effect was weakened by changing family-size desires, the son-desire ratios increased. Second, desire for sons as measured by the IS index did decrease slightly in the period 1973 to 1980, and this decrease should also affect the ratio measures. Finally, in the latest surveys, desires for smaller family sizes have outweighed preferences for sons in determining intentions to have more children, thereby depressing the son-desire ratios. Similar reasons probably account for the constancy of the parity progression ratio measure of balance desires over the entire period from 1965 to 1980.

NOTES

1. The notation "VOC" will be used to refer to the seven volumes of the Value of Children study. These are listed in the references as Arnold et al. (1975), Arnold and Fawcett (1975), Bulatao (1975), Buripakdi (1977), Iritani (1979), Lee and Kim (1979), and Wu (1977). These references report on the first phase of the Value of Children project. A second phase using larger and more representative samples has been completed, with some results reported in Bulatao (1979a, 1979b, 1981) and Bulatao and Arnold (1977). However, the reports for the second phase have so far concentrated on relationships to actual fertility rather than family-size desires. Thus, except where noted, comments in the text about VOC studies pertain to the first-phase reports.
2. As Becker (1960) notes, "higher quality" is defined from the couple's perspective according to the amount of time and resources they invest in their children; the use of the term here does not connote a moral judgment that children with more education are of "higher quality."

3. Alternatively, the second factor could be modeled as a ratio (boys/total), as in Ben-Porath and Welch (1976, 1980).

BIBLIOGRAPHY

Ahmed, N. R. (1981) Family size and sex preferences among women in rural Bangladesh. Studies in Family Planning 12:100-109.

Arnold, F., and J. T. Fawcett (1975) The Value of Children: Hawaii, Vol. 3. Honolulu: East-West Population Institute.

Arnold, F., R. A. Bulatao, C. Buripakdi, B. C. Chung, J. T. Fawcett, T. Iritani, S. J. Lee, and T.-S. Wu (1975) Introduction and Comparative Analysis. The Value of Children: A Cross-National Study, Vol. 1. Honolulu: East-West Population Institute.

Aschenbrenner, K. M. (1981) Efficient sets, decision heuristics, and single-peaked preferences. Journal of Mathematical Psychology 23:227-256.

Bagozzi, R. P., and M. F. Van Loo (1978) Fertility as consumption: Theories from the behavioral sciences. Journal of Consumer Research 4:199-228.

Bagozzi, R. P., and M. F. Van Loo (1980) Decision-making and fertility: A theory of exchange in the family. In T. K. Burch, ed., Demographic Behavior: Interdisciplinary Perspectives on Decision-Making. Boulder, Colo.: Westview Press.

Balakrishna, S., and P. N. Reddy (1971) Preferred family size and composition: An application of the method of paired comparisons. Behavioral Sciences and Community Development 5:112-115.

Becker, G. S. (1960) An economic analysis of fertility. Pp. 209-231 in Universities-National Bureau of Economic Research, Demographic and Economic Change in Developed Countries. Princeton, N.J.: Princeton University Press.

Beckman, L. J. (1978) Couples' decision-making processes regarding fertility. In K. E. Taeuber, L. L. Bumpass, and J. A. Sweet, eds., Social Demography: Studies in Population. New York: Academic Press.

Beckman, L. J. (1979) Fertility preferences and social exchange theory. Journal of Applied Social Psychology 9:147-169.

Ben-Porath, Y., and F. Welch (1972) Chance, Child Traits, and Choice of Family Size. Report No. R1117-NIH-RF. Santa Monica, Calif.: Rand Corporation.

Ben-Porath, Y., and F. Welch (1976) Do sex preferences really matter? Quarterly Journal of Economics 90:285-307.

Ben-Porath, Y., and F. Welch (1980) On sex preferences and family size. Pp. 387-399 in J. L. Simon and J. DaVanzo, eds., Research in Population Economics, Vol 2. Greenwich, Conn.: JAI Press.

Blake, J., and J. H. Del Pinal (1979) Predictors of family size preferences, 1945-1977: A multivariate analysis. Social Biology 26:302-313.

Brackbill, Y. (1974) Test-retest reliability in population research. Studies in Family Planning 5:261-266.

Bulatao, R. A. (1975) The Value of Children: Philippines, Vol. 2. Honolulu: East-West Population Institute.

Bulatao, R. A. (1979a) On the Nature of the Transition in the Value of Children. Paper No. 60-A. Honolulu: East-West Population Institute.

Bulatao, R. A. (1979b) Further Evidence of the Transition in the Value of Children. Paper No. 60-B. Honolulu: East-West Population Institute.

Bulatao, R. A. (1981) Values and disvalues of children in successive childbearing decisions. Demography 18:1-25.

Bulatao, R. A., and F. Arnold (1977) Relationships between the value and cost of children and fertility: Cross-cultural evidence. In International Population Conference, Mexico 1977, Vol. 1. Liege: International Union for the Scientific Study of Population.

Bumpass, L., and C. F. Westoff (1969) The prediction of completed fertility. Demography 6:445-454.

Bumpass, L., and C. F. Westoff (1970) The Later Years of Childbearing. Princeton, N.J.: Princeton University Press.

Buripakdi, C. (1977) The Value of Children: Thailand, Vol. 4. Honolulu: East-West Population Institute.

CELADE and CFSC (1972) Fertility and Family Planning in Metropolitan Latin America. Chicago: University of Chicago Press.

Chang, M.-C., R. Freedman, and T.-H. Sun (1981) Trends in fertility, family size preferences, and family planning practice: Taiwan, 1961-80. Studies in Family Planning 12:211-228.

Coombs, C. H., and G. S. Avrunin (1977) Single-peaked functions and the theory of preference. Psychological Review 84:216-230.

Coombs, C. H., L. C. Coombs, and G. H. McClelland (1975) Preference scales for number and sex of children. Population Studies 29:273-298.

Coombs, L. C. (1974) The measurement of family size preferences and subsequent fertility. Demography 11:587-611.

Coombs, L. C. (1976) Are Cross-Cultural Preference Comparisons Possible? Paper No. 5. Leige: International Union for the Scientific Study of Population.

Coombs, L. C. (1977) Preferences for sex of children among U.S. couples. Family Planning Perspectives 9:259-265.

Coombs, L. C. (1979) Prospective fertility and underlying preferences: A longitudinal study in Taiwan. Population Studies 33:447-455.

Coombs, L. C., and D. Fernandez (1978) Husband-wife agreement about reproductive goals. Demography 15:57-73.

Coombs, L. C., and T.-H. Sun (1978) Family composition preferences in a developing culture: The case of Taiwan, 1973. Population Studies 32:43-64.

Coxon, A. P. M. (1974) The mapping of family-composition preferences: A scaling analysis. Social Science Research 3:191-210.

Crook, N. R. (1978) On social norms and fertility decline. Journal of Development Studies 14:198-210.

Cutright, P., S. Belt, and J. Scanzoni (1974) Gender preferences, sex predetermination, and family size in the United States. Social Biology 21:242-248.

De Tray, D. (1980) Son Preference in Pakistan: An Analysis of Intentions versus Behavior. Report P-6504. Santa Monica, Calif.: Rand Corporation.

Downs, P. E. (1977) Intrafamily decision making in family planning. Journal of Business Research 5:63-74.

Easterlin, R. A. (1973) Relative economic status and the American fertility swing. In E. Sheldon, ed., Family Economic Behavior. Philadelphia: J. B. Lippincott.

Easterlin, R. A. (1975) An economic framework for fertility analysis. Studies in Family Planning 6:54-63.

Easterlin, R. A. (1978) The economics and sociology of fertility: A synthesis. In C. Tilly, ed., Historical Studies of Changing Fertility. Princeton, N.J.: Princeton University Press.

Espenshade, T. J. (1977) The taste for children. Family Planning Perspectives 9:40-47.

Farooq, G. M., I. I. Ekanem, and M. A. Ojelade (1977) Family Size Preferences and Fertility in South-Western Nigeria. Population and Employment Working Paper No. 54. Geneva: International Labour Office.

Fishbein, M. (1980) A theory of reasoned action: Some applications and implications. In M. M. Page, ed., Nebraska Symposium on Motivation 1979: Beliefs, Attitudes, and Values. Lincoln, Neb.: University of Nebraska Press.

Freedman, D. S., and L. C. Coombs (1966a) Economic considerations in family growth decisions. Population Studies 20:197-222.

Freedman, D. S., and L. C. Coombs (1966b) Childspacing and family economic position. American Sociological Review 31:631-648.

Freedman, R., and L. C. Coombs (1974) Cross-Cultural Comparisons: Data on Two Factors in Fertility Behavior. New York: Population Council.

Freedman, R., and J. Y. Takeshita (1969) Family Planning in Taiwan. Princeton, N.J.: Princeton University Press.

Freedman, R., L. C. Coombs, M.-C. Chang, and T.-H. Sun (1974) Trends in fertility, family size preferences, and practice of family planning: Taiwan 1965-73. Studies in Family Planning 5:270-288.

Freedman, R., A. I. Hermalin, and M.-C. Chang (1975) Do statements about desired family size predict fertility? The Case of Taiwan, 1967-70. Demography 12:407-416.

Freedman, R., D. S. Freedman, and A. D. Thornton (1980) Changes in fertility expectations and preferences between 1962 and 1977: Their relation to final parity. Demography 17:365-378.

Goldberg, D., and C. H. Coombs (1963) Some applications of unfolding theory to fertility analysis. Pp. 105-129 in Emerging Techniques in Population Research. Proceedings of the 1961 Annual Conference. New York: Milbank Memorial Fund.

Goodman, L. A. (1961) Some possible effects of birth control on the human sex ratio. Annals of Human Genetics 25:75-81.

Guerrero, R. (1974) Association of the type and time of insemination within the menstrual cycle with human sex ratio at birth. New England Journal of Medicine 291:1056-1059.

Guerrero, R. (1975) Type and time of insemination within the menstrual cycle and the human sex ratio. Studies in Family Planning 6:367.

Hermalin, A. I., R. Freedman, T.-H. Sun, and M.-C. Chang (1979) Do intentions predict fertility: Experience in Taiwan, 1967-1974. Studies in Family Planning 10:75-95.

Hollerbach, P. E. (1980) Power in families, communication and fertility decision-making. Population and Environment 3:146-173.

Iritani, T. (1979) The Value of Children: Japan, Vol. 6. Honolulu: East-West Population Institute.

Jejeebhoy, S. J. (1981) Cohort consistency in family size preferences: Taiwan, 1965-73. Studies in Family Planning 12:229-232.

Kar, S. B. (1978) Consistency between fertility attitudes and behavior: A conceptual model. Population Studies 32:173-186.

Khan, M. A., and I. Sirageldin (1977) Son preference and the demand for additional children in Pakistan. Demography 14:481-496.

Kiesler, S. B. (1977) Post hoc justification of family size. Sociometry 40:59-67.

Knodel, J., and S. De Vos (1980) Preferences for the sex of offspring and demographic behavior in eighteenth- and nineteenth-century Germany: An examination of evidence from village genealogies. Journal of Family History 5:145-164.

Knodel, J., and S. Piampiti (1977) Response reliability in a longitudinal survey in Thailand. Studies in Family Planning 8:55-66.

Knodel, J., and V. Prachuabmoh (1973) Desired family size in Thailand: Are the responses meaningful? Demography 10:619-637.

Knodel, J., and V. Prachuabmoh (1976) Preferences for sex of children in Thailand: A comparison of husbands' and wives' attitudes. Studies in Family Planning 7:137-143.

Koch, G. G., J. R. Abernathy, and P. B. Imrey (1975) On a method for studying family size preferences. Demography 12:57-66.

Kruegel, D. L. (1975) Validity of retrospective reports of unwanted births in the United States: Effects of preference for children of a given sex. Studies in Family Planning 6:345-348.

Kyriazis, N. (1979) Sequential fertility decision making: Catholics and Protestants in Canada. Canadian Review of Sociology 16:275-286.

Lee, R. D. (1980) Aiming at a moving target: Period fertility and changing reproductive goals. Population Studies 34:205-226.

Lee, S. J., and J.-O. Kim (1979) The Value of Children: Korea, Vol. 7. Honolulu: East-West Population Institute.

Leibenstein, H. (1974) The economic theory of fertility: Promising path or blind alley? Journal of Economic Literature 12:457-479.

Lucas, D., and A. Ukaegbu (1977) Other limits of acceptable family size in Southern Nigeria. Journal of Biosocial Science 9:73-81.

MacDonald, A. L., P. M. Simpson, and A. M. Whitfield (1978) An Assessment of the Reliability of the Indonesia Fertility Survey Data. WFS Scientific Reports, No. 3. London: World Fertility Survey.

McClelland, G. H. (1979a) Determining the impact of sex preferences on fertility: A consideration of parity progression ratio, dominance, and stopping rule measures. Demography 16:377-388.

McClelland, G. H. (1979b) Theoretical and methodological implications of the influence of sex preferences on the fertility attitude-behavior relationship. Journal of Population 2:224-234.

McClelland, G. H. (1980) A psychological and measurement theory approach to fertility decision-making. In T. K. Burch, ed., Demographic Behavior: Interdisciplinary Perspectives on Decision-Making. Boulder, Colo.: Westview Press.

McClelland, G. H. (in press) Measuring sex preferences and their effects. In N. G. Bennett, ed., Sex Selection of Children. New York: Academic Press.

McClelland, G. H., and B. H. Hackenberg (1978) Subjective probabilities for sex of next child: U.S. college students and Philippine villagers. Journal of Population 1:132-147.

Mishler, E., and C. F. Westoff (1955) A proposal for research on social-psychological factors affecting fertility: Concepts and hypotheses. In Current Research in Human Fertility. New York: Milbank Memorial Fund.

Morgan, R. (1972) Family planning acceptors in Lagos, Nigeria. Studies in Family Planning 3:221-226.

Mukherjee, B. N. (1975) Reliability estimates of some survey data on family planning. Population Studies 29:127-142.

Myers, G. C., and J. M. Roberts (1968) A technique for measuring preferential family size and composition. Eugenic Quarterly 15:164-172.

Myers, R. J. (1949) Same-sex families. Journal of Heredity 40:268-270.

Nair, N. K., and L. P. Chow (1980) Fertility intentions and behavior: Some findings from Taiwan. Studies in Family Planning 11:255-263.

Namboodiri, N. K. (1972) Some observations on the economic framework for fertility analysis. Population Studies 26:185-206.

Namboodiri, N. K. (1979) Comments on fertility as consumption: Theories from the behavioral sciences. Journal of Consumer Research 5:290-292.

Namboodiri, N. K. (1980) A look at fertility model-building from different perspectives. In T. K. Burch, ed., Demographic Behavior: Interdisciplinary Perspectives on Decision-Making. Boulder, Colo.: Westview Press.

Pakrasi, K., and A. Halder (1971) Sex ratios and sex sequences of births in India. Journal of Biosocial Science 3:377-387.

Palmore, J. A., and M. B. Concepcion (1981) Desired family size and contraceptive use: An 11-country comparison. International Family Planning Perspectives 7:37-40.

Palmore, J. A., and M. B. Concepcion (in press) Desired family size and contraceptive use. In D. Whitelegge and J. Casterline, eds., Record of the Proceedings of the World Fertility Survey Conference, London. London: World Fertility Survey.

Pebley, A. R., H. Delgado, and E. Brineman (1980) Family sex composition preferences among Guatemalan men and women. Journal of Marriage and the Family 42:437-447.

Prachuabmoh, V., J. Knodel, and J. O. Alers (1974) Preference for sons, desire for additional children, and family planning in Thailand. Journal of Marriage and the Family 36:601-614.

Pullum, T. W. (1980) Illustrative Analysis: Fertility Preferences in Sri Lanka. WFS Scientific Reports, No. 9. London: World Fertility Survey.

Pullum, T. W. (1981) Adjusting stated fertility preferences for the effect of actual family size, with application to World Fertility Survey data. In G. E. Hendershot and P. J. Placek, eds., Predicting Fertility: Demographic Studies of Birth Expectations. Lexington, Mass.: Lexington Books.

Razin, A. (1980) Number, spacing and quality of children: A microeconomic viewpoint. Research in Population Economics 2:279-293.

Repetto, R. (1972) Son preference and fertility behavior in developing countries. Studies in Family Planning 3:70-76.

Rife, D. C., and L. H. Snyder (1937) The distribution of sex ratios within families in an Ohio city. Human Biology 9:99-103.

Rinehart, W. (1975) Sex preselection: Not yet practical. Population Reports, Series I, Number 2.

Robinson, W. C., and S. F. Harbison (1980) Toward a unified theory of fertility. In T. K. Burch, ed., Demographic Behavior: Interdisciplinary Perspectives on Decision-Making. Boulder, Colo.: Westview Press.

Rodgers, J. L., and F. W. Young (1981) Successive unfolding of family preferences. Applied Psychological Measurement 5:51-62.

Rosenzweig, M. R. (1976) Female work experience, employment status, and birth expectations: Sequential decision making in the Philippines. Demography 13:339-356.

Ryder, N. B. (1981) Changes in parity orientation from 1970 to 1975. In G. E. Hendershot and P. J. Placek, eds., Predicting Fertility: Demographic Studies of Birth Expectations. Lexington, Mass.: Lexington Books.

Ryder, N. B., and C. F. Westoff (1969) Relationships among Intended, Expected, Desired and Ideal Family Size: United States, 1965. Occasional Publication of the Center for Population Research. Bethesda, Md.: National Institute of Child Health and Human Development.

Scrimshaw, S. C. M. (1978) Infant mortality and behavior in the regulation of family size. Population and Development Review 4:383-403.

Shah, N. M., and J. A. Palmore (1979) Desired family size and contraceptive use in Pakistan. International Family Planning Perspectives 5:143.

Srinivasan, K., P. H. Reddy, and K. N. M. Raju (1978) From one generation to the next: Changes in fertility, family size preferences, and family planning in an Indian state between 1951 and 1975. Studies in Family Planning 9:258-271.

Stinner, W. F., and P. D. Mader (1975) Sons, daughters or both? An analysis of family sex composition preferences in the Philippines. Demography 12:67-79.

Sun, T.-H., H.-S. Lin, and R. Freedman (1978) Trends in fertility, family size preferences, and family planning practice: Taiwan, 1961-76. Studies in Family Planning 9:54-70.

Terhune, K. W., and S. Kaufman (1973) The family size utility function. Demography 10:599-618.

United Nations, Population Division (1981) Selected factors affecting fertility and fertility preferences in developing countries. Pp. 141-227 in World Fertility Survey Conference 1980, Vol. 2. London: World Fertility Survey.

Vinokur-Kaplan, D. (1977) Family planning decision-making: A comparison and analysis of parents' considerations. Journal of Comparative Family Studies 8:79-98.

Ware, H. (1974) Ideal Family Size. WFS Occasional Papers, No. 13. London: World Fertility Survey.

Westoff, C. F. (1981) Unwanted fertility in six developing countries. International Family Planning Perspective 7:43-52.

Westoff, C. F., and N. B. Ryder (1977) The predictive validity of reproductive intentions. Demography 14:431-454.

Westoff, C. F., E. Mishler, and E. L. Kelley (1957) Preferences in size of family and eventual fertility twenty years after. American Journal of Sociology 62:491-497.

Westoff, C. F., R. G. Potter, P. C. Sagi, and E. Mishler (1961) In Family Growth in Metropolitan America. Princeton, N.J.: Princeton University Press.

Widmer, K. R., G. H. McClelland, and C. A. Nickerson (1981) Determining the impact of sex preferences on fertility: A demonstration study. Demography 18:27-37.

Williamson, N. E. (1976) Sons or Daughters: A Cross-Cultural Survey of Parental Preferences. Beverly Hills, Calif.: Sage Publications.

Williamson, N. E., S. L. Putnam, and H. R. Wurthmann (1976) Future Autobiographies: Expectations of Marriage, Children, and Careers. Honolulu: East-West Population Institute.

Willis, R. J. (1973) A new approach to the economic theory of fertility behavior. Journal of Political Economy, Supplement, S14-S69.

Wind, Y. (1976) Preference of relevant others and individual choice models. Journal of Consumer Research 3:50-57.

Winston, S. (1931) The influence of social factors upon the sex ratio at birth. American Journal of Sociology 38:225-231.

Winston, S. (1932) Birth control and sex ratio at birth. American Journal of Sociology 37:1-21.

Wu, T. S. (1977) The Value of Children: Taiwan, Vol. 5. Honolulu: East-West Population Institute.

Chapter 10

CORRELATES OF FAMILY-SIZE DESIRES

Thomas W. Pullum

INTRODUCTION

This paper examines the correlates of family-size desires. In approaching this topic, it is necessary to address a number of methodological issues.

First, the demand for children can be measured in several ways: as a generalized ideal (e.g., "for a woman in this village"), as a projected ideal (e.g., "for your daughter"), or as a personal ideal. The focus of the present paper is the latter since it generally has the greatest variability and strongest association with individual characteristics. Demand will also be expressed as desire for additional children, conditional upon current family size.

Second, where unwanted births and infertility are relatively rare, the determinants of actual fertility will closely parallel those of fertility preferences.[1] This fact is, of course, a major justification for the study of fertility preferences. It also means that, in a more developed country, differences in actual fertility can be interpreted as reflecting differences in preferences even when the latter have not been assessed directly (as in Hout, 1978). The present paper does not rely on such extrapolations, which are less appropriate in developing countries, but focuses only on explicit measures of fertility desires.[2]

Third, the present discussion will concentrate on the family-size desires and related characteristics of women, simply because responses are most commonly collected for women only. This focus can, of course, be misleading. Several studies in developing countries (Knodel and Prachuabmoh, 1976; Khan and Sirageldin, 1977; Coombs and Fernandez, 1978) have shown that the responses of husbands and wives frequently differ when both are interviewed. When only the wife is interviewed, she may speak for herself alone; however, she may also consciously or subconsciously modify her response to reflect her husband's preference. In the latter case, moreover, she may have only a general notion of her husband's preferences; it is common in a traditional setting for couples never to have explicitly discussed their family-size desires. Furthermore, in some contexts, the preference of third parties, such as the woman's mother or mother-in-law, may be influential. Thus perhaps the greatest single

weakness in the available data is an incongruence between those sampled and those responsible for reproductive decision making. This has hampered efforts to validate the responses by comparing them with later behavior; it has also reduced their predictive value, even if they are assumed valid for the respondent herself.

A fourth methodological consideration is that a stated family-size preference simply indicates the number with the highest relative utility for the respondent (Terhune and Kaufman, 1973). The adjacent alternatives, although less preferred, may also be acceptable; the researcher's focus on a single number as the ideal may therefore fail to reflect a weakness in that stated preference. In turn, this weakness may mean that the response is more strongly influenced by nonsystematic factors that weaken the association with other characteristics and reduce the stability of the response over time. This notion of a relative utility function is implicit in a number of theoretical models (e.g., Namboodiri, 1972) and measurement procedures (e.g., Myers and Roberts, 1968; Coombs, 1974).

Several social psychologists have further elaborated on the concept of an underlying distribution of utilities or preferences at the micro level. One of these efforts, the Value of Children (VOC) approach, attempts to identify perceptions of specific costs and benefits of children (Fawcett, in these volumes). Another approach (Davidson and Jaccard, 1975) involves estimating the Subjective Expected Utilities (SEU) of positive or negative outcomes resulting from the hypothetical birth of another child.

As a final consideration, family-size desire is simply one of a large set of related attitudes that makes up one's preferred role in life. Educational, career, and residential preferences have seldom been incorporated into the analysis of family-size desires, yet they could help in gauging the strength of other associations.

In this regard, three observations may be made immediately. First, family-size desires probably share many of the same determinants as these other kinds of preferences; examples include the parallel characteristics of the respondent's parents (such as family size); level of education; and other socializing influences, including the preferences of peers. Second, there will tend to be some consistency between different types of aspirations and preferences. Thus, for example, if a woman prefers to marry late or never, or if she aspires toward a demanding career which she believes to be incompatible with the maternal role, she will desire few or no children. A third implication of regarding family-size desires as simply one among a large set of preferences is that they are then subject to modification, even apart from the effects of changing norms and costs and benefits of children (see Lee, 1980; Ward and Butz, 1980). For example, unanticipated housing costs may prevent the acquisition of a house large enough to accommodate the family size originally desired, or marital discord may raise a fear of divorce. Conversely, the desired family size may rise if the sex composition of children already born is highly unbalanced, or if the woman finds it easier to combine a career with a family than she had previously believed.

Given these methodological considerations, the discussion below focuses on four primary correlates of family-size desires: life-cycle factors, gender preferences, the knowledge and use of family planning, and socioeconomic factors. This discussion is followed by a set of propositions summarizing the major points raised.

LIFE-CYCLE FACTORS

Increasing attention has been focused recently on how fertility preferences change over the life cycle, although as yet, few empirical studies have emphasized this correlation (see Namboodiri, in these volumes; Bulatao, 1975; Pullum, 1980). Some support for such a point of view is provided by the fact that stated ideal family size sometimes shows a strong positive correlation with actual family size. This association has one of two possible explanations. First, where preferences are successfully implemented, women who initially desired a large family will eventually have one, and so on. Second, where implementation is poor, women may tend to rationalize an actual large family by reporting it as their preference. This rationalization can take place long before the family has been completed. In Sri Lanka's 1975 version of the World Fertility Survey (Pullum, 1980), more than half of the variation in desired family size was due to actual family size, and the limited use of family planning in Sri Lanka suggests rationalization as the source. It should be emphasized that this association is found where neither spacing nor strategies for achieving target family sizes are used effectively.

Various strategies are available to control for this bias and estimate what the responses would be in the absence of such rationalization, i.e., if preferences could be implemented. One of the most attractive of these strategies is to focus on women with low marital durations, who are all at the same early stage of family-building. There is a price to be paid, however, for controlling actual family size in an effort to remove the rationalization effect. If preferences are being implemented at all, then a statistical control will act in part as a control for the associated characteristics, such as education, which affect actual fertility. Hence the measured impact of those variables upon desired family size will be biased toward zero, that is, underestimated. It may be noted that there is a similar risk if age or marital duration is controlled instead, because of their strong correlation with actual family size.

Several aspects of family composition, classed as life-cycle factors because of their transitory character, can affect family-size desires. One of these--the sex composition of children already born--is discussed in detail below. Other examples include the ages and spacing of children already born. Pullum (1980) found that in Sri Lanka, the age of the youngest child had a significant negative effect upon the desire for another child, regardless of whether the woman had been using contraception. The age of the youngest child, which is equivalent to the length of the open interval, may be a proxy measure

of subfecundity, or the finding may be partly due to selectivity: women who want another child will tend to have converted the open interval to a closed interval. However, regardless of the reason, the association is significant and suggests that other dimensions of family composition, such as average spacing, may have some impact.

Other life-cycle factors, such as age at marriage, marital duration, and current age, appear to have negative effects on desired family size, once actual family size has been controlled. However, a number of questions remain about the mechanisms behind these effects in developing countries. For example, is there a selection process whereby women who marry early tend to prefer larger families? Controlling for parity, does the desire for an additional child tend to decline as the woman approaches the end of her reproductive span because she does not wish to raise a child when older, or because her older children have entered reproductive age?

Although other life-cycle factors may affect fertility desires, they have apparently not been studied in developing countries. For example, the idea that fertility preferences start being formulated several years before marriage is one basis for population education programs in public schools; however, it is not clear that premarital preferences actually predict later preferences. Similarly, it is not known whether number of siblings or family satisfaction as a child predicts later family formation. The effect of the quality of the marital relationship has likewise not been studied. For example, in cultures with frequent serial monogamy, the dynamics of the desire for another child within each union are not clear, except by inference from actual fertility behavior.

Although incompletely documented, the effects of life-cycle factors on evolving family-size desires are clearly significant. Moreover, these factors are statistically associated with other determinants of fertility preferences, and thus must be addressed if those determinants are to be properly assessed.

GENDER PREFERENCES

Much of the research on family-size desires has focused on preferences for certain combinations of sons and daughters. Williamson (1976) reviewed the reasons why a preference for sons could be expected in most traditional economies. Simultaneous studies of number and sex preferences carried out by Stinner and Mader (1975b) for the Philippines and by Coombs and Sun (1978) for Taiwan support this expectation. This preference can be indicated by asking respondents at specified family compositions whether they would prefer a boy or a girl as their next child, or are indifferent. These responses should be examined as a set; the proportion indifferent, when included as in the World Fertility Survey, is often substantial (see Pullum, 1980, regarding Sri Lanka).

Because gender preferences cannot be implemented, they involve the respondent in even more abstraction than do standard questions on number preference. In fact, the actual impact of gender preference

may appear as a stated preference for additional children of unspecified gender, given the respondent's current family composition. It is generally assumed that a couple whose family has a less-preferred sex composition will be more likely to want another child. With appropriate data, one should then be able to determine whether the couple's gender preferences were implemented, and hence how many births can be attributed to these preferences.[3]

A comparative analysis of the first 15 countries to participate in the World Fertility Survey was recently prepared by the United Nations Population Division (1981). One topic focused upon was the desire to have additional children as a function of current family sex composition. Table 1 presents the results for women with two children. Two columns have been appended to the table to indicate (a) apparent preference for sons over daughters and (b) apparent preference for balance over imbalance. Using the symbols defined in

TABLE 1 Percentage of Women with Two Children Who Do Not Want Another Child, by Current Sex Composition

	Current Sex Composition			Summary Scores	
Country	Two Daughters (x)	One Son, One Daughter (y)	Two Sons (z)	Son Preference (z-x)	Desire for Balance (y-[x+z]/2)
Korea, Rep. of	36	71	77	41	15
Pakistan	12	35	44	32	7
Nepal	10	27	33	23	6
Bangladesh	50	67	69	19	8
Thailand	33	51	42	9	14
Fiji	23	36	30	7	10
Mexico	32	41	37	5	6
Colombia	45	53	49	4	6
Sri Lanka	39	60	41	2	20
Malaysia	15	25	17	2	9
Panama	34	49	34	0	15
Dominican Rep.	30	22	28	-2	-7
Peru	46	50	42	-4	6
Costa Rica	38	35	32	-6	0
Indonesia	32	35	18	-14	10

Note: Table applies to currently married fecund nonpregnant women only.

Source: United Nations (1981), reprinted by permission; based on WFS First Country Reports.

the table, (a) can be measured as z-x. A positive value of this difference indicates a preference for sons, that is, a greater desire to move out of an all-girl than an all-boy composition. The measure for (b) is y-(x+z)/2. This value will be positive when there is a preference for balance, that is, when there is a greater desire to move out of a balanced than an unbalanced composition.

Among the 15 countries, substantial proportions of women at all two-child compositions want another child. However, a stated desire to stop is generally more common among women with two sons than those with two daughters. Even in countries showing a reversal of this pattern, that is, a negative value of z-x, the difference is relatively small. Son preference appears strong in Bangladesh, Nepal, Korea, and Pakistan, all of which are Asian; daughter preference is suggested for Peru, Costa Rica, the Dominican Republic, and Panama, all of which are Latin American. (Daughter preference appears in Indonesia only at family size two and should probably be disregarded.) Balance is even more generally preferred. The only exceptions are Costa Rica and the Dominican Republic; otherwise, women with an unbalanced composition are 6 to 20 percent more likely to want another child than those with one son and one daughter. These observations for women with two living children would require modification for other family sizes; some countries, such as Indonesia, show substantial variations across family sizes.

One area requiring further research is the importance of gender preference in comparison to such other correlates of the desire for another child as current family size, as well as other psychological, economic, and social characteristics. Thus far, very few researchers have taken an integrated view of this sort. A notable exception is the study by Khan and Sirageldin (1977) of son preference in Pakistan. Using a probit transformation of the (dichotomous) desire for another child as the dependent variable, this study performed a regression analysis on life-cycle factors (wife's age and age at marriage , current family size and sex composition, and socioeconomic variables (income adequacy and urban-rural residence). The results suggested that the number of sons already born was a far better predictor than any other variable, including total number of children. A somewhat different (nonlinear) representation of family composition will be desirable in settings where balance is more important than son preference.

The Khan and Sirageldin analysis does leave some questions unanswered. For example, it is probable that son preference in Pakistan and elsewhere varies according to other characteristics, such as type or place of residence. If so, interaction terms should be included to represent the combination of these factors. Comparable cross-national analyses of gender preference would have great value.

KNOWLEDGE AND USE OF FAMILY PLANNING

The relationship between knowledge and use of family planning and family-size desires is particularly difficult to establish with

cross-sectional data from developing countries. For example, a preference for no additional children may have been adopted long before a stated preference was elicited, and this earlier preference may have led the respondent to seek out information on family planning. Alternatively, the woman may have learned about contraception first, and this knowledge may have resulted in her desire to use it. There is general evidence that when contraception is unknown or unavailable, family-size preferences will either have low salience or remain unformulated. Because knowledge of and access to family planning are usually differentially distributed across the socioeconomic spectrum, variability in family-size desires may be simply a transitory reflection of that distribution. Thus, to estimate the differentials in actual fertility that would result if preferences could be successfully implemented, it may be necessary to control for variations in the supply of contraception. Apparently, such a control has not been incorporated in any of the empirical research on developing countries. Although this omission does not invalidate an analysis, it does represent a fundamental conceptual issue since it can cause a confounding of the components of supply and demand.

SOCIOECONOMIC FACTORS

As noted above, data on family-size desires, as opposed to those on actual fertility, are often difficult to find. This observation applies to the socioeconomic correlates of fertility preferences: most studies of socioeconomic influences on fertility focus on actual rather than desired fertility; only the more psychological studies have used direct measures of fertility desires. Because the present discussion is concerned only with the latter type of data, the empirical sources included are limited to a number of surveys conducted in developing countries since about 1970, with emphasis on the World Fertility Survey (WFS).[4]

Cho (1978) used WFS reports to determine the differentials in family-size preferences among women with various levels of education in five Asian countries--Korea, Malaysia, Nepal, Pakistan, and Thailand. In Thailand, more-educated women in all age groups, though especially those 25-34, tended to want more children than they already had; Korea and Malaysia (but not Nepal and Pakistan) showed a similar pattern. This pattern appears contrary to the commonly encountered negative association between education and fertility. However, it may result from the absence of a control for actual family size or marital duration. In all of these countries, there is a sharp negative gradient between actual family size (or marital duration) and the desire for more children, and women with less education tend to have larger families already than those with more. Within specific family sizes, the pattern might therefore be much different.

As a part of a larger inquiry, Knodel and Prachuabmoh (1973) used a 1969-70 survey in Thailand to determine urban-rural differences in fertility desires. Respondents were asked how many children they

would want altogether if they had just recently married and could have their choice. This number tended to decline from rural to urban areas: its mean was 3.94 in rural areas, 3.57 in the most urban areas (Bangkok-Thonburi), and intermediate, 3.83, in the less urban areas. The same pattern was found within most five-year age groups. It should be noted that, although they wanted smaller families, the urban women were somewhat less likely than the rural to give a desired size less than their actual family size (21 percent vs. 29 percent). In addition, the desired means were not adjusted for actual fertility, which also was negatively related to urbanization.

The Cho and Knodel and Prachuabmoh studies are useful; however, like nearly all of the work on this topic, they scarcely go beyond simple bivariate relationships. Both use an age control, but neither confronts such issues as simultaneity between actual and desired family size and differences between cohorts in their distributions on other covariates. Thus although such studies can help evaluate the unmet need for contraception (Westoff, 1978), they cannot suggest what the level of fertility would be if that need were met, nor can they establish which variables are causally related to family-size desires.

The determinants of stated fertility preferences in Sri Lanka were recently studied using WFS data (Pullum, 1980). Two findings are prominent regardless of the measure of desired fertility employed. First, after controlling for current family size and other life-cycle variables, the statistical importance of measured socioeconomic variables is small. Although differences between category means are substantial for some variables, within-category differences are so large that a given variable rarely increases the total variance explained by more than 2 percent. In the heterogeneous culture of Sri Lanka, one would have anticipated a larger degree of difference. Second, among the socioeconomic variables, the largest effects were generally observed for region of residence (six regions) and religion (Buddhist, Hindu, Muslim, Christian); ethnicity, which in Sri Lanka is very strongly associated with religion, was somewhat less predictive than religion. Even for the youngest marriage cohorts, these ascriptive variables had a greater effect than such variables as husband's occupation and education that are more associated with modernism and more subject to policy manipulation. An exception to this generalization was found for the desire to continue childbearing among women with exactly two children. For this group, the woman's pattern of work and her husband's occupation were the most important socioeconomic predictors; however, they were again far less important than the life-cycle variables.

Among the various country reports within the cross-national Value of Children (VOC) study of the early 1970s (see Fawcett, in these volumes), the most complete discussion of the correlates of family-size desires is given by Bulatao (1975) for the Philippines. Table 2 presents the standardized coefficients from a regression analysis of the relationship between number of additional children desired and parity, life-cycle, socioeconomic, and VOC variables. As in Pullum's Sri Lanka analysis, the most important predictors are parity, marital duration and age, and gender preference. For the

TABLE 2 Standardized Regression Coefficients in Prediction of Number of Additional Children Desired: Philippines, 1972-73

Predictor	Urban	Rural	Female	Male	Total Sample
Parity	-.17	-.36*	-.25*	-.35**	-.25**
Marital duration	.03	.03	.04	.26*	.04
Age	.15*	.15	-.06	.07	.12*
Education	-.03	.07	.06	-.09	.01
Urbanism	.08	-.04	-.10	.04	-.00
Media exposure	.12	-.09	.12	-.09	.02
Income	-.02	-.04	.02	.01	-.01
Wife currently working	.12*	.04	.11	.07	.08
Pregnancy loss	-.03	-.01	.11	-.10	-.01
Burden of education	.04	-.02	.02	.03	.01
Number a heavy burden	.12	.19	.10	.18*	.13*
Economic impact	-.03	.09	-.03	.09	.06
Expected help	-.14*	.18	-.03	.03	-.02
Decline in utility	-.01	.00	.02	-.02	-.03
Large-family benefits	.00	.09	.03	.04	.03
Family continuity	.02	.15	.16	-.11	.02
Costs of children	-.01	-.20	-.06	-.23**	-.11*
Role expression	-.07	-.22	-.12	-.00	-.06
Decision-mindedness	.01	-.06	-.05	.03	-.00
Incentive value	-.01	-.12	-.01	-.01	-.01
Emotional rewards	-.03	.02	-.01	-.09	-.02
Parental satisfactions	.09	.14	.05	.11	.06
External pressures	.01	-.09	-.04	.05	-.00
Want a boy, another boy	.16*	.21	.15*	.27***	.21***
Want a girl, another girl	.17**	.12	.14	.15	.13*
Want companion for child, children	.17*	-.00	.08	.08	.10
Another child a financial burden	-.21***	.06	-.15	-.06	-.11*
R^2	.35	.38	.34	.36	.29

* $t > 1.96$-1.99 (depending on subgroup), $p < .05$.
** $t > 2.58$-2.64, $p < .01$.
*** $t > 3.30$-3.45, $p < .001$.

Source: Bulatao (1975:138-139).

sample as a whole (column 5 of the table), only three other variables are statistically significant, all three related to the perceived costs of children. For the urban subgroup, the woman's current labor force activity is an important predictor; however, socioeconomic variables are not otherwise significant, either individually or as a set.

It should be noted that because both Pullum (1980) and Bulatao (1975) employed a control for actual family size, the magnitudes of relationships are probably somewhat underestimated. As noted above, this type of control is suggested only when levels of unwanted fertility are high, to counteract a rationalization bias.

One of the best strategies for comparative analysis of fertility preferences in different settings is to limit attention to a specific size. A report prepared by the Population Division of the United Nations (1981), using data from 15 WFS countries, focused on currently married women with three living children. The results of this study are shown in Table 3.

This table shows the variation in the mean desired family size according to education, place of residence, occupation of husband, and wife's pattern of work. For education, three basic patterns emerge: (a) no effect (Fiji, Sri Lanka, Korea); (b) a curvilinear effect, with the middle category low (Bangladesh); and (c) a decline as education increases (all of the other 11 countries). In two countries (Pakistan and Mexico), the range exceeds one child; in another (Thailand), it is 0.9. For place of residence, the desired total in most countries was less in the urban than in the rural areas, by as much as 0.5 of a child. In only 4 of the 13 countries for which comparable data could be found (Bangladesh, Dominican Republic, Panama, and Indonesia) did place of residence have a negligible effect--that is, a range of 0.1 child or less. Occupation of husband was condensed into five categories, identified in the notes to Table 3. In 7 out of 12 countries, the agricultural category had the highest desired number; in 3 additional countries, this category was only 0.2 below the maximum category. In 10 out of 12 countries, the lowest desired number was in the combined professional, managerial, technical, and clerical category. Other generalizations about occupational effects are limited. There is great variety in the overall impact of this variable, as shown by the range in category means; Mexico has the greatest range, 0.9, and Sri Lanka the smallest, 0.2. For wife's pattern of work, the maximum variation is only 0.2 of a child. However, this variable may be inadequately measured; for example, the combined categories do not distinguish whether the work is or is not compatible with childrearing, nor whether it provides some economic independence for the wife.[5]

In summary, desired family size is usually, although not always, negatively related to indicators of socioeconomic status and modernity within a developing country. The differentials tend to be largest in Latin America (e.g., Mexico and the Dominican Republic) and smallest in Asia, especially in Sri Lanka, Indonesia, and Korea. Despite the

TABLE 3 Mean Number of Children Desired by Currently Married Women with Three Living Children, by Selected Background Characteristics

Country	Education			Residence		Husband's Occupation[a]					Wife's Work Pattern[b]			Combined
	None	Primary	Beyond Primary	Urban	Rural	1	2	3	4	5	1	2	3	
Bangladesh	4.0	3.6	3.8	3.9	3.9	4.0	3.7	3.9	3.8	3.8	--	--	--	3.9
Colombia	4.4	3.7	3.6	3.6	4.0	3.4	3.4	4.2	3.7	3.9[c]	3.8	3.7	3.7	3.8
Costa Rica	4.7[c]	4.2	4.1	4.0	4.5	--	--	--	--	--	4.2	4.2	4.2	4.2
Dominican Rep.	3.7[c]	4.4	3.9	4.3	4.4	3.8	4.5	4.4	4.2	4.7[c]	--	--	--	4.3
Fiji	3.4	3.6	3.5	3.4	3.7	3.4	3.6	3.7	3.5	3.5	3.4	3.6	3.6	3.6
Indonesia	4.1	4.1	3.7	4.0	4.0	3.8	4.2	4.0	4.1	4.7[c]	4.0	4.2	4.0	4.0
Korea, Rep. of	3.2	3.2	3.0	3.0	3.3	3.0	3.1	3.4	3.0	3.0	3.2	3.1	3.0	3.1
Malaysia	4.4	4.2	3.9	3.9	4.4	4.0	4.2	4.3	4.3	4.5	4.3	4.1	4.2	4.2
Mexico	4.8	4.1	3.5	--	--	3.7	3.8	4.6	4.0	4.0[c]	--	--	--	4.1
Nepal	3.9	3.6	3.0[d]	--	--	--	--	--	--	--	--	--	--	3.9
Pakistan	4.2	3.7	3.0	3.8	4.2	3.5	3.9	4.3	4.0	4.1	--	--	--	4.1
Panama	3.6	3.9	3.7	3.7	3.8	3.6	4.0	3.8	3.7	3.8[c]	3.9	3.8	3.7	3.8
Peru	4.0	3.7	3.5	3.5	3.9	--	--	--	--	--	3.7	3.8	3.7	3.7
Sri Lanka	3.5	3.3	3.3	3.2	3.4	3.2	3.4	3.4	3.3	3.3	3.3	3.2	3.3	3.3
Thailand	3.8	3.6	2.9	3.3	3.6	3.3	3.5	3.7	3.2	3.1[c]	3.5	3.8	3.1[c]	3.6

Note: Dash indicates data not available in published report. Current pregnancies are included in count of living children. The sample is limited to women who stated a numerical preference.

[a]Occupation codes: (1) professional, managerial, technical, clerical; (2) sales and service; (3) agricultural; (4) skilled manual; (5) unskilled manual.
[b]Work pattern codes: (1) has worked since marriage; (2) worked before marriage only; (3) never worked.
[c]Twenty or fewer cases.
[d]One case only.

Source: United Nations (1981).

small number of countries included in Table 3, there is a clear tendency for both education and occupation to be strongly related to fertility desires or for them both to be weakly related; Indonesia, where education produces a small and occupation a large differential, is the only notable exception to this statement. Place of residence and work pattern produce small effects unrelated to the other variables or to region.

Because the United Nations (1981) study assembled from the WFS data does not include such summary measures as eta-squared, it is impossible to compare within- and between-category variations. The U.N. study is also not multivariate in the sense of considering several determinants simultaneously. Moreover, it omits country-specific variables, such as region, religion, and ethnic group, which would complicate a cross-national analysis; hence it is not possible to compare the importance of these more traditional characteristics with the more modern ones included. However, despite these weaknesses, the U.N. report is at this time the most comprehensive analysis of WFS data on fertility preferences.

PROPOSITIONS

The following propositions summarize the major points made in the foregoing discussion. As appropriate, an illustrative citation is given following each proposition.

Methodological Concerns

1. A reproductive decision involves more individuals than just the woman who will bear the child. A better prediction of future fertility, and a better assessment of actual demand, will be obtained if the preferences of all individuals involved are considered (Coombs and Fernandez, 1978).

2.1. A statement of a specific preferred number simply indicates the hypothetical family size with maximum utility. Adjacent family sizes may be almost equally desirable. If so, minor variations in preference may appear to be instability in the ideal (Namboodiri, 1972).

2.2. A fertility preference is inextricably linked with its intensity, that is, with the degree of motivation to achieve the stated ideal. A strong motivation is essentially equivalent to a sharp peak in the utility function. If this intensity is not considered, the stated ideal will have a much reduced value as a predictor of achieved fertility (Knodel and Prachuabmoh, 1973).

3. Family-size desire is just one of a large set of related attitudes that make up one's preferred role in life. An integrated perspective would enhance research in fertility preferences.

Life-Cycle Factors

4. Later preferences tend to be positively associated with earlier ones; however, they are subject to re-evaluation and modification throughout the reproductive period (Ryder, 1976; Lee, 1980; Ward and Butz, 1980).

4.1. An unwanted birth tends to be rationalized: the respondent states that it was desired, thus raising the stated ideal family size (Pullum, 1980).

4.2. Conversely, if a woman has fewer children than anticipated, she tends to rationalize by retrospectively reducing the desired family size (Westoff, Mishler, and Kelly, 1957).

5. Other life-cycle factors can affect family-size desires.

5.1. The longer the interval since the last child (i.e, the older the last child), even if unplanned, the less the desire for another child (Pullum, 1980).

5.2. Women who marry early tend to prefer larger families (Bulatao, 1975).

Gender Preferences

6. In most countries, there are major differences in the desire for another child across various sex compositions. These differences are sharpest for the all-boy or all-girl compositions (United Nations, 1981). In most countries, there is a tendency for son preference, in that a woman is more likely to want another child if she has all daughters than if she has all sons. However, this pattern is not universal; it appears to be reversed in some Central and South American countries (United Nations, 1981).

7. There is a general tendency for balance--that is, at least one son and at least one daughter--to be desired. This preference is usually stronger than that for a son over a daughter (United Nations, 1981).

Knowledge and Use of Family Planning

8. Knowledge of and access to family planning will affect family-size desires.

8.1. The greater the couple's knowledge of and access to family planning methods, (a) the more salient their fertility preferences, and (b) the smaller their desired family size (Namboodiri, 1970).

8.2. Conversely, the greater the excess of actual over desired family size, the more likely that knowledge about family planning will be sought out (Westoff, 1978). Such action will depend in part upon the degree of investment required of the couple.

9. If contraception is being used for spacing purposes, and succeeds in delaying a birth for a long time, there is a tendency for the timing preference to be converted to a number preference (Coombs, 1979c). Where the spacing strategy is used to resolve uncertainty

about, say, life-cycle income prospects, its outcome will depend in part upon how the contingencies are resolved.

Socioeconomic Factors

10. Thus far, socioeconomic variables do not appear to be strongly predictive of fertility desires once life-cycle, gender-preference, and family planning variables have been taken into account (see, for example, Bulatao, 1975). However, because this finding may simply reflect difficulty in measuring the socioeconomic variables, these should be further explored.

10.1. Ascribed characteristics such as region, religion, and ethnic group appear to be more important predictors of fertility desires than characteristics more associated with modernity, such as education, occupation of husband, and wife's labor force activity (United Nations, 1981).

10.2. Generally, fertility desires are inversely related to such measures of socioeconomic status and modernity as occupation of husband and education (United Nations, 1981).

10.3. Socioeconomic differentials in desired family size tend to be greater in Latin American than in Asian countries (United Nations, 1981).

NOTES

1. That stated fertility preferences do affect contraceptive use and fertility, even in developing countries, is shown by Freedman, et al. (1975), Kar (1978), and Knodel and Prachuabmoh (1973), among others. The associations are far from perfect, however, probably because of such difficulties as measurement error and imprecision in measuring the underlying utility functions, as is discussed below.
2. In most developing countries, actual fertility, measured as completed family size or as children born during an interval of age or marital duration, is the sum of desired and undesired births. Few women in these countries are unable to have at least their desired number of children. By contrast, in countries where contraception has been well established for many years, substantial proportions of women can fall below their desired goal because of prolonged spacing or postponement that converts to termination of reproduction. Other papers in these volumes are concerned with the correlates of fertility and contraceptive use, both of which are more easily measured than number preferences (although, of course, it is more difficult to measure the effectiveness of use or the prevalence of nonprogrammatic contraception); the present paper focuses on the desires themselves.

3. McClelland (1979) recently called into question the assumption that couples expect to improve their family's sex composition with another child (see also McClelland and Hackenberg, 1978). He argued that they may be aware of the equal possibility that the next child will not be of the desired sex.
4. WFS studies have the great advantage of standardized questions (within the limits of language translation) and methodology.
5. The individual WFS surveys included more detail in these areas.

BIBLIOGRAPHY

Adamchak, D. J. (1977) Ideal family-size and family background: An examination of mothers' and daughters' family-size preferences. Social Biology 24:170-172.

Adelman, S., and S. Rosenzweig (1978) Parental predetermination of the sex of offspring: II. The attitudes of young married couples with high school and with college education. Journal of Biosocial Science 10:235-247.

Bagozzi, R. P., and M. F. Van Loo (1978) Toward a general theory of fertility: A causal modeling approach. Demography 15:301-319.

Baum, F., and D. R. Cope (1980) Some characteristics of intentionally childless wives in Britain. Journal of Biosocial Science 12:287-299.

Beckman, L. J. (1978) Couples' decision-making processes regarding fertility. In K. Taeuber, L. Bumpass, and J. Sweet, eds., Social Demography. New York: Academic Press.

Ben-Porath, Y., and F. Welch (1976) Do sex preferences really matter? Quarterly Journal of Economics 90:285-307.

Bhatia, J. C. (1978) Ideal number and sex preference of children in India. Journal of Family Welfare 14:3-16.

Blake, J. (1966) Ideal family-size among white Americans: A quarter century's evidence. Demography 3:154-173.

Blake, J. (1967) Reproductive ideals and educational attainment among white Americans, 1943-1960. Population Studies 21:159-174.

Brackbill, Y., and E. M. Howell (1974) Religious differences in family size preference among American teenagers. Sociological Analysis 35:35-44.

Bulatao, R. A. (1975) The Value of Children: Philippines, Vol. 2. Honolulu: East-West Population Institute.

Bumpass, L. (1967) Stability and change in family-size expectations over the first two years of marriage. Journal of Social Issues 23:83-98.

Bumpass, L. (1975) Comment on J. Blake's "Can we believe recent data on birth expectations in the United States?" Demography 12:155-156.

Bumpass, L., and C. F. Westoff (1969) The prediction of completed fertility. Demography 6:445-454.

Card, J. J. (1978) The malleability of fertility-related attitudes and behavior in a Filipino migrant sample. Demography 15:459-476.

Cartwright, A. (1979) Family size, contraceptive practice and fertility intentions in England and Wales, 1967-1975. Family Planning Perspectives 11:128-135.

Cho, L. J. (1978) Fertility preferences in five Asian countries. International Family Planning Perspectives and Digest 4:2-18.

Clare, J. E., and C. Kiser (1951) Social and psychological factors affecting fertility preference for children of given sex in relation to fertility. Milbank Memorial Fund Quarterly 29:440-492.

Coombs, L. C. (1974) The measurement of family-size preferences and subsequent fertility. Demography 11:587-611.

Coombs, L. C. (1977) Preferences for sex of children among U.S. couples. Family Planning Perspectives 9:259-265.

Coombs, L. C. (1978) How many children do couples really want? Family Planning Perspectives 10:303-308.

Coombs, L. C. (1979a) Prospective fertility and underlying preferences: A longitudinal study in Taiwan. Population Studies 33:447-455.

Coombs, L. C. (1979b) Reproductive goals and achieved fertility: A fifteen-year perspective. Demography 16:523-534.

Coombs, J. C. (1979c) Underlying family preferences and reproductive behavior. Studies in Family Planning 10:25-36.

Coombs, L. C., and D. Fernandez (1978) Husband-wife agreement about reproductive goals. Demography 15:57-73.

Coombs, L. C., and R. Freedman (1979) Some roots of preference: Roles, activities and familial values. Demography 16:359-376.

Coombs, L. C., and T.-H. Sun (1978) Family composition preferences in a developing culture: The case of Taiwan, 1973. Population Studies 32:43-64.

Coxon, H. P. M. (1974) The mapping of family composition preferences: A sealing analysis. Social Science Research 3:191-210.

Cutright, P., S. Belt, and J. Scanzoni (1974) Gender preferences, sex predetermination and family-size in the U.S. Social Biology 21:242-248.

Davidson, A., and J. Jaccard (1975) Population psychology: A new look at an old problem. Journal of Personality and Social Psychology 31:1073-1082.

Dobbelaeve, K. (1967) Ideal number of children in marriage in Belgium and the U.S.A. Journal of Marriage and the Family 29:360-367.

Freedman, R., and H. Sharp (1954) Correlates of values about ideal family-size in the Detroit metropolitan area. Population Studies 31:35-45.

Freedman, R., and P. K. Whelpton (1960) Social and psychological factors affecting fertility: Fertility planning and fertility rates by religious interest and denomination. Milbank Memorial Fund Quarterly 28:294-343.

Freedman, R., D. Goldberg, and H. Sharp (1955) Ideals about family-size in the Detroit metropolitan area: 1954. The Milbank Memorial Fund Quarterly 33:187-197.

Freedman, R., G. Baumert, and M. Bolte (1960) Expected family-size and family-size values in West Germany. Population Studies 13:136-150.

Freedman, R., D. Goldberg, and D. Slesinger (1964) Current fertility expectation and married couples in the United States. Population Index 30:171-175.

Freedman, R., D. Goldberg, and L. Bumpass (1965) Current fertility expectations of married couples in the United States, 1963. Population Index 31:3-20.

Freedman, R., L. C. Coombs, and L. Bumpass (1965) Stability and change in expectations about family-size: A longitudinal study. Demography 2:250-275.

Freedman, R., A. I. Hermalin, and M. C. Chang (1975) Do statements about desired family-size predict fertility? The case of Taiwan, 1967-1970. Demography 12:407-416.

Frenzel, I. (1976) Attitudes towards family-size in some East European countries. Population Studies 30:35-57.

Fried, E. S., S. L. Hofferth, and J. R. Udry (1980) Parity-specific and two sex utility models of reproductive intentions. Demography 17:1-11.

Goldberg, D., H. Sharp, and R. Freedman (1959) The stability and reliability of expected family-size data. Milbank Memorial Fund Quarterly 37:369-385.

Gray, E., and D. Morgan (1976) Desired family-size and sex of children. Journal of Heredity 67:319-321.

Groenman, S. (1955) Women's opinion about size of family in the Netherlands. Eugenics Quarterly 2:224-228.

Gustavus, S. O., and C. Nam (1970) The formation and stability of ideal family-size among young people. Demography 7:43-51.

Hartley, S. F., and L. M. Pietraczyk (1979) Preselecting the sex of offspring: Technologies, attitudes, and implications. Social Biology 26:232-246.

Hendershot, G., and P. Placek, eds. (1981) Predicting Fertility: Demographic Studies of Birth Expectations. Lexington, Mass.: Lexington Books.

Hermalin, A. I., R. Freedman, T.-H. Sun, and M. C. Chang (1979) Do intentions predict fertility? The experience in Taiwan, 1967-74. Studies in Family Planning 10:75-95.

Hoffman, L. W., A. Thornton, and J. D. Manis (1978) The value of children to parents in the United States. Journal of Population 1:91-131.

Hollerbach, P. E. (1980) Power: Families, communication and fertility decision-making. Population and Environment 3:146-173.

Hout, M. (1978) The determinants of marital fertility in the United States, 1968-1970: Inferences from a dynamic model. Demography 15:139-159.

Kahl, J. A. (1967) Modern values and fertility ideals in Brazil and Mexico. Journal of Social Issues 23:99-114.

Kantner, J. F., and C. Kiser (1954) Social and psychological factors affecting fertility: The interrelation of fertility, fertility planning, and intergenerational social mobility. Milbank Memorial Fund Quarterly 32:69-103.

Kar, S. (1978) Consistency between fertility attitudes and behaviour: A conceptual model. Population Studies 32:173-185.

Khan, M. A., and I. Sirageldin (1977) Son preference and the demand for additional children in Pakistan. Demography 14:481-495.

Kiser, C. V., and P. K. Whelpton (1951) Social and psychological factors affecting fertility: The interrelation of fertility, planning and feeling of economic security. Milbank Memorial Fund Quarterly 29:41-122.

Kiser, C. V., E. G. Mishler, C. Westoff, and R. G. Potter, Jr. (1956) Development of plans for a social psychological study of the future fertility of two-child families. Population Studies 9:43-52.

Knodel, J., and V. Prachuabmoh (1973) Desired family-size in Thailand: Are the responses meaningful? Demography 10:619-637.

Knodel, J., and V. Prachuabmoh (1976) Preferences for sex of children in Thailand: A comparison of husbands' and wives' attitudes. Studies in Family Planning 7:137-143.

Koch, G. G., J. R. Abernathy, and P. B. Imrey (1975) On a method for studying family-size preferences. Demography 12:57-66.

Krishnamoorthy, S. (1974) Effects of sex preferences and mortality on family-size. Demography 3:120-132.

Lahiri, S. (1975) Sex preference in relation to desire for additional children in urban India. Demography India 4(1):86-106.

Lee, R. D. (1980) Aiming at a moving target: Period fertility and changing reproductive goals. Population Studies 34:205-226.

McClelland, G. H. (1979) Determining the impact of sex preferences on fertility, a consideration of parity progression ratio, dominance, and stopping rule measures. Demography 16:377-388.

McClelland, G., and B. Hackenberg (1978) Subjective probabilities for sex of next child: U.S. college students and Philippine villagers. Journal of Population 1(2):132-147.

McLaughlin, S. (1974) Expected family-size and perceived status deprivation among high school senior women. Demography 11:57-73.

Medina, J. R. (1977) Male preference and family-size. Journal of Heredity 68:260-261.

Mishler, E. G., and C. Westoff (1955) A proposal for research on social and psychological factors affecting fertility: Concepts and hypotheses. Pp. 121-150 in Current Research in Human Fertility. New York: Milbank Memorial Fund.

Mosena, P. W., and J. Stoeckel (1971) The impact of desired family-size upon family planning practices in rural east Pakistan. Journal of Marriage and the Family 33:567-570.

Mueller, E. (1972) Economic motives for family limitation: A study conducted in Taiwan. Population Studies 26:383-403.

Muhsam, H. V., and C. V. Kiser (1956) Social and psychological factors affecting fertility. Milbank Memorial Fund Quarterly 34:287-312.

Myers, G. C., and J. M. Roberts (1968) A technique for measuring preferential family-size and composition. Eugenics Quarterly 15:164-172.

Nair, J. R., and R. K. Pillai (1974) Responses on desired and expected number of children as indicators of family planning acceptance. Demography India 3(1):105-119.

Nair, N. K., and L. P. Chow (1980) Fertility intentions and behavior: Some findings from Taiwan. Studies in Family Planning 11:255-263.

Nair, P. S. (1974) Desired family-size: Correlates and reliability of responses. Demography India 3(2):345-355.

Nam, C. B. (1980) Population socialization: Needed research directions. Population and Environment 3:99-102.

Namboodiri, N. K. (1970) On the relation between economic studies and family-size preferences when status differentials in contraceptive instrumentalities are eliminated. Population Studies 24:233-239.

Namboodiri, N. K. (1972) Some observations on the economic framework for fertility analysis. Population Studies 26:185-206.

Namboodiri, N. K. (1974) Which couples at given parities expect to have additional births? An exercise in discriminant analysis. Demography 11:45-56.

Palmore, J. A., and M. B. Concepcion (1980) Desired Family Size and Contraceptive Use. Paper presented at the World Fertility Survey Conference, London.

Philliber, S. G. (1980) A conceptual framework for population socialization. Population and Environment 3:3-9.

Potter, R. G., Jr. (1955) Social and psychological factors affecting fertility: The influence of siblings and friends on fertility. Milbank Memorial Fund Quarterly 33:246-267.

Potter, R. G., Jr. (1956) A critique of the Glass-Grebenik model for indirectly estimating desired family-size. Population Studies 9:251-270.

Potvin, R. H., and C. F. Lee (1974) Catholic college women and family-size preferences: A reanalysis. Sociological Analysis 35:24-34.

Prachuabmoh, V., J. Knodel, and J. O. Alers (1974) Preference for sons, desire for additional children, and family planning in Thailand. Journal of Marriage and the Family 36:601-614.

Pratt, L., and P. K. Whelpton (1955) Social and psychological factors affecting fertility: Interest in and liking for children in relation to fertility planning and size of planned family. Milbank Memorial Fund Quarterly 33:430-463.

Pullum, T. W. (1980) Illustrative Analysis: Fertility Preferences in Sri Lanka. WFS Scientific Reports No. 9. London: World Fertility Survey.

Renzi, M. (1975) Ideal family-size as an intervening variable between religion and attitudes towards abortion. Journal for the Scientific Study of Religion 14:23-27.

Riemer, R., and C. Kiser (1954) Social and psychological factors affecting fertility: Economic tension and social mobility in relation to fertility planning and size of planned family. Milbank Memorial Fund Quarterly 32:167-231.

Riemer, R., and P. K. Whelpton (1955) Social and psychological factors affecting fertility: Attitudes towards restriction of personal freedom in relation to fertility planning and fertility. Milbank Memorial Fund Quarterly 33:63-111.

Rodgers, G. B. (1976) Fertility and desired fertility: Longitudinal evidence from Thailand. Population Studies 30:511-526.

Ryder, N. B. (1976) The predictability of fertility planning status. Studies in Family Planning 7:294-307.

Ryder, N. B., and C. F. Westoff (1967) The trend of expected parity in the United States. Population Index 33:153-168.

Sarma, D. V. N., and A. K. Jain (1974) Preference about sex of children and use of contraception among women wanting no more children in India. Demography India 3(1):81-104.

Simmons, A. B. (1971) Projective testing for ideal family-size. Pp. 339-359 in J. Stycos, ed., Ideology, Faith and Family Planning in Latin America. New York: McGraw Hill.

Stinner, W. F., and P. D. Mader (1975a) Son preference among Filipino Muslims: A causal analysis. Social Biology 22:181-188.

Stinner, W. F., and P. D. Mader (1975b) Sons, daughters, or both? An analysis of family sex composition preferences in the Philippines. Demography 12:67-79.

Stolzenberg, R. M., and L. J. Waite (1977) Age, fertility expectations, and plans for employment. American Sociological Review 42:769-783.

Stycos, J. M. (1965) Social class and preferred family-size in Peru. American Journal of Sociology 70:651-658.

Terhune, K., and S. Kaufman (1973) The family-size utility function. Demography 10:599-618.

Turner, J., and A. B. Simmons (1977) Sex roles and fertility: Which influences which? Canadian Studies in Population 4:43-60.

United Nations, Population Division (1981) Selected factors affecting fertility and fertility preferences in developing countries. Pp. 147-246 in World Fertility Survey Conference 1980, Vol. 2. London: World Fertility Survey.

Votey, H. L., Jr. (1969) The optimum population and growth: A new look; a modification to include a preference for children in the welfare function. Journal of Economic Theory 1:273-290.

Ward, M., and W. Butz (1980) Completed fertility and its timing. Journal of Political Economy 88:917-940.

Westoff, C. F. (1978) The unmet need for birth control in five Asian countries. International Family Planning Perspectives 4:9-18.

Westoff, C. F., and E. Borgatta (1955) Social and psychological factors affecting fertility: The prediction of planning fertility. Milbank Memorial Fund Quarterly 33:50-60.

Westoff, C. F., and R. Potvin (1966) Higher education, religion and women's family-size orientations. American Sociological Review 31:489-496.

Westoff, C. F., and N. Ryder (1977) The predictive validity of reproductive intentions. Demography 14:431-453.

Westoff, C. F., E. G. Mishler, and E. L. Kelly (1957) Preferences in size of family and eventual fertility twenty years after. American Journal of Sociology 62:491-497.

Williamson, J. B. (1970) Subjective efficacy and ideal family-size as predictors of favorability toward birth control. Demography 7:329-339.

Williamson, N. E. (1976) Sons or Daughters: A Cross-Cultural Survey of Parental Preferences. Beverly Hills, Calif.: Sage Publications.

Wilson, F. D., and L. Bumpass (1973) The prediction of fertility among Catholics: A longitudinal analysis. Demography 10:591-597.

Wilson-Davis, K. (1980) Ideal family-size in the Irish Republic. Journal of Biosocial Science 12:15-20.

Chapter 11

INFANT AND CHILD MORTALITY AND THE DEMAND FOR CHILDREN

David M. Heer

The relationship between infant and child mortality and the demand for children is a complex issue of great relevance to policy makers. One argument is that reducing the level of infant and child mortality only exacerbates problems of economic development by accelerating the rate of population growth (Paddock and Paddock, 1964:123-29). Conversely, it is argued that this increased population growth need only be temporary, and that, under appropriate circumstances, reducing infant and child mortality will soon result in declining fertility (Taylor, 1965; Taylor et al., 1976). In fact, the demographic transition frequently shows mortality decline prior to the occurrence of fertility decline; however, a causal link between the two has not been definitively established.

Over the past 20 years, a large body of research has attempted to establish the extent of this link. Much of the earliest work involved multivariate studies on a cross-national level, with fertility as the dependent variable and infant mortality as one of several independent variables. These studies commonly found a strong relationship between infant mortality and fertility. However, the direction of the causality could not be established: for example, Heer (1966) found that when fertility was the dependent variable, the level of infant mortality had the highest standardized regression coefficient of the five independent variables; however, when the level of infant mortality was made the dependent variable, the level of fertility had the second highest standardized regression coefficient of the five independent variables.

The logical next step was to analyze the relationship between infant and child mortality and fertility at the level of the individual couple. Beginning in the late 1960's and extending through the 1970's, many data sets were analyzed for this purpose. However, most of these analyses were secondary, based on data from surveys whose primary focus was not the relationship between these two variables. One clear finding did result from these studies: it has been shown decisively that the length of postpartum amenorrhea is positively associated with the duration of breastfeeding (see Bongaarts, in these volumes); since the early death of a child interrupts lactation, the period of postpartum amenorrhea is considerably shortened following neonatal death. For example, Wyon

and Gordon (1971) found in the Khanna area of the Punjab in northern India that the median duration of postpartum amenorrhea was less than six weeks when the child died within the first month, but was 11 months when the child survived. Chowdury et al. (1976) analyzed data from Bangladesh, where neonatal death decreased the apparent length of postpartum amenorrhea by 13 months. They estimated that, if there were no infant deaths at all, the resultant decline in fertility levels would make up for a little less than one-third of that increased population.

However, this biological effect of neonatal death on subsequent fertility does not establish a relationship between infant and child mortality and the demand for subsequent births. This can only be done by looking for differential subsequent fertility behavior, holding constant the influence of the biological effect. The discussion below approaches this issue by examining the possible behavioral effects of a reduction in infant and child mortality. A series of eight propositions is presented, and the evidence for each examined. The first three of these propositions address sequential responses to actual child death, that is, those which depend on the number of prior child deaths among any specified number of births. These are followed by a number of propositions relating to the effects of the perceived level of child survival.

SEQUENTIAL RESPONSE TO ACTUAL CHILD DEATH

Proposition 1 The number of previous child deaths to a married couple will be positively associated, ceteris paribus, with that couple's demand for subsequent births. This association will be stronger at lower than at higher parities and may also depend on the sex composition of existing children. Nevertheless, for all women the number of surviving children demanded will be inversely associated with the number of previous child deaths.

Basically, it is assumed that, at least at lower parities, the discounted flow of benefits from a child usually exceeds the discounted flow of costs, and the death of a child therefore results in a net loss of utility that must be made up by additional births. Because preference for sons is common in many Third World nations (Williamson, 1976), the effect of the death of a male child should be stronger than that of a female child. Furthermore, in determining the effect of past child loss on the demand for subsequent births, the logic of economics would require consideration of the effects of previous births on capital stores. For any given number of children who survive past childhood, a couple that has lost a child has experienced greater average cost than a couple with no child loss. To the extent that this greater average cost has accelerated depletion of the couple's financial savings or stores of psychic energy, prior child loss should adversely affect current demand for surviving children. Thus it is possible that differences in prior costs will cause couples who have not experienced previous child loss to demand a higher number of surviving children than those who have.

Moreover, certain scholars, notably Scrimshaw (1978; in these volumes), have argued that prior child loss is often caused by intentional neglect, if not outright infanticide, indicating that even previous births were unwanted by the mother and that therefore at least some of the women with prior child loss will want fewer subsequent births than the average woman who has not experienced child loss.

Empirical evidence related to this proposition can be gathered directly by asking a question about the additional number of children desired. The study by Heer and Wu (1975, 1978) was one of the few studies expressly designed to examine the effect of infant and child mortality on fertility behavior and attitudes. Interviews were conducted among 8,178 respondents, both male and female, in two different townships in northern Taiwan which were sharply distinct in their level of infant and child mortality. Controlling for 16 other variables, this study examined the effect of child death for both sons and daughters. Two types of cases were compared: those in which two sons had been born but all had survived, and those in which one or more of the two sons had died. The study found that, in the former cases, the number of additional children desired was 0.60 less than in the latter. However, this can also be regarded as meaning that the number of surviving children demanded was 0.4 more when both of the sons had survived than when one of them had died. Heer and Wu also found that the effect of prior child loss in Taiwan depended heavily on the sex of the child. In the cases in which two daughters had been born, the desired number of additional children was only 0.07 less when both had survived than when one or more had died.

A second study investigating the effect of prior child death on additional children desired was conducted in Guatemala by Pebley et al. (1979). In this study, despite a fairly small sample size, there was a significant positive association between the number of prior child deaths and the desire for additional children, both at parities of 3 and 4 and of 5 or more, while holding constant seven additional variables. In accordance with Proposition 1, the regression coefficient for the effect of the number of prior child deaths on additional children demanded was smaller at parities of 5 or more than at parities of 3 and 4.

Finally, a related study was conducted by Rizk et al. (1980) in Egypt among 1,010 rural women. They found that, after adjustment for other factors, women who had lost one or more children desired almost one-half a child more than women who had not experienced child loss.

Other studies related to this proposition look only at the effect of prior child death on subsequent fertility. In this regard, it is important to remember that subsequent fertility can be equated to demand for children only when birth control is completely without cost. Easterlin et al. (1980) made a useful distinction between optimal and desired fertility: optimal fertility is defined as the number of births demanded given the fact that there is a cost to preventing further births, whereas desired fertility is the number of births which would be demanded if birth prevention had no cost. This distinction leads to Proposition 2.

Proposition 2 The magnitude of the impact of prior child deaths on the optimal number of subsequent births to married couples will depend on the perceived monetary and psychic costs of birth control (i.e., contraception, sterilization, and abortion): where these costs are high, the number of prior child deaths will have little or no effect on the optimal number of subsequent births; where they are low, the magnitude of prior child deaths will have a much stronger effect on the optimal number of subsequent births.

Given the very plausible assumption that optimal subsequent fertility can be equated with actual subsequent fertility, this proposition appears to be very strongly supported by existing studies. First, there is evidence for 88 nations from multiple-regression analyses of two dependent variables: (1) the crude birth rate in 1975, and (2) the 1965-75 percent decline in crude birth rates (Glassman and Ross, 1978). In this study, the independent variables were the 1970 infant mortality rate and the percent of persons aged 5 to 19 enrolled in primary or secondary school. The study showed that a model of these variables with a multiplicative term fit the data better than a simple additive model. For example, with birth rate decline as the dependent variable, the coefficient of determination for the model with the interaction term was 0.609, whereas it was only 0.526 for the simple additive model. Because education probably reflects knowledge about family planning, these results support Proposition 2.

Studies have also been done of individual females in countries where family planning is almost nonexistent. Chowdhury et al. (1976) analyzed two large-scale surveys--a nationwide survey of Pakistan and a survey of Matlab thana in Bangladesh. The mean length of closed birth intervals was analyzed, dependent on the survival or death both of the last previous child and the next-to-last previous child. They found a strong impact of death of the last previous child because of the shortened period of postpartum amennorhea. However, the death of the next-to-last previous child had no effect on subsequent fertility.

Rutstein and Medica (1978) analyzed data from four surveys of the rural and semiurban populations of Colombia, Costa Rica, Mexico, and Peru. For these populations, the proportion of women with at least one birth who had ever practiced contraception ranged from 34 percent in Costa Rica to 10 percent in Peru. The dependent variables used were parity-progression ratios; the effects of prior deaths on these ratios were examined, holding constant other relevant variables. The study concluded that the ratios "are scarcely affected by the number of previous child deaths." Balakrishnan (1978) reanalyzed the same data sets, using as a dependent variable the mean number of subsequent births to women who had attained first, second, or third parity according to the prior number of child deaths. This dependent variable allowed for a greater number of cases than the use at high parities of the parity-progression ratio. Controlling for other relevant variables, Balakrishnan found that at the third attained parity, the prior loss of one child compared to the prior loss of no children seemed to have some effect in Costa Rica, where the practice

of contraception was most prevalent, and possibly also in Peru; however, it had only a negligible effect for either Colombia or Mexico.

An analysis of data from a very large-scale survey in Korea by Park et al. (1979) further supports the interaction between the prevalence of family planning, prior child loss, and subsequent fertility. The probability of an additional birth was analyzed, dependent on the fate of both the last previous child born and the next-to-last. Their sample was then subdivided into three parts, depending on whether the last previous child was born before 1955, from 1944 to 1964, or from 1965 to 1971. The latter time period was chosen because vigorous contraceptive programs were first begun in Korea in 1965. The study found that the death or survival of the next-to-last previous child had no effect on the probability of an additional birth if the last previous child had been born before 1955, and only a small effect if the last previous child was born from 1955 to 1964. If the last previous child was born from 1965-1971, there was a much greater effect; for example, the probability of a fourth birth was 66 percent given the death of the second-born and the survival of the third, whereas the probability of a fourth birth given the survival of both the second and third-born was 45 percent.

Final evidence for the present hypothesis is provided by data for France analyzed by Vallin and Lery (1978). These data relate to a period when the practice of contraception was very common in France, but before the advent of the oral contraceptive or legalized abortion. The analysis focused on the reproductive histories of 92,000 women born between 1892 and 1916 whose marriages were not dissolved before their forty-fifth birthdays; parity-progression ratios were analyzed dependent on whether the last child was deceased during the first year of life or alive at the time of the survey. These ratios were computed specific to the occupation of the father of the child. At each parity, they found substantial differences dependent on the fate of the last child. As an example, for all mothers, the proportion proceeding from the second to the third parity was 57 percent if the second child survived its first year of life, and 73 percent if the second child died during the first year.

Preston's (1975, 1978) discussion of the effect of prior child loss on subsequent fertility is relevant at this point. He describes what he calls a "replacement" effect (1975:14), implying that the innovative action is taken by the couple that loses a child. This may well be correct where child mortality is low and where the practice of contraception is universal and expected; however, it does not apply to a society in which child mortality is high and the practice of contraception is limited. In the latter situation, it is the couple losing no children that must innovate in order not to have excess fertility. Thus, for Third World societies, it seems more appropriate to speak of a "prior survival" rather than of a "replacement" effect.

Preston (1978) also advocates as a measure of replacement a particular way of assessing the relative difference in stopping probabilities. (The stopping probability is the complement of the parity-progression ratio.) Preston advocated that for women of each

parity, the difference between stopping probability for women who have not lost a child and those who have should be calculated, and then divided by the stopping probability of those who have not lost a child. The result would then be interpretable as the proportion of women who would have stopped childbearing but who are induced to continue as a result of child death. However, for Third World societies, where child loss is common and family planning is relatively uncommon, it seems preferable to divide the difference in stopping probabilities by the proportion of women who have lost a child that go on to have another. This alternative measure can be interpreted as the proportion of women who would have gone on to have another child but are induced to stop because their last child survived.

These two measures can be compared in numerical terms for the Korean data analyzed by Park et al. (1979). For the cases in which the last previous birth occurred from 1965 to 1971, the proportion of women progressing from the third to the fourth birth was 45 percent if both the second and third-born survived, and 66 percent if the third but not the second survived. Moreover, the proportion of women progressing from the fourth to the fifth birth was 40 percent if both the third and fourth-born survived, and 54 percent if the third died but the fourth survived. Preston would emphasize that, from third to fourth parity, the proportion of women who would have stopped childbearing but who were induced to continue as a result of the death of the next-to-last child was 38 percent, and that the corresponding measure for women from fourth to fifth parity was 24 percent. The alternative measure would emphasize that, from third to fourth parity, 32 percent of women who would have gone on to have another child were induced to stop because their next-to-last child survived, and, from fourth to fifth parity, 26 percent were induced to stop. In general, Preston's measure will show a greater effect of prior child survival at lower parities, whereas the alternative will show a greater effect at higher parities.

In general, a substantial interaction between the prevalence of family planning and the impact of prior child survival on subsequent fertility has been demonstrated. However, this does not necessarily prove the proposition that the magnitude of the prior survival effect depends on the perceived cost of birth control: there may be a low prevalence of family planning either because the cost of birth control is high, or because the demand for surviving children is very high and in fact may exceed the maximal supply. Proposition 3 addresses this issue.

Proposition 3 The magnitude of the impact of prior child survival on the optimal number of subsequent births to married couples will depend on the gap between the number of surviving children demanded and the limit to their maximal supply. If the number of surviving children demanded is equal to or greater than the maximal supply, differences in prior child survival will have no effect on the optimal number of subsequent births. If the number of surviving children demanded at each level of prior child loss is less than the maximal

supply, the impact of prior child loss on the absolute number of optimal births will be positive and independent of the number of surviving children demanded; however, this impact relative to the optimal number of births for couples experiencing no child loss will be greater the fewer surviving children are demanded. This latter point is based on the assumption that the gap between the optimal number of births and maximal supply will always be a constant fraction of the gap between the desired number of births and maximal supply.

Although both Propositions 2 and 3 appear to be true a priori, it is an important empirical question whether the absence of family planning in any given nation can be attributed to the high perceived cost of birth control or a high demand for surviving children. The continuous debate between Kingsley Davis (1967) and those who support family planning revolves around precisely this point.

The precise effect of prior child survival on subsequent fertility, given the existence of both a family planning program and a relatively low demand for surviving children, might also be addressed. Perhaps the most direct answer to this question comes from a study by Shin et al. (1981) based on a 1974 survey of 2,143 women in a Korean town. For each five-year age group of women, they attempted to predict the number of surviving children from the number of prior infant deaths and other relevant variables. For women 35 to 39, 40 to 44, and 45 to 49, the unstandardized regression coefficients were -0.71, -0.68, and -0.57, respectively. Thus, for example, among women 45 to 49 years old, those with one child death would have 0.57 fewer surviving children than those with no child deaths.

EFFECTS OF PERCEIVED CHILD SURVIVAL LEVEL

The following propositions relate to the behavioral effects not of actual child death, but of the perceived level of child survival. As might be expected, the empirical evidence for these propositions is less substantial than for the first three.

Proposition 4 The magnitude of the perceived level of child survival in the community will be negatively associated, ceteris paribus, with the demand by parents for surviving children.

Heer and Smith (1968:106) have advanced two reasons for this proposition. First, they posited as follows:

> . . . there is a possible connection between the level of mortality and the amount of emotional energy which parents invest in their children. It may be supposed that the pain of bereavement at a child's death is directly proportional to the amount of emotional energy that the parents have invested in that child. Therefore, where mortality levels are high, one might expect parents in the interests of self-protection to place relatively little emotional involvement in any one child. But parents have limited emotional energy, and the more is focused on any one child, the less is available for other children. As a

consequence, low rates of mortality, by encouraging intensive emotional investment with each child, should promote low fertility.

Second, they posited that parents want to be certain of having a specified minimum number of surviving children and that they would rather have more than this desired number than fewer (see also Coombs and Sun, 1978; Myers and Roberts, 1968). Where the average mortality of offspring is high, the variance in mortality will also be large. Hence Heer and Smith believed that, in high-mortality areas, the desire for a minimum number of surviving children might elevate fertility enough to make the net reproduction rate and the annual rate of natural increase greater than in low-mortality areas. They developed a variety of computer-simulation models designed to show the consequences of these assumptions (Heer and Smith, 1968, 1969). To illustrate, in one of their models (1969), the following assumptions were made: (1) all women were married at age 17 to men aged 20, with women in each of nine fecundity classes having births until they decided they no longer wanted children or became infertile; (2) the event of a male birth was a random variable with a mean of 0.513; (3) the mortality of sons was a random variable, and the survival or death of each male child was determined at six-month intervals following birth according to the specified U.N. model life table; and (4) the couple's decision whether to have an additional child was made exactly one year following the birth of the last child. The couple compared the number of sons they already had with the number of living sons needed at the existing level of mortality to provide a 95 percent certainty of having at least one living son when the father reached his sixty-fifth birthday. If the current number of living sons was less than that necessary number, the couple went on to have another child; if it was more, either husband or wife would be sterilized, and the wife would bear no further children. In all computations, the probability of survival for any son was assumed to be independent of that for any other son.

Based on these assumptions, the gross reproduction rate would decline monotonically from 4.89 when the life expectation at birth was 20 years to 0.95 when it was 73.9 years. On the other hand, the assumed changes in life expectation would have a curvilinear effect on the net reproduction rate and the intrinsic rate of natural increase. When the life expectation at birth was 20 years, the net reproduction rate was 1.63 and the intrinsic rate of natural increase 19 per thousand. These two measures rose with further mortality decline, reaching a peak when the life expectation at birth was 42.5 years--2.14 for the former measure and 32 per thousand for the latter. With still further mortality fall, the two rates began to decline and, with an expectation of life at birth of 73.9 years, reached 0.93 and -4 per thousand, respectively. However, there was little decline in either rate until after the life expectation at birth reached 70.2 years; with mortality at this level, the net reproduction rate was 1.75, and the intrinsic rate of natural increase was still 26 per thousand. In this model, the difference between the net reproduction rates at a life expectation at birth of 73.9 years

and at lower levels can be taken as the effect on fertility of the perceived level of child survival, irrespective of the individual level of actual child loss, under the conditions imposed.

The two articles by Heer and Smith (1968, 1969) evoked considerable comment. O'Hara (1972a, 1975) made two important theoretical contributions to the discussion. First, he pointed out that mortality decline would reduce the expected cost of surviving children, and that this should result in a higher demand for surviving children; the Heer and Smith model had ignored this effect. Second, he showed that a decline in mortality would also cause parents to substitute child quality for child quantity. Essentially, investments in each child are made more attractive according to the probability that the child will survive to the age of investment payoff. Thus, given the fact that low mortality reduces the need to hoard extra births but also reduces the cost of surviving children, the effect of reduced mortality on fertility is indeterminate unless there is substitution of quality for quantity.

The previously mentioned study by Heer and Wu (1975 and 1978) was designed specifically to test the validity of Proposition 4. Interviews took place in two townships having very different levels of infant and child mortality: in one (Hsinchuang), the death rate at ages under five was 5 per thousand; in the other (Kungliao), it was 9.1 per thousand. An index of the perception of child survival was constructed from three questions: the first concerned the number among twenty births surviving to age 15, the second the number among 100 births surviving to that age, and the third the number surviving to age 15 among the number of babies born to the average woman in the area. In each township, the average perceived proportion surviving to age 15 was quite accurate; in Hsinchuang, 94.1 percent were perceived to survive to this age and, in Kungliao, 91 percent. However, the stability of response over a year's span of time was very poor. For example, the coefficient of correlation between test and retest for the question on number of survivors from 20 births was 0.29. Despite this lack of reliability, the perception of child survival did have some effect in the multiple-classification analysis in which fertility behavior and attitudes were dependent variables. For example, among women who had three or more births, after control for all other relevant variables including prior child loss, those who perceived child survival as less than 85 percent went on to have about 0.24 more children than those who perceived 95 percent survival or more.

After control for all other relevant variables, including the perception of child survival, residence in one township or the other had a very substantial effect on fertility behavior and attitudes. This may be attributed to the poor reliability of the measurement of the perception of child survival, and to the fact that the actual higher level of child survival in Hsinchuang did serve to reduce actual and desired fertility there. However, even after holding constant major variables at the individual level, Heer and Wu's design could not separate out other factors at the community level, such as the mean level of educational attainment, which might also have influenced the township variable. Furthermore, the importance of this

variable might also have been increased by a lack of complete reliability in the measurement of previous child loss.

The study by Pebley et al. (1979) in Guatemala provides additional evidence related to Proposition 4. In this study, perceptions of child survival were measured by averaging the results of two questions about survival from five and ten births, respectively. A multivariate logit analysis was conducted in which the dependent variable was whether or not additional children were desired. In this analysis, the perception of child survival was not shown to have any significant effect. This is not surprising in view of the probable lack of measurement reliability and the relatively small sample size. However, Pebley et al. did find a significant positive effect of a related variable, the proportion of the respondent's siblings who had died, for both women at parities 3 and 4 and those at parities of 5 or more. Most probably, this was a more valid measure of the perceived level of child survival than the questions directly aimed at its measurement.

The only other study relevant to Proposition 4 is the previously mentioned study by Rizk et al. (1980) in Egypt. This study analyzed the proportion of women who had ever practiced contraception according to variables measured at the individual level and also at the level of each of the 12 villages in which the women were interviewed; the two community variables were the average infant mortality rate and the distance of the village from family planning services. Adjusted for the effect of other variables, including individual child loss, the proportion ever practicing contraception increased from 14 percent in the communities with high infant mortality to 22 percent in those with low infant mortality.

If the perceived level of child survival has an important effect on fertility in societies where the practice of birth control is infrequent, it probably does so through a positive association between female age at marriage and the level of child survival. In broad international terms, it is obvious that there is a substantial correlation between these two variables, although there is apparently no quantitative study documenting empirical support for this conclusion. In an important study of 21 administrative regions in Taiwan based on data taken from the 1966 census for separate five-year age groups of women, Schultz (1980) found a major influence of average level of child mortality on duration of marriage, holding constant the average educational level. For example, for women 30 to 34, a decline in child mortality from 15 to 5 percent led to a compensating increase in age at first marriage of nearly two years. Schultz presented the tentative conclusion that "among younger women reaching their thirties in the later 1960s, regional variation in age at marriage appears to have overcompensated for remaining regional differences in child mortality."

<u>Proposition 5</u> The magnitude of the effect of the perceived level of child survival in the community on the optimal number of births will vary depending on the perceived monetary and psychic costs of birth control. The higher the cost of birth control, the less the

effect of the perceived level of child survival on either the absolute number of optimal births, or on that number relative to the optimal number when the perceived level of child survival is low.

This proposition is intuitively plausible, assuming that under conditions of high perceived mortality, there is little difference between the desired number of births and their maximal supply, but that this gap increases with mortality decline. The cost of birth control can then be expected to influence the gap between the desired and the optimal number of children. Apparently, however, no empirical research has addressed this issue.

Proposition 6 The magnitude of the effect of the perceived level of child survival in the community on the actual number of births per woman will vary depending on the desired number of surviving children. The desired number may be so high that, in conjunction with given birth control technology and a given set of values for the perceived level of child survival, it generates a set of values for the optimal number of births which all exceed the maximal supply; in this case, a shift from a low to a high level of perceived child survival will have no effect on actual births. Or the desired number of surviving children may be lower, so that, in conjunction with the same birth control technology and the same set of values for the perceived level of child survival, it generates a set of values in which the optimal number of births associated with a high level of perceived child survival is below maximal supply; in this case, a shift from a low to a high level of perceived child survival will reduce the actual number of births per woman.

Proposition 6 is a logical consequence of three assumptions: (1) at any given level of birth control technology, the gap between optimal and desired births is a constant positive fraction of the gap between desired births and maximal birth supply; (2) the desired number of births is equal to the desired number of survivors divided by the proportion of births perceived to survive; and (3) actual births are equal to optimal births when the latter are below maximal supply; otherwise actual births are equal to maximal supply. These assumptions appear highly plausible. Again, however, there appears to be no empirical research to support the conclusions of Proposition 6.

Proposition 7 For any given set of levels of child survival, the perceived cost of birth control will determine the relative predominance of sequential versus age-at-marriage response to mortality change. Where the perceived cost of birth control is low, the sequential response will predominate; where the perceived cost is high, the age-at-marriage response will predominate.

This proposition is based on the earlier proposition that a sequential response to prior child loss is less likely the higher the perceived cost of birth control. It is also based on the Schultz (1980) findings of a positive association between age at marriage and level of child survival in areas of Taiwan among older cohorts of

women in 1966--cohorts who had entered marriage before the practice of birth control became common in Taiwan. Apparently, however, there has been no systematic research designed to test this proposition, although early twentieth-century Ireland provides an outstanding example of an age-at-marriage response to increased child survival due to a high perceived cost of birth control among its very devoted Catholic population.

A hoarding response can be defined as any extension of the period of exposure to the possibility of birth with a rise in the level of mortality. The age-at-marriage response discussed above is an example. Another form of hoarding response becomes possible when contraception, sterilization, or abortion can be used as birth control. These practices can be initiated as soon as the desired number of surviving children has been attained, or the couple can have additional children on the chance that some of the existing ones will not survive. If sterilization is the only means of birth control, it is impossible to replace any children who might subsequently die; on the other hand, when either contraception or abortion is the means of birth control, a sequential response to future child death is always possible up to the time of menopause or sterility from natural causes.

The previously mentioned model by Heer and Smith (1968, 1969) assumed sterilization to be the means of final birth control, allowing for sequential response to child mortality and the birth of daughters only up to that point. Accordingly, the model assumed that parents hoarded sons so they could be 95 percent certain of at least one surviving son at the father's sixty-fifth birthday. As has been pointed out by O'Hara (1972b) and Ben-Porath (1980), a hoarding response is a less efficient reaction to any given level of child survival than a sequential response, since the latter minimizes childrearing costs. Obviously, if an equally satisfactory but reversible means of birth control were available, couples could do less hoarding and make more use of sequential response. O'Hara (1972b) constructed additional models similar to those of Heer and Smith, but assumed a perfectly effective reversible method of contraception. One model assumed that couples always wanted an additional child if they had no living son, but otherwise had the minimum number of births needed to ensure a 95 percent probability of one living son at the father's sixty-fifth birthday. Based on this model, the intrinsic rate of natural increase would never rise as high as that of the Heer and Smith model; the rate would also decline from that point much more rapidly with further mortality decline than the Heer and Smith rate. The following proposition generalizes these results.

<u>Proposition 8</u> Under conditions of perfectly effective birth control, at each given level of mortality, the total fertility rate and the intrinsic rate of natural increase will vary inversely with the degree of prevalence of a sequential rather than a hoarding response to child death.

CONCLUSION

Clearly, much more research has been devoted to sequential response to actual prior child loss than to the extent to which the perceived level of child survival affects fertility. Research in the former category also clearly leads to the conclusion that couples who experience child loss do not on the average fully compensate for that loss, even in nations where family planning is widespread. Those who believe that the perceived level of child survival has relatively little effect on fertility take the incomplete sequential response to mean that a reduction in infant and child mortality will probably serve to increase the rate of natural increase; those like Schultz (1980) and Heer and Wu (1978:150-152) who have taken a more optimistic view have emphasized the possible importance of the perceived level of child survival irrespective of prior child loss.

BIBLIOGRAPHY

Balakrishnan, T. R. (1978) Effects of child mortality on subsequent fertility of women in some rural and semi-urban areas of certain Latin American countries. Population Studies 32:135-145.

Ben-Porath, Y. (1980) Child mortality and fertility: Issues in the demographic transition of a migrant population. In R. A. Easterlin, ed., Population and Economic Change in Developing Countries. Chicago: University of Chicago Press.

Chowdhury, A. K. M., A. R. Khan, and L. C. Chen (1976) The effect of child mortality experience on subsequent fertility: In Pakistan and Bangladesh. Population Studies 30:249-261.

Coombs, L. C., and T.-H. Sun (1978) Family composition preferences in a developing culture: The case of Taiwan 1973. Population Studies 32:43-64.

Davis, K. (1967) Population policy: Will current programs succeed? Science 158:730-739.

Easterlin, R. A., R. A. Pollak, and M. L. Wachter (1980) Toward a more general economic model of fertility determination: Endogenous preferences and natural fertility. In R. A. Easterlin, ed., Population and Economic Change in Developing Countries. Chicago: University of Chicago Press.

Glassman, M. B., and J. A. Ross (1978) Two determinants of fertility decline: A test of competing models. Studies in Family Planning 9:193-197.

Heer, D. M. (1966) Economic development and fertility. Demography 3:423-444.

Heer, D. M., and D. O. Smith (1968) Mortality level, desired family size, and population increase. Demography 5:104-121.

Heer, D. M., and D. O. Smith (1969) Mortality level, desired family size, and population increase: Further variations on a basic model. Demography 6:141-149.

Heer, D. M., and H.-Y. Wu (1975) The effect of infant and child mortality and preference for sons upon fertility and family planning behavior and attitudes in Taiwan. In J. F. Kantner and L. McCaffrey, eds., Population and Development in Southeast Asia. Lexington, Mass.: Lexington Books.

Heer, D. M., and H.-Y. Wu (1978) Effects in rural Taiwan and urban Morocco: Combining individual and aggregate data. In S. H. Preston, ed., The Effects of Infant and Child Mortality on Fertility. New York: Academic Press.

Lapham, R. J., N. H. Wright, and A. S. Quandt (1975) The influence of special mortality reduction programs on fertility: An initial look at some empirical data and measurement problems. In Seminar on Infant Mortality in Relation to the Level of Fertility. Paris: Committee for International Coordination of National Research in Demography.

Myers, G. D., and J. M. Roberts (1968) A technique for measuring preference for family size and composition. Eugenics Quarterly 15:164-172.

O'Hara, D. J. (1972a) Changes in Mortality Levels and Family Decisions Regarding Children. Report R-914. Santa Monica, Calif.: Rand Corporation.

O'Hara, D. J. (1972b) Mortality risks, sequential decisions on births, and population growth. Demography 9:485-498.

O'Hara, D. J. (1975) Microeconomic aspects of the demographic transition. Journal of Political Economy 83:1203-1216.

Paddock, W., and P. Paddock (1964) Hungry Nations. Boston: Little Brown and Company.

Park, C. B., S. H. Han, and M. K. Choe (1979) The effect of infant death on subsequent fertility in Korea and the role of family planning. American Journal of Public Health 69:557-565.

Pebley, A. R., H. Delgado, and E. Brinemann (1979) Fertility desires and child mortality experience among Guatemalan women. Studies in Family Planning 10:129-136.

Preston, S. H. (1975) Introduction. In Seminar on Infant Mortality in Relation to the Level of Fertility. Paris: Committee for International Coordination of National Research in Demography.

Preston, S. H. (1978) Introduction. In S. H. Preston, ed., The Effects of Infant and Child Mortality on Fertility. New York: Academic Press.

Rizk, I. A., C. S. Stokes, and M. R. Nelson (1980) The Influence of Individual and Community-Level Child Mortality on Fertility in Egypt. Paper presented at the annual meeting of the Population Association of America, Denver.

Rutstein, S. (1970) The relation of child mortality to fertility in Taiwan. Social Statistics Section. Proceedings of the American Statistical Association. Washington, D.C.: American Statistical Association.

Rutstein, S., and V. Medica (1978) The Latin American experience. In S. H. Preston, ed., The Effects of Infant and Child Mortality on Fertility. New York: Academic Press.

Schultz, T. P. (1980) An economic interpretation of the decline in fertility in a rapidly developing country: Consequences of planning. In R. A. Easterlin, ed., Population and Economic Change in Developing Countries. Chicago: University of Chicago Press.

Scrimshaw, S. C. M. (1978) Infant mortality and behavior in the regulation of family size. Population and Development Review 4:383-403.

Shin, E. H., T. H. Kwon, and H. Y. Lee (1981) Determinants of fertility differentials in Korea. Sociology and Social Research 65:211-225.

Taylor, C. E. (1965) Health and population. Foreign Affairs 43:475-486.

Taylor, C. E., J. S. Newman, and N. U. Kelly (1976) The child survival hypothesis. Population Studies 30:263-278.

Vallin, J., and A. Lery (1978) Estimating the increase in fertility consecutive to the death of a young child. In S. H. Preston, ed., The Effects of Infant and Child Mortality on Fertility. New York: Academic Press.

Williamson, N. E. (1976) Sons or Daughters: A Cross-Cultural Survey of Parental Preferences. Beverly Hills, Calif.: Sage Publications.

Wyon, J. B., and J. E. Gordon (1971) The Khanna Study. Cambridge, Mass.: Harvard University Press.

Chapter 12

NORMS RELATING TO THE DESIRE FOR CHILDREN

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The concept of norms is often used to explain, predict and interpret trends and variations in reproductive behavior. Thus, a developing country's fertility rate is said to have fallen because of the rise of a "two child norm," or certain groups are said to have higher fertility or a distinct pattern of fertility differentials because of their unique norms. Not only is the concept of norms widely used within the substantive literature; it is also the focal point for a conceptual literature oriented towards nonsociological demographers (e.g., Ryder, 1973b). According to this literature, norms are distinct from preferences or tastes, and are necessary to an understanding of fertility.

This paper examines the subject of norms and their relation to fertility. However, it has less to say about fertility norms in developing countries than about why so little is known regarding them. Although the paper began as a search for information about levels and trends in norms relating to the desire for children, it has evolved over time into a theoretical and methodological exploration of the concept of norms and the difficulties of empirically assessing this concept. In this connection, the discussion that follows makes several points: (a) that the concept of norms in sociological theory has an epistemological status that makes straightforward empirical assessment of particular types of norms difficult; (b) that few social demographers have provided unambiguous evidence about the nature of family-size norms, especially in the developing countries; (c) that, even when studies have attempted to measure family-size norms, underlying theoretical ambiguities make the results less than definitive; and (d) that the utility or necessity of assessing family-size norms for understanding trends or differentials in fertility behavior is itself unclear. To make these points, the discussion addresses not only the literature explicitly focused on

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fertility norms, but also the theories of norms used more generally by sociologists. Its overriding point is that the concept of norms represents a complex collection of ideas about which sociologists frequently disagree, and for which unambiguous empirical evidence is rarely collected.

The discussion below is organized as follows. First, the concept of norms is defined, and its epistemological status briefly described. This is followed by a fuller discussion of some theoretical ambiguities and disagreements that illustrate the problems confronting the empirical assessment of particular norms. A third section focuses on the demographic literature: possible types of reproductive norms are outlined; then some commonly accepted strategies for measuring these norms are described, and the conceptual and technical problems associated with these approaches discussed. A final section of the paper takes up the issue of where norms belong in models of fertility change. Of particular concern here is the extent to which an understanding of fertility trends requires direct measurement of trends or differentials in fertility norms.

THE CONCEPT OF NORMS

As several past reviews have noted (e.g., Gibbs, 1965), sociologists do not always agree about the formal definition of norms, much less the processes through which norms arise or constrain individual behavior. However, certain assumptions about the nature of norms seem to be shared by most sociologists. One such assumption is that a social norm constitutes an expectation for, not just a description of, behavior. Norms are more than mere statistical averages: they are rules stating how people ought to behave.[1] Another widely shared assumption is that some norms, although perhaps not all of them, act to constrain the behavior of most individuals to whom they apply. To be sure, deviant behavior is as much a feature of social life as is conforming behavior, but the purpose of norms in most views is to provide individuals with incentives for behaving in ways they would not otherwise behave (Blake and Davis, 1964). Most sociologists also seem to agree that social norms, unlike other kinds of evaluative ideas, are fairly specific in their application. Norms prescribe how individuals are to behave, think, or feel in a particular circumstance or social situation, rather than as a general matter. (More general statements about desired goals are sometimes termed "values.") A final assumption shared by most sociologists is that most norms, or at least those that effectively constrain individual behavior, are widely shared by the members of the relevant group (e.g., Fried and Udry, 1980). A norm, in other words, is a social phenomenon, not just an individual one (although see Hawthorn, 1970:115). A "core" definition of the concept of norms with which most sociologists would probably agree, then, is that a norm is "any [widely shared] standard or rule that states what human beings should or should not think, say, or do under given circumstances" (Blake and Davis, 1964:456).

The concept of norms has an epistemological status within

sociological theory similar to that of the utility function within microeconomic theory. The concept, in other words, serves as a basic and highly general explanation for why people behave as they do, and hence for the predictability of human behavior and the cohesion of social groups.[2] Although the concept of norms is used by virtually all sociologists, this widespread application has not resulted in a unified understanding of how norms arise or come to constrain individual behavior. Just as economists debate whether individuals "maximize" or instead "satisfice" their utility functions, so, too, sociologists debate just how it is that norms come to influence people's ideas and actions. One result of this, of signal importance for the present discussion, is that the theoretical basis for measuring norms--for collecting unambiguous evidence about their content in particular sociohistorical settings--is generally shaky. Thus, before one can hope to assess what is known about particular norms, such as those governing fertility desires, it is necessary to understand some of the basic ambiguities and disagreements in competing theoretical views of social norms. This is the subject of the following section.

THE THEORY OF NORMS[3]

A complete theory of norms must address two interrelated issues: first, what determines the content of a group's norms, and second, how it is that these norms come to contrain the behavior of individuals in particular situations. This section focuses on the latter issue.[4] This is an important issue because almost all norm theories admit to the possibility that individuals may display normative ideas that nonetheless fail to motivate them to behave in the prescribed ways. That is, ineffective social norms can exist. Because the ultimate aim of this review is to understand the determinants of fertility, not to catalog all normative ideas, it is important to use evidence that in theory can distinguish effective norms. Sociologists do not always agree about what makes norms effective, however, and unambiguous evidence for the existence of effective social norms is therefore difficult to obtain. Moreover, all theories of normative constraint contain ambiguities that render empirical assessment of effective norms problematic.

In most views, norms have the peculiar property of being simultaneously an internal characteristic of individuals and an external constraint imposed upon them by the group. Because norms are ideas and because individuals ultimately control their own behavior (even in the face of coercive threats, it is the individual who decides to behave in a particular way) norms are necessarily internal to the individual (Hawthorn, 1970:114-119). At the same time, however, norms are group characteristics imposed upon individuals during socialization and reinforced by social control, i.e., expressed in social interaction (Ryder, 1973a, 1973b). This dual nature of norms underlies much of the disagreement found in the theory of norms. Because there are alternative ways to view the relationship

between the external and internal reality of norms, evidence for the existence of norms can also take alternative forms. Unfortunately, what for some sociologists is good evidence is for others no evidence at all.

Two widely accepted, if somewhat extreme, views of norms illustrate some basic disagreements about normative constraint: (a) the Parsonian "blueprint" view (Parsons, 1951; Blake and Davis, 1964), and (b) the "social construction of reality" view (Berger and Luckmann, 1966; Cancian, 1975; also see Kohlberg, 1976, for a related approach within psychology). As the reference to "blueprint" suggests, the Parsonian approach to norms argues that conformity occurs because most individuals have an emotional commitment to behaving as the norms of their group say they should: norms are lodged within them and guide their behavior much as blueprints guide the behavior of a builder. This emotional commitment to norms arises during the socialization process, i.e., during the individual's induction to group membership or into particular roles within the group. For Parsons, this process "works" only insofar as the individual is emotionally or physically dependent on the agents of socialization, and is therefore motivated to please them. Over time, the individual generalizes the sanctions communicated by these agents and transforms the original desire to please them into an emotional commitment to the behaviors they reinforce. Thus, in the Parsonian view, when socialization is successful, the goals for behavior prescribed by the group's norms become the <u>personal</u> goals of the individual.

In contrast to this approach, the "social construction" theory of norms assumes that the successfully socialized individual is emotionally committed to a set of <u>social identities</u> rather than to a set of normatively prescribed or positively sanctioned behaviors. In childhood especially, social labels consistently applied to the child tend to become self labels, central to the child's self concept. Once individuals are committed to these identities, they will be motivated to validate them. To do this, individuals must infer how they are expected to behave by those in a position to pass judgment on holders of such identities. Thus, individuals actively participate in their own socialization by inferring applicable rules for behavior. Unlike the Parsonian approach, this approach emphasizes the importance of all the sanctioning that individuals observe being applied to holders of their identities, not just that experienced from key agents of socialization. Moreover, it is only the social identities themselves, not the rules for validating them, to which individuals are emotionally committed.

Although there are certain obvious similarities between these two approaches to norms--both, for example, point to sanctioning as the process that ultimately gives norms their force--they also have several different implications. These include not only substantive issues, such as the rapidity with which norms can change,[5] but also methodological issues, including the types of empirical evidence that reveal the content of particular norms. Some of these latter disagreements, also germane to other norm theories, are described in

the subsections below.

The Importance of Sanctions for Inferring Norms

Because sanctions ultimately give norms their constraining force, many sociologists argue that sanctions must be observed in some manner before one can understand a group's effective norms (e.g., Fried and Udry, 1980; Griffith, 1973). Not everyone agrees with this, however. For example, the Parsonian approach suggests that widespread personal commitment to a particular way of behaving is sufficient to infer that a norm exists; observation of the sanctions giving rise to that commitment is unnecessary. Whether studies of norms should focus on sanctions or instead on individual commitment to particular behaviors is thus unclear.

The Importance of Alternative Types of Sanctions

Different theories stress different types of sanctioning as critical for effective norms. Parsonians emphasize sanctions communicated directly to the individual by key agents during periods of intensive socialization (an example would be the rewards and punishments parents and teachers give a child). These sanctions presumably determine the individual's psychological blueprint. Social constructionists, on the other hand, regard any form of sanction, whether communicated directly or observed indirectly, as potentially effective. Thus, in this approach, content analyses of children's books, national epics, religious dramas, television programs, or village gossip might suffice to infer the nature of the group's norms. For Parsonians, however, they clearly would not.

Different norm theories also disagree about the relative importance of actual (observed) versus perceived (reported) sanctions. The social construction approach clearly points to perceived sanctions as the more important: individuals respond to what they <u>believe</u> others expect from holders of their identities (Cancian, 1975:135-147). Although the Parsonian approach to this issue is not entirely clear, many social scientists (e.g., Blake and Davis, 1964; Nag, 1981) argue that actual sanctions ultimately influence individual behavior and hence are to be preferred over perceived sanctions in measuring effective social norms. When perceived and actual sanctions in a group diverge, this disagreement becomes a significant methodological issue.

The Importance of Alternative Types of Attitudes for Inferring Effective Social Norms

For those sociologists who believe that the group's effective norms can be inferred from the distribution of its members' individual attitudes, precisely which attitudes will provide necessary or

sufficient evidence depends upon the theory of norms adopted. Because the Parsonian approach emphasizes the individual's personal commitment to behaving normatively, the appropriate attitudes for measuring norms are individuals' opinions about how they and others should behave. In the social constructionist approach, personal feelings of right and wrong are irrelevant to the effectiveness of norms (Cancian, 1975:137). Instead, norms get their force from sanctions that individuals perceive among those in a position to legitimate particular social identities. Thus the appropriate attitudes for measuring norms are opinions about how other people evaluate particular behaviors, not how those being questioned themselves feel.

The Importance of Tapping Unconscious Mental States When Assessing Effective Social Norms

The Parsonian and some other approaches to norms imply that most individuals respond to norms unconsciously. Because norms are internalized, most conformity arises without conscious calculation of the costs and benefits of conformity vs. deviance, and perhaps even without conscious awareness of the norm's content (e.g., Goldberg, 1980). Thus it is sometimes argued that to assess norms from verbal reports of individuals (as opposed to direct observation) requires techniques for tapping unconscious motivational states, for example, Thematic Apperception Tests or semantic differentials (e.g., Henley and Gustavus, 1977). Social constructionists, on the other hand, are much less likely to view norms as operating largely or wholly unconsciously.[6] Cognitive construction of behavioral rules is the primary mental operation leading to normative constraint, and although this process may be partly unconscious, there is no reason to think that it is not largely conscious. The social constructionist approach to norms therefore tends to eschew the use of projective techniques for assessing group norms.

Other Theoretical Ambiguities

In addition to the ambiguities arising from basic theoretical disagreements about how norms "work," two areas of ambiguity exist regardless of theoretical approach: first, the nature of the relevant group among which to assess social norms, and, second, the consensus needed to conclude that an effective norm exists. Both issues arise because of the abstract nature of such concepts as "group" and "consensus." Theoreticians may be able to state abstractly the kind of group likely to enforce particular norms; for example, social constructionists view those in a position to legitimate acceptable behaviors for particular social identities as the "relevant group" among which to assess social norms. In practice, however, the precise boundaries of these groups are likely to be unclear.[7] This problem is especially pressing for demographers, who are typically interested in the behavior of large population aggregates, not just small and

socially homogeneous villages, professional societies, or cliques. Whenever such aggregates fail to display a normative consensus (however it may be measured), it is unclear whether this reflects the absence of effective social norms or the aggregation of groups holding distinct norms. Equally unclear in practice is the consensus needed to conclude that an effective social norm exists. While it is sometimes possible to avoid this problem by simply referring to more vs. less widely shared norms, the lack of an obviously strong consensus is likely to be bothersome. Does it indicate the lack of an effective norm, or does it indicate the presence of an effective norm that is shared by only one portion of the population under consideration? The answer to this question is generally unclear, which can make empirical assessment of social norms, especially via quantitative data, difficult indeed.

THE DEMOGRAPHIC LITERATURE

Given the theoretical and methodological ambiguities discussed above, it is not surprising that assessing particular norms, such as those governing the desire for children, is difficult and complex. This section reviews the demographic literature, and the evidence it provides (or fails to provide) on reproductive norms. The primary focus of the discussion is not on actual levels and trends in these norms, but on the various approaches to measuring them.

How Norms Relate to the Desire for Children

An important point often obscured in past discussions of fertility norms is that family-size desires can be normatively constrained in two distinct ways: (a) by direct prescription of the numbers of children that parents may bear; and (b) by indirect prescription of particular social, economic, political, or religious obligations between parents and children, husbands and wives, clients and patrons, or citizens and the state, obligations that in turn affect the value of children to parents. In other words, norms that are unrelated to fertility or family size--that make no reference to numbers of children, to sexual intercourse, to the use of contraception or to any of the "intermediate" fertility variables identified by Davis and Blake (1956)--can influence the desire for children in a given social group.[8] Thus, a complete review of norms relating to the desire for children in developing countries would have to include all norms governing social relations and institutions that indirectly provide fertility incentives or disincentives. Because a task of this magnitude is clearly beyond the scope of the present discussion, the focus here is on reproductive norms, in particular those that explicitly regulate family size. Although it is not clear that all societies have norms of this kind, most demographers seem to assume that they do (e.g., Freedman, 1963; Ryder, 1973a, 1973b, 1978; Lee, 1974; Raina, 1969), and the bulk of the empirical literature is based

on that assumption.

It should be noted that family-size norms can themselves take a variety of forms. Some discussions have assumed a simple numerical form, for example, an acceptable family-size range of from n to n+m children, or a minimum acceptable family size (e.g., Freedman, 1963). Other discussions (Rainwater, 1965; Ryder, 1978), however, have suggested that family-size norms are typically expressed as formulas for individual couples to use in determining a normatively acceptable family size (an example might be a formula for adding children according to the couple's economic resources and social status).[9] Still other authors (e.g., Page and Lesthaeghe, 1981) have argued that family-size norms are often organized as direct rules not about family size per se, but about when to start bearing children, when to add children, and when to cease bearing them. Although norms in any of these forms can be studied empirically, the fact that different societies may have different types of norms clearly complicates a cross-cultural review.

Past Methods of Assessing Family-Size Norms

Most of the literature reviewed for this paper uses survey data as the basis for assessing family-size norms. However, intensive field studies of the type traditionally conducted by social or cultural anthropologists have recently become fashionable in demography (e.g., Jones, 1977), and although there are few such studies focusing on family-size norms, their strengths and weaknesses are worth reviewing.

Measuring Family-Size Norms via Intensive Field Studies

Field studies vary in how systematically they sample, measure, and analyze observations. The hallmark of these studies, however, is their reliance on informal, intensive observation of a natural community of interacting individuals over a relatively long period of time, usually by a single researcher or small research team. Probably the signal strength of field studies is the opportunity they provide to collect many types of observations on an interacting group of individuals. In particular, field studies permit the researcher to gather data both on how individuals actually interact and on how they perceive their social relations and personal attitudes. Correlation of these two types of data provides the opportunity to understand both the "external" and "internal" reality of social norms in a particular community. Also important is the opportunity that field studies provide for understanding the social context of particular norms, and hence the meaning these norms are likely to have for the people they attempt to control.

The informality of intensive field studies is, however, also their weakness. The absence of systematic sampling of people and events in most of these studies limits the extent to which their results can be applied to larger populations, as does their focus on only one or two

communities. Also, although these studies may be no more subject than surveys to observer biases, their private nature--the "correlation" of information inside a researcher's head, rather than in a published cross-tabulation--makes it difficult to judge the extent of such biases.

Nevertheless, field studies and the ethnographies in which they result can yield important information about family-size norms, especially if observed sanctions are regarded as critical. For example, Ware (1979) has uncovered evidence about norms restricting reproduction in middle age by systematically reading African and Asian ethnographies (all of them based on intensive field studies). A casual reading of ethnographies for this chapter revealed a strong emphasis on avoiding childlessness in many Asian and African agricultural and pastoral societies, and an equally strong emphasis on avoiding too many children in some simpler hunting-and-gathering and horticultural societies (for the former, see e.g., Caldwell, 1976:79; Srinivas, 1976:149; and Barnabas, 1974; for the latter, see Lorimer, 1958:105-114; Wrigley, 1969:42-44; and Collier and Rosaldo, 1981). The sanctions reported are often memorable. For example, Rattray (cited in Ampofo, 1970:217) describes an Ashanti custom in which thorns are driven into the feet of any woman who has died childless, with the accompanying admonition, "You have not begotten a child, do not return to this world again like that"; on the other hand, Reichel-Dolmatoff (1971:144-145) reports that the hunter-horticulturist Desana scorn a couple with six or seven children and refer to them as a "family of dogs." The ease with which seemingly convincing evidence about reproductive norms can sometimes be gleaned from ethnographies suggests that demographers interested in norms should pay closer attention to this literature.

Measuring Family-Size Norms Using Survey Data

Surveys and survey-based psychometric studies of family-size norms tend to have strengths and weaknesses opposite to those of field studies. Although they permit systematic sampling of large populations and base their conclusions on a more publicly accessible inference process, they cannot observe how individuals actually interact with each other in the course of day-to-day living. In addition, the verbal reports on which these studies are forced to rely can be distorted by the social dynamics of the survey process, a problem worrisome in developing countries, where interviewers are often better educated and more urbanized than those they interview.[10] Surveys have also been accused of promoting a superficial or even misleading understanding of social norms by requiring respondents to answer through fixed, precoded choices rather than spontaneous expression. Despite these drawbacks, however, most researchers interested in family-size norms rely largely or wholly on survey data, and the methods used in these studies are thus central to the present discussion. Some of the primary methods are outlined in Table 1. These methods are arranged according to their apparent

suitability, rather than their frequency of use. The remainder of this section focuses on the strengths and weaknesses of each of these approaches, presenting illustrative data where appropriate.[11]

1. Questions About Perceived Sanctions for Alternative Family Sizes[12] There are two somewhat different types of questions here: (a) those that ask respondents about the fertility pressures and rewards offered by members of their social network, and (b) those that ask about the fertility pressures and rewards offered by the community more generally to women or couples. With either type of question, it is the existence of a consensus about these pressures or rewards across the sample being studied that permits inferences about the content of family-size norms; in other words, it is the distribution of responses--in particular, the extent to which this distribution clusters around certain values--rather than responses as traits of individuals that is significant.

The obvious advantage of such questions is that they focus on the process that in most views ultimately gives norms their force--sanctioning. If well designed and carefully analyzed, such questions thus offer the possibility of assessing family-size norms directly. However, these questions are also problematic in several respects. Obviously, they do not reveal the actual sanctioning associated with alternative family sizes (no survey method really does); nor do they reveal the individual's own moral judgments about alternative family sizes. Also, unless designed to do so, questions of this kind may fail to detect family-size norms that are expressed as starting, adding, and stopping rules. In addition, questions asking about the approval or disapproval of others may reflect projections of the respondent's own feelings.

In addition to these shortcomings, perceived-sanction questions share two problems with most survey-based measures: first, the marked effect that question wording can have on response distributions, and, second, the effect that aggregation can have. As the data shown in the upper panel of Table 2 from the Value of Children (VOC) surveys (Arnold et al., 1975) suggest, questions that deal with similar topics but differ in their referents and wording may indeed mean different things to respondents, and can therefore elicit very different answers. All three questions shown in this panel address the same issue, namely, community pressures and rewards for becoming a parent. However, because some deal with pressures while others deal with rewards, and because some are phrased more strongly than others, the response patterns vary, especially for Thailand and the Philippines. The data in the upper panel of Table 2 also illustrate the effects that aggregation can have on the consensus observed within the population. In several of the countries shown, consensus about the sanctions for parenthood is considerably greater among rural than among urban respondents, suggesting that norms for parenthood remain stronger in the rural areas. Inferences about family-size norms based on survey measures may be quite misleading unless accompanied by analyses that address significant subgroup variations.

TABLE 1 Summary of Survey-Based Measures of Family-Size Norms Used in Past Studies and Their Associated Advantages and Disadvantages

Measure	Advantages	Disadvantages
Questions About Perceived Sanctions for Alternative Family Sizes Examples: "Have you ever been critized or ridiculed for the number of children you currently have?" "Is a woman with many children more respected in the community than a woman with few children?"	Could measure sanctioning	May be used to rationalize fertility or preferences
Questions About Respondent's Own Approval or Disapproval of Alternative Family Sizes Example: "A woman's duty is to bear children."	Could measure sanctioning	No information on the communication of sanctioning
Projective Approaches Examples: Coding of positive or negative responses to photographs of families varying in number of children. Similar coding of sentence completions for "A man without children . . ." "A man with many children . . ."	May tap unconsciously held norms or those people are unwilling to articulate openly	May tap perceived costs and value of children rather than family-size norms per se
Questions About How Many Children are "Too Many" and "Too Few"	Gets at limits of "acceptable" family size	May tap perceived costs and value of children rather than family-size norms
Ideal Family Size Questions, Especially Those Having a Group Reference Example: "What is the ideal number of children for a family in your barrio?"	Readily available; some evidence for U.S. that may tap family-size norms	No information on disapproval or on perceived sanctions at individual level; does not tap acceptable range of family sizes
Desired Family Size Questions	Readily available	Does not refer to group norms or social pressures but instead to individual demand for children
Analysis of Fertility Similarities Within Social Networks	May measure effect of norms	Self-selection confounded with the effects of social influence; social network boundaries not always clear

2. Questions About the Respondent's Own Approval or Disapproval of Alternative Family Sizes One of the most commonly used approaches to measuring social norms through surveys is to ask representative samples about their own approval or disapproval of particular behaviors.[13] Where a response consensus exists, a norm can be indicated for one of two reasons: (a) because the response consensus indicates a moral consensus that the behavior in question is "right" ("wrong"), or (b) because the response consensus makes it likely that the behavior will be positively (negatively) sanctioned during informal interpersonal interaction.[14] Thus, from more than one theoretical perspective, questions that tap respondents' own approval/disapproval for alternative family sizes can provide good evidence about family-size norms.

Few surveys in the developing countries have used questions of this kind to measure family-size norms (although see Davidson et al., 1976).[15] Several, however, have used "value of children" questions that can be viewed as indicators of personal approval or disapproval because the values to which they refer are extremely general. Five examples of questions of this type, taken from the VOC studies, are shown in the lower panel of Table 2.[16] These questions are interesting because they suggest far more normative support for parenthood than do responses to the three perceived-sanction questions shown above them. In Thailand, the Philippines, Taiwan, and Korea, at least, there is an overwhelming consensus that parenthood is highly valued and hence, one would assume, highly approved. Almost everyone in these samples agrees that parenthood is the sine qua non for the assumption of social adulthood, that it is highly expectable and hence "natural," and that it is indeed one of the most honorable pursuits in life.

Unfortunately, it is unclear which type of question provides a better reading of the normative pressures or rewards for childbearing. This not only reflects the lack of consensus among sociologists about the social-psychological processes through which norms influence individual behavior or motivation; it also reflects the impact that cultural context can have on responses to alternative types of questions. For example, in cultures that place a strong value on individualism and personal autonomy, people may find it distasteful to admit to community pressures for childbearing.[17] In these cultures, questions focusing on the individual's own approval of parenthood may reveal more about social norms than do questions about community or interpersonal pressures (though this is not inevitably the case). In cultures where there is little value placed on individualism and strong value on community or family loyalty, the reverse may be the case.[18] Thus, a thorough examination of the cultural forces likely to influence responses to alternative types of survey questions is needed to assess the relative value of perceived-sanction vs. own-approval questions for measuring family-size norms.

3. Projective Approaches to Measuring Family-Size Norms Several studies of family-size norms have used techniques in which respondents

TABLE 2 Percentages Agreeing with Selected Items from the Value of Children Surveys

Item	Thailand	Philip-pines	Taiwan	Korea	Japan	Hawaii
A person with children is looked up to in the community more than a person without children	71	59	64	77	30	30
Rural residents only	84	77	72	88	40	--
A young couple is not fully accepted in the community until they have children	56	32	59	71	19	17
Rural residents only	73	41	71	79	20	--
Considering the pressures from family and friends, a person really doesn't have much choice whether or not to have children	36	41	33	31	29	14
Rural residents only	48	40	30	36	30	--
A girl becomes a woman only after she is a mother	96	88	86	85	76	46
A boy becomes a man only after he is a father	91	82	78	81	60	36
It is only natural that a woman should want children	93	94	94	94	89	82
It is only natural that a man should want children	88	96	93	96	87	76
One of the highest purposes in life is to have children	96	96	73	96	87	77

Note: For information on samples and general characteristics of these surveys, see Arnold et al. (1975). The data are not from national probability samples and should be interpreted with caution.

are asked to project answers onto ambiguous stimuli representing varying family sizes (e.g., Stycos, 1964; Sastry, 1966; Simmons, 1971; Henley and Gustavus, 1977; Polit, 1978; Bleek, 1978). Responses to these stimuli are then analyzed for their evaluative content to ascertain whether members of the sample consistently react in negative ways to certain family sizes and in positive ways to others.[19] When such consistency is observed, the existence of family-size norms is indicated, at least if it is assumed that the sentiments expressed during the test reflect social norms. One rationale for using projective techniques is their supposed ability to tap unconscious attitudes (this is, of course, compelling only if one believes that most norms operate unconsciously). Another rationale is that these techniques tap attitudes whose open expression is culturally forbidden or likely to discomfit the respondent (see George, 1973). Projective tests are also said to offer the advantage of being novel and hence more fun for respondents than traditional survey questions.

However, projective approaches to measuring family-size norms tend to have three drawbacks. First is the potential unreliability of the response coding that they often require. Second is their expense: projective tests usually require more time to administer, code, and analyze than do traditional survey items. The third drawback--one these approaches share with many of the indirect approaches to measuring family-size norms discussed below--is their inability to distinguish between two conceptually distinct sources of positive or negative family-size evaluations: (a) norms that explicitly prescibe the acceptable numbers of children, and (b) nonfertility norms or institutional conditions that render particular family sizes a net asset or liabilty to parents. In other words, projective tests may reveal the perceived costs and benefits of children rather than explicit family-size norms.[20]

This possibility is illustrated by a study that asked African school children to complete two sets of sentences: "A man/woman without children . . ." and "A man/woman with many children . . ." (Bleek, 1978). Responses were first analyzed for the predominance of positive vs. negative themes, then for specific reasons why a particular family status was viewed either positively or negatively. Although a majority of students viewed the "without children" condition negatively--as one might expect from the ethnographic record, as well as from general value-of-children questions like those shown in Table 2--the great majority of these gave individual, utilitarian reasons for their views, e.g., the man without children lacks help or is lonely. Very few referred to a loss of community respect or some general lack that might reasonably be interpreted as reflecting a social norm against childlessness. The utilitarian responses may, of course, have rationalized what was at root a view of childlessness induced by traditional norms (see Thompson, 1974, for discussion of this problem). It seems just as likely, however, that tests of this kind tap perceived costs and benefits of children rather than family-size norms per se. To the extent that this is true, projective tests may provide misleading evidence about these norms.

4. Questions About How Many Children are "Too Many" or "Too Few" Although not used with great frequency in developing country studies (however, see Micklin and Marnane, 1975; Simmons, 1974), questions that ask how many children make a family "too large" or "too small" have been said to provide important clues about family-size norms. Griffith (1973), for example, suggests these questions are preferable to ideal family size questions because they indicate not just the number that is preferred or ideal but also disapproved numbers of children, i.e., numbers likely to be negatively sanctioned. Unfortunately, as usually worded, these questions do not explicitly ask respondents about their approval or disapproval of particular numbers of children; they only ask whether certain numbers are "too small" or "too large." Like projective tests, then, these questions may elicit more information about the perceived costs and benefits of children than about family-size norms. Thus, even if such questions are preferable to ideal family size questions, they cannot be considered a strong measure of family-size norms when used on their own.[21]

5. Ideal Family Size Questions Even when posed as the number of children ideal for some reference group, rather than for the respondent herself, ideal family size questions, like projective tests and too few/too many questions, may tap child utility more than normative considerations. These questions may also provide misleading evidence about norms insofar as their wording discourages zero and one answers (a claim that Ryder [1981b] has made). Also, as noted above, these questions make no attempt to measure the limits on acceptable fertility; they simply ask respondents which single family size is the "best" according to unspecified criteria.

On the other hand, ideal family size questions offer one important advantage over other survey-based approaches to measuring family-size norms: they are used with great frequency in developing country surveys.[22] There is, moreover, one analysis suggesting that these questions may in fact tap family-size norms, at least in the United States (Trent, 1980).[23] Given the widespread availability of data on ideal family size, then, these data might provide useful clues about the nature of family-size norms.

To illustrate how ideal family size data might be used, data from a number of countries are presented in Table 3, together with summary statistics.[24] It seems reasonable to assume that most family-size norms prescribe an acceptable family-size range rather than a single acceptable number of children (e.g., Freedman, 1963). The evidence for norms contained in an ideal family size distribution, then, should consist of family sizes at either tail of the distribution that virtually no one names as ideal, that is, the kind of clustering of responses in a particular family-size range that has been observed in the United States over the past couple of decades (see Blake, 1974). Table 3 lists, first, the number of children at or below which 10 percent or less of sample ideals are found, and, second, the number at or above which another 10 percent or less are found. The use of 10 percent is arbitrary; the intent is merely to indicate extremes in

family size that very few people name as ideal. Also shown in the table, in parentheses, are the exact percentages naming the smallest or largest values as ideal.

The data in Table 3 have two striking features. First, in almost all data sets, there is a very sharp drop-off in responses at the lower end of the distribution. Indeed, the percentage naming the smallest family sizes as ideal is in most instances closer to 1 than to 10 percent. (Also, although not shown in the table, the percentage naming the next highest family size as ideal is usually quite large--well above 10 percent.) This sharp drop-off at the lower end of the distribution is consistent with arguments that, if nothing else, many societies enforce minimum family-size norms in order to ensure that married couples at least replace themselves (e.g., Davis and Blake, 1956; Ryder, 1976). Although the drop-off in some countries might be attributed to the way that ideal family size questions are worded--specifically, to the fact that they refer to "children" and thus imply multiples rather than one child or none--this explanation fails for the examples where virtually no one names not just zero or one, but two or three children as ideal.

The other striking feature of Table 3 is the lack of a sharp drop-off at the upper end of most ideal family size distributions. In some cases, this may reflect the aggregated form in which the source data were available; in many other cases, however, it clearly does not.[25] In other words, the more gradual drop-off at the upper end of the ideal family size distribution is real. However, just what it reflects is unclear. It may indicate that many societies specify minimum acceptable family sizes only, the maxima being left up to individual discretion or to individual computation according to some normatively prescribed formula.[26] Alternatively, it may indicate that different subgroups in these populations have distinct norms about the maximum family size, but share the same norms about the minimum. Or it may reflect variations in the perceived net costs and benefits of children, benefits that are great enough for most people to agree that family sizes below certain levels are less than ideal, but that vary enough for there to be little consensus about the largest number of children that is less than ideal. Unfortunately, there is no way to readily distinguish among these alternatives.[27] Thus, what the distributions in Table 3 tell us about family-size norms is not entirely clear. They may indicate a rather widespread tendency for societies to enforce minimum family-size norms, but then again, they may not.[28]

6. Desired Family Size Questions Many past studies have made inferences about family-size norms on the basis of desired family size distributions (e.g., Freedman, 1963). Where particular numbers of children are desired by very few individuals--especially at either tail of the distribution--a norm proscribing these numbers or prescribing numbers higher or lower is said to exist, much as with drop-offs at the tails of an ideal family size distribution. Unfortunately, such an inference seems completely unwarranted when the distribution refers to desired rather than ideal family size, unless

TABLE 3 Information on the Tails of Ideal Family Size Distributions for Selected Countries[a]

Country and Date	Sex	Parity at or Below Which 10% or Less of Sample Ideals Fall	Ideal Range	Parity at or Above Which 10% or Less of Sample Ideals Fall
United States				
1965[b]	Women	1 (0.5%)[c]	2-4	5 (8.0%)
1968[d]	Both sexes	1 (1.5%)	2-4	5 (7.1%)
Puerto Rico				
1940s[e]	Women	1 (2.5%)	2-4	4+(18.4%)[f]
Chile				
1959[g]	Women	1 (?)	2-4 (73%)	5 (?)
Israel				
1950s[h]	Both sexes	2 (7.1%)	3-5	6 (2.0%)
Egypt				
1969-70[i]	Women	2 (5.9%)	3-4	5 (9.9%)
	Men	2 (5.7%)	3-4	5 (9.0%)
India				
1971[j]	Men	2 (5.6%)	3-5	6 (8.7%)
1974-75[k]	Men	2 (5.3%)	3-5	6 (6.8%)
Taiwan				
1962[l]	Women	2 (3%)	3-5	6 (5%)
1967[m]	Women	2 (4.3%)	3-5	6 (8.0%)
Philippines				
1972[n]	Women	2 (7%)	3-6	7 (10%)
Ethiopia				
1970-71[o]	Both sexes	1 (3.9%)	2-5	6 (11.6%)
Nigeria				
1966[p]	Ife women	2 (1.0%)	3-7	7+(22.2%)[f]
	Oyo women	2 (1.4%)	3-7	7+(20.0%)
1967[q]	Women	3 (1.0%)	4-7	7+(26.4%)[f]
1973[r]	Women	3 (1%)	4-7	7+(16%)[f]
	Men	3 (3%)	4-7	7+(22%)[f]
Ghana				
1967-68[s]	Men	3 (7%)	4-6	7 (9%)
1973[t]	Women	3 (6%)	4-6	7 (10%)
	Men	3 (4%)	4-7	7+(21%)[f]
	Pupils	3 (4%)	4-6	7 (13%)

TABLE 3 (continued)

[a]The ideal family size questions on which these data are based all refer to the ideal for some group, not to personal family size ideals.

[b]From Ryder and Westoff (1971:28). The data are from a 1965 national probability sample of currently married women under the age of 55.

[c]The numbers shown in parentheses are the percentage selecting this parity and any lower parity (higher parity in the last column) as the ideal family size.

[d]From Gustavus and Nam (1970). The data are from a nonprobability sample of primary and secondary school pupils in two southern states.

[e]From Hill et al. (1959:72). The data were collected by P. K. Hatt in the late 1940s from an island-wide probability sample of women.

[f]In these cases, data were presented in grouped form; hence, we are unable to ascertain the exact parity at or above which 10 percent or less of the sample falls.

[g]From Taban (1963). The data are from a probability sample of married women age 35-50 living in Santiago. Tabah reports the percentage giving ideal family sizes of two or four children, but does not give the percentages below or above this range.

[h]From Talmon-Garber (1959). The data are from a probability sample of the residents of collective settlements; the date of the survey is unknown. Only those respondents giving numerical responses are included in this table.

[i]From Gadalla (1978:84). The data are from a probability sample of currently married women under the age of 50 and their husbands in three Nile Delta villages.

[j]From Sandhu and Allen (1974). The data are from a sample of farmers in three Punjabi villages and refer to ideal family size for a farmer.

[k]From Srivastava and Rostogi (1977:68). The data are from a probability sample of industrial workers in Kanpur City, Uttar Pradesh.

[l]From Freedman and Takeshita (1969:40). The data are from a probability sample of married Taichung women aged 20-39.

[m]The data are from the Taiwanese Second KAP survey, which sampled currently married women under the age of 40 on an island-wide basis.

[n]From Barretto (1974). The data are from a national probability sample of currently married women between the ages of 15 and 49. The ideals reported refer to "a family in your barrio."

[o]From Chang (1974). The data are from a probability sample of individuals over age 15 in three areas of the country, including Addis Ababa. Only those respondents giving a numerical response are included in this table.

[p]From Olusanya (1971). The data are from a probability sample of currently married women in the towns of Ife (predominantly Christian) and Oyo (predominantly Muslim).

[q]From Morgan (1975). The data are from a probability sample of ever-married women in five Ibadan-area villages. The numbers shown in the table exclude women giving nonnumerical responses.

[r]From Caldwell (1976:11). The data are from a probability sample of the Yoruba population age 17 and above in two states of Nigeria. The numbers shown in the table exclude individuals giving nonnumerical responses.

[s]From Oppong (1975). The data are from a probability sample of university students in several areas of Ghana.

[t]From Bleek (1978). The data are from nonprobability samples of adult males, adult women of childbearing age, and pupils in middle and secondary schools in and near Kwahu town.

one is willing to take the rather extreme position that the only factor constraining fertility desires is family-size norms. Thus, although the distribution of family-size desires in a population may provide possible clues about normative limits on family size, it cannot by itself provide telling evidence.

7. Analysis of Fertility Similarities Within Social Networks This approach to measuring family-size norms depends on a method of analysis rather than measurement: inferences about the existence of family-size norms are made from the consistency of fertility within social networks, rather than on the basis of particular questions about family-size ideals or attitudes (e.g., Potter and Kantner, 1955; Palmore and Freedman, 1969). In some variants, respondents are used to measure the fertility of "significant others"; in others, the information is collected independently. In either case, however, this approach tends to suffer from the problem of distinguishing normative constraint from self-selection into social networks. That is, a high correlation among the members of a given social network may reflect the impact of fertility on the choice of a network as much as the enforcement of particular fertility norms within that network (the former process may occur indirectly, for example, via choices about housing or neighborhoods that are based on fertility). Thus, this approach can at best provide indirect evidence for the existence of family-size norms.[29]

In sum, then, although some survey-based measures of norms enjoy more theoretical justification than others, no measure is beyond reproach. All are prey to certain technical problems, such as sensitivity to alternative wordings and the biases induced by the aggregation of responses. Some of the most suitable methods, such as those based on questions about perceived sanctions or the respondents' own approval of alternative numbers of children, may provide reasonable evidence about family-size norms if used with care, i.e., if administered in fairly large batteries and analyzed for subgroups of the population likely to differ in their norms. Even these methods, however, may prove misleading. For this reason, it becomes important to examine the question of whether it is necessary to measure family-size norms to understand the determinants of fertility or predict future changes in birth rates. The final section of this paper addresses this question.

THE ROLE OF NORMS IN FERTILITY MODELS

Although almost all sociologists would agree that norms are important for understanding reproductive behavior, the specific issue of whether family-size norms must be included in fertility models is unclear. There are two reasons for this. First, it is possibile that some societies have no family-size norms, or that these norms influence fertility far less than do other kinds of norms and conditions. As was noted above, many students of fertility (particularly those working in a functionalist tradition) assume that family-size norms

are found in virtually all societies; however, this remains an unproven assumption, not a fact. Indeed, much of the literature on demographic homeostasis in traditional societies (e.g., Lee, 1977) suggests that family-size norms were less important for regulating fertility than were those concerned with intermediate fertility variables or nonfertility matters. For example, Lesthaeghe (1980; see also Lesthaeghe et al., 1981) argues that many sub-Saharan African societies traditionally achieved demographic homeostasis by proscribing sexual intercourse during the postpartum lactation period, and that many pre-twentieth century European countries achieved homeostasis by requiring that young people acquire a landholding prior to marrying. These homeostatic mechanisms clearly involve norms and the institutions that these norms define. They do not, however, involve family-size norms per se. Thus, to the extent that this literature is correct, family-size norms may be irrevelant for understanding variations or trends in fertility, at least in certain societies.

The second reason that family-size norms may not be needed to understand fertility trends or variations is the possibility that the factors determining a society's family-size norms may also influence the demand for children directly, by affecting average perceptions of the costs and value of children. For example, a number of writers (Davis and Blake, 1956; Lorimer, 1958; Freedman, 1963; Blake 1972; Lee, 1974; Hill, 1974) have argued that the extent to which the family serves basic social functions helps to determine the society's family-size norms. Where the family or kin group is responsible for most of the critical business of life, including economic production, consumption, and political and ritual relations, the demand for children will tend to be relatively high, since the continuity and strength of the kin group will depend on its rate of reproduction. This incentive for high fertility (or net reproduction) will not only establish particular family-size norms, but is also likely to influence directly the individual-level demand for children. Children will, in other words, be valuable not only to the collectivity, but also to individual parents (or at least to those parents who provide the continuity for the kin group). Thus, speculation along these lines implies a causal model like that in Figure 1A.

In this model, what ultimately "drives" the demand or desire for children is not family-size norms per se, but rather the prior institutional conditions that affect both the value of children and the collectivity's family-size norms. Hence, it is the institutional incentives rather than the family-size norms that are critical for understanding fertility. If this model is correct, the need to incorporate direct measures of family-size norms into empirical fertility models is minimal, assuming that direct measures of the institutional incentives for childbearing are already represented.

This is not to suggest that family-size norms are necessarily irrelevant for understanding change or variation in fertility. Lesthaeghe (1980), for example, rejects the traditional functionalist model of norm determination in favor of a conflict model in which the interests and actions of those who control social systems determine

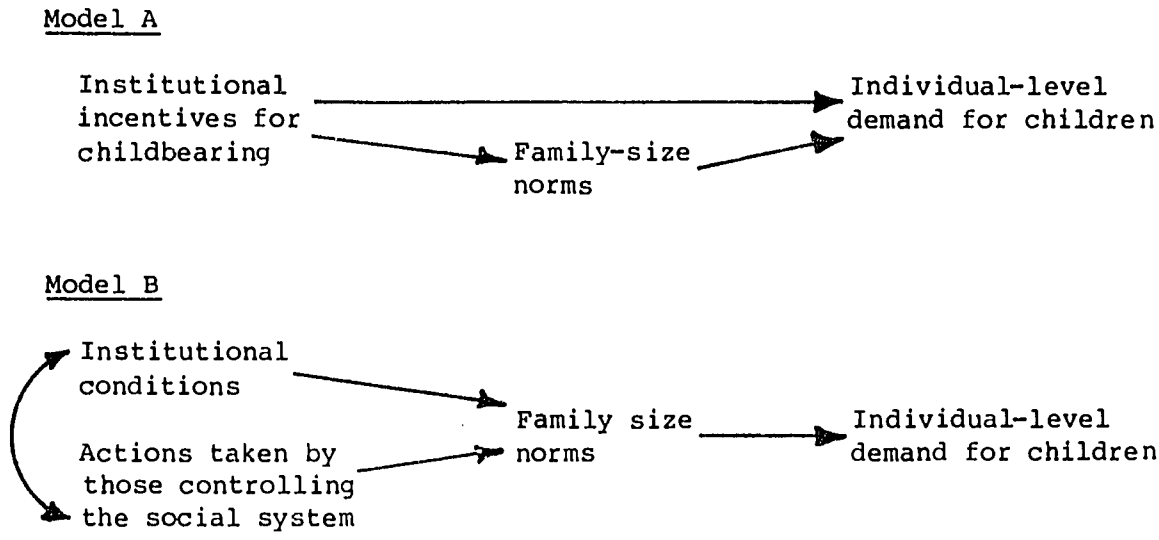

FIGURE 1 Two Models for the Effect of Norms

the norms that are enforced, including those that govern reproduction. Although these need not be family-size norms per se, the important point is that the institutional conditions that provide incentives for childbearing to some individuals will provide disincentives to others. To the extent that this is true, a given set of institutional conditions can no longer be argued to determine both family-size norms and the average individual-level demand for children. Instead, the appropriate causal model is presumably along the lines of Figure 1B. In this model, one can no longer infer the average demand for children simply by examining the institutional conditions in a society.

There is another speculation about the determinants of family-size norms which also implies the need to include norms in fertility models. This is that, under some circumstances, the fertility behavior of a population may be institutionalized as a set of family-size norms. For example, Westoff and Westoff (1968:217-218) suggest that one factor producing the post-World War II baby boom in the United States was a process in which

> suburban developments mushroomed and young couples with young children moved in, their homogeneous concentrations undoubtedly reinforcing the norm of fertility. Pregnancy and motherhood no longer signified withdrawal from social life; on the contrary, pregnancy seemed almost fashionable at the time. In the new child-centered suburban life . . . childlessness was the deviant form of behavior.

In other words, statistical norms were gradually transformed into a

set of moral norms. Clay and Zuiches (1980:277-278) offer a similar speculation about the reasons why the baby boom persisted long past the 1940s:

> It is possible that in the post-World War II "baby boom" era the family-size decisions of many couples were directly affected by sociohistorical events which were peculiar to that epoch. These couples then became reference group members, acting as "identification families" and expressing new expectations about family size for later cohorts, many of whom never experienced the initiating events.

If this kind of speculation is correct, it suggests that the establishment of particular family-size norms can have a multiplier effect on the demand for children relative to the effect of the initiating events or institutional conditions. Such an effect might be modeled without direct measures of family-size norms; however, the idea that these norms can amplify the impact of certain institutional conditions on the demand for children--and depress the impact of others--suggests that understanding family-size norms may be important for understanding fertility.

Thus the place for family-size norms in fertility models varies according to the theoretical assumptions that researchers are willing to make. As so often seems to be the case in the social sciences, the importance of understanding the nature of family-size norms would seem to depend ultimately upon one's understanding of their importance. Without knowing the extent to which these norms have an independent impact on fertility, it is impossible to judge the usefulness of developing sound measures for them.

CONCLUSION

Relatively little is known about trends and variations in family-size norms in most developing countries; even less is known about the determinants of these norms. This lack of information in part reflects a basic lack of consensus within sociology about the nature of norms, how they affect individual behavior, and hence what constitutes evidence for their existence. In other words, particular empirical measures regarded by some researchers as revealing the content of family-size norms are viewed as irrelevant or illegitimate by other researchers. Perhaps also contributing to the lack of information about family-size norms is a possible lack of such norms in some countries. Many demographers reject this possibility; however, others accept it, although emphasizing that individual reproduction is often constrained by norms relating to intermediate fertility variables or to other rights and obligations that in turn affect the value of children to parents.

NOTES

1. There are some apparent exceptions here, however. Cancian (1975), for example, includes under the concept of norms something she calls "reality assumptions"--statements about the way that nature, society, or particular roles "are." Likewise, other sociologists have included under the rubric of norms what they call "technical" or "rationality" norms--statements about the most efficient or rational ways of doing things, rather than about the morally correct or socially acceptable ways of doing them. (An example might be, "It is better to use an ax than a kitchen knife to chop wood.") Although most sociologists seem to accept the "oughtness" of norms as definitive, these exceptions illustrate that, even at this basic level, there is no absolute consensus about the nature of norms.
2. The concept of norms is especially important in so-called functionalist sociological theories, having a more epiphenomenal place in conflict theories. Roughly speaking, the followers of Marx and other conflict theorists, despite often recognizing the importance of norms for legitimizing and stabilizing particular power structures, view them as far less important than power relations for constraining behavior. Functionalist theories have the opposite emphasis. The present discussion of norms thus pertains to some branches of sociological theory more than to others, although the functionalist branch is the one that has predominated in discussions of fertility norms (e.g., Freedman, 1963; Ryder, 1973a, 1973b, 1978).
3. The following discussion rests heavily on Blake and Davis (1964) and Cancian (1975).
4. Actually, the focus is even narrower than this: it is on what produces a <u>motivation</u> to conform to norms, as opposed to a motivation to deviate from them. As Blake and Davis (1964) have noted, much deviant behavior occurs despite the individual's desire to conform to the norms of the group, and is induced by such structural factors as conflicting norms that apply in a particular situation. The present discussion, however, is concerned primarily with what leads people to <u>try</u> to conform to norms, not what permits them to actually do so. Thus, when it refers to "ineffective" social norms, it does not broadly address those to which people fail to conform, but specifically those to which they are unmotivated to conform in the first place.
5. As Cancian (1975) makes clear, the social construction approach implies that norms can change rapidly, and without intensive resocialization, although identities cannot. She notes (1975:139): "Norms, in effect, are the rules for being a particular kind of person, and the rules often change. Being a 'patriotic American' may mean killing Japanese one year and entertaining them the next." The Parsonian approach, however, implies that changes in norms will occur slowly, and primarily because of a succession of cohorts of individuals socialized to distinct norms, not because of changes in the norms adopted by

those who have already been socialized. Other areas where the two approaches have distinct substantive implications include the relationship between attitudes and behavior. As Cancian notes, the often tenuous connection between personal beliefs and actual behavior noted in past studies is perplexing in the Parsonian view, which equates norms with personal beliefs; however, it offers little problem to social construction theory, which sees personal beliefs as largely irrelevant to the normative determination of behavior.

6. To be sure, even this view recognizes that many of the "small" rules governing daily living, such as rules of etiquette, are followed by most individuals without conscious thought or calculation. However, because the social construction approach views individuals as active constructors of social reality, it emphasizes, more than the Parsonian approach, the highly conscious ways in which norms are often learned and used by individuals.
7. Moreover, most discussions that make concrete claims about the relevant group in which to assess reproductive norms do so with little theoretical or empirical justification. For example, Freedman (1963) and others refer to the society, the community, or the family as the groups in which norms are defined and maintained, whereas Ryder (1973a, 1973b, 1978) frequently focuses on population aggregates defined by level of schooling, regional location, religion, or race. None of these discussions, however, provides any evidence for these claims. One of the most theoretically cogent discussions of this issue (Kasakoff, 1981) suggests tha the usual group to define and maintain norms in most developing countries is the social network in which 80 percent of all marriages occur. If this claim is correct--it has yet to be substantiated--then examining statistics for larger population aggregates may fail to detect existing childbearing norms.
8. One frequently mentioned norm of this type (e.g., Lorimer, 1958:160) is the prescription found in parts of China and India that sons perform certain religious rituals after their father dies. This norm makes no reference to childbearing; however, it is nonetheless said to encourage high male fertility, since men must have enough children to be sure they will have sons who survive them. Sex-role norms can also influence family-size desires. For example, norms that proscribe independent wage-earning or income-generating roles for women and make them their husband's or father's dependents are likely to increase family-size desires in those societies where children are viewed as critical for economic support in old age. Because daughters will be useless for this purpose, the average number of children desired will be higher.
9. The distinction between fixed and variable family-size norms may be more apparent than real. For example, some authors seem to assume that there are fixed numerical prescriptions for family size that differ according to social status or economic class; others assume that there is a single, variable formula for computing an acceptable family size according to social status or

economic class. Whether there is any real difference between these two is unclear.

10. As Ware (1974) notes, social desirability effects on responses are likely to be severe only in cultures that prescribe considerable interpersonal politeness (e.g., many Asian cultures). Cultures lacking such norms of politeness may experience fewer of these problems.
11. Although the discussion that follows is cast entirely in terms of measuring family-size norms, some of the approaches discussed can also be used to measure child timing or spacing norms. In conducting this review, some attempt was made to assess the literature on these latter norms, but this literature was found to be extremely sparse. About the only approach used was to ask for the "preferred" or "ideal" length of time between births (Gille and Pardoko, 1966; Gould, 1969; Kumekpor, 1974; Gadalla, 1978; Tabah, 1963) or, in a few cases, the "preferred" or "ideal" age at first marriage, at first child's birth, or at last child's birth (Gadalla, 1978; Rindfuss and Bumpass, 1978).
12. Studies using perceived sanction questions include Stycos et al., 1968; Griffith, 1973; Houseknecht, 1977; Ory, 1978; Fried and Udry, 1980; and the VOC surveys (e.g., Arnold et al., 1975).
13. For example, norms about the labor force participation of wives in the United States have been assessed since the 1930s with questions such as "Do you approve or disapprove of a married woman earning money in business or industry if she has a husband capable of supporting her?" (National Opinion Research Center, 1980).
14. One problem with own-approval questions, however, is that people do not always express their approval or disapproval to others. Strong approval or disapproval of some particular behavior, however, seems likely to find public expression, even if only indirectly, for example, through gossip about third parties who behave in a disapproved way. This suggests that the value of own-approval questions for measuring social norms would be increased were they (1) worded so as to elicit the strength of approval or disapproval, and (2) accompanied by perceived-sanction questions.
15. The Davidson et al. (1976) study actually uses questions of the form, "It would be appropriate for a working woman to have a child in the next two years." Aside from the rather peculiar time reference contained in these questions, they differ from more straightforward approve/disapprove questions by referring to the "appropriateness" of behaviors rather than to the respondent's own approval or disapproval of them. As to the issue of why more surveys have not used approve/disapprove items to measure family-size norms, George (1973) suggests that, in some cultures, this may reflect people's unwillingness to express disapproval in situations where it implies that a child already born was not wanted or does not "belong." In these cultures, in other words, people would tend to avoid expressing disapproval of large families, even if they felt it.

16. Other studies containing questions of this type include Caldwell (1976), Chang (1974), and Chang (1979).
17. An alternative possibility is that people in these cultures will be especially likely to notice community pressures for childbearing--since these pressures are contranormative--and will therefore be especially likely to report them.
18. The data in Table 2 do not, however, seem entirely consistent with this view. Although the available evidence suggests that a much greater emphasis is placed on individualism in Thailand and the Philippines than in Taiwan or Korea, there is no consistent difference in either the perceived-sanction or own-approval items between these two sets of countries. The point is, however, that processes of this kind may nonetheless influence responses to both types of question, something that further complicates their use for measuring family-size norms.
19. Unfortunately, many of the studies that use this approach fail to pay much attention to the dispersion of evaluations of particular family sizes as opposed to their central tendency. As is the case with all survey-based measures of family-size norms, the evidence for norms resides not in the central tendency of responses, but rather in the consensus displayed by a sample, this consensus being indicated by the dispersion of responses. Thus, for projective test results to provide meaningful evidence about family-size norms, some evidence that most people evaluate a particular family size in the same way must be obtained. Simply to find that fewer people evaluate a one-child family positively than evaluate a two- or three-child family positively says little about norms.
20. Effective family-size norms themselves contribute to the net cost or value of alternative family sizes (Crook, 1978). For example, one of the costs of bearing a normatively proscribed number of children consists of negative sanctions from others. The costs and benefits of children referred to here, however, are those that derive from sources other than family-size norms per se. Since there are many such sources, survey measures that tap any such costs or values provide relatively poor evidence about family-size norms per se.
21. However, they may be helpful for delimiting the normatively acceptable family-size range when used in conjunction with perceived-sanction or explicit approve/disapprove questions (see Griffith, 1973, for an example).
22. Unfortunately, many of these surveys, including the World Fertility Survey (WFS) and the Value of Children (VOC) studies, have used the kind of ideal family size question that seems least appropriate for measuring group norms. The respondent is asked what family size is ideal for herself, rather than for some named reference group ("American couples," "people in your neighborhood," "people like you"). Perceptions of ideal fertility for oneself may be influenced by family-size norms, just as fertility desires may be influenced by these norms; however, personal ideal family size questions on their face tap

respondents' fertility preferences or desires more than group norms. For this reason, personal ideal family size questions, including those from the WFS and VOC, have been ignored in the discussion that follows.

23. Trent's discussion, which is concerned only with the U.S. during the 1965-70 period, uses three types of evidence to argue that ideal family size questions tap family-size norms. The first is Ryder and Westoff's (1971) observation that responses to ideal family size correlate more closely with characteristics such as race, religion, education, and income than do responses to desired or intended family size, and also have a smaller variance. If race, religion, education, etc. define normatively distinct reference groups within the population, then this difference in correlations suggests that ideal family size questions tap norms more than do intended or desired family size questions. The second form of evidence Trent presents is a 1965-70 time-series of news stories on the population problem. This time-series correlates almost perfectly with the ideal family size time-series for this period, and this correlation cannot be explained away by controlling for the total fertility rate. The final evidence consists of cross-sectional correlations between attitudes towards the population problem, on the one hand, and ideal vs. desired family size on the other. In both 1965 and 1970, ideal family size correlates more closely with population attitudes than does desired family size, and the difference in correlation is greater in 1970 than in 1965. Thus, if one assumes that family-size norms are determined or shaped by public debate on population-related issues, then both the time-series and cross-sectional data suggest that ideal family size taps norms more than does desired family size. One weakness of this evidence is, of course, that it is comparative. Thus, although ideal family size questions may tap family-size norms more than do desired family size questions, this does not prove that they do so very much or very well. Moreover, analyses such as Ryder's (1981a), claiming to show that responses to ideal family size questions are <u>more</u> influenced by personal fertility experiences than are responses to desired family size questions, shed doubt on Trent's argument.

24. Only questions that ask about ideal family size for a named reference group or in general are included in this table; questions asking for a personal ideal family size are ignored, for reasons discussed in note 22 above.

25. Moreover, Henley and Gustavus (1977) find this same shape distribution using a projective semantic-differential test, which suggests that the gradual drop-off at larger numbers of children is not an artifact of using ideal family size questions per se.

26. Perhaps consistent with this is the large number of nonnumerical responses in many of the samples where the drop-off at the upper end of the numerical response distribution is least abrupt. Nonnumerical responses tend to take either a fatalistic form (it's up to God) or an open-ended form (as many as possible). This would seem to indicate the lack of a clear norm setting a

numerical maximum on family size.

27. Disaggregation of the sample according to major sociodemographic subgroups, however, might help to clarify matters in some cases. For example, were the drop-offs observed to be just as sharp at the upper end of the distribution as at the lower end within educational or occupational strata, this would suggest that norms relating to maximum family size--or to the net value of children--do indeed exist, but vary by socioeconomic position.

28. A third pattern discernable in Table 3 is some tendency for intercountry variation in ideal family size distributions to follow variation in actual or desired fertility levels. Thus, the sub-Saharan African samples tend to show higher family-size ideals than do other countries, including the U.S. Unfortunately, this says little about the issue of primary concern here, namely, the extent to which ideal family size distributions reflect family-size norms. Indeed, some readers would no doubt interpret the correlation of ideal with desired fertility distributions as evidence that ideal family size questions do not tap social norms, but are instead largely rationalizations for personal fertility or fertility desires (e.g., Ryder, 1981a).

29. One further approach to studying family-size norms deserves mention: content analysis of a culture's symbolic products, such as its laws, religious theologies, myths, popular dramas, literature, or television programs (e.g., Middleton, 1960). If these sources make clear prescriptions about family size or dramatize the sanctions attached to bearing particular numbers of children, they may indicate the society's family-size norms. The main drawback of this approach, when used alone, is that symbolic sources may fail to influence or be accepted by the bulk of the population. Because these sources are usually produced by elite groups, it is difficult to judge whether the norms they depict or imply are held only by those elites or are held and enforced more generally in the population. Content analyses may, however, provide useful supplementary information about family-size norms (e.g., Blake, 1967). Indeed, analysis of myths, religious dramas, and the like has long been a major source of information used by ethnographers to infer the norms and values peculiar to a given culture.

BIBLIOGRAPHY

Ampofo, D. A. (1970) The motivation for reproduction and the new population dimensions of Ghana. East African Medical Journal 47:217-222.

Arnold, F., R. A. Bulatao, C. Buripakdi, B. J. Chung, J. T. Fawcett, T. Iritani, S. J. Lee, and T.-S. Wu (1975) The Value of Children, a Cross-National Study: Introduction and Comparative Analysis, Vol. 1. Honolulu: East-West Population Institute.

Barnabas, A. P. (1974) Population growth and social change: A note on rural society. Social Action 24:25-32.

Barretto, F. R. (1974) Knowledge, attitudes, and practice of family planning in the Philippines, 1972. Studies in Family Planning 5:294-299.

Berger, P. L., and T. Luckmann (1966) The Social Construction of Reality. Garden City, N.J.: Doubleday.

Blake, J. (1967) Income and reproductive motivation. Population Studies 21:185-206.

Blake, J. (1972) Coercive pronatalism and American population policy. Pp. 85-109 in R. Parke, Jr. and C. F. Westoff, eds., Aspects of Population Growth Policy. U.S. Commission on Population Growth and the American Future, Vol. VI of Commission Research Reports. Washington, D.C.: U.S. Government Printing Office.

Blake, J. (1974) Can we believe recent data on birth expectations in the United States? Demography 11:25-44.

Blake, J., and K. Davis (1964) Norms, values, and sanctions. Pp. 456-484 in R. E. L. Faris, ed., Handbook of Modern Sociology. Chicago: Rand McNally.

Bleek, W. (1978) The value of children to parents in Kwahu, Ghana. Pp. 307-323 in C. Oppong et al., eds., Marriage, Fertility and Parenthood in West Africa. Changing African Family Project Monograph Series No. 4, Pt. 1. Canberra: Australian National University.

Caldwell, J. C. (1976) The Socio-Economic Explanation of High Fertility. Changing African Family Project Monograph Series No. 1. Canberra: Australian National University.

Cancian, F. (1975) What are Norms? London: Cambridge University Press.

Chang, C.-T. (1979) Female employment and fertility behavior. Pp. 167-186 in P. S. J. Chen and J. T. Fawcett, eds., Public Policy and Population Change in Singapore. New York: Population Council.

Chang, W. P. (1974) Knowledge, attitudes, and practice of family planning in Ethiopia. Studies in Family Planning 5:344-348.

Clay, D. C., and J. J. Zuiches (1980) Reference groups and family size norms. Population and Environment 3:262-279.

Collier, J. F., and M. Z. Rosaldo (1981) Politics and gender in simple societies. Pp. 275-329 in S. B. Ortner and H. Whitehead, eds., Sexual Meanings. Cambridge, Eng.: Cambridge University Press.

Crook, N. R. (1978) On social norms and fertility decline. Journal of Development Studies 14:198-210.

Davidson, A. R., J. J. Jaccard, M. L. Morales, H. C. Triandis, and R. Diaz-Guerrero (1976) Cross-cultural model testing: Toward a solution of the etic-emic dilemma. International Journal of Psychology 11:1-13.

Davis, K., and J. Blake (1956) Social structure and fertility: An analytic framework. Economic Development and Cultural Change 4:211-235.

Freedman, R. (1963) Norms for family size in underdeveloped areas. Proceedings of the Royal Society 159(B):220-245.

Freedman, R., and J. Y. Takeshita (1969) Family Planning in Taiwan: An Experiment in Social Change. Princeton, N.J.: Princeton University Press.

Fried, E. S., and J. R. Udry (1980) Normative pressures on fertility planning. Population and Environment 3:199-209.

Gadalla, S. M. (1978) Is There Hope? Fertility and Family Planning in a Rural Egyptian Community. Chapel Hill, N.C.: Carolina Population Center, University of North Carolina.

George, E. I. (1973) Research on measurement of family-size norms. Pp. 354-370 in J. T. Fawcett, ed., Psychological Perspectives on Population. New York: Basic Books.

Gibbs, J. P. (1965) Norms: The problem of definition and classification. American Journal of Sociology 70:586-594.

Gille, H., and R. H. Pardoko (1966) A family life study in East Java: Preliminary findings. Pp. 503-521 in B. Berelson et al., eds., Family Planning and Population Programs. Chicago: University of Chicago Press.

Goldberg, D. (1980) On the Use of the VOC Studies by the Panel on Fertility Determinants. Unpublished manuscript. Population Studies Center, University of Michigan, Ann Arbor.

Gould, K. H. (1969) Sex and contraception in Sherupur. Economic and Political Weekly 4:1887-1892.

Griffith, J. (1973) Social pressure on family size intentions. Family Planning Perspectives 5:237-242.

Gustavus, S. O., and C. B. Nam (1970) The formation and stability of ideal family size among young people. Demography 7:43-51.

Hawthorn, G. (1970) The Sociology of Fertility. London: Collier-Macmillan.

Henley, J. R., Jr., and S. O. Gustavus (1977) An exploratory technique for measuring fertility norms. Social Biology 24:149-157.

Hill, R. (1974) Special lecture: The family and the regulation of population growth. Pp. 3-16 in T. Fukutake and K. Morioka, eds., Sociology and Social Development in Asia. Tokyo: Tokyo University Press.

Hill, R., J. M. Stycos, and K. W. Back (1959) The Family and Population Control: A Puerto Rican Experiment in Social Change. Chapel Hill, N.C.: University of North Carolina Press.

Houseknecht, S. K. (1977) Reference group support for voluntary childlessness: Evidence for conformity. Journal of Marriage and the Family 39:285-292.

Jones, G. W. (1977) Economic and social supports for high fertility: Conceptual framework. Pp. 3-47 in L. T. Ruzicka, ed., The Economic and Social Supports for High Fertility. Changing African Family Project Monograph Series No. 2. Canberra: Australian National University.

Kasakoff, A. B. (1981) Some Thoughts About Easterlin's Model of Fertility. Paper prepared for the workshop on Anthropology of Human Fertility, National Research Council, Washington, D.C.

Kohlberg, L. (1976) Moral stages and moralization: The cognitive-development approach. Pp. 31-53 in T. Lickona, ed., Moral Development and Behavior. New York: Holt, Rinehart.

Kumekpor, T. K. (1974) Togo. Pp. 720-735 in J. C. Caldwell, ed., Population Growth and Socioeconomic Change in West Africa. New York: Columbia University Press.

Lee, R. D., ed. (1977) Population Patterns in the Past. New York: Academic Press.

Lee, R. P. L. (1974) Social change and changes in fertility motivation. Pp. 36-39 in Reports and Papers of the Expert Group Meeting on Social and Psychological Aspects of Fertility Behavior. Bangkok: Economic and Social Commission for Asia and the Pacific, United Nations.

Lesthaeghe, R. (1980) On the control of human reproduction. Population and Development Review 6:527-548.

Lesthaeghe, R., P. O. Ohadike, J. Kocher, and H. J. Page (1981) Child-spacing and fertility in sub-Saharan Africa: An overview of issues. Pp. 3-23 in H. J. Page and R. Lesthaeghe, eds., Child-Spacing in Tropical Africa. London: Academic Press.

Lorimer, F. (1958) Culture and Human Fertility. New York: Greenwood Press.

Micklin, M., and P. J. Marnane (1975) The differential evaluation of large and small families in rural Colombia: Implications for family planning. Social Biology 22:44-59.

Middleton, R. (1960) Fertility values in American magazine fiction, 1916-1956. Public Opinion Quarterly 24:139-143.

Morgan, R. W. (1975) Fertility levels and fertility change. Pp. 187-235 in J. C. Caldwell, ed., Population Growth and Socioeconomic Change in West Africa. New York: Columbia University Press.

Nag, M. (1968) Factors Affecting Human Fertility in Nonindustrial Societies: A Cross-Cultural Study. New Haven, Conn.: Human Relations Area Files Press.

Nag, M. (1981) Anthropological Contribution to the Study of Human Fertility: Some Methodological Issues. Paper prepared for the workshop on the Anthropology of Human Fertility, National Academy of Sciences, Washington, D.C.

National Opinion Research Center (1980) General Social Surveys, 1972-1980: Cumulative Codebook. Chicago: National Opinion Research Center.

Olusanya, P. O. (1971) Status differentials in the fertility attitudes of married women in two communities in Western Nigeria. Economic Development and Cultural Change 19:641-651.

Oppong, C. (1975) A note on attitudes to jointness of the conjugal role relationship and family size: A study of norms among Ghanaian students. Human Relations 28:801-809.

Ory, M. G. (1978) The decision to parent or not: Normative and structural components. Journal of Marriage and the Family 40:531-539.

Page, H. J., and R. Lesthaeghe, eds. (1981) Child-Spacing in Tropical Africa: Traditions and Change. London: Academic Press.

Palmore, J. A., and R. Freedman (1969) Perceptions of contraceptive practice by others: Effects on acceptance. Pp. 224-240 in R. Freedman and J. Y. Takeshita, Family Planning in Taiwan. Princeton, N.J.: Princeton University Press.

Parsons, T. (1951) Social Structure. Glencoe, Ill.: The Free Press.

Polit, D. F. (1978) Stereotypes relating to family-size status. Journal of Marriage and the Family 40:105-114.

Potter, R. G., Jr., and J. F. Kantner (1955) Social and psychological factors affecting fertility, XXVIII: The influence of siblings and friends on fertility. Milbank Memorial Fund Quarterly 33:246-267.

Raina, B. L. (1969) Family size norms. Family Planning News 10:22-28.

Rainwater, L. (1965) Family Design: Marital Sexuality, Family Size, and Contraception. Chicago: Aldine.

Reichel-Dolmatoff, G. (1971) Amazonian Cosmos: The Sexual and Religious Symbolism of the Tukano Indians. Chicago: University of Chicago Press.

Rindfuss, R. R., and L. L. Bumpass (1978) Age and the sociology of fertility: How old is too old? Pp 43-56 in K. E. Taeuber, L. L. Bumpass, and J. A. Sweet, eds., Social Demography. New York: Academic Press.

Ryder, N. B. (1973a) A critique of the national fertility study. Demography 10:495-506.

Ryder, N. B. (1973b) Comment. Journal of Political Economy 81:S65-S69.

Ryder, N. B. (1976) Some Sociological Suggestions Concerning the Reduction of Fertility in Developing Countries. Paper No. 37. Honolulu: East-West Population Institute.

Ryder, N. B. (1978) Some problems of fertility research. Pp. 3-13 in D. E. Taeuber, L. L. Bumpass, and J. A. Sweet, eds., Social Demography. New York: Academic Press.

Ryder, N. B. (1981a) Changes in parity orientation from 1970 to 1975. Pp. 101-123 in G. E. Hendershot and P. J. Placek, eds., Predicting Fertility. Lexington, Mass.: Lexington Books.

Ryder, N. B. (1981b) Personal communication.

Ryder, N. B., and C. F. Westoff (1971) Reproduction in the United States, 1965. Princeton, N.J.: Princeton University Press.

Sandhu, H. S., and D. E. Allen (1974) Family planning in rural India: Personal and community factors. Journal of Marriage and the Family 36:805-813.

Sastry, K. R. (1966) Instruments for measuring family size norms in a rural community. Pp. 31-47 in K. R. Sastry and A. Govindachari, Action Research Monographs No. III. Gandhigram, India: Institute of Rural Health and Family Planning.

Simmons, A. B. (1971) Projective testing for ideal family size. Pp. 339-359 in J. M. Stycos, Ideology, Faith and Family Planning in Latin America. New York: McGraw Hill.

Simmons, A. B. (1974) Ambivalence toward small families in rural Latin America. Social Biology 21:127-143.

Srinivas, M. N. (1976) The Remembered Village. Berkeley, Calif.: University of California Press.

Srivastava, J. N., and S. R. Rostogi (1977) Socio-Demographic Survey of Industrial Workers in Kanpur City. Series B, Survey Report No. 7. Lucknow, India: Lucknow University Demographic Research Centre.

Stycos, J. M. (1964) Attitudes toward family size in Haiti. Human Organization 23:42-47.

Stycos, J. M., K. W. Back, and R. Hill (1968) Interpersonal influence in family planning in Puerto Rico. Pp. 83-97 in J. M. Stycos, Human Fertility in Latin America: Sociological Perspectives. Ithaca, N.Y.: Cornell University Press.

Tabah, L. (1963) A study of fertility in Santiago, Chile. Marriage and Family Living 25:20-26.

Talmon-Garber, Y. (1959) Social structure and family size. Human Relations 12:121-146.

Thompson, V. D. (1974) Family size: Implicit policies and assumed psychological outcomes. Journal of Social Issues 30:93-124.

Trent, R. B. (1980) Evidence bearing on the construct validity of ideal family size. Population and Environment 3:309-327.

Ware, H. (1974) Ideal Family Size. WFS Occasional Papers No. 13. Voorburg, Netherlands: International Statistical Institute.

Ware, H. (1979) Social influences on fertility at later ages of reproduction. Journal of Biosocial Science, Supplement 6:75-96.

Westoff, L. A., and C. F. Westoff (1968) From Now to Zero: Fertility, Contraception and Abortion in America. Boston: Little, Brown.

Wrigley, E. A. (1969) Population and History. New York: McGraw-Hill.

Chapter 13

PERCEPTIONS OF THE VALUE OF CHILDREN: SATISFACTIONS AND COSTS

James T. Fawcett

INTRODUCTION

The phrase "value of children" has become prominent in fertility theory and research during the past decade, but this common label encompasses diverse concepts and refers to several kinds of empirical studies (Berelson, 1976; Fawcett, 1972, 1977; Schultz, 1973). In research conducted in developing countries, three broad categories of empirical work may be discerned: (1) studies that estimate "actual" economic benefits and costs of children, usually in rural households; (2) studies that focus on the role of children in a family or community context, emphasizing their social and cultural functions, as well as their economic value; and (3) studies that assess individuals' perceptions of the economic, social, and emotional satisfactions and costs of children. The last type of study, usually based on surveys that use scales and other psychological measurement techniques to elicit judgments about these diverse value dimensions, is the focus of this chapter. First, some conceptual and methodological issues are discussed briefly. The chapter then evaluates the contributions of research on the perceived value of children to knowledge about the determinants of fertility in developing countries.

CONCEPTUAL AND METHODOLOGICAL ISSUES

No single conceptual or theoretical framework guides research on perceptions of the satisfactions and costs of children. Rather, research on this topic is eclectic, analyzing the perceived value of children descriptively and incorporating this subjective orientation in various frameworks to explain fertility.

One such framework (Hoffman and Hoffman, 1973) defines "the value of children to parents" according to a set of nine "values" derived from psychological needs (e.g., affiliation, social identity, creativity). Children are viewed as instrumental in fulfilling these values or needs, but particular values can also be met by alternatives to children. Moreover, social and cultural factors can influence the relative importance of each of the nine values, as well as the availability and acceptability of alternatives to children. This

framework also includes the costs of children and the societal barriers and facilitators that may intervene between desired family size and actual fertility, although it does not specify the relationships among these factors.

This early framework had two important features: (1) systematic classification of the various ways in which children may be valued by parents, and (2) an emphasis on separate analysis of the implications of each value for fertility. These two features are prominent in most other work in this area, even in substantially different explanatory frameworks.

An example is a cross-national study known as the Value of Children (VOC) project, based on surveys conducted in six developing and two developed countries (Fawcett, 1979). More than 20,000 men and women were interviewed by means of a lengthy questionnaire containing both open-ended and structured questions. Using an explanatory framework that owed more to demographic transition theory than to psychological need concepts (Arnold et al., 1975; Bulatao, 1979a; Fawcett et al., 1974), this study extended the conceptualization of perceived satisfactions and costs of children. Perceptions of the value of children were treated as intervening variables to explain how and why socioeconomic change affects fertility change. Both structural indicators and individual-level measures derived from the surveys were used in analyses designed to test propositions about the micro-level impacts of modernization and economic development.

Other studies, mainly in the U.S., have focused more specifically on predicting family-size decisions at the individual or couple level. These studies are based on measures of the perceived value of children, as well as other attitudinal or personality variables and individual background factors. They also draw upon general theories of decision making and attitude-behavior relationships, notably "subjective expected utility" and "expectancy x value" theories (see Adler, 1979). Although these studies give relatively little attention to social-structural variables, they do in some cases make use of a life-cycle framework to examine changes in the perceived value of children at successive parities (e.g., Campbell et al., 1976). This is an approach also used in studies based on other theoretical orientations, as discussed above (e.g., Bulatao, 1981; Callan, 1980; Hoffman and Manis, 1978a). The results from this type of life-cycle analysis provide a basis for comparing developed- and developing-country studies that differ in their theoretical origins.

The various classification schemes for satisfactions and costs (or values and disvalues) are usually based not on a single method of measurement but on a multiple indicator approach, although this point is sometimes obscured by the simplified terminology used to report results. The VOC project, for example, measured the following kinds of variables in a single survey of the "value of children":

- attitudes toward children (e.g., evaluations of the good and bad things about having children, strength of agreement or disagreement about the positive and negative aspects of children);

- self-reported motivations (e.g., reasons for wanting or not wanting another child, or fewer or more than a specified family size); and
- values and expectancies (e.g., ratings of important life values and needs, and whether children can satisfy them).

Assessment techniques used to measure these variables also measure such response qualities as intensity (e.g., through scaled ratings), salience (e.g., through open-ended questions and content analysis), and relative importance (e.g., through rankings among sets of dimensions).

Various analytical methods have been used to identify and classify the common elements among these widely varying dimensions of the perceived satisfactions and costs of children. A scheme from the VOC project, reproduced in Table 1, shows an empirically derived and conceptually meaningful way to cluster these diverse dimensions. In this table, 28 satisfactions and costs of children are grouped into 7 categories: instrumental assistance; rewarding interactions; psychological appreciation; financial costs; childrearing demands; restrictions on parents; and costs to social relationships. As will be shown below, the broad categories and the finer distinctions are each suited to particular analytic purposes.

Research in developing countries using such empirical measures of the satisfactions and costs of children asks two basic questions:

- What conditions give rise to the observed patterns; i.e., how do historical, cultural, and socioeconomic factors influence perceptions of the value of children?
- What are the effects of such perceptions on fertility preferences and behavior, and how do these effects relate to those of other direct and indirect influences?

The discussion of research findings below focuses on these basic questions and on general conclusions supported by research using diverse methods and conducted in multiple countries. In a concluding section, the contributions of this type of research are discussed, and some issues are raised concerning future research directions.

REVIEW OF RESEARCH FINDINGS

Structural Influences on Perceptions of the Value of Children

Perceptions of the value of children are influenced by structural features of the society in which the individual lives, as well as by more idiosyncratic aspects of the person's life experience. Structural factors are emphasized here and are discussed under three headings: socioeconomic status, cultural influences, and sex roles. A subsequent section examines linkages between structural factors, perceptions of the value of children, and fertility.

TABLE 1 Classification of Perceived Satisfactions and Costs of Children

Satisfactions	Costs
Instrumental Assistance	Financial Costs
Help in housework	Cost of education
Help in old age	Other financial costs
Financial, practical help	
Family name, line	Childrearing Demands
Religious, social obligations	More work
Adult status, social norms	Emotional strain
	Health, pregnancy
Rewarding Interactions	Discipline
Companionship, love	Child's sickness
Happiness	Worry over child's future
Play, fun, distraction	Other childrearing problems
Marital bond	
	Restrictions on Parents
Psychological Appreciation	Tied down
Living through children	Can't work
Achievement, power	
Character, responsibility	Costs to Social Relationships
Incentive to succeed	Marital strains
Fulfillment	Overpopulation

Source: Bulatao (1979a).

Socioeconomic Status

The impact of socioeconomic factors has been a dominant concern in research on perceptions of the value of children in developing countries. This research has been conducted in a variety of ways: comparisons of results from countries at different levels of development (Bulatao, 1980); comparisons of more and less developed regions within countries (Caldwell, 1967; Kagitcibasi, 1982); comparisons of groups of respondents defined according to socioeconomic status, both within and across countries (Arnold et al., 1975); and individual-level multivariate analyses using socioeconomic factors to predict scores on various measures of the perceived value of children (e.g., Arnold et al., 1975; Kagitcibasi and Esmer, 1980; Kee, 1980; Lee and Kim, 1977; Meyer, 1981).

Several patterns emerge consistently from such analyses. The instrumental value of children--especially expected economic help--is inversely related to socioeconomic levels. The opposite pattern is noted for most measures of rewarding interactions and psychological appreciation: these factors become more important at higher levels of development. On the costs side, the most consistent pattern is a

strong positive association between socioeconomic levels and perceptions of the restrictions and opportunity costs connected with childrearing.

To put it another way, these findings indicate that where children have economic or practical value in the household, these benefits dominate the way parents perceive the satisfactions of children. Only when the instrumental value of children is absent or of lesser consequence are children valued primarily for the emotional rewards they provide to parents. The pattern for restrictions caused by children seems to reflect conditions external to the household, such as the availability of alternative sources of gratification in urban areas and in societies at higher levels of development, as well as differences in preferences and income at the household level.

Noteworthy also is the absence of a sharp trend in the relationship between socioeconomic status and the perceived financial costs of children: concern about financial costs is generally high, with relatively little differentiation across groups. This reflects a combination of equalizing influences, including the high cost of children in more developed countries, the limited resources of most parents in poorer countries, and social class differences in the level of investment per child.

Social-structural effects on perceptions of the value of children are summarized in the following profile, drawn from a six-country comparative study (Fawcett, 1977):

> The most striking contrasts appear in comparisons of urban and rural groups. With respect to positive values, urban parents (especially the more educated) emphasize the psychological and emotional benefits that derive from interacting with children and observing and guiding their growth and development. The feedback effects on the parents' own sense of competence and maturity are also important. Rural parents, by contrast, emphasize the economic and practical benefits to be derived from children, including the long-term benefit of old-age security. On the negative side, urban parents are more concerned about opportunity costs and restrictions on freedom, along with economic costs, while rural parents tend to give greatest weight to economic factors and the physical burden of child-care. This general pattern of class differentials has been shown across a number of countries. The greatest contrast is between middle-class urbanites and rural respondents, with the urban lower-class falling between the two on most dimensions. However, the urban lower-class is distinctive in showing the highest level of concern about the economic costs of childbearing, reflecting the unfortunate combination of low income, high fertility, and high cost of living in urban areas.

These broad patterns demonstrate that although children have some universal characteristics and some near-universal roles within the family, they are not valued everywhere in the same way. Further, recent research findings using micro-level data lend support to

generalizations about historical processes in the demographic transition: as children become less valuable economically, they become more valued emotionally; and, as economic development proceeds, children are increasingly in competition with other sources of satisfaction.

Cultural Factors

Like socioeconomic level, culture has a strong effect on individual perceptions. Such influences may determine the hierarchy of general values or goals against which children are evaluated, as well as increase or decrease specific satisfactions and costs of children. Of course, culture is a holistic concept, difficult to isolate from other influences, and in some ways elusive. Thus survey research cannot be expected to produce measures adequately representing culture as an independent variable. However, cultural influences can be inferred from survey results, especially in comparative studies. At least two types of survey findings are relevant: (1) a broad response pattern observed in one country but not in others that are comparable on various noncultural dimensions (e.g., level of development); and (2) findings for particular variables that can convincingly be traced, by virtue of their content, to corresponding cultural values or practices.

An example of the first type of finding may be found in response patterns suggesting a cultural emphasis on large families per se. Such an emphasis appears to be prominent in African societies, where it is linked to a family and community structure having a shared or corporate interest in children (Ruzicka, 1977; Ware, 1978). That is, both the satisfactions and costs of children are spread across a group wider than the family of orientation, familial obligations across generations are strong, and the size of the family (or social group) is equated with power and influence. This point is emphasized in community-level studies; however, similar evidence can be found in surveys showing a link between perceived group benefits of children and large-family preferences (Okore, 1977; Saefullah, 1979).

In some Asian societies, cultural factors favoring large families seem to have different roots. In Indonesia, for example, the positive cultural value of a "busy household" is regarded as a significant factor in the preference for large families, as shown in survey findings (Darroch, Meyer, and Singarimbun, 1981; Meyer, 1981). In the Philippines, VOC survey results show that ratings on positive attitudes toward children and expected satisfactions are consistently higher than those in other countries, with less variation among socioeconomic levels. This pattern has been attributed to the pro-natalist values associated with Filipino Catholicism; regardless of whether Catholicism is the cause, however, the evidence does suggest a broad cultural influence on the perceived value of children in the Philippines (Arnold et al., 1975; Bulatao, 1975).

The second type of findings--where specific dimensions of the value of children may be linked to particular cultural values or practices--is illustrated by the relative value placed on sons and

daughters. The cultural dimensions of a preference for sons are shown most clearly in societies influenced by Confucian tradition, such as Taiwan and Korea, where having a male heir is of immense cultural significance (Lee and Kim, 1977; Williamson, 1976; Wu, 1977). In such societies, sons have important functions related to the parents' welfare in an afterlife, and filial devotion is a culturally valued trait. These influences show up in surveys on the value of children, both in the intensity of son preferences and in the qualitative responses concerning reasons for wanting sons (e.g., "to continue the family name"). Similar patterns are found in societies where certain formal religions, such as Hinduism, prescribe that sons perform important rituals (Khan, 1977). Cultural influences on gender preference are also evident in a study comparing the perceived value of children among different ethnic groups in Malaysia (Kee, 1980).

The effects of culture on the value of children can of course be construed more broadly; however, cultural influences producing a positive evaluation of large families and assigning particular functions to sons and daughters are most apparent from comparative surveys. The significance of such cultural influences lies in their abiding nature. Generally speaking, cultural values change more slowly than, for example, socioeconomic factors. Where children are valued intensely for cultural reasons, then, it is likely that perceptions of satisfactions and costs will be resistant to changes that might otherwise occur with societal modernization.

Sex Roles

A number of other sex-related factors besides those cited above affect perceptions of the value of children. The perceptions of husbands and wives illustrate these influences. Comparative studies show that there are more similarities than differences between men and women in their perceptions of the value of children. Within countries or socioeconomic groups, for example, husbands and wives show broadly similar patterns of perceived satisfactions and costs (Arnold et al., 1975). Where differences do occur, however, they can in most cases be attributed to the nature of traditional sex-role distinctions.

Husbands--who are usually the breadwinners in the family--show a greater concern about the financial costs of children. On the other hand, wives--who are usually financially dependent on others--tend to place greater importance on economic benefits and security from children. Wives are also more sensitive to the category of costs labeled "childrearing demands," which includes such factors as the work and emotional strain connected with raising children. These childrearing burdens do, of course, traditionally fall to women. Childrearing responsibilities may also be cited as a cause for the greater concern among wives over restrictions caused by children, or opportunity costs.

Such generalizations apply to most countries in which studies of the perceived value of children have been conducted. However, gender-related factors also vary according to social or cultural

settings. For example, in Turkey, women emphasize more than men the value of children for strengthening the marital bond, presumably because of the marked segregation of sex roles in that country and the reliance of women on the conjugal relationship as a source of status (Kagitcibasi, 1979). In countries such as Turkey and Taiwan, men place greater emphasis than women on the value of sons for continuing the family name (i.e., the husband's name). Linkages between the gender of the parent and the gender of the child emerge along other dimensions as well, such as in the emphasis placed by mothers on the value of daughters for help in housework. Thus both cultural and social factors influence different evaluations of children by husbands and wives.

Across countries and socioeconomic groups, women's roles vary more than men's. These differences among women's roles relate mainly to the availability of nonfamilial activities, such as employment, that may compete with childrearing. For women in particular, then, a framework encompassing both children and alternative sources of satisfaction is important (Hoffman and Manis, 1978a; Kagitcibasi, 1979). One study in the U.S. has compared women's perceptions of the value of children with their perceptions of the value of employment (Beckman, 1978; Beckman and Houser, 1979). Although this approach is promising, it still lacks a method for assessing how tradeoffs are made subjectively. Of course, the same limitation could be noted in other VOC studies, and research experience to date suggests generally that survey methods can provide only indirect evidence about these tradeoff processes.

Perceptions of the Value of Children and Fertility

Given the influences on perceptions of the value of children discussed above, this section first reviews the basic links between those perceptions and fertility preferences or behavior. This is followed by a discussion of the ways in which value perceptions and fertility behavior are related to various life-cycle factors. Throughout the discussion, emphasis will be given to general conclusions supported by cross-cultural research findings.

Linkages with Fertility

Numerous studies in developing and developed countries have shown a moderately strong relationship between some measures of the perceived satisfactions and costs of children and various measures related to family size and the practice of birth control (e.g., Arnold et al., 1975; Chang, 1979; Deven, 1977; Kagitcibasi and Esmer, 1980; Meyer, 1981; Mueller, 1972). Particular dimensions of the satisfactions and costs of children are related to fertility measures in the following characteristic ways, although exceptions have been noted in some studies:

- Expectations for economic benefits from children are associated with high fertility; the same is true for other instrumental satisfactions having to do with continuity of the family and traditional role relationships.
- Psychosocial satisfactions--the categories labeled "rewarding interactions" and "psychological appreciation" in Table 1--tend to be associated with low fertility.
- Perceptions of financial costs do not have a clear or consistent impact on fertility.
- Perceived restrictions on parents, including work-related opportunity costs, have a relatively weak negative effect on fertility.
- The perceived demands of childrearing, such as emotional strain and physical work, do not usually have a significant effect on fertility.

Such relationships, in combination with the structural influences discussed earlier, have been used to shed light on the historical processes of fertility change. The most comprehensive explanatory framework of this kind is a "theory of the transition in the value of children" in which explanations drawn from the literature on demographic transition are interpreted with reference to corresponding expected changes in perceptions of the value of children (Bulatao, 1979a, 1979b). Five types of explanatory factors were identified in this analysis, all related to socioeconomic development and modernization: vanishing economic roles for children; the rising aspirations of parents; the emergence of the conjugal family; the weakening of cultural props for high fertility; and reductions in mortality. Using a variety of analyses and data from surveys and other sources in numerous countries, this study tested predictions about fertility-related changes in the perceived value of children. The results, summarized in Table 2, give strong support to explanations connected with vanishing economic roles for children, and mixed support to those connected with rising aspirations and the emergence of the conjugal family. Of particular interest is the finding, as indicated by the two columns in the table, that different factors are important at early and late stages of the fertility transition.

A related literature review and cross-national regression analysis predicting fertility levels in 22 countries assessed the relative importance of expected economic benefits, socioemotional satisfactions, and perceived restrictions related to children (Bulatao, 1980). Again, the strongest evidence pertained to declines in the perceived economic benefits of children. Similar findings on the fertility impact of expectations for economic help from children have appeared in a number of other studies (Coombs, 1980; De Vos, 1982; Hoffman et al., 1978; Mueller, 1972; Narayan-Parker, 1979).

Drawing upon a variety of theoretical writings and empirical studies, Bulatao (1979a) has sketched the processes at work in the value-of-children transition:

TABLE 2 Observed Changes in Values and Disvalues Attached to Children

Explanatory Factor	Transition from High to Moderate Fertility Levels	Transition from Moderate to Low Fertility Levels
Vanishing economic roles for children	Financial, practical help declines	Financial, practical help declines
	Help in housework declines	Help in old age declines
Rising aspirations		Being tied down rises
		Fulfillment rises
	Cost of education declines (contrary to prediction)	Achievement, power rises
	Emotional strain rises	Discipline declines
Emergence of the conjugal family	Cost of education declines (contrary to prediction)	
	Emotional strain rises	Discipline declines
	Companionship, love rises (less sharply)	Companionship, love rises (more sharply)
	Fun rises (less sharply)	Fun rises (more sharply)
	Marital bond rises (less sharply)	Marital bond rises (more sharply)
Weakening cultural props for high fertility		Adult status, social norms rises (slightly, contrary to prediction)
Mortality reduction	Insurance against mortality declines	

Source: Bulatao (1979a).

Initially, the productive capacity of children declines, possibly because of a change in economic structure that reduces children's jobs or possibly because of the development of social prohibitions--legal or otherwise, explicit or implicit, as compulsory education would be--against children working. Whether prohibitions are the original cause or not, norms against child labor eventually become widely accepted. At the same time, or

possibly somewhat earlier, children's survival chances improve, and parents more readily make psychological investments in them.

A new image of the child spreads, in which the child is more than just a productive agent but less than an adult, requiring special care and treatment. Interaction with the child, and within the conjugal family generally, is perceived as more pleasurable and becomes more valued. These primary-group values do not sufficiently offset the burdens on parents. With children freed from labor and from contributing to their families while young, parents increasingly are benefactors rather than beneficiaries. The balance between parents and children is upset, and, to restore equilibrium, a contrary trend develops. Parents seek other, largely psychological, satisfactions from raising their children. Higher educational levels support the search for diverse gratifications. Increasingly also parents seek to escape from children, to enjoy personally more of the satisfactions that an expanding economy makes possible.

Throughout this process, short-term trends in the costs of children and fashionable opinions regarding the social importance of having children continue to operate, depressing fertility termporarily at some points and raising it at others. Other cultural differences in the values and disvalues attached to children unrelated to transition stage also continue to operate.

Although this sketch is phrased in historical terms, its main explanatory factors were tested with cross-sectional comparative data. Countries at different stages in the fertility transition, subnational regions with different fertility levels, and groups defined as having high or low fertility desires were compared according to the importance ascribed to specific dimensions of the satisfactions and costs of children. In this way, the relationship between the micro-level explanatory factors and the macro-level demographic and socioeconomic trends could be tested. Such analyses do not, of course, demonstrate causal relationships; however, they can provide persuasive supporting data for theoretical causal explanations.

Household-level regression analyses can provide similar supporting data; however, such analyses have seldom been used with value-of-children data from developing countries to test a specific theoretical perspective or a clearly articulated set of hypotheses. Rather, the typical approach has been to explore the relative contribution of a diverse set of value-of-children measures to the "explanation" of various fertility measures, controlling for the effects of standard socioeconomic and demographic predictors. Such analyses have provided evidence supporting the broad assumptions underlying this type of research--that situational and background factors operate partly through perceptions of the satisfactions and costs of children to affect fertility preferences and behavior. However, these analyses have provided relatively few generalizations about <u>how</u> that effect takes place.

Broadly speaking, such indicators of "modernity" as education and urban experience give the most consistent evidence of operating

through perceptions of the value of children to influence fertility. The impact of these factors occurs primarily through a reduction in the expectations for instrumental assistance from children (Arnold et al., 1975, Chang, 1979; Kagitcibasi and Esmer, 1980). Beyond this, it is difficult to draw general conclusions because the regression specifications vary, as do country-specific findings when similar models have been applied in comparative studies (e.g., Arnold et al., 1975).

One promising line of theoretical analysis entails deriving hypotheses about the importance of values in relation to the availability of alternatives to children that can be tested with sociodemographic measures; an example of such a hypothesis is that women with less education would be more likely to value children as their main source of achievement. Hypotheses are also derived about how perceived values are related to fertility for particular subgroups, such as Blacks in the United States (Hoffman et al., 1978 and n.d.). However, this approach has been applied only to data from the U.S., and the evidence in support of particular hypotheses is uneven. Similar analyses in developing countries might provide stronger support for the theoretical approach because of their greater differentiation in socioeconomic and fertility dimensions.

Life-Cycle Factors

Another type of explanatory framework treats each birth as a separate event and focuses on the different perceptions of satisfactions and costs that dominate at each successive parity. Such frameworks deal sometimes with the expected value of the next child and sometimes with the more general value-of-children measures (Bulatao, 1981; Callan, 1980; Campbell et al., 1976; Fawcett, 1978; Hoffman and Manis, 1978a; Townes et al., 1980). This type of analysis is often linked to a "successive decisions" framework, in which explanations for fertility preferences are sought in the perceptions of children associated with changing household and individual patterns at various stages of the life cycle. These changing patterns are numerous and diverse, however, and their effects are not easily isolated in cross-sectional studies (Bulatao and Fawcett, 1981; Namboodiri, in this volume).

For example, the psychological and biological maturation of the parents can be expected to influence their perceptions of the satisfactions and costs of children. Other important factors are related to shifts in the social and economic status of the household. The parents' experience in rearing earlier children is also likely to affect their later perceptions. A further complication is that perceived values analyzed in relation to particular parities may reflect influences that are unchanging over the life cycle, but emerge in connection with a parity-specific situation; examples are the influence of gender and number preferences.

Despite the difficulties that exist in causal attribution, the analysis of perceived satisfactions and costs in relation to parity helps to clarify links with both structural influences and fertility

behavior. The general findings from such research are summarized below, with reference to the first child, the second child, and children at higher parities.

The role expectations of society are primary factors in the perceived value of the first child. Parenthood is often equated with adulthood; when asked how one's life is changed by having children, for example, many survey respondents mention that having children makes one feel like an adult. The perceived value of the first child also relates often to the role of strengthening the marital bond. In most societies, continuity of the family name is another important reason for wanting the first child. Somewhat more symbolically, the first birth is regarded as a demonstration of virility or femininity, which may be highly valued aspects of sex role identity. Thus, the first child is seen as instrumental in achieving for the parents important roles and statuses that have little to do with the child itself.

At the same time, however, the satisfactions expected from the first child are strongly associat d with the need to give and receive love. These perceived values fall under the heading of "rewarding interactions" in the scheme given in Table 1. They include deep emotional rewards, as well as the fun expected from having a child in the family.

The main negative factor cited in connection with the first birth is opportunity costs--both interference with work and constraints on flexibility and freedom. The importance of these costs has been shown to be highest in connection with the first and second births.

A salient perceived benefit of the second child is providing companionship for the first. This value is of virtually universal importance and often interacts with the desire for a particular gender in the second child, a combination that has been appropriately labeled "balancing the family" (Bulatao, 1981). There is also evidence that expectations for emotional satisfactions strengthen in connection with the second child; this may be a consequence of the pleasure experienced in raising the first child. A study in the U.S. concluded that, all factors considered, childbearing motivations are strongest in connection with the desire for a second child (Campbell et al., 1976).

Economic factors--both expected benefits and costs--become increasingly prominent at higher parities. Overall, it appears that the commitment to establishing and balancing the family--reflected in social and psychological satisfactions--dominates in the early stages of childbearing, while economic and other costs are relatively de-emphasized. These findings correspond roughly with the idea that normative forces constrain individual decision making until some threshold number is reached, after which expected satisfactions and costs are more explicitly considered. On the other hand, such a model can also be considered an oversimplification since it disguises the real diversity of factors weighed at earlier parities, even if these factors have some common roots in social roles and norms (Bulatao, 1981).

Analysis of perceived satisfactions and costs at different

parities sheds light on the sequence of choices made regarding children and alternatives. In many respects, this seems to be the most appropriate framework for microlevel analysis. Thus far, however, studies of this kind have given inadequate attention to related changes in the family's structural circumstances and to other life-cycle factors that may vary along with parity.

DISCUSSION AND CONCLUSIONS

This report has emphasized findings for which evidence is available from more than one country, and preferably those that have been confirmed in studies using different methodologies. Such an emphasis naturally leads to conclusions at a rather broad level of generality. Greater richness and detail can of course be found in research reports focusing on specific countries or issues, many of which are included in the bibliography, although not necessarily cited in this chapter.

The complexity of the perceived value of children is apparent in comparative as well as country-specific studies. This is hardly surprising: children are at the center of social interaction for most families; there is perhaps no emotional relationship more intense than the parent-child bond; and raising children usually requires a major investment of money and time. All of these factors are potentially relevant to understanding human fertility. An important aspect of the studies discussed here is their attempt to examine the full range of satisfactions and costs--as these are perceived by parents or prospective parents--and to identify those dimensions having a systematic bearing on family size.

A general contribution of the research conducted to date has been to provide new empirical support for hypotheses about certain individual-level processes underlying the demographic transition. This support has in some cases been consistent with other studies and theoretical writings, such as the broad evidence for a decline in the perceived instrumental value of children; in other cases, it has offered new insights, such as the observation that the productive value of children declines at an earlier stage of demographic transition than does their security value. Similarly, the research results showing patterns of perceived satisfactions and costs that characterize socioeconomic groups are indicative of the ways children's roles and functions are defined by the structure of society; such findings also suggest how the value of children may change in the process of modernization.

With respect to theoretical models that posit a decision-making process or choices between children and alternatives, the studies reviewed help define the factors that are weighed in such decisions. These studies also show that there are meaningful shifts in the relative importance of various economic and noneconomic considerations across the life cycle, confirming in general that a household-level fertility decision model is tenable across a variety of economic and cultural settings.

Evidence on the fertility implications of different types of satisfactions and costs helps define meaningful relationships, but also raises some important conceptual and methodological issues. A high level of perceived economic utility has been shown to be consistently related to high fertility; this seems to reflect in a straightforward way the actual economic roles of children in the household. On the other hand, the fertility implications of the psychological and social satisfactions of children are more complex, reflecting to a large extent the availability of nonfamilial roles and of opportunities for other types of gratification, especially for women. Although such interactions are not yet clearly understood, their significance is indicated by the high level of importance attached to the emotional rewards of childrearing. The conditions under which an emphasis on psychosocial satisfactions may lead to either high or low fertility, especially in more developed countries and among higher socioeconomic groups in developing countries, require further investigation. The psychosocial aspects of opportunity costs--e.g., feelings of constraint and restrictions on freedom--also deserve more detailed study and analysis.

Perceptions of the economic costs of children are probably the weakest methodological aspect of the studies reviewed, for a variety of reasons. Researchers have noted that many people resist discussing this aspect of children, apparently because they do not like to think of them in monetary terms. It has also been found that most people cannot estimate accurately the actual costs of childrearing. Moreover, it is not clear what factors enter into people's judgments about the economic burdens associated with raising children. For example, it is likely that the importance of costs is assessed in relation to income, and that in some cases this may include consideration of the expected economic benefits from children. The causal link between perceived costs and family size is unclear for other reasons as well. For instance, some parents may have smaller families because they anticipate the financial burden, whereas others may become sensitive to costs as a result of having several children. Such considerations may be responsible for the weak effects of the perceived economic costs of children in multivariate analyses; they also dictate caution in any analysis aimed at assessing the "net" effect of measures of perceived satisfactions and costs.

More generally, the degree of validity and reliability of survey measures for different types of satisfactions and costs may vary considerably. To some extent, existing studies have taken this into account by using multiple methods of measurement and constructing composite indices; however, further attention to methodology is needed. It is encouraging to note that much of the current research on the value of children consists of community-level studies, many of which employ both surveys and other methods of data collection. Such studies will help to reveal the strengths and weaknesses of different methodologies. They should also enhance existing knowledge about how the social context affects perceptions of the value of children, as well as how family or household factors interact with individual perceptions to affect fertility.

BIBLIOGRAPHY

Adler, N. E. (1979) Decision models in population research. Journal of Population 2:187-202.

Aghajanian, A. (1979) Family economy and economic contribution of children in Iran: An overview. Journal of South Asian and Middle Eastern Studies 3:21-30.

Arnold, F., and J. T. Fawcett (1975) The Value of Children: Hawaii, Vol. 3. Honolulu: East-West Population Institute.

Arnold, F., and C. Pejaranonda (1977) Economic Factors in Family Size Decisions in Thailand. World Fertility Survey: Survey of Fertility in Thailand, Report No. 2. Bangkok and Honolulu: Chulalongkorn University Institute of Population Studies; Population Survey Division, National Statistical Office; and East-West Population Institute.

Arnold, F., R. A. Bulatao, C. Buripakdi, B. J. Chung, J. T. Fawcett, T. Iritani, S. J. Lee, and T.-S. Wu (1975) The Value of Children: Introduction and Comparative Analysis, Vol. 1. Honolulu: East-West Population Institute.

Asirifi, B. B. A. (1977) The value of children in Africa. In Family Welfare and Development in Africa. London: International Planned Parenthood Federation.

Bajracharya, B. B. (1980) Economic Value of Children: A Case Study of a Tharu Village. Centre for Economic Development and Administration, Tribhuvan University, Dirtipur, Kathmandu, Nepal.

Beach, L. R., B. D. Townes, F. L. Campbell, and G. W. Keating (1976) Developing and testing a decision aid for birth planning decisions. Organizational Behavior and Human Performance 15:99-116.

Beckman, L. J. (1978) The relative rewards and costs of parenthood and employment for employed women. Psychology of Women Quarterly 2:215-234.

Beckman, L. J., and B. B. Houser (1979) Perceived satisfactions and costs of motherhood and employment among married women. Journal of Population 2:306-327.

Ben-Porath, Y. (1977) The economic value and costs of children in different economic and social settings. Pp. 77-90 in International Population Conference, Mexico 1977, Vol. 2. Liege: International Union for the Scientific Study of Population.

Berelson, B. (1976) The value of children: A taxonomical essay. Pp. 11-24 in N. B. Talbot, ed., Raising Children in Modern America: Problems and Prospective Solutions. Boston: Little, Brown.

Bleek, W. (1978) The value of children to parents in Kwahu, Ghana. Pp. 307-323 in C. Oppong et al., eds., Marriage, Fertility, and Parenthood in West Africa. Changing African Family Project Monograph Series No. 4, Pt. 1. Canberra: Australian National University.

Boulier, B. L. (1977) Children and household economic activity in Laguna, Philippines. Journal of Philippine Development 4:195-221.

Bulatao, R. A. (1975) The Value of Children: Philippines, Vol. 2. Honolulu: East-West Population Institute.

Bulatao, R. A. (1978) The Value of a Filipino Child: Pleasure and Profit Against Cost and Concern. East-West Population Institute Reprint No. 113. Reprinted from Population of the Philippines, pp. 161-171, ESCAP Country Monograph Series No. 5. Bangkok: United Nations.

Bulatao, R. A. (1979a) On the Nature of the Transition in the Value of Children. Paper No. 60-A. Honolulu: East-West Population Institute.

Bulatao, R. A. (1979b) Further Evidence of the Transition in the Value of Children. Paper No. 60-B. Honolulu: East-West Population Institute.

Bulatao, R. A. (1980) The transition in the value of children and the fertility transition. Pp. 95-122 in C. Hohn and R. Mackensen, eds., Determinants of Fertility Trends: Theories Re-examined. Liege: Ordina Editions.

Bulatao, R. A. (1981) Values and disvalues of children in successive childbearing decisions. Demography 18:1-25.

Bulatao, R. A., and F. Arnold (1977) Relationships between the value and cost of children and fertility: Cross-cultural evidence. In International Population Conference, Mexico City 1971, Vol. 1. Liege: International Union for the Scientific Study of Population.

Bulatao, R. A., and J. T. Fawcett (1981) Dynamic perspectives in the study of fertility decision-making: Successive decisions within a fertility career. Pp. 433-449 in International Population Conference, Manila 1981, Vol. 1. Liege: International Union for the Scientific Study of Population.

Buripakdi, C. (1977) The Value of Children: Thailand, Vol. 4. Honolulu: East-West Population Institute.

Cain, M. T. (1977) The economic activities of children in a village in Bangladesh. Population and Development Review 3:201-227.

Caldwell, J. C. (1967) Fertility attitudes in three economically contrasting rural regions of Ghana. Economic Development and Cultural Change 15:217-238.

Callan, V. J. (1980) The Value of Children to Australian, Greek and Italian Parents in Sydney. Paper No. 60-C. Honolulu: East-West Population Institute.

Campbell, F. L., B. D. Townes, L. R. Beach, and D. C. Martin (1976) Shifts in Values Associated with Fertility Decisions Following Childbearing. Paper presented at the workshop on Psychosocial Aspects of Fertility and Fertility Regulation, Montreal.

Chang, C.-T. (1976) Desired Fertility, Income and the Valuation of Children. Population and Employment Project Working Paper No. 36. International Labour Office, Geneva.

Chang, C.-T. (1979) Female employment and fertility behavior. Pp. 167-186 in P. S. J. Chen and J. T. Fawcett, eds., Public Policy and Population Change in Singapore. New York: Population Council.

Cho, N. H., K. S. Lee, S. Y. Hong, and S. H. Kim (1977) Effects of Economic Factors on Fertility Behavior. Seoul: Korean Institute for Family Planning.

Chung, B. J. (1972) Costs and benefits of children in Hong Kong: Measurement in a pilot study. Pp. 210-230 in J. T. Fawcett, ed., The Satisfactions and Costs of Children: Theories, Concepts, Methods. Honolulu: East-West Population Institute.

Chung, B. M., J.-H. Cha, and S. J. Lee (1974) A Study on Boy Preference and Family Planning in Korea: Project Final Report. Korean Institute for Research in the Behavioral Sciences, Seoul.

Concepcion, M. B., ed. (1976) Children of the Lakeshore: Studies on the Value of Children in Selected Laguna Lake Towns. Manila: Population Institute, University of the Philippines.

Coombs, L. C. (1980) Economic Factors in Fertility Decisions: The Role of Costs and Benefits. Taiwan Population Studies, Working Paper No. 45, Population Studies Center, University of Michigan, Ann Arbor.

Darroch, R. K., P. A. Meyer, and M. Singarimbun (1981) Two Are Not Enough: The Value of Children to Javanese and Sundanese Parents. Paper No. 60-D. A Joint Publication of the East-West Population Institute, Honolulu, and the Population Studies Center, Gadjah Mada University, Yogyakarta, Indonesia.

Davidson, A. R., and J. J. Jaccard (in press) Variables that moderate the attitude-behavior relation: Results of a longitudinal survey. Journal of Personality and Social Psychology.

Deven, F. (1977) Relationships between Advantages and Disadvantages of Having Children and Combinations of Desired and Actual Family Sizes: Some Data From the 3rd National Survey on Family Development in Belgium. Paper presented at the formal session, Value and Cost of Children to Parents, Conference of the International Union for the Scientific Study of Population, Mexico City.

De Vos, S. (1982) The Economic Old Age Security Value of Children in the Philippines and Taiwan in the Middle 1970s. Unpublished Ph.D. dissertation, Department of Sociology, University of Michigan, Ann Arbor.

Easterlin, R. (1969) Towards a socioeconomic theory of fertility: A survey of recent research on economic factors in American fertility. Pp. 127-156 in S. J. Behrman, L. Corsa, Jr., and R. Freedman, eds., Fertility and Family Planning: A World View. Ann Arbor, Mich.: University of Michigan Press.

Easterlin, R. A. (1980) Birth and Fortune. New York: Basic Books.

Epstein, T. S., and D. Jackson, eds. (1977) The Feasability of Fertility Planning: Micro Perspectives. New York: Pergamon Press.

Espenshade, T. J. (1977a) The taste for children: Books in review. Family Planning Perspectives 9:40, 43, 47.

Espenshade, T. J. (1977b) The value and cost of children. Population Bulletin 32(1).

Falbo, T. (1978) Reasons for having an only child. Journal of Population 1:181-184.

Fawcett, J. T., ed. (1972) The Satisfactions and Costs of Children: Theories, Concepts, Methods. Honolulu: East-West Population Institute.

Fawcett, J. T. (1975) Social and psychological aspects of fertility: Issues and priorities. Asian Population Studies Series No. 26. Pp. 25-30 in Report and Papers of the Expert Group Meeting on Social and Psychological Aspects of Fertility Behavior, Bangkok 10-18 June 1974. Bangkok: Economic and Social Commission for Asia and the Pacific, United Nations.

Fawcett, J. T. (1977) The value and cost of children: Converging theory and research. Pp. 91-114 in L. T. Ruzicka, ed., The Economic and Social Supports for High Fertility. Canberra: Department of Demography, Australian National University.

Fawcett, J. T. (1978) The value and cost of the first child. Pp. 244-265 in W. B Miller and L. F. Newman, eds., The First Child and Family Formation. Chapel Hill, N.C.: Carolina Population Center, University of North Carolina.

Fawcett, J. T. (1979) Editor's Foreword: Current Studies on the Value of Children. Paper No. 60-A. Honolulu: East-West Population Institute.

Fawcett, J. T., S. Albores, and F. Arnold (1972) The value of children among ethnic groups in Hawaii: Exploratory measures. Pp. 234-259 in J. T. Fawcett, ed., The Satisfactions and Costs of Children: Theories, Concepts, Methods. Honolulu: East-West Population Institute.

Fawcett, J. T., F. Arnold, R. Bulatao, C. Buripakdi, B. J. Chung, T. Iritani, S. J. Lee, and T.-S. Wu (1974) The Value of Children in Asia and the United States: Comparative Perspectives. Paper No. 32. Honolulu: East-West Population Institute.

Gandotra, S. M. M., and S. D. N. Pandey (1979) Values attached to children in Indian society and family size norms: The changes and impact. Journal of Family Welfare (Bombay) 26:9-14.

Greenberg, D. H., and W. P. Butz (1974) Methods of Surveying and Estimating the Economic Value of Children. Santa Monica, Calif.: Rand Corporation.

Guthrie, G. M. (1966) Structure of maternal attitudes in two cultures. Journal of Psychology 62:155-165.

Ho, T. J. (1979) Time costs of child rearing in the rural Philippines. Population and Development Review 5:643-662.

Hoffman, L. W. (1975) The value of children to parents and the decrease in family size. Proceedings of the American Philosophical Society 119:430-438.

Hoffman, L. W., and M. L. Hoffman (1973) The value of children to parents. Pp. 19-76 in J. T. Fawcett, ed., Psychological Perspectives on Population. New York: Basic Books.

Hoffman, L. W., and J. D. Manis (1978a) Effects of the first child on the women's role. Pp. 340-367 in W. B. Miller and L. F. Newman, eds., The First Child and Family Formation. Chapel Hill, N.C.: Carolina Population Center, University of North Carolina.

Hoffman, L. W., and J. D. Manis (1978b) Influences of children on marital interaction and parental satisfactions and dissatisfactions. Pp. 165-213 in R. M. Lerner and G. B. Spanier, eds., Child Influences on Marital and Family Interaction: A Life-Span Perspective. New York: Academic Press.

Hoffman, L. W., and J. D. Manis (1979) The value of children in the United States: A new approach to the study of fertility. Journal of Marriage and the Family 41:583-596.

Hoffman, L. W., and F. Wyatt (1960) Social change and motivations for having larger families: Some theoretical considerations. Merrill-Palmer Quarterly 6:235-244.

Hoffman, L. W., A. Thornton, and J. D. Manis (1978) The value of children to parents in the United States. Journal of Population 1:91-131.

Hoffman, L. W., A. Thornton, and J. D. Manis (n.d.) Fertility Variables and the Value of Children. Unpublished manuscript. University of Michigan, Ann Arbor.

Hull, T. H. (1975) Each Child Brings its own Fortune: An Inquiry into the Value of Children in a Javanese Village. Ph.D. dissertation. Australian National University, Canberra.

Hull, V. J. (1977) Social and economic supports for high fertility in peasant communities: General issues emerging from specific research. Pp. 241-249 in L. T. Ruzicka, ed., The Economic and Social Supports for High Fertility. Canberra: Australian National University.

Iritani, T. (1979) The Value of Children: Japan, Vol 6. Honolulu: East-West Population Institute.

Kagitcibasi, C. (1979) Effects of Employment and Children on Women's Status and Fertility Decisions. Paper prepared for the International Development Research Centre Workshop on Women's Roles and Fertility, Ottawa.

Kagitcibasi, C. (1980) The value of children: Some social-psychological determinants of fertility in Turkey. Pp. 140-147 in United Nations, Demographic Transition and Socio-Economic Development. Department of International Economic and Social Affairs Population Studies No. 65. New York: United Nations.

Kagitcibasi, C. (1982) The Changing Value of Children in Turkey. Paper No. 60-E. Honolulu: East-West Population Institute.

Kagitcibasi, C., and Y. Esmer (1980) Development, Value of Children and Fertility: A Multiple Indicator Approach. Report prepared for the Middle East Awards Program. Bogazici University, Istanbul.

Karki, Y. B. (1982) Fertility and the Value of Children: A Study of Rural and Urban Populations in Nepal. Unpublished Ph.D. dissertation. London School of Economics and Political Science, University of London.

Kee, P.-K. (1980) Fertility Values of Children and Parents in Peninsular Malaysia: A Cross-Cultural Study of Malays, Chinese, and Indians. Unpublished Ph.D. dissertation. Department of Psychology, Australian National University, Canberra.

Khan, M. E. (1977) Value of Children: Some Preliminary Observations from Indian Data. Paper presented at the Conference of the International Union for the Scientific Study of Population, Mexico City.

Khuda, B.-e- (1977) Value of Children in a Bangladesh Village. Pp. 681-728 in J. C. Caldwell, ed., The Persistence of High Fertility, Vol. 2. Canberra: Australian National University.

Kirchner, E. P. (1974) Reasons for Wanting Children: Factors and Correlates: Final Report. National Institute of Child Health and Human Development, Washington, D.C.

Lamanna, M. A. (1977) The Value of Children to Natural and Adoptive Parents. Ph. D. dissertation. Department of Sociology, University of Notre Dame.

Lee, S. J., and J.-O. Kim (1977) The Value of Children: Korea, Vol 7. Honolulu: East-West Population Institute.

Leibenstein, H. (1974) An interpretation of the economic theory of fertility: Promising path or blind alley? Journal of Economic Literature 12:457-479.

Meade, R. D., and L. Singh (1973) Motives for childbearing in America and in India. Journal of Cross-Cultural Psychology 4:89-110.

Mehryar, A. H., S. Tolnay, and S. Jamshidi (1977) Changing perception of children's value and cost by groups of parents in an Iranian city. Pp. 423-435 in L. T. Ruzicka, ed., The Economic and Social Supports for High Fertility. Canberra: Australian National University.

Meyer, P. A. (1981) The Value of Children in the Context of the Family in Java. Unpublished Ph.D. dissertation. Department of Demography, Australian National University, Canberra.

Moors, H. G. (1978) The Netherlands Survey on Fertility and Parenthood Motivation, 1975: A Summary of Findings. WFS Report No. 12. Voorburg, The Netherlands: International Statistical Institute.

Mueller, E. (1972) Economic motives for family limitation: A study conducted in Taiwan. Population Studies 26:383-403.

Mueller, E. (1976) The economic value of children in peasant agriculture. Pp. 98-153 in R. G. Ridker, ed., Population and Development: Search for Selective Interventions. Baltimore, Md.: The Johns Hopkins University Press.

Nag, M., R. C. Peet, and B. White (1977) Economic value of children in two peasant societies. Pp. 123-139 in International Population Conference, Mexico 1977, Vol. 1. Liege: International Union for the Scientific Study of Population.

Narayan-Parker, D. (1979) Perceived Economic Costs and Benefits of Children, Occupation, and Family Size in Rural India. Ph.D. dissertation. Iowa State University, Ames.

Okore, A. O. (1977) The rationale for high fertility in rural Nigeria: The case of the Ibos in Arochukwu in Imo state. Pp. 253-274 in L. T. Ruzicka, ed., The Economic and Social Supports for High Fertility. Canberra: Australian National University.

Prasadja, A. B., and M. A. Sumhudi (1975) The Value of Children in a Rural Islamic Community: A Case Study about Religious Leaders and the Role of the Child in Cibadak, West Java. Serpong Paper No. 15, Serpong Family Planning Project. University of Indonesia, Jakarta.

Prasithrathsint, S., and F. A. Day (1977) Cost and values of children in rural Thailand. Pp. 307-316 in L. T. Ruzicka, ed., The Economic and Social Supports for High Fertility, Vol. 1. Canberra: Department of Demography, Australian National University.

Rabin, A. I. (1965) Motivation for parenthood. Journal of Projective Technique and Personality Assessment 29:405-411.

Rabin, A. I., and R. J. Greene (1968) Assessing motivation for parenthood. Journal of Psychology 69:39-46.

Ruzicka, L. T., ed. (1977) The Economic and Social Supports for High Fertility. Canberra: Department of Demography, Australian National University.

Saefullah, A. D. (1979) The Value of Children among Tea Estate Workers' Families: A Case Study in a Village in West Java. Development Studies Centre. Canberra: Australian National University.

Schultz, T. W. (1973) The value of children: An economic perspective. Journal of Political Economy 81(2, part 2):S2-S13.

Simmons, A. B. (1977) The VOC approach in population policies: New hope or false promise? Pp. 157-180 in International Population Conference Mexico 1977, Vol. 1. Liege: International Union for the Scientific Study of Population.

Smetana, J. G., and N. E. Adler (1979) Decision-making regarding abortion: A value x expectancy analysis. Journal of Population 2:338-357.

Spengler, J. J. (1966) Values and fertility analysis. Demography 3:109-130.

Srinivasan, K., P. C. Saxena, and T. Kanitkar (1979) Demographic and Socio-Economic Aspects of the Child in India. Bombay: Himalaya Publishing House.

Terhune, K. W. (1973) Fertility Values: Why People Stop Having Children. Paper presented at the annual meeting of the American Psychological Association, Montreal.

Terhune, K. W., and S. Kaufman (1973) The family size utility function. Demography 10:599-618.

Tobin, P. L. (1976) Conjugal role definitions, value of children and contraceptive practice. Sociological Quarterly 17:314-322.

Tobin, P. L., W. B. Clifford, R. D. Mustian, and A. C. Davis (1975) Value of children and fertility behavior in a tri-racial rural county. Journal of Comparative Family Studies 6:46-55.

Townes, B. D., L. R. Beach, F. L. Campbell, and D. C. Martin (1976) Birth-planning values and decisions: Preliminary findings. Pp. 113-130 in S. H. Newman and V. D. Thompson, eds., Population Psychology: Research and Educational Issues. Washington, D.C.: U.S. Government Printing Office.

Townes, B. D., L. R. Beach, R. L. Campbell, and D. C. Martin (1977) Birth-planning values and decisions: The prediction of fertility. Journal of Applied Social Psychology 7:73-88.

Townes, B. D., L. R. Beach, F. L. Campbell, D. C. Martin, and R. J. Wood (1980) Family building: A social psychological study of fertility decisions. Population and Environment 3:210-220.

Turner, J. (1974) Economic Context and the Meaning of Children to Parents in Chile. Paper prepared for the 2nd International Conference of the Association for Cross-Cultural Psychology, Kingston, Ontario.

UNESCO (1975) Attitudes and Beliefs Related to Fertility Behavior in Malaysia and Indonesia. Occasional Paper No. 1, Regional Communications Unit (Family Planning). UNESCO, Kuala Lumpur.

Vinokur-Kaplan, D. (1977) Family planning decision-making: A comparison and analysis of parents' considerations. Journal of Comparative Family Studies 8:79-98.

Vinokur-Kaplan, D. (1978) To have--or not to have--another child: Family planning attitudes, intentions, and behavior. Journal of Applied Social Psychology 8:29-46.

Vlassoff, M., and C. Vlassoff (1980) Old age security and the utility of children in rural India. Population Studies 34:487-499.

Ware, H. (1978) The Economic Value of Children in Asia and Africa: Comparative Perspectives. Paper No. 50. Honolulu: East-West Population Institute.

White, B. E. (1975) The economic importance of children in a Javanese village. Pp. 127-146 in M. Nag, ed., Population and Social Organization. The Hague: Mouton.

White, B. E. (1976) Production and Reproduction in a Javanese Village. Ph.D. dissertation. Department of Anthropology, Columbia University, New York.

Williamson, N. E. (1976) Sons or Daughters: A Cross-Cultural Survey of Parental Preferences. Beverly Hills, Calif.: Sage Publications.

Wong, A. K. (1977) The value of children and the household economy in an urban setting: A review of current VOC studies in the developing world. Pp. 319-344 in L. T. Ruzicka, ed., The Economic and Social Supports for High Fertility. Canberra: Australian National University.

Wu, T.-S. (1977) The Value of Children: Taiwan, Vol. 5. Honolulu: East-West Population Institute.

Chapter 14

DIRECT ECONOMIC COSTS AND BENEFITS OF CHILDREN

John C. Caldwell

INTRODUCTION

This paper examines the economic costs and benefits of children. At the outset, two qualifications must be noted.

First, economic analysis appropriate for Western sccieties may yield quite misleading results if applied to other societies without allowing for such factors as differences in family relations. This is kept in mind in the present paper's discussion of developing countries.

Second, there are a number of generalizations about the costs and benefits of children in traditional societies. For example, most children in these societies work from a young age, often from around 5 years (Oppong, 1973; Cleave, 1974; Richards, 1939). They start by imitating their elders, almost as a form of play which develops into something more akin to apprenticeship, and by adolescence are carrying a work load approaching that of an adult. Children live modestly and do not have first claim on subsistence or other work profits. The trouble with these generalizations is that they are unquantified. Thus the differences in the value placed on children between the societies being described and those of the contemporary West are not always clearly discerned. Moreover, the net difference between children's contributions and costs is not defined with any precision.

The present paper is hampered by this lack of precise estimates in the literature. As a result, some of the analyses presented here will approach the subject from a reverse point of view: discussing the way that contributions and costs of children affect fertility levels, it will explore the implications of stable high fertility and irreversible low fertility for the magnitude of those contributions and costs. This will be accomplished through application of the "wealth flows" theory (J. Caldwell, 1976b, 1982c). This theory states that, in pretransition societies (i.e., before the onset of fertility decline), the net value of intergenerational wealth flows (labor and services, goods and money, and present and future guarantees, including old age support) is upward, whereas in posttransition societies it is downward.

The discussion that follows is intended to guide the collection of empirical data required to support and refine the theoretical work on children's economic contributions and costs. Although debate rages on

the relative value of children's contributions and costs, empirical data for the Third World have barely begun to appear.

CENTRAL ISSUES

At least during the past 100 years, fertility decline, once definitely established, has persisted until relatively low levels have been reached (Knodel and van de Walle, 1979). This transition pattern is much more significant in understanding the world's future population trends than is the overall fertility rate or the different rates of various communities. Thus identifying the conditions responsible for this fertility decline is of paramount importance. It is highly probable that those mechanisms responsible for the onset of the decline not only help to sustain it, but are also self-reinforcing in that one change implies another (see J. Caldwell, 1982b).

To trace these mechanisms, it is logical to begin by examining the characteristics of the preexisting stable high-fertility society. The discussion below focuses on the balance of children's contributions and costs in these societies, including the social conditions prescribing that balance; it then addresses the conditions responsible for changes in the balance, and thus for the onset of fertility decline.

The Balance of Children's Contributions and Costs in Pretransition Societies

Attempts have been made to explain stable high fertility as the necessary compensation for relatively stable high mortality, either through a largely automatic response to mortality (Heer and Smith, 1967) or through some organization of the culture to ensure that fertility will be at least as high as mortality (Notestein, 1945). This explanation implies that the economic rewards of high fertility at the family level are insignificant in such societies and that fertility will decline--perhaps with some lag--when mortality declines. This is a testable hypothesis, although little adequate testing has been done. It is true that, in stationary high-fertility and high-mortality societies, there is always a significant proportion of large families. However, the evidence to date suggests that the parents of such large families are not relatively economically disadvantaged (J. Caldwell, 1966a, 1976a), nor do their children have a lower potential for socioeconomic mobility (Imoagene, 1976). On the contrary, families that end up very small because of unusually high mortality or sub-fecundity tend to be distressed.[1] The primary conditions of stable high fertility must therefore be sought in the positive advantages accruing to such fertility at the family level, rather than in the negative motive of avoiding community disadvantages arising from population decline. These positive advantages can be identified as follows: (1) defense and strength; (2) investment for the future; and (3) situational advantage. The latter will be

analyzed at greatest length because of its importance, especially in peasant societies.[2]

Defense and Strength

Family numbers have long meant community strength, and have protected both factions and families within communities (J. Caldwell, 1981). Likewise, the safety of houses has depended on the fact that there are always people within. Moreover, the ability of the old to have their way has depended on strong young relatives. In contemporary Bangladesh, numbers count in land disputes in the courts (J. Caldwell, 1981, drawing on Jalaluddin, in preparation), and family numbers and structure count at the critical time when land is inherited (Cain, 1978). In Nigeria, few doubt that family strength depends on networks of relationships augmented by the marriages of both sons and daughters (J. Caldwell, 1976a). This advantage of high fertility is usually understated because of a sensitivity among researchers about stressing physical insecurity and the need for protection against enemies and strangers. Indeed, even in relatively secure areas, such as Yorubaland in Nigeria, family numbers can allow the family to throw its weight around in village or town; as a result, various economic and other privileges are secured to such an extent that nearly everyone in the area sees large families, successful families, and prosperous families as synonomous (J. Caldwell, 1976a).

Investment for the Future

Children represent an investment for the future, even in circumstances where the rate of return is negative (J. Caldwell, 1981). For protection and support in old age, there is often no satisfactory form of investment except surviving children, expecially in Third World rural areas (and even for many in urban areas). Admittedly, where there is enough money, there may be the possibility of buying land. However, this is not possible where land tenure is familial or communal; moreover, even where the possibility exists, maximizing the investment often means having adequate supplies of family labor as well as extra land. Even in the towns and among the riche people, many other types of investment are realistically distrusted because there is apprehension about the effects of political change or inflation, or because only some social groups can become moneylenders. Even where money, land, or pensions are available, these can only be fully utilized or protected where there are also physically capable members of the younger generation.

Another major reason why children are the only possible investment in poor parts of the Third World is rarely noted and remains unresearched: poor families cannot reduce the consumption of hungry or badly fed family members in order to build up a fund for investment without giving rise to protest by relatives and the wider community; however, doing so to feed more children is regarded as natural.

Parents with fewer children may not even reap the full immediate consumption benefits because they are perceived as able to help feed or provide for other needy relatives (J. Caldwell, 1965).

In addition, in economies where land is communal, the only real investment may be in reproducing labor. Where families are living at a level above destitution, there may still be no means of converting a production surplus into savings and thence into investment because of the lack of financial markets. The resulting focus on self-financing and family enterprise is one factor explaining the economic role of children in such societies. Consequently, the development of financial markets and, more generally, security of property rights transacted in impersonal markets is an institutional aspect of economic development having potentially profound effects on the family and its fertility motivation (Willis, 1981).

Schooling increases the potential returns on investment in children, at least as long as substantial differentials continue to exist between the wages paid to the educated and the uneducated and between those paid in urban and rural areas (J. Caldwell, 1965, 1966a, 1976a, 1981). This has probably been significant in sustaining high fertility in urban areas of tropical Africa, although it is unlikely to raise fertility for three reasons. First, this occurs in societies where marital fertility has been little controlled; the returns from education are likely to restrict the marital period further by delaying marriage, both to allow the completion of training and to allow parents to secure a longer undivided return. Second, parents may fear that education will weaken their children's commitment to them (the degree of risk varying from culture to culture and from one time to another). Third, parents may realize that increasing levels of education in the community threaten to alter existing educational wage differentials, thus diminishing incentives to higher fertility based on those differentials.

Situational Advantage

Perhaps the most important factor in the balance of children's contributions and costs is the situational advantage within the family. This means simply that some family members are more advantaged than others: high-fertility societies are invariably characterized by marked age and sex distinctions in work, consumption, and many other matters. Although it is probably changes in this factor which usually determine the onset of fertility decline, the least research has been done in this area. These are not merely chance aspects of the society, but are fundamental to familial production and ensure adequate returns to those with the most power--the old, although not always the very oldest, and usually the male. Certainly most culture, from family conversation (J. Caldwell and P. Caldwell, in preparation) to theology, is concerned with maintaining age and sex roles. It should be noted that this aspect of culture helps to maintain the stability of the productive system (J. Caldwell, 1980a); it is not primarily a fertility prop, even though it

does have implications for the value of high fertility. Indeed, high fertility may not be economically advantageous in any society with only modest differentiation by age and sex. Age and sex roles do not necessarily change at the same rate as the means of production, but almost inevitably lag behind. This is why fertility does not fall as soon as familial production ceases to dominate the economy.

Because of situational advantage within the family, the value of high fertility should be measured not by per capita figures but by the returns to major decision makers for the balance of their lives after they have reached positions where they can control decisions. Thus there must be a research focus on when such decision-making power is attained with regard to work, consumption, other budgetary decisions, and reproduction (being attempted by J. Caldwell and Reddy). With regard to reproduction, the important decision in high-fertility societies is the negative one--the sanction on controlling fertility in any way. Since this is usually argued in terms of purity and propriety, the decision makers may well not be the generation of biological parentage, but the elder generation, a point of considerable significance in assessing the value of continued reproduction.

The emphasis in research must thus be on intrafamilial research, that is, on power relations within the family and on relative consumption and work, as well as on changes in these relationships. Such research is difficult because of both the intimate way in which the family must be penetrated and the complexity of all the ways in which family members are of economic advantage to each other. Economic advantage may be provided by work which yields money, subsistence work, the provision of services, guarantees of present and future security, the ability to take a larger share of consumption, and so on. All these transactions have been described as "wealth flows" (J. Caldwell, 1976b). The quantifying of wealth flows is difficult because of inadequate measures. Moreover, the cultural superstructure justifying unequal sharing is so pervasive that research workers often cannot even perceive the magnitudes involved; in Bangladesh, for example, survey workers described even the lightest of male activities as more intensive than any female work, especially domestic work (J. Caldwell et al., 1980), giving some hint of the biases that must be overcome in such research.

The wealth flows approach is believed to be particularly valuable for overcoming the misleading dichotomy between "productive" and "household" work--a product of the culture from which the researchers come. This dichotomy has led to a misunderstanding of the economics of fertility in both the Third World and contemporary industrial society. The harmful nature of this dichotomy has also been stressed in the "new home economics" approach, which has emphasized the value of household or nonmarket production, though not always counting all items included under wealth flows.

In Nigeria during 1974-75, one attempt was made to measure money flows between parents and children, both normally and during emergencies (Changing African Family, 1975; J. Caldwell, 1976a). This study also included a range of information on material assistance

during education; however, current labor and services were not measured at the time. Although the money flows were found to be important, it was concluded that they were almost certainly substantially understated. If research is to lead to an understanding of the economics of fertility, it must concentrate on all work, and indeed on the use of all time. One comparative study both failed to do this and also incorporated measures of work and consumption by age that were inapplicable because they were derived from research carried out at other places, at other times, and even under other assumptions (Mueller, 1976).

Time-use studies have been carried out in Indonesia and Nepal (White, 1975; Nag et al., 1977; Nag et al., 1978), the Philippines (Boulier, 1977; Rosenzweig, 1978), and Bangladesh (Khuda, 1978, 1980a, 1980b; Cain, 1977; J. Caldwell et al., 1980), and an inventory of children's activities was undertaken in Nigeria (Changing African Family, 1974). However, only one of these studies involved continuous observation (J. Caldwell et al., 1980).[3] This study was also the only one of its type to date to examine various populations, from those least likely to experience fertility decline to urban middle-class poulations most likely to do so. Some of the relevant findings were the relatively greater work inputs of females of all ages, and the value of both wives and sons for rural-urban migrants establishing themselves in the town. This study confirmed that men benefit from the work of growing sons long before old age, and that middle-aged men move towards activities that are often more apparent than necessary--for instance, of the "business discussions" type. The study also demonstrated the very small amount of parental time devoted to child care, except among the urban middle class, thus confirming the findings of a Sudan study (Din, 1977b).

All the studies tend to support the hypothesis of the value of high fertility in Third World countries in rural and poor urban areas. Even in richer urban areas, children may be valuable: the J. Caldwell et al. (1980) study showed how high fertility can be rewarding to the traditional urban, commercial elite, though not to the modern white collar elite, demonstrating the inadequacy of income as a discriminating analytical tool. This study also showed that the contributions of children are equally great among the rural landless and the urban poor and among the farmers and the urban commercial traditional elite; however, the former two groups have relatively greater problems ensuring continuing control over their children and the rewards from the children's labor because they do not own the property where the work is done.

One study of Botswana (Mueller, 1979) presents a tentative conclusion, subject to a series of qualifications listed in the paper, that the marginal productivity of extra children (and women) in cattle-owning households may be zero. This would be true, however, only if all children did the same kind of work. Instead, type of work varies widely by sex and age. Children undertake specialized work which adults, and to some extent older children, regard as menial: looking after the cattle, securing firewood from the forest, taking messages, carrying around siblings, and so on (J. Caldwell et al.,

1980; Changing African Family, 1974). In families with few children, adults have to undertake these tasks, and they may be distressed for many years by having to do so (J. Caldwell, 1976a). The hypothesis of zero marginal productivity for children also fails to take into account that a considerable number of children are needed to stabilize the large family system, both by producing competition for the regard and favor of the elders and by allowing sharing of work so that its onerousness does not produce rebellion.

A complication in assessing child labor is that none of the labor input studies has solved the problem of labor intensity. One Bangladesh study employed an intensity scale for assessing work; however, it was possible to show that even trained observers were strongly affected by their attitudes towards sex and age (J. Caldwell et al., 1980). Neither is imputing values from market wage rates satisfactory: research in South India has shown that women are paid less than men, even for activities acknowledged to be done better by women, because wage rates are set according to the requirements of social stability (J. Caldwell et al., in preparation).

The study of family consumption patterns is even less advanced. Very little work identifies consumption by individual members of the family, and practically no studies relate consumption to work inputs (one attempt on Bangladesh data is now being made [J. Caldwell et al., 1982]).[4] Some measures do exist of the food consumption of different family members. Although such differences might be expected to be less than usual during observation, they have in fact been shown to be very considerable (Trivandrum Centre for Development Studies, 1973-74). The social anthropological evidence indicates that the most common mechanism allowing children and women to eat less than adult males is separate and successive meals, with the older men eating first and sufficiently, even when food is scarce. In the period 1978-80, a major field study was undertaken of family allocation of food and health care in rural Bangladesh. The first report on the analysis shows males to average 20 percent more calories and 21 percent more protein than females. The study concludes as follows:

> Overall, the actual nutrient intake patterns and crude adjustments for sex-specific requirements demonstrate that female children, irrespective of the adjustment, are markedly disadvantaged in terms of food intake relative to requirements. A similar discrimination of lower magnitude appears to exist with regard to the elderly. In the adolescent and childbearing years, the differences are difficult to confirm conclusively because of the difficulty in quantifying extra requirements related to body weight, pregnancy and lactation, and activity (Chen et al., 1981:63).

This study also demonstrates that daughters are 40 percent less likely than sons to be taken to health facilities for diarrheal treatment. Another study of rural Bangladesh (Mahmud and McIntosh, 1980) indicates a similar inequality in internal family food distribution. It also indicates lower consumption per capita in larger families,

although it is unable to show the relative deprivation by age and sex.

Work on guarantees and safety is even less advanced. Studies of the condition of the aged that give emphasis to their support and its relation to earlier reproduction are rare (J. Caldwell, 1966a; Sunarto, 1978). Guarantees of safety have not been the subject of social scientific study. Although it should be possible to examine the great crises of life and the part played by descendants or those related through the marriage of descendants, such work is only just beginning. Similarly, if it is possible to set a premium on an insurance policy, it should be possible to examine guarantees as material inputs.

Finally, this discussion of situational advantage within the family implies that much more sophisticated research is desirable on the locus of reproductive decision making. The rationality of fertility decisions can be meaningfully measured only for that part of a person's life after he or she has been a decisive decision maker with regard to his or his children's fertility. Research should focus on the change in locus with social change, as well as on the relationship between reproductive decision making and budgetary and other decision making within the family. Such relationships should be defined if there is to be any economic theory of fertility. However, preliminary work shows such research to be very difficult. One reason is that part of the power to make decisions lies in the fact that the power is not questioned and hence not discussed. Often it is pretended that the power does not exist, or that consensus exists when in fact only one or two family members are in a position to challenge the decision. When the fundamental decision is to maintain the status quo, such as not to control fertility, identifying the ultimate decision maker is extremely difficult until so much change has already occurred that behavior has begun to alter.

Fundamental to many of these research problems are basic considerations, usually ignored in population studies, about economic ends and the people whose interests are considered. Ultimately, economic ends are social ends in that the cost of something no one wants is irrelevant. Classical demographic transition theory seems to have assumed that all decision makers (apparently mostly couples) aim to maximize benefits to the husband, the wife, and their dependent children, while caring little for other relatives. One can easily construct a model on this basis which demonstrates the economic advantage of low fertility. However, this model collapses if a man cares more about raising the living standard of his father or adult brother than that of his wife or children, or if he cares almost exclusively about his own living standard and believes that his wife and children benefit morally by granting him a higher living standard at the expense of their own (J. Caldwell, 1977a). These are not quibbles: the situations described in these examples are nearer reality in most high-fertility countries than is the assumption of an isolated nuclear family, homogeneous in its consumption standards. Wealth flows between relatives outside the bounds of the nuclear family create a larger unit for reciprocal economic relations and guarantees. This larger unit is safer in a society where survival

depends little on government assistance, but the existence of the larger unit has implications for shared work, consumption, and reproductive decisions. Demographers have barely begun to explore these implications.

Conditions Responsible for the Onset of Fertility Decline

Several factors combine to create the balance of children's contributions and costs in pretransition societies. Similarly, a number of complex factors are responsible for shifts in that balance and hence for the onset of fertility decline.

Broadly, the shift is equivalent to a change in the direction of intergenerational wealth flows, a change that occurs over a relatively short time (J. Caldwell, 1976b). This is generated by a shift in internal family relationships, causing a new balance of work, consumption, and guarantee relations, and rendering high fertility uneconomical to the reproductive decision makers. This shift must be understood according to a complex set of economic and social factors, discussed in the subsections below.

Economic Patterns

In general, high fertility is associated with a pattern in which children provide an economic advantage to their parents. This may be in the form of providing cheap labor and investments or guarantees for the future, while maintaining relatively low levels of consumption (J. Caldwell, 1976b). When this economic advantage is reduced or lost, the pattern of high fertility will also change.

The likely effect of changing family relations was shown first in a study of changing family relations in 1962 among the Ghanaian urban elite (J. Caldwell, 1968), and the decisive loss of economic advantage with such change was demonstrated for a Nigerian city in 1973 (J. Caldwell and P. Caldwell, 1978). The latter society was near the equilibrium point: few were limiting fertility, but the practice had started. Parents who saw that their children were unlikely to provide net returns over a lifetime recognized that limiting family size was economical. This suggests that guarantees of future material returns as against future risks are of crucial importance.[5]

Another society in which the high-fertility system was in precarious balance was Australia in the two decades immediately before compulsory schooling (Ruzicka and J. Caldwell, 1977; J. Caldwell and Ruzicka, 1978). Children's productivity was not a central factor in the high fertility levels in that country; rather, because of an emphasis on the benefits of austerity for children, their consumption of goods was unusually low. This changed under attack from the new schooling system, combined with an increase in consumer goods for children. At the same time, fathers were attracted by new consumer goods that offered alternatives that might be preferred to the home services provided by children.

Control Over Fertility

The broad economic pattern described above is complicated by a number of other factors. Primary among these is women's increasing control over their own fertility. Although not as powerful a fertility determinant as the decreasing economic advantage of having children, this factor can play an important role. This is illustrated by the long, slow fall of French marital fertility prior to the last part of the nineteenth century, a seeming anomaly in the pattern of fertility decline. Noted less often, however, is the fact that French marital fertility between 1880 and 1910 declined as steeply as in other Western European countries (van de Walle, 1974, and other Princeton European Project volumes; J. Caldwell, 1981). A plausible explanation for this is that all fertility transitions are generated by two factors: the primary one of the decreasing economic advantage (or increasing disadvantage) of having children, and the secondary one of women's increased ability to determine their own fertility. These are not entirely separate forces; although in most cases they are found to operate more or less simultaneously, they can move at different speeds. This could well have been the case in France, with the lesser fall due to women's increased fertility control occurring first. The separate nature of women's fertility decisions is important because women may not reap the same economic benefits from high fertility as their husbands and may incur considerable physical and psychological costs from pregnancy, childbirth, and nursing. They may also find social and economic disadvantages to themselves as individuals in the restrictions placed on their movements or their ability to earn by pregnancy and the raising of young children.

Family planning programs may also accelerate a fertility decline. They cannot reduce pretransition fertility to levels below which it would otherwise fall, nor can they induce the onset of fertility decline earlier than it would otherwise occur, unless there is an element of duress in the system. However, they do make fertility control easier and generally lead to the kind of cooperation between husbands and wives that may well speed up the transformation of family relationships. Moreover, where children have become only a marginal advantage, family planning programs may convince parents that they are already a disadvantage.

Education

The onset of fertility decline tends to coincide with changes in the family that render children relatively more costly, less useful, or both. It has been argued that, in Western Europe, this was determined by the move toward mass education (J. Caldwell, 1980b). That move was accompanied by a number of other legislative and social changes that enhanced child dependency. However, it was mass schooling that increased the cost of children by causing them to demand higher

consumption and their parents to concede to this demand. Similarly, in Ghana, it has been shown that educated children are treated differently by parents than their uneducated siblings (J. Caldwell, 1968). Moreover, school children do less work, often claiming that, to be as successful as their parents wish, they must spend much time on their homework.

The impact of schooling is complex. The cost is often not borne wholly or even largely by the parents; however, they may coordinate the meeting of costs, especially the sibling chain whereby education assistance commits receivers to helping their siblings (J. Caldwell, 1977a). In industrialized societies, children in large families are unlikely to receive as much education as children in smaller ones; in some societies where fertility has begun to fall recently, this situation seems to be emerging.

In the pretransition setting, education does not have the same effect. Only one Third World relationship between "quantity" and "quality" of children has been observed. In tropical Africa, it is frequently felt that there is a good deal of luck involved in a child's success in school; that is, success is related much more to inherent ability or to chance relations with enthusiastic teachers than to financial investment. Since there will be several unsuccessfully educated children for every successful one, it is believed that large numbers of children are required to ensure a potential success into whom investment can be channelled. This has been described as the "lucky dip" principle (J. Caldwell, 1977a).

Education in pretransition settings does not necessarily instigate a movement towards lower fertility. Research in tropical Africa has shown that, where educated parents can ensure better educational opportunities and ultimately better jobs for their children, and where they can ensure that some of the subsequent earnings go directly to the parents and are also used in the sibling chain for educating other brothers and sisters, then the schooling of children is not economically disadvantageous to parents and fertility remains high. Educated children also have the advantage that they can exert influence in the society and can bring parents into contact with the different and exciting modern world.

Social Factors

It is argued that, in most societies, high fertility is either economically advantageous or disadvantageous. However, it is not argued that fertility is completely economically determined. In high-fertility societies, births may be spaced to maximize the chance of child survival (Page and Desthaeghe, 1981); marriages may be postponed to increase the return on a girl's education; or terminal abstinence may begin when a woman becomes a grandmother so that maternal and grandmaternal roles will not be in conflict (J. Caldwell and P. Caldwell, 1977). Even the increasing use of contraception and of family planning services need not be taken as an attempt to restrict family size because of economic disadvantage. Research in

one part of tropical Africa has shown that nearly all the demand for contraception is as a substitute for sexual abstinence before marriage, by females after birth, and by grandmothers (J. Caldwell and Ware, 1977; J. Caldwell and P. Caldwell, 1977). Elsewhere, the demand may be much more closely related to preventing marital conception at any given time, but even here the motive is not exclusively a desire to limit family size. This is evidence that all aims are ultimately social: none of these activities is undertaken primarily to limit the final size of the family. This view appears to be supported by data being accumulated by the Princeton project on pretransition indices of marital fertility.

Similarly, although parents in industrialized countries would be most economically advantaged by having no children, the great majority do not make this choice. In the past, one reason for this has been the attitude that a family could hardly be considered complete with fewer than two parents and a child (or more usually two children), although this view may be changing.

Primary among the social factors influencing fertility decline are changes in family structure. Because the balance of family relations can change the economic value of high fertility, fertility is peculiarly susceptible to changes in patterns of family relations. In the West, family relations changed over a long period (Stone, 1979), strongly affected by the introduction of mass education and other parallel institutional changes to protect children. These changes probably had some impact on spousal relations as well (J. Caldwell, 1980b). There is also evidence that such changes tend to affect child-parent relationships (J. Caldwell, 1968; V. Hull, 1975). In the Third World, relationships that reduce age and sex differentiation have been taught by missionaries, colonial administrators, and secular schoolteachers; currently, they are being taught by national school systems, the mass media, and the new national elites. For fertility decline, the rapid establishment of a global society is probably much more important than the creation of a global economy. Indeed, communist countries, at least in Eastern Europe, while rejecting the Western economy, are likely to teach with unusual efficiency family relations that were once more typical of Western Europe; as a result, fertility has often declined steeply. Similarly, most Third World social change was not required for accommodation to economic transformation, even though that change has been described by Western sociologists as "modernization" rather than Westernization.

Clearly, studies are needed of persistent high fertility in societies where family production is collapsing and where spreading educational systems and the growth of the mass media should be inducing changes in family relations.[6] One study in a society of this type, Ibadan in southwestern Nigeria, showed that the restriction of fertility was still rare even among the middle classes; however, where it did occur, it appeared to be the result of quite dramatic changes in parent-child and husband-wife relations (J. Caldwell and P. Caldwell, 1978). Where it had not occurred among the professional classes, the major cause was the persistence of a system whereby children owe parents great deference and substantial worldly goods.

There are two major regions especially marked by the persistence of high fertility: tropical Africa and the major Muslim area from Morocco through the Middle East to Pakistan and Bangladesh. In neither is there a marked movement toward egalitarian emotional relations within the nuclear family. Close, egalitarian spousal relationships exist in neither: in tropical Africa, they are not close partly because of lineage attachments; in the Muslim world, they are not egalitarian because of socioreligious ideology. In both cases, the formation of an emotionally close and egalitarian parent-child bond is inhibited because of the failure to develop such a spousal bond.

EVIDENCE FROM CROSS-CULTURAL SURVEYS

As indicated in the introduction to this paper, data on the contributions and costs of children, and corresponding effects on fertility transition, are generally lacking. The World Fertility Survey is yielding detailed fertility data for a range of Third World societies, some with stable high fertility and more with declining fertility, as well as retrospective individual fertility histories dating back in a number of societies to the onset of fertility transition. However, most surveys contain nothing on the contributions and cost of children--astonishingly, not even whether children go to school or not--and very few other socioeconomic or cultural data. Some surveys may, however, be able to pinpoint the timing of fertility decline and therefore may stimulate efforts to demonstrate parallel changes in the society.

A more hopeful source of evidence is the East-West Population Institute's Value of Children (VOC) Project (Fawcett, 1972; Arnold et al., 1975; Bulatao, 1975, 1981; Bulatao and Arnold, 1977; Hoffman, 1972; Hoffman and Hoffman, 1973). This work represents a substantial contribution to the study of the costs and benefits of children.[7] A comparative report has been prepared on the nature of the transition in the value of children (Bulatao, 1979). This report measures perceived changes in the value of children, or, at least, stated perceptions of those changes. The findings indicate that fertility decline (in a predominantly Southeast and East Asian selection of countries) is associated with declining economic roles for children and the emergence of the conjugal family. Little support is given for theories of fertility transition based on the weakening of cultural props or the impact of perceived child mortality decline, which are not the focus of the present discussion; in addition, somewhat surprisingly and perhaps even anomalously, no perceived rise in child costs was reported.

Some survey reports assume that the value of children can be measured by stated desired family size or even by achieved fertility. It seems likely that, before the onset of fertility decline, achieved fertility largely measures the impact of the social constraints discussed above, while stated fertility desires are more a measure of education and a corresponding understanding of the researcher's world

view. During the fertility decline, "ideal family size" responses may reflect little more than the current fertility levels of the society or its subsections. Certainly, fertility trends in Australia appear to have changed direction at least as early as stated ideal fertility trends, although this does not necessarily invalidate the "ideal" measure as one of changing fertility desires (Lee, 1981).

Some of the literature also assumes, perhaps too glibly, that desired fertility is really not the desired number of children, but the desired number of sons. This is certainly untrue not only in the industrialized world but also in tropical Africa; elsewhere, however, the situation is more complex. In parts of Indian and Chinese culture, individual families have traditionally placed less value on daughters because they marry and lose their close connection with the family; before marriage, however, they often work harder than their brothers, and, in the community as a whole, younger women work longer hours than anyone, albeit as daughters-in-law rather than as daughters. Recently, moreover, daughters have had increasing value in linking families to desired sons-in-law often working outside agriculture. Where families are not clearly patrilineal and patriarchal, as for instance in much of Southeast Asia, the family may become much more centered on its women. This may be a partial explanation for the current fertility declines in substantial parts of the region, in that women can make their feelings known not only about their health, but also about their desire to work for wages.

Much of the research needed is very difficult, and some may prove to be impossible. Convincing data are needed to identify conclusively (if they exist) high-fertility countries where fertility would be uneconomical to the reproductive decision makers, or low-fertility countries (except where the cause is pathological) where high fertility would be economically rewarding. Until such flows are adequately measured, we could adopt a worse approach than to define high-fertility societies as those where high fertility is still economically rewarding.

The ultimate problem in attaining such measurements is to find suitable units embracing the value of money now and in the future, subsistence labor now, care in old age at a definite period in the future, help in sickness or other crises at an unpredictable time, a continuing guarantee of safety and of power, a few services now, and so on. Although it is worthwhile to note and assess these benefits, it is doubtful if they can all be quantified in commensurate units. What value, after all, can be put on a guarantee that one's life will be preserved when one is in mortal peril? For this reason, there may be no completely satisfactory measure, and one may have to be satisfied with the conclusion that, when fertility begins to decline, reproductive decision makers believe high fertility to have become uneconomical, with some research attempt made to establish an objective foundation for these beliefs.

In general, it is clear that further research is needed to yield empirical data supporting analysis of the fertility decline. The focus of this research should be on hard data related to the contributions and costs of children.

CONCLUSIONS

It has been argued here that economic ends cannot be divorced from social ends, and hence that the same economic calculus cannot be used for all societies. It has also been argued that our interest should be focused on conditions of stable high fertility and on the onset of fertility decline. The value of children earlier in the transition is quite different from their subsequent value. Thus research on the contributions and costs of children in industrial societies is of little value in producing theory to explain the onset of fertility transition or the nature of pretransition society, even though such research is more common because of where most researchers live. Admittedly, research of this type may help explain the options open to a couple in an industrialized society in determining the extent to which the wife may work outside the home. However, it may give a totally incorrect impression about the situation in a developing country, where a rural-urban migrant family having attained middle-class status is likely to have substituted housework for female farmwork, and maternal child care for sibling child care.

The present paper has indicated that work on the consumption and contributions of children in stable high-fertility societies and in those societies at the beginning of fertility transition has barely begun. What has been undertaken tends to suggest that children may well pay their keep before adulthood and may be the best form of investment for the future. In these societies, and indeed in industrial societies, the quantity-quality choice in childbearing is largely a figment of the theorist's imagination, except possibly in a small section of the urban upper middle class. Work in Australia suggests that the choice between full-time salaried work and childbearing may be a real one for a proportion of younger parents (J. Caldwell et al., 1976). In high-fertility countries, little significant difference has been found between work in the family house and work on the family farm, or between subsistence and wage labor, partly because of the substitutability of different types of work. Certainly, over the long run, there is an enormous difference between a largely familial economy, with a cultural superstructure justifying and organizing it, and a fully developed labor market economy: the former will inevitably be characterized by high fertility because anything else is disadvantageous, and the latter by low fertility for the same reason.

The economic benefits of children are their labor and their present and future guarantees of physical and economic security. Their costs are consumption costs, although more hands may grow more food, at least from about 5 years of age, and costs may be indistinguishable from investment in future human resources. Even for children under 5 years of age, much of the time cost may be borne by mothers and siblings, with little pressure on such decision makers as fathers, grandfathers, grandmothers, and uncles. More sophisticated attempts must be made to measure all forms of wealth flows, even guarantees, partly by measuring how often guarantees have to be called in, and by assessing the cost in a crisis if no guarantee can be

called in.

In high-fertility societies, some work has been done on variations in costs and benefits among social groups and between urban and rural areas; however, these differences are not great enough to make low fertility advantageous where relationships within the family have not been revolutionized. Although such revolutionary change may be assisted by public policies (compulsory education, child labor laws) which increase child dependency, these are unlikely to have much impact unless there are broader social pressures to change family relationships. Mass schooling may provide both kinds of pressure.

When the balance of costs and benefits makes unlimited fertility advantageous, fertility will be little restricted; when their net effect is to make fertility disadvantageous, it is likely to be restricted. In societies where high fertility strengthens the kin group by providing greater physical security and a more effective economic unit, there is no distinction between social and economic benefits.

PROPOSITIONS

The propositions below relate to family conditions in pretransition societies, reproductive decision making, and factors affecting the onset of fertility decline. References after each proposition that support it with limited data or theoretical arguments are labelled "A"; those that provide significant empirical evidence are labelled "B."

Family Conditions in Pretransition Societies

1. In many pretransition societies, the members of large families are at least as well-off as the members of small families, and their chances for upward socioeconomic mobility are at least as great (A: J. Caldwell, 1976a; Imoagene, 1976).

2. Pretransition societies are less egalitarian within the family than posttransition societies with regard to the sharing of food (especially animal protein and other prized food), care and decision making, and decisions controlling individual activities (A: J. Caldwell, 1978, 1979a, 1980a; B: J. Caldwell et al., 1980, 1982). These inequalities are supported by most aspects of the culture: adage and proverb, stories, religion (A: J. Caldwell, 1980a; B: J. Caldwell and P. Caldwell, in preparation).

3. In most pretransition societies, family numbers are important for security, for furthering the family's interests, or both (A: J. Caldwell, 1981; B: Cain, 1978, 1980, 1981; J. Caldwell, 1976a). For most of the population in pretransition societies, the best investment is in extra children (A: J. Caldwell, 1981; B: J. Caldwell, 1966a). This investment can be made in conditions where saving for other forms of investment is impossible (A: J. Caldwell, 1981).

3.1. Children's work in pretransition societies is a significant

contribution to the volume of work done by the whole family (A: J. Caldwell, 1976b; B: Birdsall, 1980b; Boulier, 1977; Cain, 1977, 1980; J. Caldwell et al., 1980; Changing African Family, 1974; DaVanzo and Lee, 1978; Din, 1977a, 1977b; Evenson and King-Quizon, 1978; Ho, 1979; T. Hull, 1975, 1981; Kayongo-Male, 1980; Khuda, 1978, 1980a, 1980b; Monsted, 1977; Mueller, 1976; Nag et al., 1977; Nag et al., 1978; Popkin, 1978; Rosenzweig, 1978; White, 1975).

3.2. In such societies, a major contribution of children's work is that it is of a type not usually preferred by adults (A: J. Caldwell, 1976a; B: J. Caldwell et al., 1980).

3.3. In such societies, the distinction between "productive" and "household" work is misleading (and emphasis on it is evidence of continuing age-sex distinctions about the value of work) (A: J. Caldwell, 1981; B: J. Caldwell et al., 1980). Moreover, the measurement of wealth flows is difficult because of age and sex distinctions in the minds of researchers and field workers who place a value on inputs (B: J. Caldwell et al., 1980).

Reproductive Decision Making

4. The economic value of children can be understood only in the context of their value to reproductive decision makers (A: J. Caldwell, 1981).

5. In pretransition societies, reproductive decision making is neither the monopoly of the biological parents nor is it equally shared between them (A: J. Caldwell, 1981; B: J. Caldwell and Reddy, in preparation).

6. In all pretransition societies, the well-being of reproductive decision makers during the balance of their lives after decision making is at least as great in high-fertility as in low-fertility families (A: J. Caldwell, 1976a; B: J. Caldwell, 1966a).

Factors Affecting the Onset of Fertility Decline

7. In pretransition societies, the net value of intergenerational wealth flows (labor and services, goods and money, present and future guarantees, including old age support) is upward, whereas in posttransition societies it is downward (A: J. Caldwell, 1976b, 1978).

8. The reversal in the direction of the net intergenerational wealth flows occurs over a relatively short period, and the flow cannot subsequently change once again to an upward direction (A: J. Caldwell, 1976b; B: Knodel and van de Walle, 1979).

9. In pretransition societies, the economic value of children is not the only determinant of fertility control; societies also have a range of other social priorities (A: J. Caldwell, 1976b; B: J. Caldwell and Ware, 1977; J. Caldwell and P. Caldwell, 1976, 1977).

10. Fertility decline is preceded by subtle changes in family relations in the direction of greater equality (A: J. Caldwell, 1976b, 1978; B: J. Caldwell et al., 1980, 1982).

10.1. Greater intergenerational equality lowers the net economic value of children (contributions minus costs) to parents (A: J. Caldwell, 1976b; B: J. Caldwell and P. Caldwell, 1978).

10.2. Greater equality between spouses (i) lowers the net economic value of wives to husbands, and (ii) makes it more likely that some fertility restriction will be practiced because the wives' interest in their own health and reduction in discomfort, as well as their mobility and personal earnings, can play a role in decision making (A: J. Caldwell, 1981; Ruzicka and J. Caldwell, 1977; B: J. Caldwell and Reddy, in preparation).

10.3. There is a relationship between changing spousal relations and changing intergenerational relations (A: J. Caldwell, 1981; Ruzicka and J. Caldwell, 1977).

10.4. In circumstances where the upward flow of net intergenerational wealth is already weak, an improvement in the position of women (particularly wives) or a preexisting high standing of women may result in some fertility decline because of the wives' desire to reduce the physical burden of repeated childbirth or their desire for individual earnings (A: J. Caldwell, 1981).

10.5. In the West, such changes in the family were decisively accelerated by the move towards mass schooling and accompanying legislative and social change increasing child dependence (A: J. Caldwell, 1980b; B: J. Caldwell, 1980b).

10.6. In the Third World, such changes have also occurred, but more important has been the direct pressure towards new family relations exerted by the West through missionaries, administrators, education systems, the new elites, and the media. For demographers, the move towards a global society has been more important than that towards a global economy (A: J. Caldwell, 1976b, 1980c; B: J. Caldwell, 1968).

11. The demand for contraception should not be equated with a demand for limiting family size; not all contraceptive innovators are demographic innovators (B: J. Caldwell and P. Caldwell, 1976; J. Caldwell and Ware, 1977).

11.1. The chief role of family planning programs is to accelerate fertility decline following the destabilization of hitherto stable high-fertility societies (A: J. Caldwell, 1981; J. Caldwell et al., in preparation).

11.2. Such programs will encounter little success in most Muslim countries until a greater degree of equality exists between spouses, or in sub-Saharan Africa until stronger spousal links come into existence (A: J. Caldwell, 1981; P. Caldwell, 1977).

11.3. In pretransition societies, sanctions against fertility control must be considered a type of fertility decision (A: J. Caldwell, 1978).

NOTES

1. Reasons for this will be suggested below. Some of the disadvantages of such small families can be and widely are at

least partially offset by the coresidence of extended families or larger units. This is evidence however, that large agglomerations are an advantage, and such a strategy is likely therefore to accompany high fertility. High fertility, in addition, will be preferred to agglomerations of smaller families because the patriarch's power (and share of resources) is less threatened by his wives and descendants than by other male kin or nonrelatives.

2. It should be noted that above, and during the balance of this paper, the term "pretransition" is employed to mean prior to fertility decline. It is, however, arguable that the true pretransition society is that prior to either fertility or mortality decline and that this society should be studied separately from one in which mortality decline has begun. The problem here is that no true societies of this type any longer exist.
3. Although there are dangers in continuous observation, such as the observation's inducing changes in work patterns, these dangers do not appear to be as great as those involved in even 24-hour retrospective reports, which are subject to differences in age and sex emphases on work; the major drawback in continuous reporting is the cost in labor and money.
4. There is evidence of greater sibling deprivation (as measured by weight, height, nourishment, schooling, and IQ) for children from large families in posttransition societies. Similar results are shown for Colombia, although this study is based upon 1967-68 data for the four major cities at a time when sustained fertility decline in these centers was already underway (Birdsall, 1980a). However, this type of research has a basic problem: it demonstrates that (in certain circumstances) siblings are a cost to each other rather than to their parents. If the latter profit by high fertility, the result may well be child deprivation.
5. This pattern appears to be contradicted by the delay of fertility decline in many countries, such as Britain in the 1870s, in which the majority of the population was urbanized, only 15 percent of the workforce was in agriculture, and familial production had virtually disappeared. This can be explained, however, by the failure to account for unpaid labor in analyses of such situations. If all activity and all time inputs are measured, rather than just wages paid, it can be seen that most of this activity throughout the nineteenth and into the twentieth century consisted of the household production of goods and services. This was subsistence production, carried out largely by wives and children. In this system, the "breadwinner" worked outside the home doing paid and more honored work, while reaping the benefits of fertility in the form of cheap and efficient home production. In due course, the market was to compete ever more successfully in producing household goods and services, and ultimately in tempting wives, too, to become breadwinners--with consequences for fertility that have yet to be fully worked out.

6. High fertility can persist in societies with a considerable part of the workforce in nontraditional occupations. In Africa, this has roused considerable interest and has given rise to the theory of dual dependence, which argues that the existence of traditional family relations has allowed employers in urban, plantation, or mining areas to pay even married men with children a wage suited to the needs of only a single person (Meillassoux, 1972; see also Boeke, 1953). Far from resulting in low rates of marriage and fertility, this has meant that the migrant must leave his dependents within the larger rural family, where the wife and children may undertake farming, and where high fertility remains rewarding.
7. There has also been a considerable amount of research of this nature in Indonesia, some of it related to the VOC project (T. Hull, 1975; Saefullah, 1979; Meyer, 1981; Singarimbun et al., 1977).

BIBLIOGRAPHY

Aries, P. (1973) Centuries of Childhood. London: Jonathan Cape.

Arnold, F. S., R. A. Bulatao, C. Buripakdi, B. J. Chung, J. T. Fawcett, T. Iritani, S. J. Lee, and T. S. Wu (1975) The Value of Children: A Cross-National Study, Vol. 1. Honolulu: East-West Population Institute.

Birdsall, N. (1980a) A cost of siblings: Childschooling in urban Colombia. Pp. 115-150 in J. L. Simon and J. DaVanzo, eds., Research in Population Economics, Vol. 2. Greenwich, Conn.: JAI Press.

Birdsall, N. (1980b) Measuring time use and nonmarket exchange. Pp. 157-174 in W. P. McGreevey, ed., Third-World Poverty: New Strategies for Measuring Development Progress, The Battelle Human Affairs Research Centers Series. Lexington, Mass.: Lexington Books, D. C. Heath.

Boeke, J. H. (1953) Economics and Economic Policy of Dual Societies. New York: Institute of Pacific Relations.

Boulier, B. L. (1977) Children and household economic activity in Laguna, Philippines. Journal of Philippine Development 4:195-222.

Bulatao, R. A. (1975) The Value of Children: Philippines, Vol. 2. Honolulu: East-West Population Institute.

Bulatao, R. A. (1979) On the Nature of the Transition in the Value of Children. Paper No. 60-A. Honolulu: East-West Population Institute.

Bulatao, R. A. (1981) Values and disvalues of children in successive childbearing decisions. Demography 18:1-26.

Bulatao, R. A., and F. S. Arnold (1977) Relationships between the value and cost of children and fertility: Cross-cultural evidence. Pp. 141-156 in Proceedings, International Population Conference, Mexico 1977, Vol. 1. Liege: International Union for the Scientific Study of Population.

Cain, M. T. (1977) The economic activities of children in a village in Bangladesh. Population and Development Review 3:201-227.

Cain, M. T. (1978) The household life cycle and economic mobility in rural Bangladesh. Population and Development Review 4:421-438.

Cain, M. T. (1980) Risk, fertility, and family planning in a Bangladesh village. Studies in Family Planning 11:210-222.

Cain, M. T. (1981) Risk and insurance: Perspectives on fertility and agrarian change in India and Bangladesh. Population and Development Review 7:435-474.

Caldwell, J. C. (1965) Extended family obligations and education: A study of an aspect of demographic transition amongst Ghanian university students. Population Studies 19:183-199.

Caldwell, J. C. (1966a) The erosion of the family: A study of the fate of the family in Ghana. Population Studies 20:5-26.

Caldwell, J. C. (1966b) Africa. Pp. 163-181 in B. Berelson et al., eds., Family Planning and Population Programs: A Review of World Developments. Chicago: University of Chicago Press.

Caldwell, J. C. (1967) Fertility attitudes in three economically contrasting rural regions of Ghana. Economic Development and Cultural Change 15:217-238.

Caldwell, J. C. (1968) Population Growth and Family Change in Africa: The New Urban Elite in Ghana. Canberra: Australian National University Press.

Caldwell, J. C. (1969) The demographic implications of the extension of education in a developing country: Ghana. Pp. 137-159 in N. O. Addo et al., eds., Population and Socio-Economic Development in Ghana. Legon: University of Ghana.

Caldwell, J. C. (1974) The Study of Fertility and Fertility Change in Tropical Africa. WFS Occasional Papers, No. 7. The Hague and London: International Statistical Institute and World Fertility Survey.

Caldwell, J. C. (1976a) Fertility and the household economy in Nigeria. Journal of Comparative Family Studies 7:193-253.

Caldwell, J. C. (1976b) Toward a restatement of demographic transition theory. Population and Development Review 2:321-366.

Caldwell, J. C. (1976c) The Socio-Economic Explanation of High Fertility. Papers on the Yoruba Society of Nigeria. Changing African Family Monograph, Series No. 1. Canberra: Department of Demography, The Australian National University.

Caldwell, J. C. (1977a) The economic rationality of high fertility: An investigation illustrated with Nigerian survey data. Population Studies 31:5-27.

Caldwell, J. C., ed. (1977b) The Persistence of High Fertility: Population Prospects in the Third World. No. 1, Changing African Family Series: Family and Fertility Change. Canberra: Department of Demography, The Australian National University.

Caldwell, J. C. (1978) A theory of fertility: From high plateau to destabilization. Population and Development Review 4:553-577.

Caldwell, J. C. (1979a) Education as a factor in mortality decline: An examination of Nigerian data. Population Studies 33:395-413.

Caldwell, J. C. (1979b) Marriage, the family and fertility in sub-Saharan Africa with special reference to research programmes in Ghana and Nigeria. Pp. 359-372 in S. A. Huzayyin and G. T. Acsardi, eds., Family and Marriage in Some African and Asiatic Countries. Research Monograph No. 6. Cairo: Cairo Demographic Centre.

Caldwell, J. C. (1980a) The transition from familial to labor market production and the social implications. Pp. 50-67 in Fifth World Congress for Rural Sociology, Mexico, 1980. Mexico City: The International Rural Sociology Association.

Caldwell, J. C. (1980b) Mass education as a determinant of the timing of fertility decline. Population and Development Review 6:225-255.

Caldwell, J. C. (1980c) The Failure of Theories of Social and Economic Change to Explain Demographic Change: Puzzles of Modernization or Westernization. Working Paper No. 11. Department of Demography, Australian National University, Canberra.

Caldwell, J. C. (1980d) Variations in the incidence of sexual abstinence and the duration of postnatal abstinence among the Yoruba of Nigeria. Pp. 397-407 in H. Leridon and J. Menken, eds., Natural Fertility. Liege: Ordina Editions.

Caldwell, J. C. (1981) The mechanisms of demographic change in historical perspective. Population Studies 35:5-27.

Caldwell, J. C. (1982a) Theory of Fertility Decline. London: Academic Press.

Caldwell, J. C. (1982b) An explanation of the continued fertility decline in the west: Stages, succession and crisis. Pp. 233-266 in J. Caldwell, Theory of Fertility Decline. London: Academic Press.

Caldwell, J. C. (1982c) The wealth flows theory of fertility decline. Pp. 333-351 in J. Caldwell, Theory of Fertility Decline. London: Academic Press.

Caldwell, J. C., and P. Caldwell (1976) Demographic and contraceptive innovators. Journal of Biosocial Science 8:347-365.

Caldwell, J. C., and P. Caldwell (1977) The role of marital sexual abstinence in determining fertility: A study of the Yoruba in Nigeria. Population Studies 31:193-217.

Caldwell, J. C., and P. Caldwell (1978) The achieved small family: Early fertility transition in an African city. Studies in Family Planning 9:2-18.

Caldwell, J. C., and P. Caldwell (1981) Cause and sequence in the reduction of post-natal abstinence in Ibadan City, Nigeria. Pp. 181-199 in H. J. Page and R. Lesthaeghe, eds., Child-Spacing in Africa: Traditions and Change. London: Academic Press.

Caldwell, J. C., and P. Caldwell (in preparation) Measurement of Rural Conversation in South India.

Caldwell, J. C., and A. Igun (1970) The spread of anti-natal knowledge and practice in Nigeria. Population Studies 24:21-34.

Caldwell, J. C., and P. H. Reddy (in preparation) South India Fertility Study.

Caldwell, J. C., and L. T. Ruzicka (1978) The Australian fertility transition: An analysis. Population and Development Review 4:81-103.

Caldwell, J. C., and H. Ware (1977) The evolution of family planning in an African city: Ibadan, Nigeria. Population Studies 31:487-507.

Caldwell, J. C., D. Campbell, P. Caldwell, L. Ruzicka, W. Cosford, R. Packer, J. Grocott, and M. Neill (1976) Towards an Understanding of Contemporary Demographic Change: A Report on Semi-Structured Interviews. Australian Family Formation Project, Monograph No. 4. Canberra: Department of Demography, Australian National University.

Caldwell, J. C., A. K. M. Jalaluddin, P. Caldwell, and W. Cosford (1980) The Control of Activity in Bangladesh. Working Paper No. 12. Department of Demography, Australian National University, Canberra. Presented at the IUSSP Seminar on Interrelationships between Demographic Factors and Income Distribution: Individuals and Families and Income Distribution.

Caldwell, J. C., A. K. M. Jalaluddin, P. Caldwell, and W. Cosford (1982, in preparation) Work-in-Progress. Bangladesh consumption data for families whose labor inputs are described in the above paper.

Caldwell, J. C., P. H. Reddy, and P. Caldwell (in preparation) The Origin of Fertility Decline in South India.

Caldwell, P. (1977) Egypt and the Arab and Islamic worlds. Pp. 593-616 in J. Caldwell, ed., The Persistence of High Fertility: Population Prospects in the Third World. Canberra: Department of Demography, Australian National University.

Caldwell, P., and J. C. Caldwell (1981) The function of child-spacing in traditional societies, and the direction of change. Pp. 73-92 in H. J. Page and R. Lesthaeghe, eds., Child-Spacing in Africa: Traditions and Change. London: Academic Press.

Changing African Family (1974) Nigerian Segment, Project 2. The Value of Children. Work Performed by Children in the Western and Lagos States of Nigeria. Canberra: Department of Demography, Australian National University.

Changing African Family (1975) The Nigerian Family, Project 1. Intra-Family Flow [of] Money and Assistance. Canberra: Department of Demography, The Australian National University.

Chen, K. C., E. Huq, and S. D'Sousa (1981) Sex bias in the family allocation of food and health care in rural Bangladesh. Population and Development Review 7:55-70.

Cleave, J. (1974) African Farmers: Labor Use in the Development of Smallholder Agriculture. New York: Praeger.

DaVanzo, J., and D. L. P. Lee (1978) The Compatibility of Child Care with Labor Force Participation: Preliminary Evidence from Malaysian Time Budget Data. Santa Monica, Calif.: Rand Corporation.

deMause, L., ed. (1974) The History of Childhood: The Evolution of Parent-Child Relationships as a Factor in History. London: Condor Book, Psycho-History Press.

Din, M. el A. G. el (1977a) The economic value of children in rural Sudan. Pp. 617-632 in J. Caldwell, ed., The Persistence of High Fertility: Population Prospects in the Third World. Canberra: Department of Demography, Australian National University.

Din, M. el A. G. el (1977b) The rationality of high fertility in urban Sudan. Pp. 633-649 in J. Caldwell, ed., The Persistence of High Fertility: Population Prospects in the Third World. Canberra: Department of Demography, Australian National University.

Evenson, R. E., and E. King-Quizon (1978) Time Allocation and Home Production in Philippine Rural Households. Washington, D.C.: International Center for Research on Women.

Fawcett, J. T., ed. (1972) The Satisfactions and Costs of Children: Theories, Concepts, and Methods. Honolulu: East-West Population Institute.

Fawcett, J. T., ed. (1973) Psychological Perspectives on Population. New York: Basic Books.

Haswell, M. R. (1953) Economics of Agriculture in a Savannah Village. Colonial Research Studies No. 8. London: H.M.S.O. for the Colonial Office.

Heer, D. M., and D. O. Smith (1967) Mortality level and desired family size. Pp. 26-36 in Sydney Conference 21 to 25 August 1967: Contributed Papers. Canberra: International Union for the Scientific Study of Population.

Ho, T. (1979) Measuring time costs of rearing children in the Philippines. Population and Development Review 5:643-662.

Hoffman, L. W. (1972) A psychological perspective on the value of children to parents: Concepts and measures. Pp. 27-56 in J. T. Fawcett, ed., The Satisfactions and Costs of Children: Theories, Concepts, and Methods. Honolulu: East-West Population Institute.

Hoffman, L. W., and M. L. Hoffman (1973) The value of children to parents. Pp. 19-76 in J. T. Fawcett, ed., Psychological Perspectives on Population. New York: Basic Books.

Hull, T. (1975) Each Child Brings its Own Fortune: An Inquiry into the Economics of Fertility in a Javanese Village. Unpublished Ph.D. dissertation. Department of Demography, Australian National University, Canberra.

Hull, T. (1981) Perspectives and data requirements for the study of children's work. Pp. 47-79 in G. Rodgers and G. Standing, eds., Child Work, Poverty and Underdevelopment. Geneva: International Labour Office.

Hull, T., and V. Hull (1977) The relation of economic class and fertility: An analysis of some Indonesian data. Population Studies 31:43-57.

Hull, V. (1975) Fertility, Socioeconomic Status and the Position of Women in a Javanese Village. Unpublished Ph.D. dissertation. Department of Demography, Australian National University, Canberra.

Hull, V. (1976) The Positive Relation Between Economic Class and Family Size in Java. Monograph Series No. 2. Yogyakarta: Population Institute, Gadjah Mada University.

Imoagene, O. (1976) Social Mobility in Emergent Society: A Study of the New Elite in Western Nigeria. Changing African Family Monograph No. 2. Canberra: Department of Demography, Australian National University.

Jalaluddin, A. K. M. (in preparation) The Value of Children in Bangladesh. Unpublished Ph.D. dissertation, Department of Demography, Australian National University, Canberra.

Johnson, A. (1975) Time allocation in a Machiguenga community. Ethnology 14:301-310.

Kabwegyere, T., and J. Mbula (1979) A Case of the Akamba of Eastern Kenya. Changing African Family Monograph Series No. 5. Canberra: Department of Demography, Australian National University.

Kayongo-Male, D. (1980) Determinants of Amount and Quality of Children's Family Labour (Rural Kenya). Paper K-9, Fifth World Congress for Rural Sociology, Mexico City.

Khuda, B.-e- (1978) Labour Utilization in a Village Economy in Bangladesh. Unpublished Ph.D. dissertation. Department of Demography, Australian National University, Canberra.

Khuda, B.-e- (1980a) Unemployment and Underemployment in Rural Bangladesh: Levels and Differentials. Development Research and Action Programme Publication, No. 100. Bergen: The Chr. Michelsen Institute.

Khuda, B.-e- (1980b) Time Allocation Among People in Rural Bangladesh. Development Research and Action Programme Publication, No. 101. Bergen: The Chr. Michelsen Institute.

Knodel, J., and E. van de Walle (1979) Lessons from the past: Policy implications of historical fertility studies. Population and Development Review 5:217-245.

Lee, R. D. (1981) A model for forecasting fertility from birth expectations data. Pp. 75-99 in G. E. Hendershot and P. J. Placek, eds., Predicting Fertility: Demographic Studies of Birth Expectations. Lexington, Mass.: Lexington Books, D.C. Heath and Co.

Lucas, D., and A. Ukaegbu (1977) Other limits of acceptable family size in Southern Nigeria. Population Studies 31:73-81.

Mahmud, S., and J. P. McIntosh (1980) Returns to scale to family size: Who gains from high fertility? Population Studies 34:500-506.

Meillassoux, C. (1972) From reproduction to production: A marxist approach to economic anthropology. Journal of Economy and Society 1(1).

Meyer, P. (1981) The Value of Children in Java. Unpublished Ph.D. dissertation. Department of Demography, Australian National University, Canberra.

Monsted, M. (1977) The changing division of labour within rural families in Kenya. Pp. 259-314 in J. Caldwell, ed., The Persistence of High Fertility: Population Prospects in the Third World. Canberra: Department of Demography, Australian National University.

Mueller, E. (1976) The economic value of children in peasant agriculture. Pp. 98-153 in R. Ridker, ed., Population Development: A Search for Selective Interventions. Baltimore, Md.: The Johns Hopkins University Press.

Mueller, E. (1979) Household Structure, Time Use, and Income Distribution. Paper prepared for the annual meeting of the Population Association of America, Philadelphia.

Nag, M., R. C. Peet, and B. White (1977) Economic value of children in two peasant societies. Pp. 123-140 in International Population Conference, Mexico, Vol. 1. Liege: International Union for the Scientific Study of Population.

Nag, M., B. White, and R. C. Peet (1978) An anthropological approach to the study of the economic value of children in Java and Nepal. Current Anthropology 419:293-306.

Notestein, F. W. (1945) Population: The long view. In T. W. Schultz, ed., Food for the World. Chicago: University of Chicago Press.

Ohadike, P. O. (1968) Marriage, family and family growth in Lagos. Pp. 379-392 in J. C. Caldwell and C. Okonjo, eds., The Population of Tropical Africa. London: Longmans Green.

Okediji, F. O., J. Caldwell, P. Caldwell, and H. Ware (1976) The changing African family project: A report with special reference to the Nigerian segment. Studies in Family Planning 7:126-136.

Okore, A. O. (1978) The Value of Children among Ibo Households in Nigeria: A Study of Urban Umuahia and Arochukwu Divisions in Imo State. Unpublished Ph.D. dissertation. Department of Demography, Australian National University, Canberra.

Oppong, C. (1973) Growing up in Dagbon. Tema, Accra: Ghana Publishing Corporation.

Oppong, C., G. Adaba, M. Bekombo-Priso, and J. Mogey, eds. (1978) Marriage, Fertility and Parenthood in West Africa. Changing African Family Monograph Series No. 4. Canberra: Department of Demography, Australian National University.

Orubuloye, T. (1981) Abstinence as a Method of Birth Control: Fertility and Child-Spacing Practices Among Rural Yoruba Women of Nigeria. Changing African Family Mongraph Series No. 8. Canberra: Department of Demography, Australian National University.

Page, H. J., and R. Lesthaeghe, eds. (1981) Child-Spacing in Africa: Traditions and Change. London: Academic Press.

Popkin, B. M. (1978) Women, Work and Child Welfare. Washington, D.C.: International Center for Research on Women.

Richards, A. I. (1939) Land, Labour and Diet in Northern Rhodesia: An Economic Study of the Bemba Tribe. London: Oxford University Press.

Rosenzweig, M. R. (1978) The value of children's time, family size and non-household activities in a developing country: Evidence from household data. Pp. 331-347 in J. L. Simon, ed., Research in Population Economics, Vol. 1. Greenwich, Conn.: JAI Press.

Ruzicka, L. T., ed. (1977) The Economic and Social Supports for High Fertility: Proceedings of the Conference held in Canberra 16-18 November 1976. Changing African Family Series: Family and Fertility Change, No. 2. Canberra: Department of Demography, Australian National University.

Ruzicka, L. T., and J. C. Caldwell (1977) The End of Demographic Transition in Australia. Australian Family Formation Project Monograph No. 5. Canberra: Department of Demography, Australian National University.

Ryder, N. B. (1973) Recent trends and group differences in fertility. Pp. 57-68 in C. F. Westoff et al., Toward the End of Growth: Population in America. Englewood Cliffs, N.J.: Prentice-Hall.

Saefullah, A. D. (1979) The Value of Children among Tea Estate Workers' Families. Unpublished M.A. thesis. Department of Demography, Australian National University, Canberra.

Sanda, A. O. (1976) Ethnic Relations in Nigeria. Changing African Family Mongraph Series No. 3. Ibadan: Department of Sociology, University of Ibadan.

Sembajwe, I. (1981) Fertility and Infant Mortality Amongst the Yoruba in Western Nigeria. Changing African Family Mongraph Series No. 6. Canberra: Department of Demography, Australian National University.

Singarimbun, M., R. K. Darroch, and P. Meyer (1977) The Value of Children: A Study in Java. Report Series No. 13. Yogyakarta: Population Institute, Gadjah Mada University.

Stone, L. (1979) The Family, Sex and Marriage in England 1500-1800. London: Weidenfeld and Nicolson.

Sunarto, H. S. (1978) The economic livelihood of the aged in [the special region of] Yogyakarta. Translated by Julie Larsen from Cakrawala 10:20-32.

Trivandrum Centre for Development Studies (1973-74) Diet Survey. Trivandrum, Kerala.

van de Walle, E. (1974) The Female Population of France in the Nineteenth Century. Princeton, N.J.: Princeton University Press.

Ware, H. (1974a) Ideal Family Size. WFS Occasional Papers, No. 13. The Hague and London: International Statistical Institute and World Fertility Survey.

Ware, H. (1974b) The Changing African Family: West Africa, Essay and Bibliography. Canberra: Department of Demography, Australian National University.

Ware, H. (1974c) Educational differentials in family building aspirations and practice in rural Nigeria. Rural Demography 1:129-171.

Ware, H. (1975a) The Relevance of Changes in Women's Roles to Fertility Behaviour: The African Evidence. Paper presented at the annual meeting of the Population Association of America, Seattle.

Ware, H. (1975b) The limits of acceptable family size in Western Nigeria. Journal of Biosocial Science 7:273-296.

Ware, H. (1976) The motivations for the use of birth control: Evidence from West Africa. Demography 13:479-493.

Ware, H., ed. (1981) Women, Education and Modernization of the Family in West Africa. Changing African Family Monograph Series No. 7. Canberra: Department of Demography, Australian National University.

Westoff, C. F. (1972) The modernization of contraceptive practice. Family Planning Perspectives 4:9-12.

Westoff, C. F. (1973) Changes in contraceptive practices among married couples. Pp. 19-32 in C. F. Westoff et al., Toward the End of Growth: Population in America. Englewood Cliffs, N.J.: Prentice-Hall.

Westoff, C. F., J. F. Kantner, R. Parke, R. G. Ridker, N. B. Ryder, M. Zelnik, et al. (1973) Toward the End of Growth: Population in America. Englewood Cliffs, N.J.: Prentice-Hall.

White, B. (1975) The economic importance of children in a Javanese village. Pp. 127-146 in M. Nag, ed., Population and Social Organization. The Hague: Mouton.

Willis, R. (1981) The Direction of Intergenerational Transfers and Demographic Transition: The Caldwell Hypothesis Reexamined. Paper prepared for the IUSSP Seminar on Individuals and Families and Income Distribution, Honolulu.

Chapter 15

THE CHANGING ECONOMIC COSTS AND BENEFITS OF HAVING CHILDREN

Peter H. Lindert

THE MODERNIZATION OF CHILDREN AND THE FERTILITY TRANSITION

It is generally accepted that the economic costs and benefits of children affect fertility patterns in developed countries today (e.g., United Nations, 1973; Easterlin, 1978). However, there is less agreement on whether this is a constant influence throughout modern history, present in the least developed countries today, or whether awareness of the economics of having children only arises, or becomes relevant, somewhere in the middle of the development process. The present paper focuses on recent evidence related to this issue.

There are basically three schools of thought on the relationship between the role of child economics in fertility and the process of modernization.[1] The first posits a threshold of economic consciousness (or "economic rationality") before which attitudinal inertia prevents any conscious individual control of family size;[2] that is, couples only regulate their fertility in conformance with traditional rules of marriage, intercourse, and breastfeeding. The costs and values of children are irrelevant simply because they are not perceived. Only after this threshold of economic consciousness has passed do couples become aware of the economics of having children; by this time, children are in fact becoming more costly, more of an impediment to the attainment of new adult-centered aspirations. As will be discussed below, this theory seems to conflict with evidence showing that, even in traditional societies, families respond to economic opportunities and even view children largely in economic terms.

The second basic theory posits a different kind of threshold level of development--a supply-demand crossroads (Easterlin, 1975; Tabbarah, 1971, 1976). At this threshold, fertility switches from being determined by the supply of children (natural fertility) to being driven downward by the declining demand for children. In this theory, homo economicus is not born during the development process, but already exists in traditional societies. However, during the early stages of modernization, couples perceive enough net benefits (economic and otherwise) in extra children to want larger families than they can achieve. Therefore, within the constraints of natural fertility (including traditional mores), they leave fertility

"unregulated" in order to have as many children as possible, "as many as God wills." Thus in the early phase of economic development, fertility may rise at first, as better living standards increase fecundity and possibly relax some of the social restrictions on marriage. At the same time, however, economic development makes children more costly (or less remunerative), pulling the desired number of children down toward the attainable maximum. The threshold--the supply-demand crossroads--is reached when the desired number of children drops below the attainable number for the first time, or when couples perceive this soon thereafter. Thus net child costs rise throughout modernization, but this rise affects fertility only after the threshold has been crossed. The evidence cited below leans slightly, although not yet decisively, against this view.

Present evidence warns us not to reject a third theory of how child costs and benefits relate to the fertility transition. This theory stresses the omnipresence of economic consciousness at all phases of development: a large share of couples is always roughly aware of the economic consequences of children, regardless of the noneconomic considerations that prevail. In all countries and all eras, fertility follows changes in the demand for children, driven by considerations of both economics and taste. Fertility fails to fall in the early phases of most countries' development, and falls thereafter, for a straightforward reason: the relative costliness of extra children fails to rise until a fairly advanced stage in development,[3] i.e., until what Lee and Bulatao (in these volumes) call a "transition in demand." It appears, therefore, that the fertility transition parallels the long-term pattern of child costs and benefits. The following section examines this basic notion of the relative, changing costs and benefits of children, both perceived and actual. This is followed by a review of the current related empirical evidence.

THE CHANGING ECONOMICS OF CHILDREN

Perceptions of Young Couples

Do couples know the actual costs or benefits of having a child? Calculating these lifelong economic impacts would take over a hundred hours, a time cost which would itself exceed the likely benefits of the extra information to the average couple. If young couples are then too rational to undertake such an unprofitable (and contraceptive) action, is there any basis for believing they perceive these costs and benefits at all? In fact, couples consistently show such an awareness in all settings, as much in their statements as in their behavior. An excellent survey of fertility attitudes across 23 diverse nations has recently been compiled by scholars at the East-West Population Institute (e.g., Arnold et al., 1975; Fawcett, 1977; Bulatao, 1979a, 1979b, 1982). Several striking patterns emerge from these and similar interview studies.

In the least developed settings, couples show a strong awareness

of both the costs and benefits of children. In fact, these economic dimensions dominate their responses to open-ended questions on the good and bad aspects of children. Such an economic awareness among peasant villagers should not be surprising in view of the actual economic importance of children where incomes are low.

In more developed countries, mention of the purely economic aspects of children is less evident, a fact contradicting the view that couples gain greater economic consciousness as the development process unfolds. On the benefits side, couples in the United States, West Germany, and other developed countries stress emotional rewards through direct interaction and companionship. On the costs side, developed-country couples stress "too much responsibility," "career conflicts," "fear of doing a bad job as a parent" (usually with previous children, if a new one were to arrive), "general freedom and fun conflicts," and "interference with husband/wife affiliative relationship." On the other hand, even these modern cost-side perceptions have economic aspects: they can translate into an acute awareness of time costs, and of the high price of each hour of time demanded by an extra child in a high-wage world.

It is interesting to note that, in general, what couples say about extra children corresponds closely with the evidence on actual child benefits and costs discussed below. This is not surprising since the gross costs and benefits of each child have generally been large in relation to total family income. The shift from perceiving ordinary commodity-purchase costs (or "money" costs) toward perceiving time costs matches what actually happens to the relative prices of commodity inputs and time during economic growth. The facts also mirror the respondents' shift from an emphasis on economic benefits and costs in least-developed (or peasant) settings to a mention of economic forces only on the cost side in the most developed settings. Perception and reality are related when it comes to the economics of children.

Actual Child Costs and Benefits: An Overview

Three Key Questions

Discussions about what children actually cost or bring have often been ambiguous because they have failed to clarify three basic questions. Once these have been resolved, it is much easier to measure costs, benefits, and movements in a relative-price index.

The first of these questions, affecting the costs side in particular, is "Cost of what kind of child?" Children differ in many respects, including the inputs they receive. However, increases in real quantities received do not make children more "costly" and should not be mistaken for price or cost increases. The best example is the comparison of rich and poor couples' children. Couples with higher incomes give their children much more in money value. However, over half of this difference comes from real differences in the commodities acquired on each child's behalf, and it is as misleading to say that

high-income couples are faced with a higher "cost" of children as to say that food "costs" them more just because they spend more on it. Differences in money amounts spent on children really just show that different couples raise very different kinds of children. Thus only when we hold the kind of child, that is, the real inputs into the child, constant can we use the prices and wage rates from different settings to determine where an extra child's time and commodity inputs cost more.

A second important question is "Costs and benefits to whom?" Interest could focus on the costs and benefits either to society or to the parents. For fertility analysis, the latter must be chosen, since the couple is serving its own private interest. Estimates of the effects of an extra child on society as a whole must therefore be adjusted for taxes, subsidies, and other elements of costs and benefits not accruing to the parents.

Finally, it is crucial to ask "Costs or benefits relative to what?" If the couple did not have the extra child, what alternative life course would they follow? How much more or less would each of them work? What leisure would they enjoy? What commodities would they consume without the extra child? Moreover, how could these questions be answered empirically? Only recently have they been raised explicitly in the literature on the economics of fertility; however, as will be shown below, they are crucial to any measure of how relative child costs or benefits evolve as a nation modernizes.

Quantifying the Costs and Benefits of Children

Child costs and benefits can be quantified for fertility analysis through three basic steps: (a) measuring the absolute money value of the time and commodity inputs into an extra child, net of the child's economic contribution, for a given time period and social group; (b) deriving the time and commodity values of the alternative activities replaced by the child; and (c) weaving these two sets of measures and wage and price series into price indices of the relative cost of an extra child for different times and groups.

The absolute money value of the costs and benefits of an extra child have been measured many times (Lindert, 1978:Chap. 4, 1980; Mueller, 1976; and sources cited in each). The procedure is somewhat involved. Rough judgments must be made about how time and commodities are really divided among household members. This is tricky, especially because many things are obviously used jointly for several purposes: e.g., the extra child shares living space with others in complex ways, and the time spent with an extra child is often also spent on other things. Fortunately, however, the measures can afford to be rough for fertility analysis, as will be shown below.

The fact that child benefits and costs occur over a whole lifetime adds two further complications. First, even after a cross-section for a single year is accepted as a proxy for life experiences over historical time, future costs and benefits must be discounted back to a fertility-decision time before the birth of the would-be extra

child. The choice of discount rates is an unresolved issue, though one can roughly apply rates of return on such risky human investments as schooling. Second, child mortality must be considered. The costs and benefits of an extra child in, say, his or her seventh year must be multiplied by the chance of survival through that year; this can be done with appropriate mortality schedules.

Once these complications have been addressed, one can measure the absolute money costs and benefits of an extra child according to the following formula:

$$\text{Cost}_N = \sum_{t=0}^{T} \frac{\sum_{n=1}^{N} s_t w_{nt} L^N_{nt} + \sum_{j=1}^{J} s_t P_{jt} C^N_{jt}}{(1+r)^{t+0.5}},$$

where T = the number of years until the couple's lifetime planning horizon;

s_t = the probability that the child will survive from birth to age t;

w_{nt} = the after-tax shadow wage rate of the nth family member in year t, valued at the rate expected for workers with that member's attributes at the time of decision;

L^N_{nt} = the nth family member's time given up for the extra child in tth year, for $n = 1, \ldots, N-1$; for $n = N$, L^N equals minus the work time contributed by the Nth family member while still within the household, either at paid work or at household chores that would have to have been performed whether or not this extra child existed;

C^N_{jt} = the input of the jth commodity into the extra child in the tth year, minus any subsidies to having the child (prorated across all J commodities); for the years after the child has left home, this set of variables reflects the net flow of transfers from parents to child (parents' gifts and bequests minus support by this child's household);

P_{jt} = the price of the jth commodity in the tth year, as anticipated at the decision time one year before birth of the Nth family member; and

r = the rate of discount.

Although most past studies have failed to consider time costs and survival probabilities, such measures have revealed a number of important patterns. Over the years of the child's stay in the parents' household, his or her time costs fall and commodity costs rise, as any parent can testify: the time-cost profile starts at burdensome heights in the child's infancy and plummets by the start of the school years; commodity costs rise inexorably until the child forms a separate household.

The well-known rise in the child's own earnings eventually overtakes all costs, perhaps some time before he or she leaves the

parents' home. For this reason, the net cost is likely to decline across the preadult years. This decline in turn magnifies the importance of child mortality. In a setting in which children could earn substantial amounts, improvements in child survival lower net child costs. This simple survival factor should be added to debates over the role of child mortality rates in the early delay of the fertility decline.

Other patterns relate to the child's sex and parity. In general, boys and girls seems co receive similar total inputs of time and commodities, though exceptions are documented. Some American studies have found greater food consumption by boys and greater clothing expenditures on behalf of girls in the early teen years. The main parity pattern, for both time and commodities, is that an only child costs more than one among two or more, and each child beyond the second may cost slightly less than the one before. This latter declining cost pattern results partly from economies of scale and costless sharing ("cheaper by the dozen") and partly from a real reduction in the level of inputs into each child (lower "child quality") as the number of siblings rises (Lindert, 1978:Chap. 4, 1980:appendices, and sources cited in each).

The overall shares of time and commodity values spent on an extra child are represented on the left side of each panel in Figure 1. From this figure, it looks as though time inputs are a rising share of the total value of inputs into an extra child. This might be true, or it might be that development brings no clear change in the value share of time inputs. We know that development raises wage rates relative to commodity prices, a trend that would indeed raise the share of time inputs in total input value; it may also be that real hours of time inputs per child of given parity also rise, though the data on time use in less developed settings are too fragile to support such a conclusion.[4] On the other hand, because economic development brings a rise in the ratio of commodity inputs to real hours of time imput, the rise in the share of time inputs in total input value suggested in Figure 1 cannot be definitively established.

The second accounting step in creating an index of the relative cost of an extra child in different settings--deriving the time and commodity values of the activities replaced by the extra child--yields a set of expenditure weights for indexing the input prices of these activities. This index can then be compared to that of child costs. To determine what couples would have done without an extra child, their labor-supply and consumption behavior can be compared with that of couples who are similar in every respect except for having had one less child.[5]

On the time-use side, standard cross-sectional studies (time-panel studies where possible) are used to estimate the effects of the presence of children of various ages and numbers, plus many other variables, on the labor force participation and working hours of different family members. Such studies typically show that, for an extra child at any given age, mothers work less outside the home,

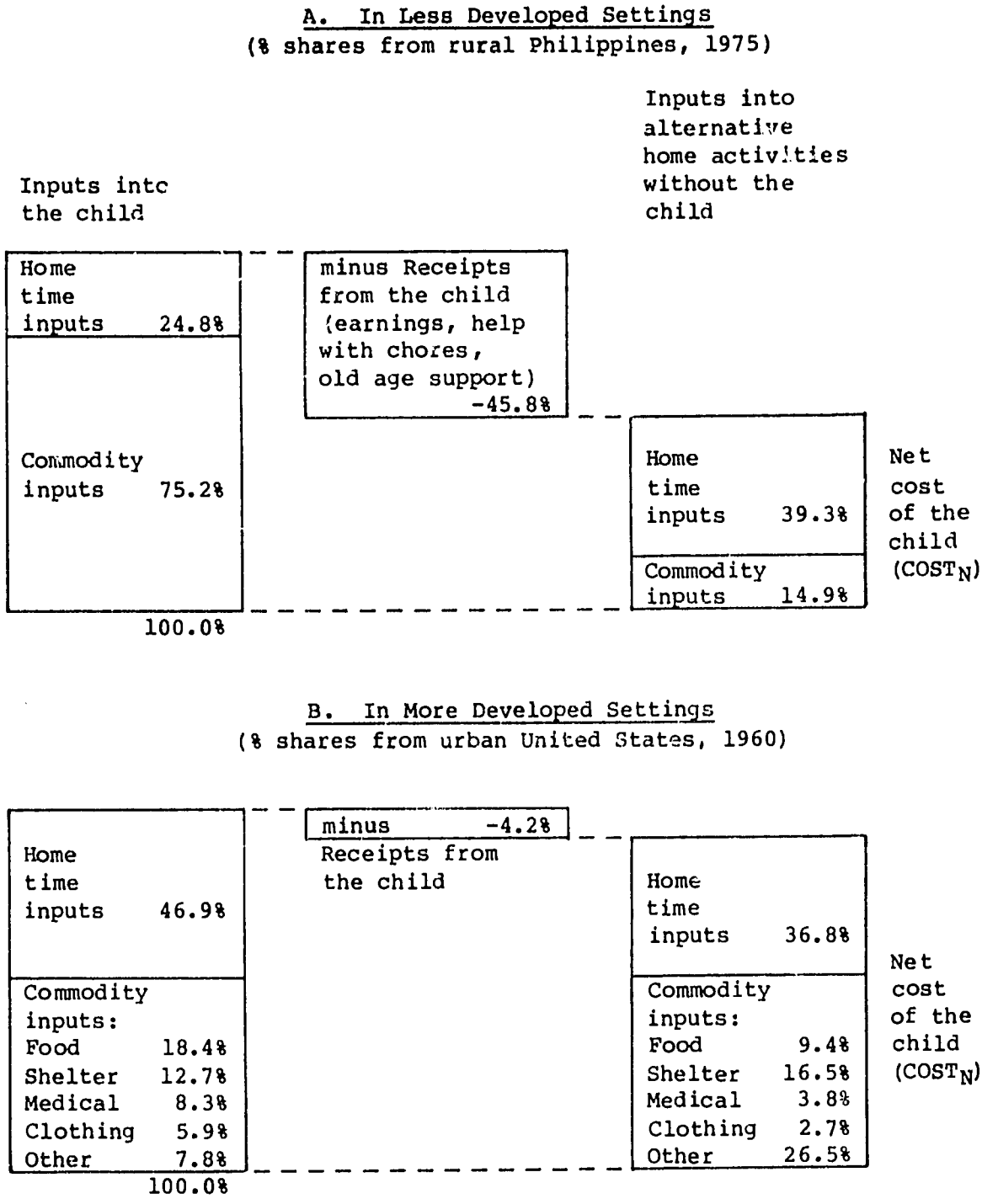

FIGURE 1 An Illustrative Overview of the Economic Costs and Benefits of a Third Child and the Alternatives to It.

Source: All percentage shares of total child inputs calculated from Lindert (1980:Figure 1.4 and Table 1.3), using a 13 percent rate of time discount.

especially in the most developed settings. For fathers, the effect is probably the opposite: extra children may cause fathers to work more hours per year ("moonlighting" and searching harder for work), though this effect is apparently not strong enough to outweigh the loss of the mother's earnings (e.g., Lindert, 1978:Chap. 4 and App. A and B; Simon, 1977:55-61). Each such change in work outside the home can be combined with the previous estimates of time inputs into children: (time spent on the extra child) - (reduction in time spent working outside the home) = (time that would have been spent on alternative activities without the extra child). This resulting amount of time for other things, again valued at wage rates and discounted back to the time of decision making, yields the values of time inputs shown on the right-hand side of Figure 1. This time would have been spent on the couple's own enjoyments and on earlier children.

The values of commodities that the household would have purchased without the extra child--better home furnishings, travel, adult clothing, room space for other things, etc.--can be similarly derived. The subtraction in this case involves the change in the household's "imports" of commodities rather than its "exports" of labor supply to the outside world: (value of commodities devoted to the extra child) - (increase in the value of commodities bought by the whole household as a result of the extra child) = (value of the alternative commodities replaced by the child, i.e., the commodity inputs shown on the right side of Figure 1). Past studies have noted remarkably consistent patterns in the effects of extra children on commodity purchases, as suggested by the detail in the lower panel of Figure 1. Extra children, like poverty, raise the share of household income spent on food; they greatly lower the household's purchases of all luxuries (income-elastic goods and services); and they also slightly reduce an urban household's purchase or rental of housing, since the need to economize drives larger families toward lower-priced living space, often toward the more spacious remote urban fringe. The effects of these changes on the relative cost of an extra child with given attributes can in turn be estimated.

The third accounting step is to combine the two sets of net time and commodity costs--those for the extra child and those for the other life course--with time series on wage rates and prices to derive a relative child cost index. The net time and commodity inputs into the extra child become value-share weights for P_C, the index of child input prices; those for the alternative activity's inputs become value-share weights for P_A, the index of input prices for alternative home activities. The relative cost index of the extra child is then $P_R=P_C/P_A$, which can be followed either over time or at one point in time across groups (e.g., rural versus urban, high income versus low). This is the sort of relative price measure most appropriate to the demand-for-children part of fertility analysis. It is a price measure, as household decision theory usually requires, not an absolute money magnitude that mixes price and quantity elements.

Evolution of the Cost Index over Time

How does the relative cost index (P_R) behave over time, as a nation develops? Figure 2 sketches an answer now suggested by a growing body of evidence. The main input-price movement is the rise in real wage rates; at the same time, luxuries become increasingly cheap, as will be discussed in more detail below. These two trends should make an extra child more and more expensive, given that a child demands relatively large amounts of time and competes with luxuries. Yet Figure 2 shows a prolonged stagnation or even a slight decline in P_R before it ultimately rises.

This apparent contradiction is explained by the fact that the relevance of wage rate gains keeps changing as a country develops. The left-hand side of Figure 1 shows why this is so. In less developed settings, an extra child is "time-supplying" in the sense that he or she supplies enough economic value of time, in chores and paid work, to outweigh the value of the time spent on him or her. As long as this is true, any equiproportional rise in all real wage rates will reduce the net cost of an extra child. Thus only at the later stages of development do real wage gains raise relative child costs.

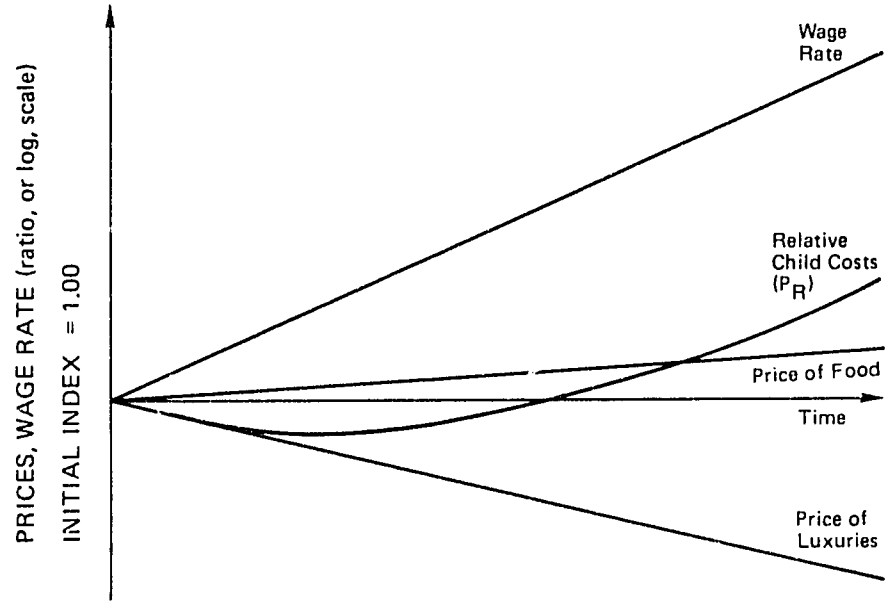

FIGURE 2 A Sketch of the Likely Long-Run Evolution of Relative Child Costs

Note: Each curve is to be viewed as a trend line, abstracting from cyclical and other short-run fluctuations. Wage rates and prices are all relative to an overall cost-of-living index, after prices of luxuries and other goods have been properly adjusted for quality change.

REVIEW OF RECENT EVIDENCE

Are Extra Children Ever Economic Assets?

There has been a considerable debate over whether a child is a net economic benefit or burden in the least developed and most "traditional" settings. Many have argued that children give more than they get (Cain, 1977; Nag et al., 1978);[6] others stress net economic costs (Mueller, 1976; Vlassoff, 1979). Current evidence suggests that a child is probably a net economic burden even in the least developed settings, as implied by Figure 1 above, especially if only the years in which the child is growing up in the parents' household are considered. To see why, one must take care to include all the economic elements introduced above, particularly the following points:

1. The benefits from an extra child must be weighed against both time and money costs, not just one or the other, as in past studies.

2. Weighting each year's economic consequences of a living child by cumulative survival chances (the s_t's) has the effect already noted: it raises the relative weight of the economically burdensome infant and early childhood years.

3. Positive discount rates, not applied by past studies, would also tilt the scales toward net economic burdens.

The likelihood that children will be a net economic burden even in the least developed settings can be seen from some Third World data that address only the first of these three points. That is, they are based on estimates of the total time and commodity costs and benefits of children within their parents' households, without application of survival or discount rates.

A recent fairly comprehensive rough estimate for the rural Philippines in 1975 found the flows of economic costs and returns for any child after the first-born shown in Table 1. The net cost of a child would have been even higher if the time costs of caring for children over 6 years old had been included. It would have been still higher for first-borns, whose earning power is about the same as that of the later-borns, to whom these figures apply, but whose time costs are probably greater. In addition, the data on which such estimates are based probably overstate the earning power, and understate the net costs, of children in less developed agricultural settings. The clearest such distortion is the peak-season bias in valuing children's work time. In less developed countries today, as in historical records from agriculture in earlier centuries, children work at a measurable market wage rate mostly during the harvest and other peak seasons (Hansen, 1969; and several historical sources cited by Lindert and Williamson, 1982:Part VI). As a result, studies tend to measure children's work and wage rates primarily in the harvest, when their relative wage is disproportionately high. This is true for the sources of the 1975 Philippine data.

A similar overestimation of children's economic contributions is found in studies concluding that children pay for themselves while

TABLE 1 Economic Costs and Returns per Child (Excluding First-Born) in Pesos per Year, 1975: Rural Philippines

Age of Child at Last Birthday	Preschool Child Care Time by Parents	Child's Commodity Consumption	Productive Work Time Contributed by Child	Net Annual Cost
0	491	391	0	882
1-4	295	391	0	686
5	295	610	0	905
6	0	610	0	610
7-9	0	610	-960	-350
10-14	0	915	-960	-45
15-19	0	1,099	-960	139

Note: Net undiscounted cost per year = 228.05 pesos or 5.6 percent of a husband's average earnings.

Source: Lindert (1980:44-47). Reprinted by permission of the University of Chicago Press. c 1980 by the National Bureau of Economic Research.

still living with their parents. The best example is Cain's (1977) careful study of the village of Char Gopalpur, Bangladesh. To observe a large sampling of wage rates for children, Cain had to measure wage rates for boys during the November-December paddy harvest. The fact that few children were hired at other times of the year is a strong clue that the demand for their services was highly seasonal, so that their true year-round average wage rate was probably well below the male rates used by Cain. Moreover, even this presumably inflated figure would not have been greater than the costs of an extra child in that village had Cain not excluded time costs and all nonfood commodity costs.

When these likely empirical biases are recognized, and when the more remunerative later years of childhood have been deflated by appropriate survival and discount rates, it seems likely that children are a net economic cost even in the least developed settings. This conclusion implies in turn that children provide their parents some consumption utility or noneconomic benefits at all stages of modernization.

The Shift to Time-Intensive Children

To understand the trends in relative costs indicated by Figure 2, one must start with the clearest relative-price movement of all: the rise

in the price of human time. The relevance of rising wage rates for relative child costs (P_R) depends on whether an extra child tends to be "time-intensive," that is, whether that child takes a greater value of net time inputs than the home activities he or she replaces, or the opposite, "time-supplying." It would be difficult to make this determination for developing countries if detailed studies of time use within the home were needed. Fortunately, they are not. One can establish whether an extra child would be time-intensive or time-supplying just by studying the effects of extra children on the family's net supply of labor to the outside world. The more the child would raise family earnings (and the value of home production of sold goods) for any given set of wage rates, the more time-intensive he or she would be, meaning that higher wage rates would make children look increasingly costly as generations pass.

There are many studies of the effects of children on family earnings. Those that are able to weigh the average earnings of an extra child against his or her net impact on other family members' earnings show an extra child as time-supplying for most of the development process, becoming time-intensive only in the most advanced settings (see Boulier, 1976; Cain, 1977; Nag et al., 1978; Lindert, 1978:Chap. 4, 1980:38-50; Vlassoff, 1979). This historic drift is also suggested by cruder estimates of how extra children seem to affect aggregate household earnings (not broken down by individual earners). In rural India in the late 1960s (Chernichovsky, 1975:69ff), the extra child had a positive impact, and was thus probably time-supplying, contrary to the result consistently obtained from studies of postwar high-income countries.

The main reason for the early decline and later rise in the relative cost of an extra child (the shape of the P_R curve in Figure 2 above) is now apparent: the rise in the value of human time, itself the essence of economic development, first lowers the relative cost of time-supplying children and later raises the cost of time-intensive children.

Shifting Prices

If the shift toward time-intensity and the rise in real rates were the only long-run relative-price movement, the turning point in relative child costs would probably come too late in the history of most countries to explain the onset of their fertility decline without the help of other variables. However, other forces are at work that tend to make the turning point in the P_R curve come earlier, around the time that fertility starts its irreversible drop.

It has been noted that an extra child is invariably food-intensive and luxury-replacing. Thus the effect of an extra child on expenditure shares is like the effect of poverty: children will seem increasingly costly relative to other things as the price of staples rises and that of luxuries falls. This has been the prevailing trend over the course of economic development. It is not evident, though, from the available conventional price series, which show no trend in

the price ratio between staples and luxuries. On the other hand, the usual price indices are likely to be biased in the direction of understating the relative decline in the prices of luxuries. Most luxuries are "new goods" that experience considerable quality improvement over time. The usual price series fail to consider these points. Moreover, to follow the prices of a fixed bundle of goods over many years, the usual Laspeyres indices must overlook those goods not existing in early years and those whose quality is changing. Thus indices of the price of transportation will continue well into the age of the bicycle and automobile before adding these modes to the bundle. Indices of housing costs will go to some lengths to follow rents on a fixed set of deteriorating inner-city dwellings; new units are added to the bundle in due course, but their initial availability and higher quality are not allowed to pull down the overall rate of seeming inflation. At the same time, urbanization, improved communications, and the rise of mail-order shopping greatly cut the seldom-measured information costs of most income-elastic goods. The noneconomist's hunch that exposure to new "goods aspirations" should make children seem costly thus has a direct counterpart in a true measure of relative child costs, one that would raise P_R throughout the development process.

Old Age Support

It is traditional to argue that, in underdeveloped countries, parents expect and receive significant economic support from their surviving children, especially sons, in their old age. The subsequent decline in this reliance on children is traditionally thought to be one of the main ways in which economic development reduces fertility. The evidence for this view comes in three forms, each of which can be challenged.

The most directly relevant kind of evidence is interview responses on the perceived importance of old age support and its relationship to the case for having children. The responses seem to form a neat pattern: time, development, and urbanization all reduce the stated importance of future old age support from children (Arnold et al., 1975; Bulatao, 1982; Mainichi Newspapers, 1972:Chap. 1; Vlassoff and Vlassoff, 1980).[7] However, this interview evidence can be challenged. It is cheap for interview respondents to say they feel old age support from children is one of the most salient advantages of having children. (Saying so may even have its own advantages if the children are present at the interview.) Such responses may also express the anticipation of future companionship as much as of future support.

A second kind of evidence is provided by cross-sectional international regression analyses showing that fertility is significantly lower in countries with social insurance benefits established for the elderly, with other variables held equal (Hohm, 1975, 1976; Entwisle and Winegarden, 1981). However, the regression specifications can be challenged in conventional ways, and alternative

analyses fail to turn up significant effects of pension programs on fertility (Kelly et al., 1976). It may be that pension programs are given credit for fertility reductions that are actually due to such variables as socialism, the position of women, and housing scarcity.

The third form of evidence consists of data on co-residence of parents and their grown children. There is clearly more of a tendency for elderly parents to live with, or at least near, their children in less developed countries and earlier historical eras (Stern et al., 1975; Beresford and Rivlin, 1966; Taeuber and Taeuber, 1971:Table VI-7). However, the fact that grown-up children and their parents live together does not tell us who is supporting whom. In many cases, the elderly parents retain ownership of the land or home and are implicitly supporting the younger generation with free rent in exchange for personal labor services. To be sure, one could still maintain that children provide great psychic insurance for the unlikely but very important possibility of old age impoverishment. Even here, though, there is reason to question just how far ahead young couples look when making fertility decisions.

The relevance of old age support for parents thus needs further research. Data permitting, a decline in expected old age support can be incorporated into the relative cost concept as a supply of work from the children, one that comes after they have become adults, further explaining the delay and ultimate arrival of the fertility transition. In the early phases of development, when this support is thought to be most influential, its economic value is in fact increased by two trends. Declining mortality increases the probability that any one child will live long enough to deliver the support a parent expects, on the assumption that the parent will live a long time; this contributes to high fertility for some time. Meanwhile, income growth cuts the share of parents actually expecting such support. Such reasoning can help align the evolution of relative child costs further with the evolution of fertility itself.

CONCLUSIONS

A careful and straightforward definition of the relative cost of an extra child can help organize otherwise vague arguments about how changes in the economic environment should affect fertility incentives. It can also add to our understanding of why fertility failed to decline in the early stages of so many countries' development, and offer a partial explanation of the ultimate fertility decline.

Such a relative cost concept can be matched against historical information on price and wage trends and on shifts in the net impacts of a child on family allocations of home time and commodities. This will suggest both forces steadily reducing fertility incentives throughout development and forces whose incentive effect has reversed itself. From the earliest stages of modern economic development, likely declines in the prices of luxury goods relative to staples should have made children seem more costly, other things being equal.

Yet the implications of improvements in real wages and child survival rates would have had an opposite effect in the early stages of development. With children still time-supplying, early increases in real wage rates for common labor would have made children seem cheaper relative to the home activities with which they compete. It may be, for example, that wage gains undercut the case for holding down family size in England's Industrial Revolution, as the dismal scientists advancing the Iron Law of Wages feared. By contrast, in the later stages of development, children become time-intensive, especially outside of agriculture, translating further improvements in real wage rates into increasing awareness of the costs of a child to the mother's career. As far as we can judge from crude comparisons of time-use studies across classes and nations, this shift to time-intensity has not been due to any marked rise in the gross time inputs into a child of given birth order and spacing; rather, it has been due to the decline in child time contributions to parents' households and to the drift toward less time-intensive, more commodity-intensive alternatives to an extra child.

Future research on the influence of changing child costs and benefits on fertility can follow these leads in any of several directions. Ways of developing low-cost proxies for the hard-to-measure relative cost index are discussed elsewhere (Lindert, 1980:63-64). Two other items stand out on the research agenda. First, better studies are needed of the effect of the price of living space on fertility incentives. As noted above, extra children actually lower couples' purchases of housing services in nonfarm cross-sections by pushing them away from prime central living sites. Presumably, children raise a couple's demand for living space as measured by surface area. If this point can be quantified, it might turn out to be very important; it might also help to explain why fertility is so low in areas of acute housing shortage, as in the cities of the Soviet Union. Housing policy may interact with population policy in a stronger way than has been suspected. The other main research area is the general quantifying of the effects of different government policies on relative child costs. The child cost framework gives a coherent way of weighing several policy effects at once. For example, it can be estimated how much change in social security pension rights for the elderly would be required to match the effects of a particular tax exemption for each extra child. Schooling, food subsidies, excise taxes on luxury goods, and general income taxes are but a few of the other policy dimensions that can be quantified and compared once the rules for measuring child costs and benefits have been understood.

NOTES

1. Here, as usual, modernity is defined in a way both vague and familiar. Its presence or absence cannot be defined with any more precision than the start or end of a mountain range. It involves higher levels of average income, education, health, and, more

loosely, urbanization and industrialization.

2. The existence and early postwar hegemony of this view are well documented in Caldwell (1976:323-328).
3. The omnipresence of economic rationality is stressed by Simon (1974:163-164) and Caldwell (1976:326). The discussion of the delayed turn toward relatively costly children, however, stems from Lindert (1978:Chap. 4; 1980).
4. For comparisons of time inputs into children in very different settings, see Szalai (1972), Lindert (1978:Chap. 4), and Minge-Klevana (forthcoming). Some American studies have found small significant tendencies for more educated mothers to spend more time with each child for a given number of children, but this result is fragile and not supported in all cases. More reliable is the tendency of a greater and greater share of childcare time to fall on the mother and the schools as development proceeds, as fathers remain minimally involved, and as help from older siblings and the extended family recedes.
5. For a more detailed justification and application of this procedure, see Lindert (1978:Chaps. 3 and 4).
6. Other assertions that may sound like arguments for net economic benefits are in fact different. For example, Caldwell (1978) has argued that, in peasant agriculture, an extra child is rightly perceived as raising the family's income. However, this does not mean the child is a net benefit. It means instead that the child will raise net family labor "exports" (work outside the home) by bringing in more out-of-home earnings than he or she takes from other family members while growing up. This is consistent with a net-cost position of the sort shown in the lower half of Figure 1. There the child raises net family earnings outside the home, as Caldwell suggests; however, there is still a net economic cost because <u>within</u> the home, that child takes more time and commodities than are given back in help with chores that would have to have been done even without the child's existence.
7. It should be noted that the Vlassoffs' (1980) study plausibly concluded that old age support was less prevalent in perception and in fact than one might have expected from the kind of village they studied in Maharasthra in 1975-1976. However, the interview responses they received were broadly consistent with the international patterns in the other studies cited here.

BIBLIOGRAPHY

Arnold, F., R. A. Bulatao, C. Buripakdi, B. J. Chung, J. T. Fawcett, T. Iritani, S. J. Lee, and T.-S. Wu (1975) <u>The Value of Children: Introduction and Comparative Analysis</u>, Vol. I. Honolulu: East-West Population Institute.

Beresford, J. C., and A. M. Rivlin (1966) Privacy, poverty and old age. <u>Demography</u> 3:247-258.

Boulier, B. L. (1976) Children and Household Economic Activity in Laguna, Philippines. Institute for Economic Development and Research, Discussion Paper No. 76-19 (29 July), University of the Philippines, Manila.

Bulatao, R. A. (1979a) On the Nature of the Transition in the Value of Children. No. 60-A. Honolulu: East-West Population Institute.

Bulatao, R. A. (1979b) Further Evidence on the Transition in the Value of Children. No. 60-B. Honolulu: East-West Population Institute.

Bulatao, R. A. (1982) The transition in the value of children and the fertility transition. Pp. 95-122 in C. Hohn and B. Mackensen, eds., Determinants of Fertility Trends: Theories Re-examined. Liege: Ordina Editions.

Cain, M. T. (1977) The economic activities of children in a village in Bangladesh. Population and Development Review 3:201-228.

Caldwell, J. C. (1976) Toward a restatement of demographic transition theory. Population and Development Review 2:321-366.

Caldwell, J. C. (1978) A theory of fertility: From high plateau to destabilization. Population and Development Review 4:553-578.

Chernichovsky, D. (1975) Fertility Behavior in Developing Economies: An Investment Approach. Unpublished Ph.D. dissertation. City University of New York.

Easterlin, R. A. (1975) An economic framework for fertility analysis. Studies in Family Planning 6:54-63.

Easterlin, R. A. (1978) The economics and sociology of fertility: A synthesis. Pp. 57-133 in C. Tilly, ed., Historical Studies of Changing Fertility. Princeton, N .: Princeton University Press.

Entwisle, B., and C. R. Winegarden (1981) Fertility and Pension Interrelationships in Developing Countries: Econometric Evidence. Research Report No. 81-9. Ann Arbor, Mich.: Population Studies Center, University of Michigan.

Fawcett, J. T. (1977) The value and cost of children: Converging theory and research. Pp. 91-114 in L. T. Ruzicka, ed., The Economic and Social Supports for High Fertility. Canberra: Department of Demography, Australian National University.

Hansen, B. (1969) Employment and wages in rural Egypt. American Economic Review 59:298-313.

Hohm, C. F. (1975) Social security and fertility: An international perspective. Demography 12:629-644.

Hohm, C. F. (1976) Reply to Kelly, Cutright, and Hittle. Demography 13:587-589.

Kelly, W. R., P. Cutright, and D. Hittle (1976) Comment on C. F. Hohm's "Social security and fertility: An international perspective." Demography 13:581-586.

Lindert, P. H. (1978) Fertility and Scarcity in America. Princeton, N.J.: Princeton University Press.

Lindert, P. H. (1980) Child costs and economic development. Pp. 3-79 in R. A. Easterlin, ed., Population and Economic Change in Developing Countries. Chicago: University of Chicago Press.

Lindert, P. H., and J. G. Williamson (1982) English workers' living standards during the Industrial Revolution: A new look. Economic History Review (forthcoming).

Mainichi Newspapers, Population Problems Research Council (1972) Summary of Eleventh National Survey on Family Planning. Tokyo: Mainichi Newspapers.

Minge-Klevana, W. (forthcoming) The Rise of the Cost of Children in Western Industrial Societies. Chicago: Chicago University Press.

Mueller, E. (1976) The economic value of children in peasant agriculture. In R. D. Ridker, ed., Population and Development. Baltimore, Md.: The Johns Hopkins University Press.

Nag, M., B. N. F. White, and R. C. Peet (1978) An anthropological approach to the study of the economic value of children in Java and Nepal. Current Anthropology 19:293-306.

Simon, J. L. (1977) The Economics of Population Growth. Princeton, N.J.: Princeton University Press.

Stern, D., S. Smith, and F. Doolittle (1975) How children used to work. Law and Contemporary Problems 39:93-117.

Szalai, A., ed. (1972) The Uses of Time. The Hague: Mouton.

Tabbarah, R. (1971) Toward a theory of demographic development. Economic Development and Cultural Change 19:257-276.

Tabbarah, R. (1976) Population education as a component to development policy. Studies in Family Planning 7:197-201.

Taeuber, I. B., and C. Taeuber (1971) People of the United States in the Twentieth Century. Washington, D.C.: U.S. Government Printing Office.

United Nations, Department of Economic and Social Affairs (1973) The Determinants and Consequences of Population Trends. New York: United Nations.

Vlassoff, M. (1979) Labour demand and economic utility of children: case study in rural India. Population Studies 33:415-428.

Vlassoff, M., and C. Vlassoff (1980) Old age security and the utility of children in rural India. Population Studies 34:487-499.

Chapter 16

WOMEN'S WORK ACTIVITY AND FERTILITY

Guy Standing*

The interrelationships between fertility and female labor force participation have been explored in numerous studies. This has made it difficult to identify the findings that are analytically useful and methodologically sound. However, this paper briefly reviews the principal findings associated with the most widely used economic perspective, noting some of the conceptual and methodological limitations that have persisted. In doing so, the paper does not discuss the problems with measuring female labor force participation in low-income countries. Those have been the subject of recent intensive research and are a primary research priority, since they affect the analysis of the data and the meaning of observed patterns of behavior.

COMMON METHODOLOGICAL DIFFICULTIES

The usefulness of much of the empirical research on women's work and fertility has been greatly reduced by methodological weaknesses, some imposed by the nature of the available data, some by the type of statistical analysis conducted, and some simply by the ambiguity of the hypothetical relationships involved. On the latter point, many observed correlations have been consistent with a variety of interpretations, and have therefore not justified conclusions about a specific causal relationship. In particular, the problem of possible simultaneous relationships has continued to trouble researchers.[1] For example, in an area with high female labor force participation and low fertility, the labor participation may have induced lower fertility; the area may have attracted women with relatively low fertility propensities; the area may have had a low fertility level, which may in turn have encouraged the growth of female employment; or the correlation may have resulted from other influences such as household income or level of schooling. Although such ambiguities are

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inherent in the use of cross-sectional data, the failure to take this into account has led many authors to deduce causal relationships when several possible interpretations were possible.

In addition, many studies have been impaired by a lack of control variables, whether in tabulations, regressions, or other multivariate statistical analyses.[2] They have relied on simple tabulations, often not even controlling for such basic influences as age, marital status, or schooling. Another major methodological issue has been the difficulty of estimating shadow wage rates--opportunity incomes--faced by prospective labor force participants, an issue only partly resolved by examples of imputed opportunity incomes.

With these methodological limitations in mind, the following sections review the literature on women's work and fertility. First, the relationship is discussed generally, followed by a more detailed focus on the way it is affected by the type of work and the type of childcare involved. Succeeding sections cover several aspects of the relationship: the time-frame of the work (past, current, or prospective), the effects of interruptions for childbearing and childrearing on women's work, the effects of fertility on labor discrimination, and intrafamily substitutions for women's work. Finally, some concluding remarks are offered, followed by a series of propositions summarizing the most provocative points raised by the paper, and suggesting priorities for future research.

THE RELATIONSHIP BETWEEN WOMEN'S WORK AND FERTILITY

The simplest hypothesis is that fertility is inversely related to women's labor force participation; in fact, researchers in the early 1960s saw the promotion of female employment as a powerful means of reducing fertility (see, e.g., Collver and Langlois, 1962). In the United States, early empirical research indicated that rising female wage rates tended to reduce fertility, and that this effect outweighed the positive effect on fertility of a comparable increase in the husband's income (Mincer, 1963). Other research showed, not surprisingly, that young children reduced the probability of wives' participation in the labor force (Mincer, 1962; Cain, 1966; Bowen and Finegan, 1969; Sweet, 1970; inter alia). It was widely inferred that, in low-income countries, high levels of fertility would be encouraged to the extent that female labor force participation was low: if there were few opportunities for income earning, the cost of childbearing would be reduced. Moreover, if, as they grew older, daughters had little chance of providing an income for their parents, a premium would be placed on having sons; this in itself would encourage higher fertility to increase the probability of raising one or more sons to adulthood.[3] In addition, if children were able to contribute to production and income from an early age, not only would the costs of childbearing be reduced, but the children's work could be substituted for that of women, further encouraging fertility.

More recent research, however, has complicated these early views. First, women who work earn income, whether in monetary or nonmonetary

form, which itself enables the family to afford a larger number of children. Second, childbearing and childraising may in fact not constrain the labor force participation of women, and may have negligible opportunity costs. This view, developed to explain an apparent lack of statistical relationship in some studies carried out in the 1960s, focuses on the "role compatibility" between women's work and fertility (Stycos and Weller, 1967). It is useful to discuss two aspects of this notion in some detail.

Role Compatibility According to Type of Work

It has long been recognized that some types of work are more compatible with having and raising children than others. As early as 1960, Jaffe and Azumi (1960) observed that the fertility levels of women working in what they called "cottage industries" were similar to those of the "economically inactive," and that only women who worked "away from home" had lower average fertility. Although this observation has recently been questioned (DaVanzo and Lee, 1978), it is nonetheless generally accepted that the opportunity cost of children is low for women doing agricultural work, in particular for those on family farms where work schedules have been assumed to be flexible and childcare can be combined with work rather easily.[4] Some studies have found no inverse relationship between fertility and female labor force participation in rural areas of low-income countries. For instance, Miro and Mertens concluded for their Latin American data that "the occupations in which women of rural-small urban areas work are still too much linked to traditional modes of life to have any significant unidirectional influence on fertility" (Miro and Mertens, 1968:113).[5] Similar conclusions were drawn from a Turkish study in which the roles of mother and worker were shown to be sufficiently compatible because of the predominantly rural nature of the society (Stycos and Weller, 1967). Gendell, basing his conclusion largely on Indian evidence but referring to low-income, rural economies in general, found that women's work had "little or no influence in at least the traditional sectors of these societies" (Gendell, 1967).[6]

In a related argument, it has been suggested that an inverse relationship between women's work and fertility exists only in the urban areas of low-income countries. Indeed, several studies have actually suggested a positive relationship in rural areas. This was the conclusion of studies in Eygpt (Bindary et al., 1973), Thailand (Goldstein, 1972:427), and the Soviet Union, Czechoslovakia, and Italy (Pinelli, 1971:603). In Italy, a regression analysis suggested that regional fertility rates were related to the female occupational activity rate, positively in the case of agricultural work and negatively in the case of other occupations (Federici, 1967); the Pinelli (1971) study found that Italian women working in agriculture had higher fertility rates than those who were economically inactive.

On the other hand, although various studies have reported an

inverse relationship between women's work and fertility in urban areas (e.g., Gendell et al., 1970; Miro and Rath, 1965; Kupinsky, 1971), and in white collar and professional jobs (Weller, 1968; Hass, 1971; Goldstein, 1972), doubt has been cast on the existence of a specifically urban effect. In a new industrial Peruvian town, Chimbote, working women were reported as wanting more children than economically inactive women (Hawthorn, 1970:103). Similar findings were reported for Puerto Rico (Carleton, 1965) and Malaysia (Fong, 1974). A study in Bangladesh even suggested a positive effect for nonagricultural work (Chaudhury, 1974).

The most frequently cited characteristic of work affecting its compatibility with fertility is the labor relation involved: it is assumed that wage employment away from the home is much more incompatible with fertility than nonwage activity, whether on farms, in trading, or in "unpaid family work," or more generally in small-scale, family-based forms of production. Jaffe and Azumi's (1960) study of Puerto Rican and Japanese data, which found only an inverse relationship among women working in nondomestic industries, supports this hypothesis. In cross-sectional analysis of data from 60 countries, Kasarda found a negative partial correlation between fertility and the production of women employed in nonfamilial enterprises, controlling for levels of urbanization, industrialization, and schooling; from that he concluded that increased employment of women outside the home influences a nation's fertility rate (Kasarda, 1971:311). Similar conclusions have been reached in analyses of data from Colombia (Chi and Harris, 1975) and from metropolitan areas of Latin America (Hass, 1971). Various studies in Thailand have also supported this relationship. In a simultaneous equations model of family behavior, nonagricultural employment was found to be inversely related to fertility (Maurer et al., 1973). A study of married women in 12 rural zones of Thailand also reported a significant relationship between fertility and nonfamilial work, though most of the explained variance was due to life-cycle variables and to "modernity" (Cook and Leoprapai, 1977).

In any case, establishing a causal relationship between more urban, modern types of employment and fertility levels is problematical. More modern, urban jobs may actually facilitate and subsidize childbearing, providing high incomes that enable women to afford children, and providing maternity leave and pay. For example, a study of women in their 20s in Ibadan, Nigeria, reported that housewives had the lowest fertility; in Lagos, white-collar women workers, despite their relatively late age at marriage, still had more children on average than those with "no occupation" (Ware, 1977:18-21). Moreover, an inverse relationship between fertility and modern, urban employment may be due to "job commitment" effects discussed later, or to the impact of schooling rather than to incompatibility; it may also reflect a tendency for selection of nontraditional jobs by women having attitudes and attributes restricting their fertility.

It is clear from this discussion that the theory of role

compatibility needs to be applied with greater precision. The type of employment in one setting may not be comparable with that in another. This sort of research should therefore specify and focus on the "compatibility costs" of work, such as distance from home, length of the working day, availability of maternity leave and benefits, and availability of institutional childcare support. Too little work has been done on these aspects (but see Darian, 1975). Yet, the links between job characteristics and fertility will be illuminated satisfactorily only when all or most of those factors are examined together.

Role Compatibility According to Type of Childcare

Just as the compatibility of work and fertility will vary according to the type of work, it will also vary with the time intensity and quality of the childcare involved. In low-income environments where access to schooling is limited, most jobs require little schooling, and when there is little opportunity for occupational mobility, the time intensity of childcare could be expected to be relatively low. In that case, the opportunity costs of work would also be low. Conversely, where the allocation of time could affect children's preschool learning, schooling, health, and acquisition of skills and attributes needed to attain occupational and income mobility, women's work activities could be expected to be more constrained by their ability and incentive to influence their children's development. In the United States, it has been observed that, among women with small children, those with higher levels of schooling tend to reallocate more time from labor force to childcare activities than those with little schooling, even though the opportunity costs of economic inactivity are much higher for the former group (Leibowitz, 1972). This may be due to relatively educated women having higher labor force participation rates and thus more labor force time to reallocate in this way; however, it may also be due to their greater ability and desire to contribute to their children's general development and informal education in what are regarded as the vital, formative early years. There is evidence that women of high socioeconomic status in the United States spend more time with their children than do those with lower status and schooling (Hill and Stafford, 1974). This may not apply in low-income environments, especially if there is a high monetary return to schooling, but where more educated women do withdraw from economic activity it could be depicted as raising the family's expected long-term income.

To examine the compatibility between women's work and fertility according to the type of childcare, it is perhaps most useful to define those conditions under which fertility is least likely to constrain women's work activities.

The <u>first</u> is when there is a closely knit extended family. This permits childcare to be shared among large family-based groups or taken over by elderly relatives.

A <u>second</u> and related condition is when the cost of the domestic

labor needed to provide substitute childcare is low. This can be because low-cost childcare facilities exist; because women have a relatively high opportunity income compared to the cost of domestics' wages, as is the case with relatively high-income families; or because older children are available to care for younger ones. This use of older children, common in low-income environments, implies that the imputed cost of an additional child may actually be quite small. Yet, if children are expected to attend school up to secondary level, their use for childcare will be reduced; this would in turn increase the incompatibility between fertility and nondomestic work. The degree of incompatibility may also be increased for affluent families by changes in the cost of domestic labor. The wage cost of domestic workers is generally a function of the level of female employment, particularly the opportunity income of women in agriculture. Where rural incomes and employment opportunities are low, many young single women migrate into urban areas where they work as domestics for extremely low wages; this in turn lowers the opportunity costs of activity by relatively educated urban women. Not surprisingly, several studies have suggested an inverse relationship between the wage rate of domestics and the fertility of urban women (McCabe and Rosenzweig, 1976; Cain and Weininger, 1973). At the same time, where these domestics are so desperate for income that they must work whether or not they have children, their use can be expected to weaken the relationship between fertility and female labor force participation generally. On the other hand, if women's employment prospects improve and domestics' rates rise, the degree of incompatibility between fertility and labor force work among relatively educated women will increase.

The third condition reducing the constraints imposed by fertility on women's work, as suggested above, is when the desired schooling of children is low (de Tray, 1974), or more generally where the desired input of parental time is small. If the cost of fertility includes the expected cost of raising a child to some normative educational level, and if a woman's domestic contribution reduces that cost, then a low educational norm will reduce the degree of incompatibility.[7] If the family has only a slight ability to raise highly schooled children, or a very low perception of the need to do so, the degree of incompatibility will again be small.[8]

The fourth condition reducing incompatibility is when work is done purely out of financial or economic necessity rather than out of intrinsic interest. If fertility norms are high, additional children will induce women to work more to meet increased consumption requirements. This may help explain high fertility combined with high rates of work activity among low-income women, if it is true that work done out of necessity does not influence fertility decisions (Chai and Myoung, 1976).

A fifth condition relates to the arguments cited above suggesting that, for low-income families in which women work in "informal" jobs, the degree of incompatibility is relatively small, and that somehow this facilitates the combination of work and high fertility. However, such combinations may actually highlight something more sinister. It is well known that women who have to work are more likely to reduce

the period of breastfeeding. In a cross-cultural analysis of 83 countries, for example, it was concluded that women began supplementary feeding much earlier where they participated to a large extent in subsistence production (Nerlove, 1974). This in turn would reduce the periods of postpartum amenorrhea, reduce birth intervals, and raise fertility (see Bongaarts, in these volumes). The more sinister aspect of this pattern is that early weaning in impoverished environments raises the probability of infant and child mortality, since substitute feeding is less hygienic and can lead to diarrheal diseases that are a major cause of death in such environments (Chen, in these volumes). This will induce higher fertility in an effort to achieve a desired family size.

A sixth condition reducing incompatibility is an ability and willingness to adjust the allocation of time to other activities, particularly leisure. Several empirical time-use investigations in rural low-income areas have shown that young children primarily reduce women's leisure rather than work time (Kossoudji and Mueller, 1979; King, 1976; Ho, 1979). Others have suggested that both work and leisure time are reduced (Boulier, 1977). If the primary effect is on leisure time, this may help to explain why educated women, who have a greater financial ability to enjoy leisure, want fewer children (Freedman, 1975).

OTHER ASPECTS OF THE RELATIONSHIP BETWEEN FERTILITY AND WOMEN'S WORK

Time Frame of Work

An important and complex issue related to fertility and women's economic activity is the time frame of the work involved. It is not only a woman's current work activities that affect fertility, but also her past work experience, as well as her prospects for future employment.

Most studies have concentrated on the relationship between women's current labor force activity and fertility; these have been the least able to identify the direction of causality.[9] Some (e.g., for Puerto Rico, Nerlove and Schultz, 1970; for Colombia, Angulo and Rodriguez, 1978; for Peru, Bolivia, and Ecuador, Heer, 1964; for the Philippines, Harman, 1970, and Rodgers et al., 1978) have emphasized a trade-off between the decision to work and fertility. Some have stressed a trade-off between the amount of time spent on work and fertility (e.g., Cohen, 1969, and Shea et al., 1970, for the United States; Peek, 1978, for Chile). Others have tried to identify a relationship between current activity and fertility desires (e.g., for Peru, Stycos, 1965; for the United States, Whelpton et al., 1966, inter alia).

Other studies have concentrated on longitudinal relationships, emphasizing the impact of premarital employment, or employment after marriage but before the start of childbearing. Early studies of this type in the United States had problems identifying causality. Thus although the 1940 Indianapolis study and the three Growth of American

Families Surveys of 1955, 1960, and 1965 all reported inverse relationships between length of work since marriage and fertility, they were unable to draw causal inferences (Pratt and Whelpton, 1956; Freedman et al., 1959; Whelpton et al., 1966; Ryder and Westoff, 1971). They suggested that the greater the woman's previous work attachment, the lower her desired fertility in terms of completed family size. As one study admitted, it was difficult to determine whether the observed correlation was due to the effect of employment on fertility desires, or to both factors reflecting a common "social-psychological orientation" (Westoff et al., 1961).[10]

In low-income environments, there is some evidence that work experience affects fertility. Data from Monterrey, Mexico, suggest that, although informal economic activity did not constrain fertility, families in which the wife had done nondomestic work before marriage had lower fertility than those in which the wives had only worked at home (Zarate, 1967). In Thailand, data suggest that, in both rural and urban areas, women who had worked for wages before marriage had fewer children than those who had not (Standing, 1978:179-181). The combined impact of type and time frame of occupation was considered in a Brazilian survey, where past work experience in high-status occupations was statistically associated with lower fertility (Rosen and Simmons, 1971). In West Malaysia, labor force experience after marriage seemed associated with fewer births among urban women but with more births among rural women; regrettably, however, the study only controlled for the influence of age (Concepcion, 1974).

A more indirect aspect of the relationship between work experience and fertility is that young women's work experience appears to raise both the age of marriage and the age of initial childbearing. This was observed in a recently completed study of Jamaica, where it also appeared that consensual unions were contracted later among those who experienced no prolonged unemployment on leaving school; all of these factors seem to have had a negative effect on the women's actual and desired fertility (Standing, 1981). Again, the causal relationships among such linkages are not easily identified. Late age at marriage may increase the probability of nondomestic work experience, making it essential to specify a particular period in which work was or was not done. One factor to be considered is that, if the opportunity income of older women is higher--income per period being positively related to age--the opportunity cost of inactivity will be correspondingly higher; this will in turn encourage lower fertility. Regardless of the precise causal relationships, the effect of labor force experience on age at marriage may be an important way in which women's work influences fertility (Namboodiri, 1964). Referring to Latin America, one analysis concluded that the "chief effect" of increasing female labor force participation was to raise the mean age at marriage and so increase the proportion of women who never married (Heer, 1964). Even here, it might be argued that early labor force participation only influences the age of childbearing and the spacing of children, without much affecting completed family size. Although it has commonly been observed that rising age of marriage is associated with lower fertility, the relationship is by no means clearly established.

A third aspect of the longitudinal relationship between work experience and fertility is the view that work experience before or in the early stages of marriage alters the husband-wife relationship, making it more egalitarian; the wife becomes less subordinate in decision making, particularly with regard to fertility and childraising (Weller, 1968; Ridley, 1968; but cf. Hass, 1971). Of course, this is a complex issue. Although it is no longer assumed that husbands and wives have uniform perspectives on fertility decisions, it is not known precisely how their perspectives differ, or whether there are long-term changes in the weight given the wife's preferences. The extent to which work experience increases that weight, as well as the general concepts of egalitarian and subordinate family relationships, is a topic requiring research.

Finally, one difficulty with this type of research is determining the relative impact of past and current experience, since there is typically a high correlation between premarital, postmarital, and current labor force activity (see, e.g., Standing, 1980; Rodgers, 1980). As an example of the importance of this issue, if labor force activity before or early in marriage is seen as the primary influence lowering fertility, the impact on fertility of increasing current female employment opportunities will be delayed. Moreover, if current employment opportunities among prospective mothers are seen as the greater influence, then an increase in employment levels can be expected to have a more immediate impact on fertility.

Interruption Effects

The opportunity cost of a period of labor force withdrawal cannot be assessed simply according to the income foregone in that period. Although this has commonly been recognized in the case of relatively educated women, it also applies to impoverished working-class women and to some groups of peasants.

Any interruption of employment for women in "career" jobs, which tends to mean more educated women, involves a reduction in expected lifetime earnings due to the loss of continuity and career progression (Mincer and Polachek, 1974; inter alia). Conversely, where the type of work being done by women can facilitate personal and family upward mobility, it is more likely to affect fertility negatively (Tien, 1967). In the United States, at least, this "interrution cost" has seemed to encourage both fewer children and a closer spacing of children to concentrate the period of labor force withdrawal (Ross, 1974). Moreover, career jobs require and generate commitment and thus offer alternative interests and achievements that constrain domesticity and motherhood.

Indeed, this motivation is sometimes seen as the crucial factor. For example, in an Italian study, women who stated that they worked because they wanted to do so appeared to have lower fertility than those who worked from economic necessity or for a higher standard of living (Pinelli, 1971:609). This interest in work has typically been

correlated with high-status, career jobs, making it likely that, ceteris paribus, women in such jobs will have relatively low fertility (Kupinsky, 1971). Some studies suggesting this possibility were noted earlier (see also Goldstein, 1972:429; Salaff and Wong, 1977; Safilios-Rothschild, 1972; and Suzman et al., 1976).

However, this notion of commitment, while intuitively appealing, can become almost tautological. Women who work regularly are liable to develop greater commitment; those who have few or no children may rationalize that fact by expressing a strong commitment to work, and so on. The same could be said about the usefulness of another attitudinal variable, women's "approval of nondomestic work roles." On introducing this variable, one Latin American study found it seemed to explain the variance in fertility previously attributed to type of employment (Hass, 1972). Once again, however, the question of direction of causality must be raised. There is also a more general difficulty with the use of attitudinal data: attitudes are flexible and tend to be ex post rationalizations; they are also strongly influenced by the way questions are posed and coded. If empirical work is to continue to focus on "commitment" factors, it must devise indices derived primarily from actual behavior.

It is also worth noting that, although it is commonly assumed that interruption and thus fertility costs are higher for career women, those costs may actually be as high if not higher for working-class women. If there is high unemployment, a woman leaving a job to care for a child may well be unable to get work again when she wants to. In this context, Pinelli (1971) indicated that women in permanent agricultural jobs had lower fertility than those doing temporary agricultural work; the implication was that the former would be more committed to their jobs and would have greater interruption costs because they might not be able to get their permanent jobs back. This observation suggests that many poor working-class women dare not leave their jobs when they have children; this is particularly likely for women in urban environments where consensual and other forms of nonmarital sexual union predominate, as in the Caribbean and many parts of Latin America, if only because such women will be relatively dependent on their own income.[11] This combination of work and childbearing may contribute to high child mortality, and may also have a long-term negative effect on women's ability to work and the income they receive when they do so. This is true not only for wage employment, but also for women in peasant households. If these women have to stop nondomestic work, or even reduce the amount of time they devote to it, they and their families may have to sell off assets, fall into debt, or face the loss of their land because they are unable to afford rent. These issues have not received the attention they deserve in the literature.

Labor Discrimination Effects

Discrimination against women in the labor force has received relatively little attention in the fertility literature. However, it

can have a significant effect because it alters the opportunity costs of childbearing and childrearing.

First, if the fertility norm is high (or if past levels of fertility have been high), there will be a tendency to exclude young women from "progressive" jobs and even from schooling and training opportunities, if only because both families and employers will regard women as secondary, intermittent workers. This will contribute to the process by which women are systematically excluded from industrial and high-income forms of employment. To that extent, women's opportunity incomes will be low, as will the foregone income and interruption costs of fertility. Such "statistical" discrimination will in turn encourage high levels of fertility.

Second, if discrimination lowers the opportunity income women would expect based on their schooling and other qualifications, it is likely that the available work will fail to satisfy their status aspirations. The resulting "status frustration" can be expected to lower their propensity to enter or become committed to labor force activity.[12] This could be expected to influence women's attitudes toward fertility, forcing them to realize more of their self-esteem and status in motherhood.

Third, if women are prevented or discouraged from taking wage jobs or high-income forms of economic activity, sex-related differentials in opportunity incomes will affect the comparative advantages of time allocations within families, and thus the intrafamily division of labor. Men will be encouraged to contribute more time to labor force activity and women to domestic or quasi-domestic activity, further encouraging higher fertility.

Fourth, discrimination against women tends to be part of a wider process of labor market segmentation and--in both nonwage and wage-based economies--stratification. It has been argued that, as jobs become less "progressive" and increasingly "static," they will tend to be done by women rather than men (Standing, 1978:Chap. 3). However, even theoretically, the fertility effects of such changes in the nature of jobs is unclear: static jobs have low interruption costs, encouraging higher fertility; yet a growth of static relative to progressive jobs appears to raise women's relative and absolute opportunity incomes and the opportunity cost of their inactivity, encouraging lower fertility. These complex relationships between the labor market structure, the nature of jobs, and fertility patterns require more substantive attention.

Fifth, by reducing women's incomes and ability to contribute to family production, discrimination reduces their relative autonomy in decision making (Piepmeier and Adkins, 1973), which arguably reduces their control over their own fertility. Again, this is a moot point; one Indian study, for example, found no such relationship, though this may well have been due to the study's concentration on low-income manual workers (Mukherjee, 1974).

Labor Substitution Effects

One of the most important factors in the relationship between women's work and fertility is the extent to which intrafamily substitutions are feasible: if work schedules and age-sex labor divisions are flexible, it is unlikely that any interruption in women's work will have much impact on the income of families in which production is family-based. It has been observed that, in low-income agrarian economies, working days are commonly rather short (Cleave, 1974; Sahlins, 1974; inter alia). In such circumstances, there is considerable potential for husbands, other adults, and perhaps most of all children, to take over women's work.

This form of intrafamily substitution should be clearly distinguished from the impact of fertility on the amount of time devoted by different family members to childcare, for which there may be less scope. Not surprisingly, many studies have suggested that the major fertility constraint on women's work activity occurs when the children are very young, that the number of children per se is of minor significance, and that older children do not have much constraining influence. Indeed, some have suggested that the presence of older children increases the leisure time of both the mother and the father (King, 1976; Quizon and Evenson, 1978). Given that infancy involves the greatest constraint, and that this age is typically associated with close maternal involvement, notably breastfeeding, the scope for substitution by other family members is limited. This is supported by the Laguna time-use study, which observed that the number of children (controlling for age of youngest child) did not affect the fathers' allocation of time to childcare (Boulier, 1977). On the other hand, it seems from that study and from the companion time-use survey in Malaysia (DaVanzo and Lee, 1978) that, if women in low-income rural areas allocate more time to market activities, husbands, and to a greater extent children, spend more time on domestic activities.

The prevalence of child labor is an important factor in fertility behavior, not only affecting the direct costs and economic returns of children, but also providing substitute labor for women and reducing one constraint on fertility. If children are available as workers, women can withdraw from some tasks; in addition, women may actually be eased out of labor force activities to the point where the income and opportunity costs of childbearing would be very small. This has possible policy implications. If child labor were abolished or reduced by the spread of schooling, the use of adult female labor would be increased, as women substituted for children. At the same time, the direct economic value of children to families would be reduced, which would tend to raise the age of marriage and childbearing, in part because the cost of children would have increased. Thus the substitution of women for child workers could be expected to reduce fertility in two ways: by raising the costs of children and by the raising opportunity costs of women's inactivity.

CONCLUSIONS

Despite the large body of literature, the influence of work activity on fertility remains unclear, whether type of employment, motivation, or area of employment is considered. Many of the observed correlations may be due to the influence of factors affecting both work activity and fertility; moreover, conflicting empirical results can at least partly be attributed to widely varying methodological approaches, differences in the number and type of control variables used, and differences in measures of fertility and women's work activity.

Perhaps the most widely accepted economic hypothesis is that, ceteris paribus, fertility will be inversely related to the opportunity income of women. However, current work activity alone need not reflect the woman's opportunity income; past work experience, as well as schooling and training, must also be considered. Thus it is not surprising that work experience before or immediately after marriage tends to be inversely related to subsequent fertility, and that schooling has often explained correlations between current work activity and what are essentially past fertility levels. At the micro level, these inverse correlations may be due to the influence of schooling on opportunity income and the motivation to work, as well as on contraceptive knowledge. One multivariate analysis found schooling to be the only variable with a significant and negative impact on desired fertility; employment as a separate variable was statistically insignificant (Speare et al., 1973). A survey in New Delhi revealed that, on average, the fertility of uneducated working women was similar to that of all nonworking women (Minkler, 1970).

In an attempt to measure the woman's opportunity wage, bypassing the use of a measure of work as a determinant of fertility, one study suggested that in Puerto Rico women with high opportunity wages had higher levels of fertility. The authors' conclusion is worth quoting: "Our results suggest that female educational attainment has a direct negative linear effect on fertility, perhaps because of its association with contraceptive knowledge, but has an exponentially positive influence through the wife's wage" (McCabe and Rosenzweig, 1976:152). This further underlines the tenuous influence of economic activity per se. As noted earlier, its most important effects may be indirect: perhaps most crucially, schooling and associated nondomestic employment may raise the expected age at which women first become pregnant, in turn lowering fertility.

In conclusion, the complexity of the relationship between women's work and fertility raises questions about the whole theoretical approach to this issue. One feels that the literature is constantly finding sufficient reason but no efficient cause. It is essential that future research set up clean theoretical frameworks, pose alternative interpretations of observed relationships, and find better ways to refute some hypotheses in favor of others.

PROPOSITIONS

Although this paper has raised a number of points about the relationship between women's work and fertility, the propositions below focus only on the more provocative of these points, rather than the more familiar. They also indicate same high-priority areas for future research.

1.1 In nonindustrialized, low-income environments, women's involvement in productive activity will have little relationship to fertility at the macro level; as industrialization and the growth of wage employment spread, an inverse relationship will become more likely, only to be gradually weakened with advanced industrialization and private affluence.

This broad hypothesis is implicit in the general literature reviewed in this paper. The first part is contained within the compatibility framework. With the growth of wage employment from a low base, there has generally been discrimination against women; to the extent that family incomes increase, it becomes more likely that women with husbands in relatively high-income wage jobs will be able to afford larger families. It is also apparent that, in affluent industrialized countries, the fertility constraint on women's work activity, and of activity on fertility, have been reduced. The opportunity costs of work fall as cheaper or more readily available childcare facilities emerge, and as maternity leave and benefits become more widespread. At the same time, standard working hours are reduced, there is a spread of part-time jobs, and more jobs become "static" in nature. This weakening of the inverse relationship has been seen in the U.S. and in the U.K. in recent years (Bowen and Finegan, 1969:585; Oppenheimer, 1970; Weller, 1977:6; Wabe, 1969).

1.2 There is little relationship between fertility and women's work in areas of traditional, nonwage forms of subsistence production. An inverse relationship is more likely with agricultural jobs and other basic forms of manual labor; in "modern sector" jobs, however, that relationship would be weak or even nonexistent.

This proposition applies Proposition 1.1 cross-sectionally to developing countries. There is evidence that, in many such economies, women in modern firms such as multinational corporations receive certain fringe benefits similar to those of women employed by large companies in affluent industrialized countries. In these cases, the relationship between fertility and women's work could be expected to be similar.

2.1 Fertility is related to the type of occupation. This hypothesis has long been a central feature of the empirical literature. If there is a consensus, it is that the fertility of working women will be highest among "unpaid family workers," followed by "own-account domestic" workers, "own-account nondomestic" workers, and "wage employment" workers. However, in low-income environments, these conventional assumptions may be inadequate. The "unpaid family

worker" category is especially nebulous. Important groups are also omitted whose fertility patterns could be quite distinctive, such as labor-service tenants, cash-paying tenants, sharecroppers, bonded laborers, and even slaves, who still exist in quite large numbers in parts of the world. Even the category of "wage employment" is heterogeneous, as illustrated by Italian data (Pinelli, 1971). Moreover, not all agricultural work, for instance, involves the same amount of physically taxing work or regularity of employment, and such distinctions may affect the impact of the work on fertility.

2.2 Although fertility (desired and actual) will be related to the socioeconomic class of the family, it will be more closely related to the husband's status than to the wife's occupation.

This proposition has no statistical support. Various studies have emphasized the need to relate fertility to the work status of both husbands and wives (e.g., Oppenheimer, 1977). Such research would need to account carefully for across-class and within-class factors. Another important empirical question is in what circumstances it could be anticipated that fertility would be more closely related to the wife's rather than the husband's prior occupation and socioeconomic achievement.

3 Premarital work experience in the period immediately following school has the most important impact on women's completed fertility because it determines not only the probability of subsequent work activity, but also the age of marriage and first pregnancy.

This hypothesis requires careful specification of the work experience variables, particularly the timing of the reference period. It will be advisable to restrict the reference period to a limited time after the end of schooling, or after a certain age if the woman had little or no schooling. Likewise, it will be necessary to screen out those who could not really have had postschool labor force experience before they were married or had their first child. It will also be important to decide whether longitudinal, retrospective data will be adequate, or whether multiple-round surveys will be required to capture the relationship. The longitudinal relationship is associated with the common notion of work commitment, though attitudinal data supporting that notion are of questionable validity, as noted above. Indices of commitment should be developed that are derived from specific characteristics of various types of work and women's behavioral characteristics, such as continuity on the job, labor turnover, and acquisition of formal work skills.

4 Labor market discrimination against women increases fertility. This general proposition deserves high priority because emarkably little work has been done on the impact of labor market structure on fertility, and because it generates a number of more specific hypotheses. There is no need to take a position as extreme as that argued by Safilios-Rothschild (1978), who asserted that fertility will decline in low-income countries only "when sex role socialization is no longer clear-cut, unambiguous and universal." However, the impact

of discrimination on fertility needs to be explored.

4.1 If women are relegated to occupations and types of jobs that are incompatible with their status aspirations, they will orient their time and preferences to non-labor force activities, which will encourage higher levels of fertility.

This hypothesis has not received any attention in empirical research by economists, partly because it is very difficult to incorporate it into the "household decision making" analytical framework without at least drawing on data and knowledge of labor market structure. The effect of status frustration on female labor force participation was raised as an explanation of somewhat contradictory international findings on the relationship between schooling and female work activity (Standing, 1978).

4.2 Fertility will be increased if there is labor market segmentation whereby women are either excluded from "progressive" career jobs or have little job-occupational mobility.

This hypothesis was implicit in the work of Tien (1967) and can be understood within the context of the low interruption cost of women's labor force withdrawal. Clearly, its relevance is essentially in areas of growing wage-labor employment.

5.1 In low-income areas, and particularly among rural families, children born to women who must work are more likely to suffer from sickness and debilitation and have a high infant mortality rate.

If true, this hypothesis has implications for the idea that promoting nondomestic employment for women would be a way of reducing fertility. There is some empirical support for the hypothesis (e.g., Levinson, 1972). However, research needs to identify the particular types of work, and the combinations of work and childcare, which are most likely to have such harmful consequences. This is a primary concern of a research project in progress by the International Labor Organization (see, e.g., Anker, 1978). This hypothesis leads to a range of related concerns about family formation and dissolution in impoverished environments, among which the following proposition is probably the most serious.

5.2 In low-income areas, women who combine childbearing and work will suffer from increased malnutrition and ill health, and thereby will be more likely to experience secondary sterility, as well as be more likely to fail to carry the infant to term; these tendencies imply an inverse relationship between work activity and fertility.

It is well known that during pregnancy and lactation women need more calories, and that anemia affects most mothers in low-income countries. As work activity also increases caloric needs, women combining work with childbearing are most likely to lose their child or suffer secondary sterility, as well as to have a reduced ability to work.

NOTES

1. For a good recent review of nonrecursive models attempting to deal with simultaneity, see Cramer (1980). The crucial issue is the identification of exogenous variables.
2. A discussion of these and related methodological difficulties is presented in the introduction to Standing and Sheehan (1978).
3. May and Heer (1968) estimated in the 1960s that, for an Indian couple to have 95 percent probability of raising one son to adulthood, they had to have over six children.
4. However, few studies have disaggregated agricultural work by type of farming, type of work task, or, most importantly, worker status.
5. Note that they did not control for the influence of such basic factors as age or marital status.
6. For related studies, see Jaffe and Azumi (1960), Kasarda (1971), Chi and Harris (1975), Hass (1971), Maurer et al. (1973), and Cook and Leoprapai (1977).
7. The reference to norms implies acceptance of exogenous social influences. Decisions on what level of schooling to pursue could be regarded purely as a matter for the parents, or group-specific and community norms could be seen as shaping those decisions.
8. This consideration also helps explain the effect on fertility of income earned by the wife. In agrarian economies or in urban areas where "nonmodern" production predominates, women's participation in many forms of work will encourage higher fertility because more children can be afforded without generating any of the negative price effects associated with a long-run growth in income. That is, the negative price effect will probably not offset the presumed positive income effect; this is because the former only really arises if higher household income is associated with a need, or perceived need, for higher-"quality" (higher-priced, or in effect more-schooled) children. In an economy dominated by agriculture, informal activity, and other "traditional" forms of work, the price effect is likely to be minimal, reducing the incompatibility between fertility and women's work.
9. Besides the studies mentioned in the text, a number of others are reviewed in Standing (1978:192-199, Table 28).
10. A more recent study investigating the "simultaneous interdependence" between planned labor force participation and birth expectation suggested that work plans have a substantial impact on birth expectations, but not the reverse (Waite and Stolzenberg, 1976).
11. This highlights one aspect of the "interruption" issue which has not been extensively analysed. Where union or marital instability is high, or female labor force attachment can be expected to be high or increasing, interruption costs will increase as women in effect seek to insure themselves against the prospective loss of a partner's income.
12. The notion of status frustration is discussed in Standing (1978:Chap. 6).

BIBLIOGRAPHY

Angulo, A., and C. L. de Rodriguez (1978) Female participation in economic activity in Colombia. In G. Standing and G. Sheehan, eds., Labour Force Participation in Low-Income Countries. Geneva: International Labour Organization.

Anker, R. (1978) Demographic Change and the Role of Women: A Research Programme in Developing Countries. World Employment Programme research working paper. International Labour Organization, Geneva.

Bindary, A., C. B. Baxter, and T. H. Hollingsworth (1973) Urban-rural differences in the relationship between women's employment and fertility: A preliminary study. Journal of Biosocial Science 5:159-167.

Blake, J. (1965) Demographic science and the redirection of population policy. Pp. 41-69 in M. Sheps and J. C. Ridley, eds., Public Health and Population Change. Pittsburgh, Pa.: University of Pittsburgh Press.

Boulier, B. L. (1977) The influence of children on household economic activity in Laguna, Philippines. Journal of Philippine Development 4:195-222.

Bowen, W. G., and T. A. Finegan (1969) The Economics of Labor Force Participation. Princeton, N.J.: Princeton University Press.

Cain, C. G. (1966) Married Women in the Labor Force: An Economic Analysis. Chicago: University of Chicago Press.

Cain, C. G., and A. Weininger (1973) Economic determinants of fertility: Results from crosssectional aggregate data. Demography 10:205-223.

Carleton, R. O. (1965) Labor force participation: A stimulus to fertility in Puerto Rico? Demography 2:233-239.

Chai, L. H., and C. Myoung (1976) Fertility and women's labor force participation in Korea. In Recent Empirical Findings on Fertility: Korea, Nigeria, Tunisia, Venezuela, Philippines. Interdisciplinary Communications Program Monograph Series No. 7. Washington, D.C.: Smithsonian Institution.

Chaudhury, R. (1974) Labor force status and fertility. Bangladesh Development Studies 11:819-838.

Chi, S. K. P., and R. Harris (1975) Interaction between Action Programmes and Social Structural Variables: A Study of Family Planning and Fertility Differentials in Four Colombian Cities. Paper presented at the annual meeting of the Population Association of America, Seattle.

Cleave, J. H. (1974) African Farmers: Labor Use in the Development of Small-Holder Agriculture. New York: Praeger.

Cohen, M. S. (1969) Married women in the labor force: An analysis of participation rates. Monthly Labor Review 92:31-35.

Collver, A. (1968) Women's work participation and fertility in metropolitan areas. Demography 5:55-60.

Collver, A., and E. Langlois (1962) The female labor force in metropolitan areas: An international comparison. Economic Development and Cultural Change 10:367-385.

Concepcion, M. B. (1974) Female labor force participation and fertility. International Labour Review 109:503-517.

Cook, M. J., and B. Leoprapai (1977) Labor Force Participation, Village Characteristics and Modernism and Their Influence on Fertility among Rural Thai Women. Bangkok: Institute for Population and Social Research, Mahidol University.

Cramer J. C. (1980) Fertility and female employment: Problems of causal direction. American Sociological Review 45:167-190.

Darian, J. C. (1975) Convenience of work and the job constraint of children. Demography 12:245-258.

DaVanzo, J., and D. L. P. Lee (1978) The Compatibility of Child Care with Labor Force Participation and Non-market Activities: Preliminary Evidence from Malaysian Time Budget Data. Paper presented at the Conference of the International Center for Research on Women, Women in Poverty: What Do We Know?, Belmont, Md.

De Tray, D. N. (1974) Child quality and the demand for children. In T. W. Schultz, ed., Economics of the Family: Marriage, Children and Human Capital. Chicago: University of Chicago Press.

Federici, N. (1967) The effects of female employment on fertility. Demografia 3-4. (Reprinted in E. Szabady et al., eds., World Views of Population Problems, pp. 77-82. Budapest: Akademiai Kiado, 1968.)

Fong, M. S. (1974) Some Social and Economic Determinants of the Work of Married Women in the Fertile Ages in West Malaysia. Paper presented at the annual meeting of the Population Association of America, New York.

Freedman, D. S. (1975) Consumption of modern goods and services and its relation to fertility: A study in Taiwan. Journal of Development Studies 12:95-117.

Freedman, R., P. K. Whelpton, and A. A. Campbell (1959) Family Planning, Sterility and Population Growth. New York: McGraw-Hill.

Gendell, M. (1967) The influence of family building activity on women's rate of economic activity. Pp. 285-286 in Proceedings of the World Population Conference, Belgrade, 1965, Vol. 4: Migration, Urbanization, Economic Development. New York: United Nations.

Gendell, M., M. N. Maraviglia, and P. C. Kreitner (1970) Fertility and economic activity of women in Guatemala City, 1964. Demography 7:273-286.

Glass, D. V. (1968) Fertility trends in Europe since the Second World War. Population Studies 22:103-146.

Goldstein, S. (1972) The influence of labor force participation and education on fertility in Thailand. Population Studies 26:419-436.

Harman, A. J. (1970) Fertility and Economic Behavior of Families in the Philippines. Report RM-6385-AID. Santa Monica, Calif.: Rand Corporation.

Hass, P. (1971) Maternal Employment and Fertility in Metropolitan Latin America. Ph.D. dissertation. Duke University, Durham, N.C.

Hass, P. (1972) Maternal role incompatibility and fertility in urban Latin America. Journal of Social Issues 28:111-127.

Hawthorn, G. P. (1970) The Sociology of Fertility. London: Collier-Macmillan.

Heer, D. M. (1964) Fertility differences between Indian- and Spanish-speaking parts of Andean countries. Population Studies 18:71-84.

Hill, C. R., and F. P. Stafford (1974) Allocation of time of preschool children and educational opportunity. Journal of Human Resources 9:323-341.

Ho, T. J. (1979) Time costs of child rearing in the rural Philippines. Population and Development Review 5:643-662.

Jaffe, A. J., and K. Azumi (1960) The birth rate and cottage industries in underdeveloped countries. Economic Development and Cultural Change 9:52-63.

Kasarda, J. D. (1971) Economic structure and fertility: A comparative analysis. Demography 8:307-317.

King, E. M. (1976) Time Allocation in Philippine Rural Households. Discussion Paper No. 76-20. Manila: Institute of Economic Development and Research, University of the Philippines.

Kossoudji, S., and E. Mueller (1979) The Economic Status of Female-Headed Households in Rural Botswana. Mimeo. University of Michigan, Ann Arbor.

Kupinsky, S. (1971) Non-familial activity and socioeconomic differentials in fertility. Demography 8:353-368.

Kupinsky, S., ed. (1977) The Fertility of Working Women: A Synthesis of International Research. New York: Praeger.

Leibowitz, A. S. (1972) Women's Allocation of Time to Market and Non-Market Activities: Differences by Education. Ph.D. dissertation. University of Colombia.

Leibowitz, A. S. (1975) Education and the allocation of women's time. In F. T. Juster, ed., Education, Income and Human Behavior. New York: McGraw-Hill.

Levinson, F. J. (1972) An Economic Analysis of Malnutrition among Young Children in Rural India. Ph.D. dissertation. Cornell University, Ithaca, N.Y.

Maurer, K., R. Ratajczak, and T. P. Schultz (1973) Marriage, Fertility and Labor Force Participation of Thai Women: An Econometric Study. Report R-829-AUD/RF. Santa Monica, Calif.: Rand Corporation.

May, D. A., and D. M. Heer (1968) Son survivorship motivation and family size in India: A computer simulation. Population Studies 22:199-120.

McCabe, J. L., and M. R. Rosenzweig (1976) Female labor force participation, occupational choice, and fertility in developing countries. Journal of Development Economics 3:141-160.

Mincer, J. (1962) Labor force participation of married women: A study of labor supply. In H. G. Lewis, ed., Aspects of Labor Economics. Princeton, N.J.: Princeton University Press.

Mincer, J. (1963) Market prices, opportunity costs and income effects. In C. F. Christ, ed., Measurement in Economics. Stanford, Calif.: Stanford University Press.

Mincer, J., and S. Polachek (1974) Family investments in human capital: Earnings of women. Journal of Political Economy 82(2, Part 2):S76-S108.

Minkler, M. (1970) Fertility and female labor force participation in the Old Delhi area. Journal of Family Welfare 17:31-43.

Miro, C. A., and W. Mertens (1968) Influences affecting fertility in urban and rural Latin America. Milbank Memorial Fund Quarterly 46(3, Part 2):89-117.

Miro, C. A., and F. Rath (1965) Preliminary findings of comparative fertility surveys in three Latin American countries. Milbank Memorial Fund Quarterly 43(4, Part 2):36-62.

Mueller, E. (1979) Time-Use in Rural Botswana. Paper presented at the seminar on the Rural Income Distribution Survey of Gabarone, Botswana, at the Population Studies Center, University of Michigan, Ann Arbor.

Mukherjee, B. N. (1974) The status of married women in Haryana, Tamit Nadu and Meghalaya. Social Change 4(1).

Namboodiri, K. (1964) The wife's work experience and child spacing. Milbank Memorial Fund Quarterly 42(3).

Nerlove, M., and T. P. Schultz (1970) Love and Life between the Censuses: A Model of Family Decision-Making in Puerto Rico, 1950-1960. Report RM-6322-AID. Santa Monica, Calif.: Rand Corporation.

Nerlove, S. (1974) Women's workload and infant feeding practices: A relationship with demographic implications. Ethnology 13:207-214.

Oppenheimer, V. (1970) The Female Labor Force in the United States: Demographic and Economic Factors Governing Its Growth and Changing Composition. Population Monograph Series No. 5. Berkeley, Calif.: University of California Press.

Peck, P. (1978) Family composition and married female employment: The case of Chile. Pp. 51-74 in G. Standing and G. Sheehan, eds., Labor Force Participation in Low-Income Countries. Geneva: International Labour Organization.

Piepmeier, K. P., and T. S. Adkins (1973) The status of women and fertility. Journal of Biosocial Science 5.

Pinelli, A. (1971) Female labor and fertility in relationship to contrasting social and economic conditions. Human Relations 24:603-610.

Pratt, L., and P. K. Whelpton (1956) Extra-familial participation of wives in relation to interest in and literacy of children, fertility planning and actual and desired family size. Milbank Memorial Fund Quarterly 34:44-78.

Quizon, E. K., and R. E. Evenson (1978) Time Allocation and Home Production in Philippine Rural Households. Paper presented at the conference of the International Center for Research on Women, Women in Poverty: What Do We Know?, Washington, D.C.

Ridley, J. C. (1968) Demographic change and the roles and status of women. Annals of the American Academy of Political and Social Science 375:15-25.

Rodgers, G. B. (1980) Female Labor Force Participation in Peru: An Analysis using the World Fertility Survey. World Employment Programme research working paper, restricted. International Labour Organization, Geneva.

Rodgers, G. B., M. J. D. Hopkins, and R. Wery (1978) Population, Employment and Inequality: BACHUE-Philippines. Farnborough: Saxon House for the International Labor Office.

Rosen, B. C., and A. B. Simmons (1971) Industrialization, family and fertility: A structural-psychological analysis of the Brazilian case. Demography 8:49-69.

Ross, S. (1974) The Effect of Economic Variables on the Timing and Spacing of Births. Ph.D. dissertation. Columbia University, New York.

Ryder, N. B., and C. F. Westoff (1971) Reproduction in the United States. Princeton, N.J.: Princeton University Press.

Safilios-Rothschild, C. (1972) The relationship between work commitment and fertility. International Journal of Sociology and the Family 2.

Safilios-Rothschild, C. (1978) The Demographic Consequences of the Changing Roles of Men and Women in the Eighties. Paper presented at the International Union for the Scientific Study of Population conference on Economic Demography, Helsinki.

Sahlins, M. (1974) Stone-Age Economics. London: Tavistock Publishers.

Salaff, J. W., and A. K. Wong (1977) Chinese women at work: Work commitment and fertility in the Asian setting. In S. Kupinsky, ed., The Fertility of Working Women: A Synthesis of International Reserach. New York: Praeger.

Shea, J. R., R. S. Spitz, F. A. Zeller, et al. (1970) Dual Careers: A Longitudinal Study of Labor Market Experience of Women. ITS Manpower Research Monograph No. 21. Washington, D.C.

Speare, A. S., M. Speare, and H.-S. Lin (1973) Urbanization, non-familial work, education and fertility in Taiwan. Population Studies 27:323-334.

Standing, G. (1978) Labour Force Participation and Development. Geneva: International Labour Organization.

Standing, G. (1980) Analyzing Women's Labor Force Activity with the WFS: Insights from Sri Lanka. World Employment Programme research working paper, restricted. International Labour Organization, Geneva.

Standing, G. (1981) Unemployment and Female Labour: A Study of Labour Supply in Kingston, Jamaica. London: Macmillan for the International Labor Office.

Standing, G., and G. Sheehan, eds. (1978) Labour Force Participation in Low-Income Countries. Geneva: International Labour Organization.

Stycos, J. M. (1965) Female employment and fertility in Lima, Peru. Milbank Memorial Fund Quarterly 43:42-54.

Stycos, J. M., and R. J. Weller (1967) Female working roles and fertility. Demography 4:210-217.

Suzman, R., K. A. Miller, and M. Charrad (1976) Employment effects of fertility control in Tunisia. In Recent Empirical Findings on Fertility: Korea, Nigeria, Tunisia, Venezuela, Philippines. Interdisciplinary Communications Programme, Monograph Series No. 7. Washington, D.C.: Smithsonian Institution.

Sweet, J. A. (1973) Women in the Labor Force. New York: Seminar Press.

Tien, H. Y. (1967) Mobility, non-familial activity and fertility. Demography 4:218-227.

Wabe, J. S. (1969) Labor force participation in the London metropolitan region. Journal of the Royal Statistical Society, Series A 32(Part 2):245-264.

Waite, L. J., and R. M. Stolzenberg (1976) Intended childbearing and labor force participation of young women: Insights from non-recursive models. Pp. 33-60 in L. E. Suter, L. J. Waite, and R. M. Stolzenberg, Birth Expectations and Working Plans of Young Women: Changes in Role Choices. PB-251. Washington, D.C.: Bureau of the Census.

Ware, H. (1977) Women's work and fertility in Africa. In S. Kupinsky, ed., The Fertility of Working Women: A Synthesis of International Research. New York: Praeger.

Weller, R. J. (1968) The employment of wives, dominance and fertility. Journal of Marriage and the Family 30:437-442.

Weller, R. J. (1977) Wife's employment and cumulative family size in the United States, 1970 and 1960. Demography 14:43-65.

Weller, R. J., and J. M. Sakoda (1970) A Longitudinal Study of Female Employment and Fertility in Puerto Rico: 1940-1960. Paper presented at the annual meeting of the International Union for the Scientific Study of Population, Mexico City.

Westoff, C. F., R. G. Potter, P. C. Sagi, and E. G. Mishler (1961) Family Growth in Metropolitan America. Princeton, N.J.: Princeton University Press.

Whelpton, P. K., A. A. Campbell, and J. E. Patterson (1966) Fertility and Family Planning in the United States. Princeton, N.J.: Princeton University Press.

Zarate, A. O. (1967) Differential fertility in Monterrey, Mexico: A prelude to transition? Milbank Memorial Fund Quarterly 45:213-229.

Chapter 17

WOMEN'S ROLES, OPPORTUNITY COSTS, AND FERTILITY

Christine Oppong

INTRODUCTION

The relationship between women's roles and fertility has become an increasing research and policy concern.[1] Numerous hypotheses, often focusing on the opportunity costs of childbearing and rearing, have been formulated linking these roles to fertility levels and desires, as well as to fertility regulation practices. The specific variables studied have included the rising market price of maternal time, the economic rewards and demands (including domestic labor) of children, the division of childcare among parents and kin, and conflicts between maternal and other roles.

This research has suffered generally from a lack of integration. Scholars from several disciplines have used different concepts, types of data, and methodologies, generating a need for synthesizing conceptual frameworks and approaches (see Burch, 1980; Mauldin and Berelson, 1979; Tabah, 1979). This need for cross-culturally applicable techniques has been intensified by the growing body of data gathered over the past decade by scholars in the area of women's studies.[2] The need is also apparent in view of the wide variations across cultures in women's roles and associated opportunity costs.[3] This complexity is further intensified by ongoing changes in distribution of wealth, division of labor, patterns of consumption, and so on,[4] as well as legal, political, and cultural changes.[5]

The present paper offers a conceptual framework that can be used to integrate data on women's roles. In particular, it indicates how the concepts of role theory (Biddle, 1979) can be incorporated into models seeking to explain the opportunity costs of childcare; here a recent synthesis by Turchi and Bryant (1979) proves useful. First, a basic conceptual framework is presented and its major components--women's roles and the opportunity costs of children--defined. Next, these components are discussed in further detail. This is followed by an examination of potential conflicts between women's roles, the relationship of these conflicts to the opportunity costs of childrearing, and the implications for fertility desires and behavior. Finally, some suggestions for further research are given.

CONCEPTUAL FRAMEWORK

A conceptual framework for integrating cross-cultural data on women's roles and demographic change, including fertility and its regulation, has recently been developed (Oppong, 1980). This framework divides women's roles into seven categories: maternal, conjugal, domestic, occupational, kin, community, and individual. The last includes relationships with friends and peers, as well as the "self-actualizing" activities associated with modernization and affluence. These roles involve various behaviors and expectations. Role behaviors include the acquisition and allocation of resources (time, knowledge, and money and material goods); the exercise of power and decision making; and the conduct of relationships with others. Role expectations include prescriptions (norms, and rules and law); values (preferences and assessments); and perceptions (descriptions and beliefs, and representations). From these categories, a simple matrix can be developed to classify various types of data (Oppong and Church, 1981), and subsequently to test hypotheses and build models addressing the relationship between women's roles and fertility (see Oppong and Abu, forthcoming).

The other primary component of the conceptual framework is the opportunity costs of children. Microeconomic theory has defined three main factors as the critical determinants of the demand for children: (1) the perceived value of children; (2) the relative time and material resources available; and (3) the perceived opportunity costs of children. The opportunity costs include the time spent by parents and others in caring for children and the value of market goods and services used in childrearing. Like other kinds of costs, these may be viewed according to alternative expenditures and activities foregone. Perceived increases in these foregone alternatives are given as major reasons in many cultural contexts for decreasing family-size desires.

Economic theories of fertility have usually assumed that childrearing time is largely provided by mothers; thus the cost of their time is a central variable in many such models. Women's other roles have seldom been addressed. The main choice or tradeoff has been assumed to be between occupational and parental activities. As Mueller (1982) has pointed out, little attention is paid in such models to the possibility that time for other housework and leisure may be curtailed to make room for childcare, or, for that matter, the reverse. Because the value of the mother's time is thought of as determined by her income-earning potential, past analyses have usually estimated the opportunity cost of a woman's time on the basis of her education and possibly years of labor market experience; sometimes occupation, location, and other variables such as household composition and therefore substitute childcare have been considered. The use of educational level as a proxy for opportunity cost has unfortunately been the basis for analyses in the developing world, where such assumptions do not necessarily apply (e.g., Snyder, 1974). Some of the shortcomings of these analyses have recently been

emphasized (e.g., Oppong, 1982a). Given the wide degree of cross-cultural variability in the opportunity costs of childrearing, these costs need to be delineated with much greater attention to their complexity than has been the case in the past. Figure 1 represents the interrelationships between women's roles and the time and material inputs to childrearing, and how these determine the opportunity costs of children. These two primary determinants are in turn influenced by expectations, which vary widely, both historically and cross-culturally.[6] Tables 1 and 2 list some of these expectations.

As Figure 1 and Tables 1 and 2 indicate, a number of factors affect the time parents spend in childrearing. These include norms, values, and beliefs regarding childrearing (parental role expectations); the value placed by parents on the time they spend with their children; the amount of time spent by kin or others; and the costs of childcare services. The amount of time spent in maternal activities will also be affected by alternative role expectations; it has been argued that the degree of availability of such alternate activities, which tends to increase with modernization, will determine the priority given to childrearing time (see Turchi and Bryant, 1979). Thus the development of opportunity costs has been linked to the changing roles and role rewards of women, in particular to an increase in valued alternative activities, including involvement with the larger society in the occupational, community, and individual roles. Frequently, this point of view has assumed that maternal and other roles are incompatible. Changes in women's role priorities, expectations, and opportunities are viewed as bringing about various changes in the costs and benefits of children.

The following sections examine in greater detail the primary components of the conceptual framework. First, the rewards associated with women's various roles, maternal and nonmaternal, are addressed. This is followed by a discussion of the opportunity costs--in material goods and time--of childrearing. Next is an examination of the potential conflicts between women's roles. Throughout these sections, a number of hypotheses are presented, along with related evidence; these hypotheses focus on the potential fertility effects of the various components of the framework.

REWARDS OF MATERNAL AND ALTERNATE ROLES

Any role will have certain associated potential rewards. Essentially, these include satisfaction, security, and support in the form of material resources (economic rewards), influence and power (political rewards), prestige and approval (social rewards), and emotional benefits (psychic rewards). These various rewards have been associated with fertility expectations and behavior (e.g., Fawcett, 1977; Hoffman, 1973) and are discussed below, first for the maternal role, and then for women's alternative roles.

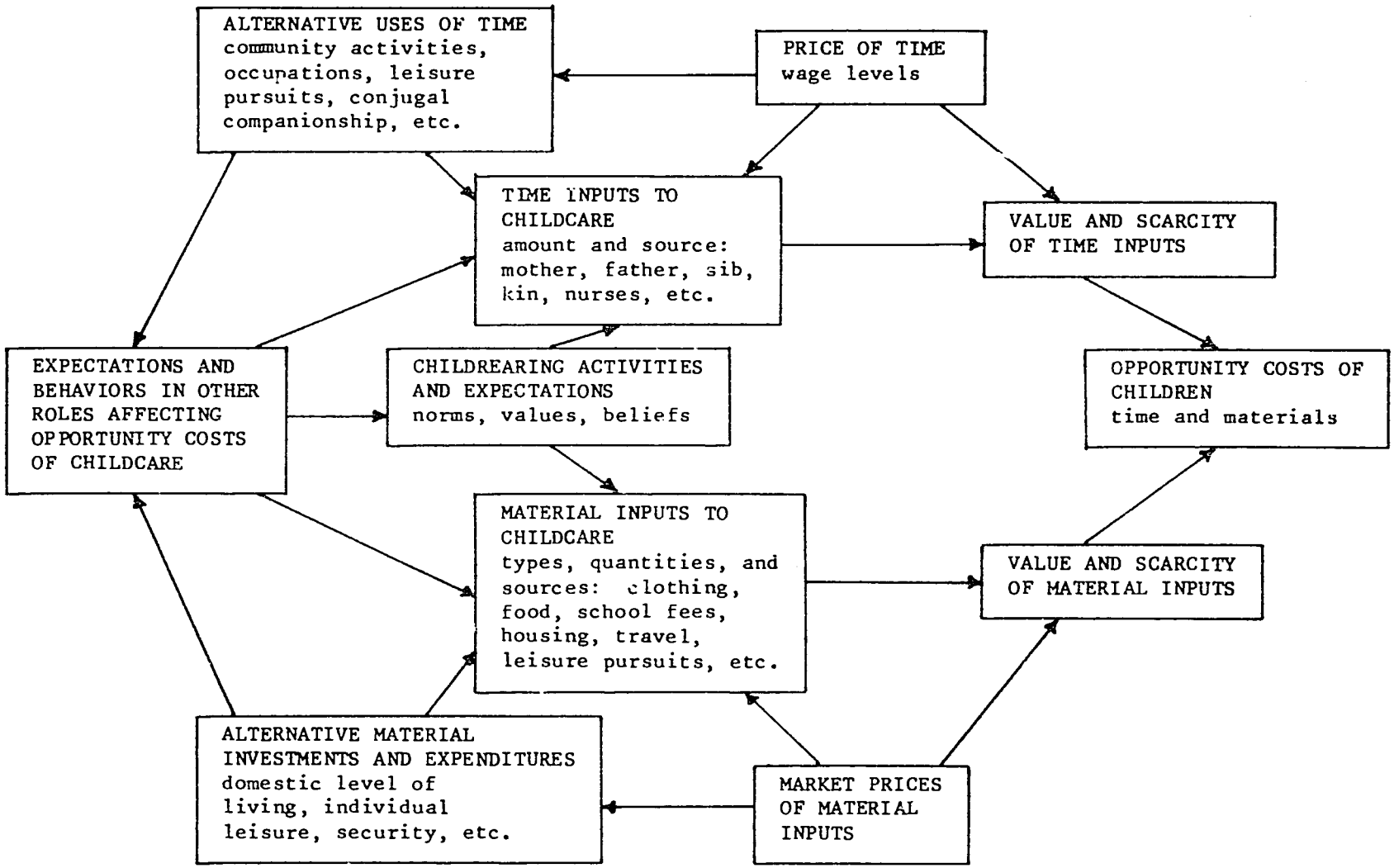

FIGURE 1 Parental Role Expectations and Behavior and the Opportunity Costs of Childcare

Source: Adapted from Turchi and Bryant (1979:22).

TABLE 1 Expectations Affecting Opportunity Costs of Children: Time and Material Inputs

Topic	Focus of Norms or Prescriptions	Focus of Values or Preferences	Focus of Beliefs or Perceptions
Time Inputs			
Maternal care	Proper amount of time biological mother should spend with child at each development stage	Evaluation of maternal care	Importance of Maternal care
Paternal care	Proper amount of time biological father should spend with child	Evaluation of paternal care	Importance of paternal care
Fostering	Circumstances, if any, under which fostering is prescribed	Approval of fostering	Effects of fostering
Childcare by siblings, kin, or maids	Circumstances, if any, under which siblings, kin, or maids are expected to care for children	Relative preference for care by siblings, kin, or maids	Efficacy of siblings, kin, or maids as child-minders
Institutional childcare	Conditions, if any, under which creches and kindergartens are thought to be proper substitutes	Degree of preference for creches and kindergartens for childcare	Effects of the care given in creches and kindergartens
Material Inputs			
Resources	Quantities and types of food, clothing, house space, leisure, travel, schooling, toys, etc. appropriate for girls and boys at each development stage	Preference for different qualities and types of these material goods for girls or boys of each age group	Importance of these resources for child development
Responsibility for providing resources	Allocation of responsibility for providing resources and facilities among biological mother, father, kin, community, state, etc.	Preferences regarding allocation of responsibility	Effects on children of different ways of allocating responsibility

TABLE 2 Women's Role Expectations and Resources Affecting Opportunity Costs of Children

	Expectations			Resources		
Role	Norms or Prescriptions	Values or Preferences	Beliefs or Perceptions	Time	Personal Resources	Group Resources
Conjugal	Extent to which conjugal bond should be companionate; amount of time, money, and space spouses should have for themselves alone	Preferences for conjugal intimacy, privacy, and leisure without children	Perceptions about conjugal privacy and intimacy	Time spent on conjugal activity (leisure, companionship, etc.) incompatible with childcare	Communication skill; a spouse oriented toward the value of conjugal interaction	Opportunities for privacy, free time, intimacy without children
Domestic	Amount of domestic living space, privacy, and facilities individuals should enjoy	Preferences for allocation of domestic space and resources	Perceptions about people with different domestic living styles	Time spent on home maintenance; provision of services; privacy	Resources available for improving level of domestic living	Availability of goods and services desired
Occupational	Whether mothers ought to work away from home; extent to which work and childcare should be segregated	Women's preferences for work that is incompatible with childcare	Perceptions about working mothers and their ability to fulfill demands of both roles	Hours spent on work incompatible with childcare	Education, skill, training, job experience, potential income level	Job opportunities, wages available
Community	Extent to which women should participate in community activities from which children are excluded	Preferences for community activities from which children are excluded	Perceptions about women who participate in community activities	Expenditure of time on community activities incompatible with childcare	Resources spent on community activities incompatible with childcare	Community activities, organizations
Individual	Extent to which women should interact with friends and seek self-development and recreation in all-adult company	Preferences about women's education, leisure activities, self-development, especially when incompatible with childcare	Perceptions about women who are educated, mix with nonkin, participate in leisure activities without children	Time spent on self-development, activities without children	Education, leisure, skills, hobbies	Opportunities available for leisure activities, nonkin relationships, etc.

The Maternal Role

Economic Rewards

The material rewards of the maternal role, including labor, income, financial security, housing, and maintenance, are often hypothesized to affect maternal role commitment, the relative priority assigned to this role, numbers of children produced, and lack of incentives for fertility regulation (e.g., Bulatao, 1982). A growing body of evidence illustrates the extent to which women in different cultures and time periods rely upon the support of their own and other people's children in fulfilling their critical productive and distributive roles in the home, farm, and market. This support is a strong incentive for high fertility in traditional subsistence societies, particularly in those areas of the world where women play important productive and income-generating roles, such as West Africa (e.g., Caldwell, 1977a, 1977b; Schildkrout, 1981) and India (Gulati, 1980).

The consideration of children's household as well as farm labor has led to a significant upward revision of the estimated magnitude of this effect (compare Mueller, 1976, with Nag et al., 1978). Globally, child labor is currently estimated to be extremely widespread, and international data are seen as chronically understating the numbers of children and hours involved (Rodgers and Standing, 1981b). Time-budget studies are beginning to demonstrate graphically the extent to which child labor provides a valuable substitute for adult time, enabling parents, kin, and others to undertake alternative activities, and thus affecting perceptions of the value of children (see, e.g., Badran, 1974; Bulatao, 1975; Buripakdi, 1977; Cain, 1977; Din, 1977a; Khuda 1977, 1980; Mamdani, 1972; Nag et al., 1978; White, 1976).

Children may also be critical to women's enjoyment of conjugal support from husbands and affines that may depend upon childbearing. Offspring may be the only source of financial support in old age in societies without such benefits as pension schemes and social security systems, where there may also be little possibility of support from other kin or affines in the absence of adult children. In such societies, residence with an adult child may be the norm in postproductive years (e.g., Ware, 1978; Din, 1977b; Nag et al., 1978).

A number of hypotheses relate the economic rewards of the maternal role to other women's roles. These relate generally to pronatalist pressures in societies where spouses, domestic groups, and kin groups cooperate in subsistence production and maintenance, and in which children are an important labor source for older family members. These hypotheses are listed below, followed by a review of the related empirical evidence.

<u>Proposition 1</u> Occupational role rewards. As long as older children provide valued labor in income-generating enterprises, such as agriculture, trade, and craft production, the desire for more children will be enhanced.

Proposition 2 Domestic role rewards. (a) As long as older children provide valued domestic services, women as housewives will want more children, particularly when household labor is arduous and time-consuming. (b) As long as children and grandchildren provide an important source of future economic rewards and security, incentives to regulate fertility will be diminished.

Proposition 3 Conjugal role rewards. In societies where marriage is primarily concerned with procreation and production, and rewards are perceived as accruing from children, women as wives will want many children, and there will be little or no incentive to regulate fertility. Examples of such rewards include husbands' and affines' provision of maintenance (food, shelter, land, income, inheritance) to the mothers of their children, even after divorce or widowhood, and the fruits of enterprises the children have helped the father to set up and run.

Proposition 4 Kin role rewards. In societies where kin groups are involved in labor-intensive production, pronatalist pressures will be exerted upon female members, who will benefit from the expansion and improved economic viability of the group.

These hypotheses are supported by a strong body of empirical evidence. Cross-national analysis of data from fifty countries has suggested that child labor in household production is positively associated with high fertility (Kasarda, 1971). Cross-national analyses have related changing perceptions of the costs and values of children, themselves correlated with fertility variables, to actual changes in the patterns of child labor (Bulatao, 1982). Youssef (1982) has recently reemphasized the potential linkages between women's domestic work loads and childbearing, and the need for more research in this regard, since much of the productive work of women in the developing world is in informal and domestic settings. Other cross-national analyses have attempted to support the hypothesis that the presence or absence of sources of old age security other than children, including pensions, is related to fertility levels (Hohm, 1975; Entwistle, 1980).[7] Single-country studies providing supportive evidence include Caldwell (1967, 1977a) for Ghana and Nigeria; Cain (1977) for Bangladesh; Nag et al. (1978) for Java and Nepal; DaVanzo (1972) for Chile; Din (1977b) for Sudan; and McSweeney (1979) for Upper Volta. Ho's (1979) time-budget study for the Philippines has shown how childbearing may be considered a profitable investment for rural families engaged in home-based income generation.

Political Rewards

It has been suggested that the relative power and influence enjoyed by women as mothers is relevant to their childbearing preferences and perceptions (Safilios-Rothschild, 1982). A woman's children and grandchildren and their spouses may be the only people over whom she

has influence and control, both in their labor activities and in their marriage and reproductive decisions. A woman may have to bear children for her husband, her affines, or her husband's family or kin group to maintain her conjugal status, to have meaningful domestic and community roles, and to validate her role as sister or daughter. Indeed, in some societies, if she bears no child, she may be sent back to her parental home, the wedding payments stopped, and refunds demanded. Moreover, particularly in situations of affinal tension in which a woman feels continually a stranger in her husband's house, her children may be her only secure allies.

The following hypothesis relates to women's political rewards as mothers:

Proposition 5 In societies so structured that women perceive power and influence as accruing to the maternal role, they will want many children, and there will be little incentive to regulate fertility other than for purposes of mother and infant well-being.

Empirical evidence indicates the degree to which adult children and their spouses and children are often subjected to influence and control by mothers, grandmothers, and mothers-in-law. Srinivas (1977) and Sharma (1980), for example, provide evidence of the influence of older female relatives in India, although they do not provide a quantitative link with fertility (see also Beckman, in these volumes).

Social Rewards

Ethnographic accounts of motherhood in many different cultures have shown that mothers are generally awarded much higher social status than childless women. Childbirth frequently validates their marital status; strengthens affinal and kin ties; confers adult community status, often symbolized by ornaments, dress, or deferential modes of address; and alters seniority within the domestic group (e.g., Fortes, 1974). The transition to motherhood may be the vital sign of socially acceptable adulthood without which a female is considered juvenile or deviant. Such perceptions persist in the developed world, where childlessness has only recently begun to lose its stigma (Robinson, 1977). Moreover, there may be pressure to perpetuate and continually renew the status of motherhood.

The following hypothesis relates to the social rewards conferred by motherhood:

Proposition 6 As long as women are rewarded by deference and prestige for being mothers, they will have an incentive for high fertility.

Evidence for this hypothesis is given in the Value of Children (VOC) studies (Bulatao, 1982).

Psychic Rewards

It has been observed that the mother/child bond is the most solid and emotionally binding in a number of cultures. This observation leads to the following hypothesis:

Proposition 7 Women will tend to prefer high fertility in contexts in which the maternal/child bond is their most emotionally gratifying tie.

Rewarding interactions--companionship and love--are listed among satisfactions in the VOC studies (Bulatao, 1982). Further research is needed to explore the links between various aspects of maternal status and fertility.

Alternative Role Rewards

The preceding sections have identified a number of rewards of the maternal role that encourage high fertility. However, alternatives to these rewards are provided by other roles. In fact, the availability of these alternatives has been seen as an essential defining feature of variation and change among societies (Hoffman, 1973).

For women to be able to choose between alternative activities, they must have opportunities for choice. This means they must have time available after satisfying basic and subsistence needs, as well as some freedom to select alternative courses of action and modes of consumption. All of these depend in turn upon the level of economic development and the kinds of social constraints imposed. In some cultural contexts, the roles of docile daughter, compliant wife, and dependent mother may be encouraged, supported by myth and religious beliefs giving central priority to the maternal and domestic roles (e.g., Chowdhury, 1980, on Bangladesh; and Turchi and Bryant, 1979, on many Muslim nations).

In such contexts, migration away from kin constraints has been noted as having a potentially liberalizing effect, making women feel freer to break from traditional sex role expectations. Similarly, an outcome of several political revolutions has been to sweep away the patriarchal traditions and constraints that hindered women's ability to achieve status through employment and political participation. Meanwhile, improved levels of income and education have also been associated with rising aspirations for improved domestic living, expensive consumer goods, and self-gratifying activities, all of which may effectively compete with childrearing costs for allocation of available income. These alternative rewards to those provided by the maternal role are discussed in the subsections below.

Economic Rewards

A phenomenon associated with modernization and industrialization is that women increasingly seek and find economic rewards in nondomestic activities. Instead of being unpaid family workers, increasing numbers of women become wage-earning employees. Although their income may remain far below that of men in their societies, this occupational role is an increasingly important source of economic rewards and status outside the family setting.

Political Rewards

In modernizing nations, women have achieved civic and community rewards similar to those of men, including franchise, political rights, and community offices. In addition, employment outside the home provides opportunities for wielding power and influence in a range of nonfamilial contexts. The expansion of women's role opportunities can also affect the allocation of parental and domestic responsibilities among spouses, leading to more equal relationships and decision making. A growing body of evidence indicates that with increasing sexual equality in education, employment, and income, there is a shift to greater equality in the division of domestic labor. This evidence comes from various countries (e.g., Strzeminska, 1972; Stafford and Duncan, 1979; Oppong, 1982b), although time budget evidence still indicates that women bear the major burdens (Szalai et al., 1972).

Social and Psychic Rewards

Among the laboring poor who comprise most of the women of the developing countries, little time is available for personal pleasure, recreation, and rest after the demands of work and family have been satisfied. Indeed, recent time budget studies have documented the extent to which women spend more of their time in toil than men. Social pleasures are mainly experienced with children and kin, as babies are cared for, home-based tasks accomplished, and family and community rituals performed. In contrast to this family focus, a critical aspect of modernization is the increased importance of the individual role, fostered by education, mobility, and diverse contacts. Opportunities for individual development are characteristic of modern societies, as is personal competence in activities unrelated to familial concerns and childraising (e.g., Turchi and Bryant, 1979:61). In modern industrial and postindustrial societies, there is a strong emphasis on the individual's right to self-actualization through recreation, leisure, and pleasure (Jancar, 1978:210; Yankelovitch, 1981). At the societal level, the working week is shortened, providing the individual with more disposable time for self-expression and personal enjoyment (Robinson, 1977:161-162); studies of social relationships have noted the substitution of

friendship for kin ties (Robinson, 1977:170). This applies to females as well as males, and stands in marked contrast to an earlier era in the same countries when work and family values were stressed and sanctioned.

Leisure time use is noted to increase with education. The educated are described as gaining more satisfaction from these activities (e.g., Robinson, 1977:118), and as engaging in more social transactions with friends and neighbors than the uneducated, who have most frequent ties with kin (Robinson, 1977:143). In numerous contexts, both urban and rural, women have been shown to enjoy less time for individual recreation and development and community participation (Szalai et al., 1972; Szalai, 1975; Zeidenstein, 1979); however, time budget data from Europe and North America have indicated that, as women reach higher levels of education, there are significant shifts towards parity in leisure spending, access to the mass media, and so on (Strzeminska, 1972; Stafford and Duncan, 1979).

Hypotheses treating the expansion or extension of women's roles are generally based on a relationship between increased time spent on nondomestic and nonfamilial activities and decreasing fertility (see, e.g.. Chowdhury, 1978; Giele, 1977:24, Goldberg, 1957, 1974; Ibrahim, 1968; Marshall, 1972; Mukherjee, 1975; Newland, 1977; Shahani, 1974; Syed, 1978; Youssef, 1978). This role expansion is in turn associated with economic development and higher standards of living. Comparisons of agricultural, industrial, and postindustrial societies have in fact shown that increases in education and political involvement are accompanied by decreasing birth rates (see Oppong and Haavio Mannila, 1979). Several specific hypotheses may be formulated:

Proposition 8 As women's opportunities for economic, political, social, and psychic rewards from roles outside the home expand, fertility desires will be lowered to accomodate new and conflicting ambitions; women will regulate their fertility accordingly if they have the resources and power to do so.

Proposition 9 The availability of alternative role rewards will tend to weaken the constraints of spouse, affines, and kin, freeing the woman to choose these alternatives.

Proposition 10 These alternative rewards will also tend to change the sharing of costs and tasks by husband and wife. Taking a relatively greater share of parenting may in turn lower the husband's family-size desires.

Proposition 11 When women receive little emotional satisfaction from marriage, they will seek it more frequently in motherhood; conversely, egalitarian, companionate marriage relationships may lead to lower family-size desires.

Such hypotheses linking participation in nondomestic activities and greater conjugal equality and companionship with lower fertility desires and increased levels of family planning have been the subject

of a number of studies in developed countries (Pratt and Whelpton, 1956; Coombs and Freedman, 1979; Tickamyer, 1979; Wu, 1977; Turchi and Bryant, 1979; Smith and Scholer, 1978). In the VOC studies, two types of opportunity costs have been identified as disvalues linked with reduced fertility demands: restrictions on parents who are tied down, and costs to social relationships, including marriage. Indeed, such costs were found to be more significant than those related to work restrictions, although their importance varied among different cultural contexts (Bulatao, 1982). Being tied down was found to be an important factor for about 10 percent of the wives in Malaysia, the Philippines, and Indonesia; this figure ranged from 40 to 80 percent in the countries of Western Europe and the United States for which data were analyzed (see Hoffman, 1975). Based on these data, an association between these opportunity costs and lower fertility was hypothesized.

One aspect of impatience with being tied down by children is a desire that grows with developmentfor other kinds of goods and services (Bulatao, 1982). Indeed, a number of studies have been able to reveal significant correlations between consumption aspirations and their achievement and lower fertility. Using data from Taiwan, Freedman (1975) showed ownership of modern consumer goods and use of recreational facilities such as cinemas, restaurants, and travel to be related to lower ideal family size and more frequent use of contraception, with education and income controlled. Similar observations were made in a recent Egyptian study by Loza-Soliman (1981).

Bulatao (1982) has argued that, beyond these desires for goods and recreation, a sense of being restricted by children may relate to a basic change in outlook--the developing sense that one should be able to set one's own goals and have the freedom to pursue them. Using regression analysis, he produces supportive statistical evidence. Female employment is seen to significantly increase such feelings of restriction; the effect of education is also positive, indicating that it may help develop higher aspirations.

Studies from Europe support these findings (Aries, 1980; Steiner, 1977; Hawthorn, 1980; Schmid and Hohn, 1981); similar trends have been noted in Australia (McDonald, 1981). A number of ethnographic accounts of urban educated women in countries of the developing world show how changes in role priorities and expectations are taking place; how increasing emphasis upon pursuit of personal security, comfort, leisure and recreation, and gratification are associated with the postponement of marriage, the delay of births, the termination of conceptions, and the rejection of traditional pronatalist norms (Dinan, in press; Oppong and Abu, forthcoming).

Empirical studies have also addressed changes in the conjugal bond. There is evidence that, in the more egalitarian marriages associated with modernization, intimacy and togetherness are more highly valued (e.g., Palsi, 1977). In such contexts, higher fertility may be viewed as costing too much in lost conjugal leisure and togetherness. A number of studies have indeed found correlations between the companionate nature of marriage and desired and actual

family size. In some cases, these features have been linked with the similarity of spouses' roles in the external domain (Bagozzi and Van Loo, 1980; Erickson et al., 1979; Fox, 1977; Howell, 1979; Oppong, 1977a; Rainwater, 1965; Rosen and Simmons, 1971; Scanzoni, 1975, 1976a, 1976b; Scanzoni and Szinovacz, 1980; Tobin, 1976).

OPPORTUNITY COSTS OF CHILDREARING

As was noted above, the opportunity costs of childrearing include inputs of both money and material goods, and time. These inputs, their dimensions, sources, and quality, are among the primary components of the framework presented earlier, and are critical variables affecting how women's various roles, and the potential conflicts between them, are perceived.

Material Inputs

Two general points need to be made about the material inputs to childcare.

One is that assumptions about the universal "breadwinning" function of the father, used in many previous models, are demonstrably untenable. A growing body of data indicates the extent to which women who are alone in female-headed households support their children; mothers in conjugal family households share financial responsibility for the children; and nonparental kin provide support. Thus the sources of material support must be identified and documented.

The second point is that rising maternal aspirations for the quality of children's material resources, as well as increasing costs of those resources, will often accompany modernization. Although there are few empirical data on material childrearing costs in preindustrial societies, these costs are generally assumed to be low: breastfeeding on demand is assumed to occur simultaneously with other activities; children, after weaning, consume food similar to that of adults, have minimal possessions and clothing, and do not go to school. However, with modernization come new opportunities and pressures for schooling, special foods, clothing, toys, and so on that cause childrearing costs to rise steeply. Moreover, technological development creates a demand for more highly trained workers, adding to pressures for increased education.

A number of hypotheses can be formulated relating these changes to fertility desires and practices. In general, these hypotheses relate to a potential role conflict arising from perceived inadequacies in material resources.

Proposition 12 As long as childrearing costs are perceived to be low in relation to available resources, financial and role conflicts will not create a pressure to regulate fertility.

12.1. Aspirations for higher-quality childcare and changing educational and occupational opportunities will cause mothers

perceiving resource constraints to demand fewer children.

12.2. As long as the material costs of childrearing are borne by others, so that children are not perceived as using up material resources mothers would prefer to allocate to other role activities, financial strain will not lead women to decide to limit fertility. Perceptions about material inputs to childcare are therefore likely to be affected by current norms, values, and beliefs regarding the parts played by fathers, kin, and the community or state in child maintenance, as well as the actual amounts of material assistance forthcoming from these other sources.

These impacts of finite resources on fertility desires and practices have been well documented by the cross-cultural VOC studies (e.g., Arnold and Fawcett, 1975; Fawcett, 1977; Bulatao, 1975, 1982). Attempts have also been made to assess the potential impacts on fertility of state population policies designed to absorb some of the child costs normally borne by parents in order to increase family-size desires (e.g., Bodrova, 1976).

However, a shift is noted from a concern with material constraints to greater emphasis on time constraints and costs. As Lindert (in these volumes) has pointed out, this shift in focus is related to the relative prices of time and commodity inputs during the course of economic development--the shift to time-intensive children and the rise in the price of human time. These time costs are discussed below.

Role Substitutability: Sharing and Delegation of Childcare: Time Inputs

An assumption falsely made in a number of studies of the opportunity costs of childrearing is that time costs are born by mothers alone.[8] In actual fact, one of the most pervasive findings from historical and cross-cultural evidence on socialization is the extent to which children have traditionally been cared for by siblings, grandparents, and other kin, sometimes being fostered in houses of nonparental kin.[9] In only a few of the world's cultures have mothers and their small children been found to live alone (D'Andrade, 1966). Historical North American and European data show that full-time motherhood and domesticity were not ancient or premodern patterns (e.g., Hareven, 1976; Stone, 1977). Moreover, time-budget studies have illustrated in detail how much of the care of infants and young children may be undertaken by children seven or older (e.g., King, 1976; Boulier, 1976; Khuda, 1980).

Exclusive mother-care is increasingly recognized by demographers and economists to be a modern North American and European phenomenon (e.g., Ware, 1981:81, 100). Thus Lindert (in these volumes.note 4) has noted the tendency for a greater and greater share of childcare time to be borne by the mother and the school as development proceeds. In modernizing countries highly differentiated by socioeconomic status, it may be only a portion of the affluent and educated middle class who consciously devote a noticeable amount of

their time specifically to childcare (e.g., Din, 1977a, 1977b; Caldwell, in these volumes; Oppong and Abu, forthcoming). Indeed, the mothering process itself is observed to change as women are educated and have enhanced feelings of personal responsibility (e.g., Caldwell, 1979), and as subtle psychological changes occur in the way the mother-child relationship is perceived (LeVine, 1980). This development may lead to women feeling trapped by baby care and domesticity (Gavron, 1966; Friedan, 1963). Thus the patterns of role activities and expectations now current in Europe and North America of individualized, personal maternal care, with the husband as the main assistant, cannot be used in models of mothering in the rest of the world (Robinson, 1977). Significantly, it is in settings in which mothers have more opportunities for materially rewarding alternate activities such as wage and salaried employment that cultural norms also stress the importance of the use of the mother's own time in childrearing (Kupinsky, 1977).

A relevant consideration here is the changing kin role, in particular with regard to time inputs into childcare--the decreasing availability of kin to share women's maternal responsibilities, partly because of their migration and dispersal, partly because of the increased market price of their time. Therefore, a current crisis for many women is the increasing lack of maternal role surrogates (Oppong, 1977b).

There is thus evidence of two important kinds of changes taking place as populations become more socially and spatially mobile: decreasing opportunities for delegation of childcare by women, and increasing expectations of personal maternal care of infants and young children--normative pressures, as well as individual preferences and changing perceptions about the value and necessity of personal maternal care.[10] Several hypotheses related to these factors and their effect on fertility can be formulated.

Proposition 13 As long as childcare delegation is feasible and acceptable (i.e., child minders are available, are considered adequate, and are not too costly in money, status loss, disapprobation, etc.), women will not decide to limit their fertility because of the time constraints of childcare.

13.1. Perceptions of the feasibility of childcare delegation will be affected by current norms, values, and beliefs regarding fostering, nursemaids, care by siblings, etc.; actual availability of kin and others to care for children; and the financial and other costs of such care.

13.2. Actual availability of alternative childcare will depend upon such factors as the degree of flexibility in allocating parental tasks within the conjugal relationship; the physical proximity of kin; and the availability of community and neighborhood facilities for childcare.

A number of works have addressed the potential effects of the costs of parenting being concentrated among couples and individual parents (e.g., Davis, 1955:34-36; Freedman, 1963; Petersen, 1961:54;

Ryder, '959:427). Thus, for example, Leibenstein (1977) has noted that, in contexts where childrearing costs in time and money are not borne by parents, there will be less desire to limit fertility. Support for this observation is provided by several sets of data from Ghana (Oppong, forthcoming). It is therefore a relevant policy consideration to identify the extent of "free riding," who bears such costs and who does not. In this connection, it may be noted that evidence on the effects of availability of public childcare facilities is difficult to separate from that on the effects of other programs that are part of pronatalist government policy interventions (Federici, 1981).

ROLE CONFLICT AND INCOMPATIBILITY

As noted above, most discussions of women's various roles assume some degree of incompatibility between those roles. However, it is important to add that such incompatibility is intimately related to the way in which the costs of childrearing in both money and time are distributed. Role conflict is diminished by the sharing of these costs, and will depend on the extent to which choices must be made in the allocation of resources to different roles. Conflicts do not arise when activities can be done simultaneously, or when childcare can be delegated at reasonable cost to prevent the conflict from arising.

Perhaps the single most decisive influence on fertility-related expectations and behaviors has been the employment of women away from the home. Where this separation of income generation and productive work from the familial roles has not occurred, role conflicts between the maternal and occupational roles are not apparent (Oakley, 1976, 1980; Standing, in these volumes). In these contexts, moreover, children often make an important economic contribution as well, which further promotes fertility (see, e.g., Youssef, 1982; Caldwell, in these volumes).

However, more than away-from-home employment is involved in women's potential role conflicts. Also important is the extent to which the world of children and that of adult decision making, leisure, recreation, and companionship are separated. For example, in industrial countries there are widespread taboos on breastfeeding in public, as well as on the appearance of children in many community decision-making and recreational places. In the developing world, in contrast, children are prominent at virtually all gatherings; moreover, kin are neighbors, household members, and often workmates, providing continuous opportunities for childcare delegation and greater role integration generally.

The following hypothesis summarizes the potential conflict between the maternal and other roles:

<u>Proposition 14</u> So long as mothers and other caretakers of babies and small children have full access to all community and recreational activities, as well as companionship and self-development, there will

be little or no conflict between the maternal and community and individual roles to exert pressure for fertility regulation. Conversely, as soon as childbearing and childcare become incompatible with other roles that provide valued rewards (including pleasure, money, goods, power, and prestige), there will be pressure and motivation to regulate fertility.

RESEARCH NEEDS

This section suggests some areas of needed further research toward an understanding of the relationships between women's roles, the opportunity costs of childrearing, and fertility. These research areas include time use, role expectations, focused biographies, and familial roles at the micro level.

Time Use

Recording the allocation of time to activities associated with women's various roles through time-budget studies is an increasingly widespread part of ethnographic research in several disciplines (Birdsall, 1980). Such studies have been undertaken in both industrial and preindustrial contexts. Recent rigorous quantitative studies in this area include Berk and Berk (1979), Berk (1980), Hill and Juster (1980), Leibowitz (1972), McSweeney (1979), Popkin (1980), Quizon and Evenson (1978), and United Nations (1978). The time available to individuals is identical and finite; therefore, their allocation of time to different role activities, as well as changes in these allocation patterns in changing circumstances, helps define the kinds of choices that have to be made, and the values, constraints, and decision-making processes involved (Mueller, 1982). Analysis of data from Bangladesh (Cain et al., 1979), for example, has demonstrated clearly the advantages of the time-use approach, particularly in the developing nations, given their flexibility in categorizing work, measuring the work day, and documenting occupational multiplicity and seasonal variation in work-time inputs. These data disclose differences in income earning and home production by sex, class (land owned), and kinship status, as well as by the presence or absence of young children; they can therefore reveal both the time costs of childrearing and how these are allocated, as well as the labor benefits derived from children.

However, in spite of considerable work on time budgets, surprisingly little is known yet about cross-cultural differences in the time allocated by mothers and others to childcare (Birdsall et al., 1979:225) or to pregnancy and lactation (e.g., Ware, in press). Precise descriptions of these time allocations are needed to determine the extent of cross-cultural and intracultural differences. The same applies to women's other roles. Specifically, more data are needed on (a) the circumstances under which time devoted to each of the seven roles is elastic or static, and (b) the conditions under which

substitutes are found to spend time in any of the role activities (Mueller, 1982). More data are also needed on alternative activities for women, including different types of leisure, sport, travel, companionship, etc. Critical to such studies is the way time allocation changes with technological change, the impact of various policies, the introduction of new facilities, and so on (Birdsall et al., 1979:232-233). Some attempts have been made to collect comparative cross-country data on the allocation of time and energy to activities associated with different roles (Szalai et al., 1972). However, the need remains for more research and documentation in these areas, which should ideally be integrated with more systematic collection and analysis of wide-ranging ethnographic data.

Role Expectations

There is increasing awareness of the need for more precise definitions and measurement of role expectations--norms/laws, preferences/values, and perceptions/beliefs--including priorities among them and how they change (e.g., Turchi and Bryant, 1979:34; Safilios-Rothschild, 1978; Schmid and Hohn, 1981:169). It will obviously be necessary to draw upon the more theoretical work of sociologists and social psychologists (e.g., Biddle, 1979). This should in turn facilitate the gathering of data on variation and change in role expectations, independent of the changes in parenting and procreative behaviors for which an explanation is sought (Burch, 1981:461). Meanwhile, it is becoming increasingly obvious that such study of role expectations needs to be tied closely to the study of role behavior--time-budget and value studies--to document the process of resource allocation, as well as the effects of various constraints on decision making (e.g., Hill and Juster, 1980; Dow and Juster, 1980). In addition, more attention should be given to perceptions of the value and scarcity of time and material inputs into childrearing.

Focused Biographies

To further increase understanding of how women's various roles interact, conflict, or change, more detailed studies will be required using ethnographic methods of participant observation and focused interviewing. This will permit observation of variations and changes in the role profiles of women in different socioeconomic contexts. Specifically, there is a need to examine factors affecting parental role behaviors and expectations, as well as factors affecting changing role preferences and perceptions, including preferences for solitary or conjugal leisure pursuits, high standards of domestic furnishings and facilities, and individual occupational achievement.

Fortunately, there is a new awareness of the value of focused biographies (e.g., Bertaux, 1981). Recent work has stressed the usefulness of the life-cycle approach, exploring ways in which time may be expended in different roles at successive stages of life

(Bulatao and Fawcett, 1981). Meanwhile, Epstein (1982) has again emphasized the need for life-cycle approaches in studies of women and fertility change in the developing world.

Familial Roles

There is a continuing need for basic field research within the domestic domain that is unaffected by Western household models. Such research is of critical interest to those who must formulate policies and programs geared to changing women's roles and economic and demographic conditions. Especially needed are micro analyses of role change and adaptation consequent upon societal change, as well as changing reward, opportunity, and cost structures that affect fertility desires and costs (Cogswell and Sussman, 1974:19).

Numerous earlier case studies--focusing on the complex interrelationships between occupational and domestic roles, resource allocation, marital relationships and kin ties, and community and individual roles, and their effects on fertility desires--testify to the value of such an approach. Such studies have described in detail the rewards and costs of maternity. Rainwater's (1965) sociopsychological study of factors associated with family-size issues, including changing roles and perceived costs, is an example (see also Blake, 1961; Bleek, 1976; Gavron, 1966; Howell, 1979; Hamamsy, 1957).

Within the context of such ethnographic studies, more comparative data could usefully be collected on time use and individual life histories, and methods could be improved for the more precise measurement of role expectations and activities and their effects on fertility. Moreover, sociologists studying the family have done relatively little work on fertility in the developing world, and fertility researchers have as yet done little micro-level work on comparative family systems (Tien and Bean, 1974:3-4). This gap in the research has been increasingly recognized of late, as has the need to try to relate macro- and micro-level factors (Birdsall et al., 1979; Hauser, 1979:19; Miro and Potter, 1980; Miro, 1980). Some research is beginning to address this need. Current sociological studies are focusing on the rewards and costs of familial roles and relationships, as well as domestic decision making; based on social exchange theory, these studies show the way to probe the opportunity costs of childcare--who perceives them and who pays them (e.g., Scanzoni and Szinovacz, 1980; Nye, 1982). There have also been some recent attempts at empirical modeling of time use, preferences, and conflicts in domestic settings (e.g., Dow and Juster, 1980). Recent analyses referred to above have linked studies of familial roles and resources to individual opportunity costs and choices, to institutional change, and to class and cultural variations (e.g., Scanzoni's and Rainwater's work on United States couples, and recent work on various sets of Ghanaian data summarized in Oppong, forthcoming).

Bagozzi and Van Loo (1978, 1980) have recently tried to develop an interactionist model in which role expectations, social exchanges

between family members, and socioeconomic constraints and resources have a place. This model includes norms, sanctions, power, and conflict, and points to the need for increased concern with choice and decision-making processes. The need to understand how opportunity costs change is obviously critical, and requires an examination of the way role expectations are transformed, leading, for instance, to irresponsible parental activities or the regulation of reproduction. Another important issue is the contrasting expectations, activities, and resources of females and males in the fertility decision-making process.

CONCLUSION

Each social science discipline applies its own specialized terms and concepts to the study of fertility. The importance of integrating these approaches has recently been stressed (see Burch, 1980; Robinson and Harbison, 1980) and was the starting point for this paper. To address this need, a conceptual framework has been presented that integrates concepts of role theory with those of opportunity costs. A second central observation of this paper is that a number of old assumptions of earlier economic theory need to be revised or discarded. Instead, there is a need for the comparative perspectives and rich ethnographic data of social anthropology and the precise measurement and analytic techniques of family sociology in research on women's roles, in particular the maternal role and patterns of parenting. Thus the basic research needs emphasized in this paper have included the adoption of interdisciplinary approaches to women's roles, opportunity costs, and fertility, including the use of varied data sets and methods of collection and analysis.

NOTES

1. See, e.g., Anker et al. (1982), Alman (1978), Birdsall (1974, 1976), Dixon (1975, 1976a), Javillonar et al. (1979), Marshall (1972), Oppong and Haavio-Mannila (1979), Reining (1977), Safilios-Rothschild (1979, in press), and Piepmeier and Adkins (1973).
2. Some recent volumes in this field include Beere (1979), Boulding et al. (1976), Buvinic (1976), Buvinic and Youssef (1978), Friedl (1975), Giele and Smock (1977), Rosaldo and Lamphere (1974), Saffioti (1978), Safilios-Rothschild (1977), Schlegel (1977), Ware (1981), Whyte (1977), Youssef et al. (1979), and Zeidenstein (1979).
3. For examples of the rapidly growing and rich literature documenting the extent of diversity, contrast, and change in different areas undergoing modernization, see Beck and Keddie (1978) on the Muslim world, and Oppong (in press, a) on West Africa.

4. Historical works emphasizing the domestic impacts of colonization industrialization, urbanization, etc., include Cott (1977), Tilly and Scott (1978), and Etienne and Leacock (1980).
5. Examples of the impacts on women's roles of socialism and communism in Eastern Europe include Jancar (1978) and Scott (1974). Steiner (1977) is among those who have documented change in Western Europe, in particular the trend towards self-development and individualism, meanwhile indicating the subtle and profound differences among European cultures.
6. Examples of cross-cultural and historical works demonstrating variability and change in parental roles include Aries (1973), Banks (1954), Gulati (1980), Minturn and Lambert (1964), Oppong et al. (1978), Rodgers and Standing (1981a), Stone (1977), Stone (1972), and Whiting and Whiting (1975).
7. Given this important link between the economic contributions of children and fertility incentives, increasing attention has been focused on the impact on fertility of changes in this economic pattern. Caldwell's work on "wealth flows" provides an important treatment of this issue (1968, 1977a, 1977b, in these volumes).
8. For a case in point, see Ware (1977:27) regarding Snyder's misconceived West African study, in which women's education is used as an index of wages she will have to forego through child raising.
9. See, e.g., Barry and Paxton (1971), Goody (1978, 1982), Fortes (1949), Stack (1974), Oppong (1973, 1982a), and Etienne (1979).
10. Feminists have noted the normative impacts of the works of Bowlby on mother-care.

BIBLIOGRAPHY

Alman, J., ed. (1978) Women's Status and Fertility in the Muslim World. New York: Praeger Publishers.

Anker, R. M., M. Buvinic, and N. H. Youssef, eds. (1982) Interactions Between Women's Roles and Population Trends in the Third World. London: Croom Helm.

Aries, P. (1973) Centuries of Childhood, 3rd ed. Harmondsworth, Eng.: Penguin Books.

Aries, P. (1980) Two successive motivations for the declining birth rate in the West, notes and commentary. Population and Development Review 6:645-656.

Arnold, F., and J. T. Fawcett (1975) The Value of Children: Hawaii, Vol. 3. Honolulu: East-West Population Institute.

Badran, H. (1974) The costs of children: The decision to have a big family depends on the more or less conscious evaluation of the cost benefit ratio. Ceres 7:25-30.

Bagozzi, R. P., and M. F. Van Loo (1978) Towards a general theory of fertility: A causal modelling approach. Demography 15:301-320.

Bagozzi, R. P., and M. F. Van Loo (1980) Decision making and fertility. A theory of exchange in the family. In T. K. Burch, ed., Demographic Behavior: Interdisciplinary Perspectives on Decision Making. Boulder, Colo.: Westview Press.

Banks, J. A. (1954) Prosperity and Parenthood: A Study of Family Planning Among the Victorian Middle Class. London: Routledge.

Barry, H., and L. M. Paxton (1971) Infancy and early childhood: Cross cultural codes. Ethnology 2:466-508.

Beck, L., and N. Keddie, eds. (1978) Women in the Muslim World. Cambridge, Mass.: Harvard University Press.

Beere, C. A. (1979) Women and Women's Issues: A Handbook of Tests and Measures. San Francisco, Calif.: Jossey Bass Publications.

Berk, R. A., and S. F. Berk (1979) Labor and leisure at home. In Content and Organization of the Household Day, Vol. 87. Beverly Hills, Calif.: Sage Publications.

Berk, S. F., ed. (1980) Women and Household Labor. Beverly Hills, Calif.: Sage Publications.

Bertaux, D. (1981) Biography and Society: The Life History Approach in Social Sciences. Sage Studies in International Sociology 23. Beverly Hills, Calif.: Sage Publications.

Bhatia, S. J. (1979) Status of women and fertility in India. Journal of Family Welfare 25:20-32.

Biddle, B. J. (1979) Role Theory: Expectations, Identities and Behavior. New York: Academic Press.

Birdsall, N. (1974) An introduction to the social science literature on "woman's place" and fertility in the developing world. Annotated Bibliography, Vol. 2, No. 1. Washington, D.C.: Smithsonian Institution.

Birdsall, N. (1976) Women and population studies: A review essay. Signs Journal of Women in Culture and Society 1:699-712.

Birdsall, N. (1980) Measuring time use and nonmarket exchange. In W. P. Greevey, ed., Third World Poverty: New Strategies for Measuring Development Progress. Lexington, Mass.: Lexington Books.

Birdsall, N., J. Fei, S. Kuznets, G. Ranis, and T. P. Schultz (1979) Demography and development in the 1980s. In P. Hauser, ed., World Population and Development: Challenges and Prospects. Syracuse, N.Y.: Syracuse University Press.

Blake, J. (1961) Family Structure in Jamaica: The Social Context of Reproduction. Glencoe, Ill.: The Free Press.

Bleek, W. (1976) Sexual Relationships and Birth Control in Ghana. Amsterdam: Anthropological Sociological Center.

Bodrova, V. (1976) Population of the European Socialist Countries. Moscow: Statistika Publishers.

Boserup, E. (1970) Woman's Role in Economic Development. London: George Allen and Unwin.

Boulding, E., S. A. Nuss, D. L. Carson, and M. A. Greenstein (1976) Handbook of International Data on Women. New York: Wiley.

Boulier, B. L. (1976) Children and Household Economic Activity in Laguna, Philippines. Discussion Paper No. 76-19. Institute of Economic Development and Research, University of the Philippines, Manila.

Bulatao, R. A. (1975) The Value of Children: The Philippines, Vol. 2. Honolulu: East-West Population Institute.

Bulatao, R. A. (1981) Values and disvalues of children in successive childbearing decisions. Demography 18:1-26.

Bulatao, R. A. (1982) The transition in the value of children and the fertility transition. Pp. 95-122 in C. Hohn and B. Mackensen, eds., Determinants of Fertility Trends: Theories Re-examined. Liege: Ordina Editions.

Bulatao, R. A., and J. T. Fawcett (1981) Dynamic perspectives in the study of fertility decision-making: Successive decisions within a fertility career. International Population Conference, Manila 1981, Vol. 1. Liege: International Union for the Scientific Study of Population.

Burch, T. K. (1980) Decision-making themes in demography: An introduction. In Demographic Behaviour: Interdisciplinary Perspectives on Decision-Making. Boulder, Colo.: Westview Press.

Burch, T. K. (1981) Interactive decision-making in the determination of residence patterns and family relations. International Population Conference, Manila 1981, Vol. 1. Liege: International Union for the Scientific Study of Population.

Buripakdi, C. (1977) The Value of Children: Thailand, Vol. 4. Honolulu: East-West Population Institute.

Buvinic, M. (1976) Women and World Development: An Annotated Bibliography. Washington, D.C.: Overseas Development Council.

Buvinic, M., and N. H. Youssef (1978) Women-Headed Households: The Ignored Factor in Development Planning. Report to AID/WID Grant AID/OTR-1593. Unpublished mimeo. International Center for Research on Women, Washington, D.C.

Cain, M. T. (1977) The economic activities of children in a village in Bangladesh. Population and Development Review 3:201-227.

Cain, M. T., S. R. Khanam, and S. Nahar (1979) Class Patriarchy and the Structure of Women's Work in Rural Bangladesh. Center for Policy Studies Working Paper No. 43. Population Council, New York.

Caldwell, J. C. (1967) Fertility attitudes in three economically contrasting rural regions of Ghana. Economic Development and Cultural Change 15:217-238.

Caldwell, J. C. (1968) Population Growth and Family Change in Africa: The New Urban Elite in Ghana. New York: Humanities Press.

Caldwell, J. C. (1977a) The economic rationality of high fertility: An investigation illustrated with Nigerian survey data. Population Studies 31:5-27.

Caldwell, J. C., ed. (1977b) The Persistence of High Fertility: Population Prospects in the Third World. Changing African Family Series, Monograph No. 3. Canberra: Australian National University.

Caldwell, J. C. (1979) Education as a factor in mortality decline: An examination of Nigerian data. Population Studies 33:395-413.

Caldwell, J. C., A. K. M. Jalaluddin, P. Caldwell, and W. Cosford (1980) The Control of Activity in Bangladesh. Working Paper No. 12. Department of Demography, Australian National University, Canberra.

Chowdhury, R. H. (1978) Female status and fertility behaviour in a metropolitan urban area of Bangladesh. Population Studies 32:261-273.

Chowdhury, R. H. (1980) Female Status and Fertility Behavior in Bangladesh. Mimeo. UNESCO, Paris.

Chowdhury, R. H., and N. R. Ahmed (1980) Female Status in Bangladesh. Dacca: Bangladesh Institute of Development Studies.

Cogswell, B. E., and M. B. Sussman (1974) Changing roles of women. In H. Y. Tien and F. D. Bean, eds., Comparative Family and Fertility Research. Leiden: Brill.

Coombs, L. C., and R. Freedman (1979) Some roots of preference: Roles, activities and familial values. Demography 16:359-376.

Cott, N. F. (1977) The Bonds of Womanhood: Woman's Sphere in New England 1780-1835. New Haven, Conn.: Yale University Press.

D'Andrade, R. (1966) Sex differences and cultural institutions. In E. E. Maccoby, ed., The Development of Sex Differences. Stanford, Calif.: Stanford University Press.

DaVanzo, J. S. (1972) The Determinants of Family Formation in Chile 1960. Rand Corporation Report R-830-AID. Rand Corporation, Santa Monica, Calif.

Davis, K. (1955) Institutional patterns favoring high fertility in underdeveloped areas. Eugenics Quarterly 2:33-39.

Din, M. el A. el G. (1977a) The economic value of children in rural Sudan. Pp. 617-632 in J. Caldwell, ed., The Persistence of High Fertility. Canberra: Australian National University.

Din, M. el A. el G. (1977b) The rationality of high fertility in urban Sudan. Pp. 633-649 in J. Caldwell, ed., The Persistence of High Fertility. Canberra: Australian National University.

Dinan, C. (in press) Gold diggers and sugar daddies. In C. Oppong, ed., Female and Male in West Africa. London: George Allen and Unwin.

Dixon, R. B. (1975) Women's Rights and Fertility. Reports on Population Family Planning No. 17. New York: Population Council.

Dixon, R. B. (1976a) The roles of rural women: Female seclusion, economic production, and reproductive choice. In R. Ridker, ed., Population and Development: The Search for Selective Interventions. Baltimore, Md.: The Johns Hopkins University Press.

Dixon, R. B. (1976b) Measuring equality between the sexes. Journal of Social Issues 32:19-32.

Dow, G. K., and F. T. Juster (1980) Goods Satisfaction with Activities and Well Being: An Exploratory Analysis. ISR working paper. University of Michigan, Ann Arbor, Mich.

Entwistle, B. (1980) On the Relationship Between Pension Programmes and Fertility Levels. Paper presented at the annual meeting of the American Sociological Association, New York.

Epstein, S. (1982) A social anthropological approach to women's roles and status in developing countries: The domestic cycle. In R. Anker et al., eds., Interactions Between Women's Roles and Population Trends in the Third World. London: Croom Helm.

Erickson, J. A., W. L. Yancey, and E. P. Ericksen (1979) The division of family roles. Journal of Marriage and the Family 41:301-314.

Etienne, M. (1979) The case of social maternity: Adoption of children by urban Baule women. Dialectical Anthropology 4:237-242.

Etienne, M., and E. Leacock, eds. (1980) Women and Colonization: Anthropological Perspectives. New York: Praeger.

Fawcett, J. T., ed. (1973) Psychological Perspectives in Population. New York: Basic Books.

Fawcett, J. T. (1977) The value and cost of children: Converging theory and research. In L. T. Ruzicka, ed., The Economic and Social Supports for High Fertility. Canberra: Australian National University.

Fawcett, J. T., and M. H. Bornstein (1973) Modernization, individual modernity and fertility. Pp. 106-131 in J. T. Fawcett, ed., Psychological Perspectives in Population. New York: Basic Books.

Federici, N. (1981) Effects of social policies on women's roles and demographic consequences in developed countries. International Population Conference, Manila 1981, Vol. 3. Liege: International Union for the Scientific Study of Population.

Fortes, M. F. (1949) Time and social structure: An Ashanti case study. In M. F. Fortes, ed., Social Structure. Oxford, Eng.: Oxford University Press.

Fortes, M. F. (1974) The first born. Journal of Child Psychology and Psychiatry 15:81-104.

Fortes, M. F. (1978) Family marriage and fertility in West Africa. In C. Oppong et al., eds., Marriage, Fertility and Parenthood in West Africa. Canberra: Australian National University.

Fox, G. L. (1977) Sex role attitudes as predictors of contraceptive use among unnamed university students. Sex Roles 3:265-283.

Freedman, D. S. (1975) Consumption of modern goods and services and their relation to fertility: A study in Taiwan. Journal of Development Studies 12:95-117.

Freedman, R. (1963) Norms for family size in underdeveloped areas. Proceedings of the Royal Society 159:220-234.

Freedman, R. (1979) Theories of fertility decline: A reappraisal. In P. Hauser, ed., World Population and Development: Challenge and Prospects. Syracuse, N.Y.: Syracuse University Press.

Friedan, B. (1963) The Feminine Mystique. New York: W. W. Norton and Company, Inc.

Friedl, E. (1975) Women and Men: An Anthropologist's View. New York: Holt, Rinehart and Winston.

Gavron, H. (1966) The Captive Wife: Conflicts of Housebound Mothers. London: Routledge and Kegan Paul.

Giele, J. Z. (1977) Introduction: The status of women in comparative perspective. In J. Z. Giele and A. C. Smock, eds., Women: Roles Status in Eight Countries. New York: John Wiley and Sons.

Giele, J. Z., and A. C. Smock, eds. (1977) Women: Roles and Status in Eight Countries. New York: John Wiley and Sons.

Goldberg, D. (1957) Family Role Structure and Fertility. Unpublished Ph.D. dissertation. University of Michigan, Ann Arbor, Mich.

Goldberg, D. (1974) Modernism: The Extensiveness of Women's Roles and Attitudes. WFS Occasional Paper, No. 14. Voorburg, The Netherlands: International Statistical Institute.

Goldberg, D. (1975) Socio-economic theory and differential fertility: The case of the LDCs. Social Forces 54:84-106.

Goody, E. N. (1978) Some theoretical and empirical aspects of parenthood in West Africa. In C. Oppong et al., eds., Marriage, Fertility and Parenthood in West Africa. Canberra: Australian National University.

Goody, E. N. (1982) Parenthood and Social Reproduction: Fostering and Occupational Roles in West Africa. Cambridge, Eng.: Cambridge University Press.

Gulati, L. (1980) Child Labour in Keralas Coir Industry: A Study of a Few Selected Villages. Working paper. Centre for Development Studies, Trivandrum, India.

Hamamsy, L. S. (1957) The role of women in a changing Navaho society. American Anthropologist 59:101-111.

Hareven, T. (1976) Modernization and family history: Perspective in social change. Signs 2(1).

Hauser, P., ed. (1979) World Population and Development Challenges and Prospects. Syracuse, N.Y.: Syracuse University Press.

Hawthorn, G. (1980) The Paradox of the Modern: Determinants of Fertility in Northern and Western Europe since 1950. Paper prepared for the International Union for the Scientific Study of Population Seminar on Determinants of Fertility Trends, Bad Homburg.

Hill, C. R., and F. P. Stafford (1974) Allocation of time to pre-school children and educational opportunity. Journal of Human Resources 9:323-343.

Hill, C. R., and F. P. Stafford (1980) Lifetime Fertility Child Care and Labour Supply. Institute for Social Research Working Paper Series. University of Michigan, Ann Arbor.

Hill, M. S., and F. T. Juster (1980) Constraints and Complementarities in Time Use Survey. Research Center, Institute for Social Research, University of Michigan, Ann Arbor.

Hill, R., J. M. Stycos, and K. W. Back (1959) The Family and Population Control. Chapel Hill, N.C.: University of North Carolina Press.

Ho, T. J. (1979) Time costs of childrearing in the rural Philippines. Population and Development Review 5:643-662.

Hoffman, L. W. (1973) A psychological perspective on the value of children to parents: Concepts and measures. In J. T. Fawcett, ed., Psychological Perspectives in Population. New York: Basic Books.

Hoffman, L. W. (1975) The value of children to parents and the decrease in family size. American Philosophical Society Proceedings 119:430-438.

Hohm, C. F. (1975) Social security and fertility: An international perspective. Demography 12:629-644.

Hohn, C., and R. Mackensen, eds. (1982) Determinants of Fertility Trends: Major Theories and New Directions for Research. Liege: Ordina Editions.

Hollerbach, P. E. (1980) Power in Families, Communication and Fertility Decision-Making. Working Paper No. 53. Center for Policy Studies. New York: Population Council.

Howell, S. (1979) The Chewong of Malaysia. Populi 6(4).

Ibrahim, A. (1968) Self Concept and Family Planning. Unpublished Ph.D. dissertation. University of California, Los Angeles.

Indian Council of Social Science Research (1977) Critical Issues on the Status of Women: Suggested Priorities for Action. New Delhi: Rakesh Press.

Jancar, B. W. (1978) Women under Communism. Baltimore, Md.: The Johns Hopkins University Press.

Javillonar, G., L. Zivetz, S. Thompson, and J. Griffith (1979) Rural Development: Women's Roles and Fertility in Developing Countries, Review of Literature. Mimeo. Agency for International Development, Washington, D.C.

Kasarda, J. D. (1971) Economic structure and fertility: A comparative analysis. Demography 8:307-317.

Khuda, B.-e- (1977) Value of children in a Bangladesh village. Pp. 681-728 in J. Caldwell, The Persistence of High Fertility, Vol. 1. Canberra: Australian National University.

Khuda, B.-e- (1980) Time Allocation Among People in Rural Bangladesh. Derap Publications No. 101. Bergen: The Chr. Michelsen Institute, Derap.

King, E. M. (1976) Time Allocation in Philippine Rural Households. Discussion Paper No. 76-20. Institute of Economic Development and Research, University of the Philippines, Manila.

Kossoudji, S., and E. Mueller (1979) The Economic Status of Female Headed Households in Rural Botswana. Mimeo. University of Michigan, Ann Arbor, Mich.

Kupinsky, S., ed. (1977) The Fertility of Working Women: A Synthesis of International Research. New York: Praeger.

Leibenstein, H. (1977) Beyond economic man: Economics, politics, and the population problem. Population and Development Review 3:183-199.

Leibenstein, H. (1980) Relaxing the Maximization Assumption in the Economic Theory of Fertility. Paper presented at International Union for the Scientific Study of Population Seminar on Determinants of Fertility Trends: Major Theories and New Directions for Research, Bad Homburg.

Leibowitz, A. S. (1972) Women's Allocation of Time to Market and Non-Market Activities: Differences by Education. Unpublished Ph.D. dissertation. Columbia University, New York.

LeVine, R. A. (1980) Influences of women's schooling on maternal behavior in the Third World. Comparative and International Education Society 24(2, Part 2):78-105.

Lowenthal, N. H., and A. S. David (1972) Social and Economic Correlates of Family Fertility: An Updated Survey of the Evidence. Research Triangle Institute, Research Triangle Park, North Carolina.

Loza-Soliman, S. (1981) Roles of women and their impact on fertility: An Egyptian case study. International Population Conference, Manila 1981, Vol. 3. Liege: International Union for the Scientific Study of Population.

MacFarlane, A. (1978b) The Origins of English Individualism. Oxford, Eng.: Blackwell.

Mamdani, M. (1972) The Myth of Population Control. New York: Monthly Review Press.

Marshall, J. M. (1972) Studies Relating Women's Non-Familial Activity and Fertility. Bibliography Series I. Carolina Population Center, Chapel Hill, N.C.

Mason, K. O., A. S. David, E. K. Gerstel, Q. W. Lindsey, and M. V. E. Rulison (1971) Social and Economic Correlates of Family Fertility: A Survey of Evidence. Chapel Hill, N.C.: Research Triangle Institute.

Mauldin, W. P., and B. Berelson (1979) Conditions of fertility decline in developing countries 1965-75. Studies in Family Planning 9:139-141.

McDonald, P. (1981) Social change and age at marriage. International Population Conference, Manila 1981, Vol. 2. Liege: International Union for the Scientific Study of Population.

McSweeney, B. G. (1979) Collection and analysis of data on rural women's time use. Studies in Family Planning 10(11/12).

Minturn, L., and W. Lambert (1964) Mothers of Six Cultures. New York: John Wiley and Sons.

Miro, C. A. (1980) The Potential of the WFS to Clarify the Socio-Economic Determinants of Fertility in Developing Countries. Paper presented at a Conference of the World Fertility Survey, London.

Miro, C. A., and J. Potter (1980) Population Policy Research Priorities in the Developing World. London: Frances Pinter.

Mueller, E. (1976) The economic value of children in peasant agriculture. In R. Ridker, ed., Population and Development: The Search for Selective Interventions. Baltimore, Md.: The Johns Hopkins University Press.

Mueller, E. (1982) The allocation of women's time and its relationship to fertility. In R. Anker et al., eds., Interactions Between Women's Roles and Population Trends in the Third World. London: Croom Helm.

Mukherjee, B. N. (1975) Status of women as related to family planning. Journal of Population Research 2:5-33.

Nag, M., B. F. White, and C. Peet (1978) An anthropological approach to the study of the economic value of children in Java and Nepal. Current Anthropology 19:293-306.

Newland, K. (1977) Women and Population Growth: Choice Beyond Childbearing. Worldwatch Paper No. 16. Washington, D.C.: World Watch Institute.

Newland, K. (1979) The Sisterhood of Man: The Impact of Women's Changing Roles on Social and Economic Life Around the World. A World Watch Institute Book. New York: W. W. Norton.

Nye, F. I. (1976) Role Structure and the Analysis of the Family. Beverly Hills, Calif.: Sage Publications.

Nye, F. I., ed. (1982) Family Relationships Rewards and Costs. Beverly Hills, Calif.: Sage Publications.

Oakley, A. (1976) Woman's Work: The Housewife Past and Present. New York: Vintage Books.

Oakley, A. (1980) Prologue: Reflections on the study of household labor. In S. F. Berk, ed., Women and Household Labor. Beverly Hills, Calif.: Sage Publications.

Okonjo, K. (1979) Rural women's credit systems: A Nigerian example. Studies in Family Planning 10(11/12).

Oppong, C. (1973) Growing Up in Dagbon. Tema: Ghana Publishing Corp.

Oppong, C. (1974) Attitudes to family size among unmarried junior civil servants in Accra. Journal of African and Asian Studies 9(1-2).

Oppong, C. (1976) Financial constraints and family size. Canadian Journal of African Studies 10:403-408.

Oppong, C. (1977a) Family type and size: Some recent evidence from Ghana. Pp. 345-354 in L. T. Ruzicka, ed., The Economic and Social Supports for High Fertility. Canberra: Australian National University.

Oppong, C. (1977b) Issues concerning the changing status of African women: Some lessons from the Ghanaian experience. In Family Welfare and Development in Africa. London: International Planned Parenthood Federation.

Oppong, C. (1977c) The crumbling of high fertility supports. Pp. 331-360 in J. C. Caldwell, ed., The Persistence of High Fertility: Population Prospects in the Third World. Canberra: Australian National University.

Oppong, C. (1978) Property, power and time. In Marriage, Fertility and Parenthood in West Africa. Canberra: Australian National University.

Oppong, C. (1980) A Synopsis of Seven Roles and Status of Women: An Outline of a Conceptual and Methodological Approach. World Employment Programme Research Working Paper. Restricted. International Labour Office, Geneva.

Oppong, C. (1982a) Family structure and women's reproductive and productive roles: Some conceptual and methodological issues. In R. Anker et al., eds. Interactions Between Women's Roles and Population Trends in the Third World. London: Croom Helm.

Oppong, C. (1982b) Middle Class African Marriage. New York: George Allen and Unwin.

Oppong, C., ed. (in press, a) Female and Male in West Africa. New York: George Allen and Unwin.

Oppong, C. (in press, b) Paternal Costs, Role Strain and Fertility Regulation: Some Ghanaian Evidence. World Employment Programme Research Working Paper. International Labour Office, Geneva.

Oppong, C. (forthcoming) Some aspects of anthropological contributions to the study of fertility. In G. Farooq and G. Simmons, eds., The Economics of Fertility Behavior in Developing Countries: Research and Policy Issues.

Oppong, C., and K. Abu (forthcoming) The Changing Maternal Role of Ghanain Women: Education, Migration and Employment. World Employment Programme Research Working Paper. International Labour Office, Geneva.

Oppong, C., and K. Church (1981) A Field Guide to Research on Seven Roles of Women: Focussed Biographies. World Employment Research Working Paper. International Labour Office, Geneva.

Oppong, C., and E. Haavio-Mannila (1979) Women, population and development. In P. Hauser, ed., World Population and Development Challenges and Prospects. Syracuse, N.Y.: Syracuse University Press.

Oppong, C., G. Adaba, M. Bekombo-Priso, and J. Mogey, eds. (1978) Marriage, Fertility and Parenthood in West Africa. Canberra: Australian National University.

Palsi, B. J. (1977) Wife's status and husband-wife companionship in an Australian metropolis area. Journal of Marriage and the Family 39:185-192.

Petersen, W. (1961) Population. New York: Macmillan.

Piepmeier, K. B., and T. S. Adkins (1973) The status of women and fertility. Journal of Biosocial Science 5:507-529.

Pinchbeck, I., and M. Hewitt (1969) Children in English Society. London: Routledge and Paul Kegan.

Popkin, B. M. (1980) Time allocation of the mother and child nutrition. Ecology of Food and Nutrition 9:1-14.

Pratt, L., and P. K. Whelpton (1956) Extra familial participation of wives in relation to interest in and liking for children, fertility planning, and actual and desired family size. Milbank Memorial Fund Quarterly 34:44-78.

Quizon, E. K., and R. E. Evenson (1978) Time Allocation and Home Production in Philippine Rural Households. Paper presented at International Center for Research on Women Conference, Women in Poverty: What Do We Know?, Washington, D.C.

Rainwater, L. (1965) Family Design, Marital Sexuality, Family Size and Family Planning. Chicago: Aldine Atherton.

Reining, P. (1977) Village Women: Their Changing Lives and Fertility: Studies in Kenya, Mexico and the Philippines. Washington, D.C.: American Association for the Advancement of Science.

Robinson, J. P. (1977) How Americans Use Time: A Socio-Psychological Analysis of Everyday Behavior. New York: Praeger.

Robinson, J. P. (1980) Housework technology and household work. In S. F. Berk, ed., Women and Household Labor. Beverly Hills, Calif.: Sage Publications.

Robinson, J. P., P. E. Converse, and A. Szalai (1972) Everyday life in twelve countries. In A. Szalai et al., The Use of Time. The Hague: Mouton.

Robinson, W. C., and S. F. Harbison (1980) Towards an unified theory of fertility. In T. K. Burch, ed., Demographic Behavior: Interdisciplinary Perspectives on Decision-Making. Boulder, Colo.: Westview Press.

Rodgers, G., and G. Standing, eds. (1981a) Child Work, Poverty, and Underdevelopment. Geneva: International Labour Office.

Rodgers, G., and G. Standing (1981b) The economic roles of children: Issues for analysis. In G. Rodgers and G. Standing, eds., Child Work, Poverty, and Underdevelopment. Geneva: International Labour Office.

Rosaldo, M. Z., and L. Lamphere, eds. (1974) Woman, Culture, and Society. Stanford, Calif.: Stanford University Press.

Rosen, B. C., and A. B. Simmons (1971) Industrialization, family and fertility: A structural psychological analysis of the Brazilian case. Demography 8:49-69.

Ryder, N. B. (1959) Fertility and family. In P. M. Hauser and O. D. Duncan, eds., The Study of Population. Chicago: University of Chicago Press.

Saffioti, H. (1978) Women in Class Society. New York: Monthly Review Press.

Safilios-Rothschild, C. (1977) A Preliminary Theoretical Model of Sex Stratification and Sex Discrimination. Mimeo. National Institute of Education, Washington, D.C.

Safilios-Rothschild, C. (1978) The relationship between work and fertility: Some methodological and theoretical issues. In S. Kupinsky, ed., The Fertility of Working Women: A Synthesis of International Research. New York: Praeger.

Safilios-Rothschild, C. (1979) The demographic consequences of the changing roles of men and women in the 80s. Conference on Economic and Demographic Change: Issues for the 1980s, Helsinki, Vol. 3. Liege: International Union for the Scientific Study of Population.

Safilios-Rothschild, C. (1982) Female power, autonomy and demographic change in the Third World. In R. Anker et al., eds., Interactions Between Women's Roles and Population Trends in the Third World. London: Croom Helm.

Safilios-Rothschild, C. (in press) A class and sex stratification model and its relevance for fertility trends in the developing world. In C. Hohn and R. Mackensen eds., Determinants of Fertility Trends: Major Theories and New Directions for Research. Liege: International Union for the Scientific Study of Population.

Salaff, J. W. (1972) Institutionalized motivation for fertility limitation in China. Population Studies 26:233-262.

Scanzoni, J. H. (1975) Sex Roles, Life-Styles and Childbearing: Changing Patterns in Marriage and the Family. New York: The Free Press.

Scanzoni, J. H. (1976a) Gender, roles and the process of fertility control. Journal of Marriage and the Family 38:677-691.

Scanzoni, J. H. (1976b) Sex role change and influences on birth interactions. Journal of Marriage and the Family 38:43-58.

Scanzoni, J. H. (1980) Contemporary marriage types. Journal of Family Issues 1:125-140.

Scanzoni, J. H., and M. Szinovacz (1980) Family Decision-Making: A Development Model. Beverly Hills, Calif.: Sage Publications.

Schildkrout, E. (1981) The employment of children in Kano. Pp. 81-112 in G. Rodgers and G. Standing, eds., Childwork, Poverty, and Underdevelopment. Geneva: International Labour Office.

Schlegel, A., ed. (1977) Sexual Stratification: A Cross Cultural View. New York: Columbia University Press.

Schmid, J., and C. Hohn (1981) Socio-cultural change with reference to female employment, educational characteristics, and housing conditions in Western countries where fertility is around or below replacement. International Population Conference, Manila 1981, Vol. 1. Liege: International Union for the Scientific Study of Population.

Schultz, T. W. (1974a) The high value of human time: Population equilibrium. Journal of Political Economy 82:2-10.

Schultz, T. W., ed. (1974b) Economics of the Family: Marriage, Children and Human Capital. Chicago: University of Chicago Press.

Scott, H. (1974) Does Socialism Liberate Women? Experiences from Eastern Europe. Boston: Beacon Press.

Shah, N. M. (1981) Redefinition of Female Roles and Status in Pakistan: Issues and Suggestions. Paper presented at the International Union for the Scientific Study of Population General Conference, Manila.

Shahani, L. R. (1974) The Relationship Between the Status of Women and Family Planning in the Asian Region. Philippines: UNESCO.

Sharma, U. (1980) Women, Work and Property in North-West India. London: Tavistock Publications.

Smith, K. C., and C. Scholer (1978) Women as mothers in Japan: The effects of social structure and culture on values and behavior. Journal of Marriage and the Family 40:613-620.

Snyder, D. (1974) Economic determinants of family size in West Africa. Demography 11:613-627.

Spengler, J. J. (1966) Values and fertility analysis. Demography 3:109-130.

Spiro, M. E. (1975) Children of the Kibbutz. Cambridge, Mass.: Harvard University Press.

Srinivas, M. N. (1977) The changing position of Indian women. Man 12:221-238.

Stack, C. B. (1974) All Our Kin: Strategies for Survival in a Black Community. New York: Harper and Row.

Stafford, F., and G. J. Duncan (1979) The Use of Time and Technology by Households in the United States. Institute for Social Research Working Paper Series. University of Michigan, Ann Arbor, Mich.

Standing, G. (1978) Labour Force Participation and Development. Geneva: International Labour Office.

Standing, G. (1981) Income Transfers and Remittances: A Module for Migration Surveys. Geneva: International Labour Office.

Steiner, S. (1977) The Female Factor: A Study of Women in Five Western European Societies. New York: G. P. Putnam and Sons.

Stone, L. (1977) The Family, Sex and Marriage in England, 1500-1800. New York: Harper and Row.

Stone, P. J. (1972) Childcare in twelve countries. In A. Szalia et al., The Use of Time. The Hague: Mouton.

Strzeminska, H. (1972) Educational status and time budgets. In A. Szalai et al., The Use of Time. The Hague: Mouton.

Syed, S. H. (1978) Female status and fertility in Pakistan. Pakistan Development Review 17:408-430.

Szalai, A. (1975) The situation of women in the light of contemporary time budget research. UN Mexico E/CONF 66/BP/6. Mimeo.

Szalai, A., P. Converse, P. Feldheim, E. Scheuch, and P. Stone (1972) The Use of Time. The Hague: Mouton.

Tabah, L. (1979) Fertility trends in the developed world. Populi 6(1).

Thadani, V. N. (1980) Property and Progeny: An Exploration of Intergenerational Relations. Centre for Policy Studies Working Paper No. 62. Population Council, New York.

Tickamyer, A. R. (1979) Womens roles and fertilty intentions. Pacific Sociological Review 22:167-184.

Tien, H. Y., and F. D. Bean, eds. (1974) Comparative Family and Fertility Research. Leiden: Brill.

Tilly L. A., and J. W. Scott (1978) Women, Work and Family. New York: Rinehart and Winston.

Tobin, P. L. (1976) Conjugal role definitions, value of children, and contraceptive practice. Sociological Quarterly 17:314-322.

Turchi, B. A., and E. S. Bryant (1979) Rural Development Activities, Fertility and the Cost and Value of Children. Mimeo. Agency for International Development, Washington, D.C.

United Nations (1980) The Economic Role of Women in the ECE Region. New York: United Nations.

United Nations Asian and Pacific Centre for Women and Development (1980) Notes on Data Collection with Special Reference to Women. New York: United Nations.

United Nations Economic and Social Council (1978) Progress Report on the Development of Statistics of Time Use. Statistics Commission Twentieth Session E/CN 3/519. New York: United Nations.

United Nations Development Program (1980) Evaluation Study No. 3. Rural Women's Participation in Development. New York: United Nations.

Walker, K. E., and M. E. Woods (1976) Time Use: A Measure of Household Production of Family Goods and Services. Washington, D.C.: American Home Economics Association.

Ware, H. (1977) Womens work and fertility in Africa. In S. Kupinsky, ed., The Fertility of Working Women: A Synthesis of International Research. New York: Praeger Publishers.

Ware, H. (1978) Population and Development in Africa South of the Sahara: A Review of Literature, 1970-1978. Mexico City: El Colegio de Mexico, International Review Group of Social Science Research on Population and Development.

Ware, H. (1981) Women, Demography, and Development. Demography Teaching Notes 2-3. Development Studies Centre, Australian National University, Canberra.

Ware, H. (in press) Female and male life cycles. In C. Oppong, ed., Female and Male in West Africa. New York: George Allen and Unwin.

Weisner, T. S., and R. Gallimore (1977) My brother's keeper: Child and sibling caretaking. Current Anthropology 18(2).

Westoff, C. F., and N. B. Ryder (1977) Fertility differences by employment patterns and role attitudes. In C. F. Westoff and N. B. Ryder, eds., The Contraceptive Revolution. Princeton, N.J.: Princeton University Press.

White, B. (1976) Population involution and employment in rural Java. Development and Change 7:267-290.

Whiting, B. B., and J. W. M. Whiting (1975) Children of Six Cultures. Cambridge, Mass.: Harvard University Press.

Whyte, M. K. (1977) The Status of Women in Pre-Industrial Societies. Princeton, N.J.: Princeton University Press.

Wu, T. S. (1977) The Value of Children: Taiwan, Vol. 5. Honolulu: East-West Population Institute.

Yankelovitch, D. (1981) New Rules in American Life: Searching for Self-Fulfillment in a World Turned Upside Down. New York: Random House.

Youssef, N. H. (1978) The status and fertility patterns of Muslim women. In L. Beck and N. Keddie, eds., Women in the Muslim World. Cambridge, Mass.: Harvard University Press.

Youssef, N. H. (1982) The interrelationship between the division of labor in the household: Women's roles and their impact on fertility. In R. Anker et al., eds., Interactions Between Women's Roles and Population Trends in the Third World. London: Croom Helm.

Youssef, N. H., M. Buvinic, and A. Kudal (1979) Women in Migration: A Third World Focus. Mimeo. International Center for Research on Women, Washington, D.C.

Zeidenstein, S., ed. (1979) Learning about rural women. Studies in Family Planning 10(11/12).

Chapter 18

EFFECTS OF INCOME AND WEALTH ON THE DEMAND FOR CHILDREN

Eva Mueller and Kathleen Short

The income-fertility relation has long played a central role in the demographic transition literature. There is a good deal of historical evidence that income growth and economic development tend in the long run to reduce birth rates. This idea was given new prominence at the Bucharest Conference with the slogan "development is the best contraceptive." On the other hand, if children resemble normal goods, economic theory would postulate a positive relation between income and the number of children demanded. Indeed, in the short run (for instance over the business cycle), income has often been shown to be positively related to the birth rate. Numerous attempts have been made to reconcile these apparently contradictory findings.

A primary reason for the complexity of the income-demand for children relation is that income change goes hand-in-hand with other changes--in education, capital accumulation, technology, the value of time, the availability of consumption goods, educational aspirations, income distribution, female labor force participation, and the like. One must therefore distinguish between income's direct effect on the demand for children and its indirect effects via these other related variables. A further difficulty is that fertility may in turn affect income level and distribution.

This paper addresses the direction, magnitude, and reliability of these complex effects. Its central hypothesis, that income affects the demand for children, rests on the assumption that, in both more developed countries (MDCs) and less developed countries (LDCs), family-size desires are responsive to an economic calculus. Such a belief is basic to much of the literature on the economics of population. Ultimately this is an empirical issue; here it suffices to address very briefly three common criticisms of this economic approach.

First, critics point out that a theory of the demand for children may be irrelevant in very poor populations since biological constraints (poor health and nutrition) may cause the supply of surviving children to fall short of demand. At somewhat higher income levels, when such supply constraints are alleviated, the high psychic and information costs of fertility control may keep supply from adjusting to demand for a while longer (Easterlin, 1978). In response to this criticism, it may be said that it is true that supply-side

influences may dominate over demand-side influences at early stages of development; however, it is clear that, at some stage in development, demand falls below potential supply, and fertility decline begins. Moreover, some methods of fertility control, such as abortion, long breastfeeding, abstinence, and late marriage, are widely practiced in traditional populations.

A second criticism holds that the demand for children is governed by social norms for family size that depend on noneconomic characteristics of the household or the community (Blake, 1968). This appears to be a rather shortsighted and static observation. In the short run, income and other economic variables may affect consumer choices within a normatively prescribed range; in the longer run, economic changes can be expected to contribute to changes in prevailing norms regarding age at marriage, family size, living standards, and leisure time.

A third and much more valid criticism concerns the pertinence of the theory of consumer demand, which essentially addresses how consumers allocate their resources in the short run, with income and prices varying but tastes and preferences given. The Columbia-Chicago school applies this theory to reproductive decisions, which involve a rather long-term commitment. Also, the study of fertility decisions in less developed countries is concerned primarily with long-term changes in birth rates, or differentials in birth rates between countries at different stages of development. In the long run, tastes and preferences cannot be taken as given; rather, it must be assumed that long-term income growth and accompanying changes in available goods and services and their costs affect consumer preferences, though not necessarily uniformly among all groups. Attention to changing tastes is particularly necessary when dealing with developing countries, where a far-reaching transformation of the economy and of people's lifestyle is occurring. Therefore, in the discussion below, taste changes are treated as modifying the way economic factors influence the demand for children.

This paper is organized as follows. First, a path-type model is presented that distinguishes between the direct (or pure) income effect and indirect effects via other variables causally linked to income. This discussion is based largely on the theoretical literature. It will be argued that the <u>pure</u> income effect on the demand for children is very likely to be positive, while some major <u>indirect</u> effects are negative. Because the timing and strength of the indirect effects may be expected to vary among different places and times, depending primarily on the particular culture and economic structure, the <u>total</u> income effect may be either positive or negative. The following section will discuss alternative concepts of income and their bearing on the income-demand for children relation. Of particular interest are the distinctions between current and permanent income and the way in which income is adjusted for the number of people it supports. The next section will summarize both macro- and micro-level empirical findings on the relation of income to fertility. The concept of income will be expanded in this section to include other resources, especially land, that may affect the family's

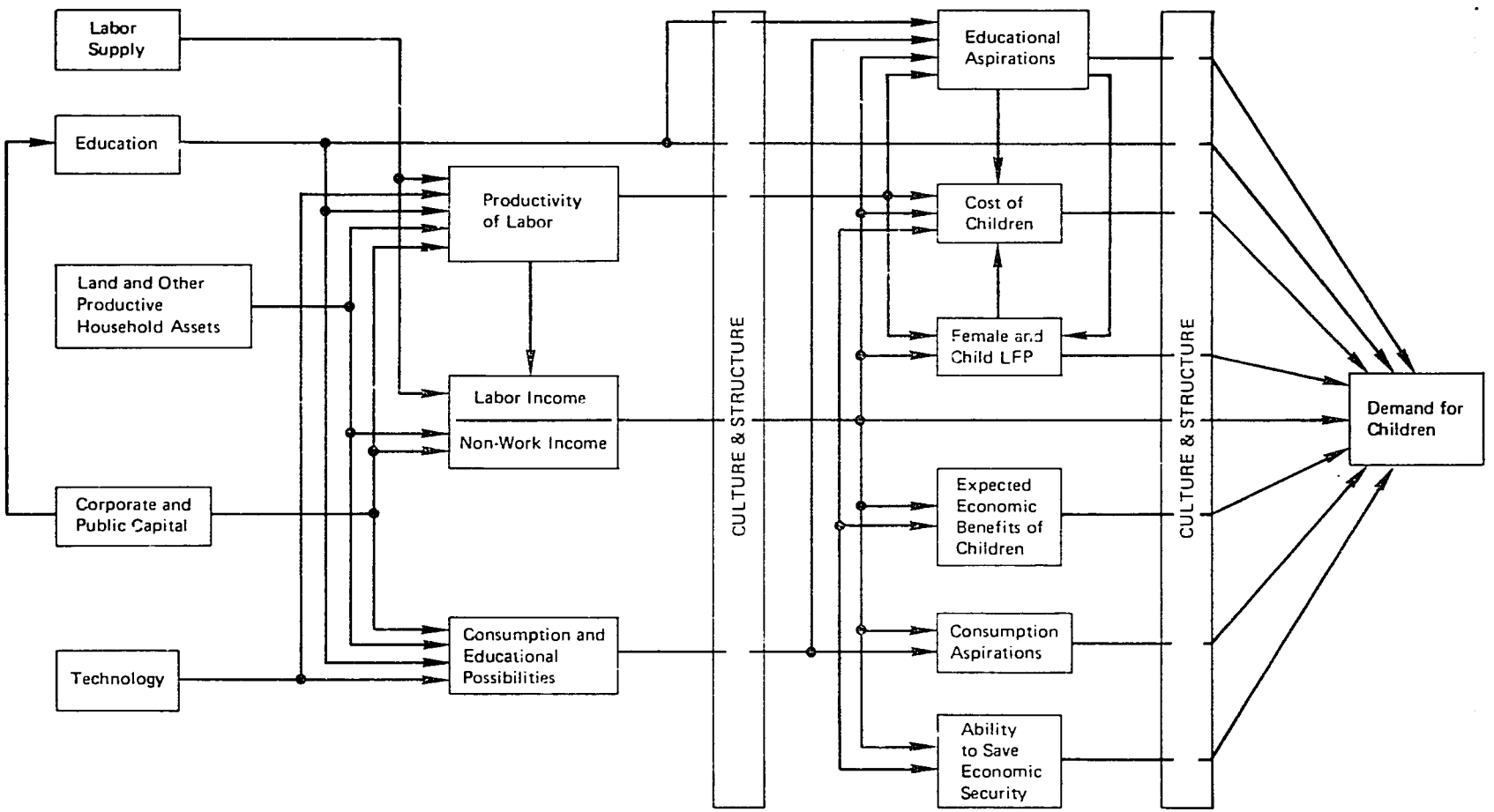

FIGURE 1 Income and the Demand for Children: An Illustrative Path Diagram

ability to support children. Finally, the contention of a number of economic demographers that progress toward greater income equality itself reduces fertility will be scrutinized. In this context, the distinction between absolute and relative income as they pertain to the demand for children will also be examined.

THE INCOME EFFECT IN THE CONTEXT OF A CAUSAL MODEL

A model of the relationship between income and the demand for children is outlined in Figure 1. This model is intended primarily as an organizing device for the discussion which follows, and depicts some of the ramifications of the income-fertility relation without trying to be comprehensive. For example, consideration of distributional effects is deferred to a later section. For simplicity of presentation, the figure depicts a recursive model. Possible causal paths that run in the opposite direction will be noted as the discussion proceeds. The expression "demand for children" refers to surviving children; the term "income" refers to current household income as defined in national income accounts.[1]

Economists conceptualize family size as being determined by the demand for children and the family's ability to supply surviving children. Supply-side factors such as health, nutrition, long breastfeeding, and age at marriage, as well as access to contraceptives, are influenced by income, just as the demand-side variables are. However, since these are discussed elsewhere (see Nag, in these volumes), they are excluded from the present discussion.

On the demand side, income acts as a constraint on the family's ability to obtain goods and services that provide utility. Thus, when a family receives more income, it can expand the quantity, quality, and assortment of utilities it acquires, including those derived from children. Income can have both <u>pure</u> and <u>indirect</u> effects on the demand for children. The pure income effect is defined here as the change in the demand for children that is directly attributable to a change in income. The indirect effects are those which operate through variables that are causes or consequences of income change, such as changes in the value of time, the cost of children, tastes for consumer goods, perceived benefits from children, female and child labor force participation, and the family's sense of security and optimism about its future financial status. The <u>total</u> income effect encompasses both the pure and indirect effects.

Simon (1977) makes a similar distinction between short- and long-run income effects on fertility, with the former resembling the pure income effect and the latter the total income effect. The implication of his distinction is that the indirect effects lag behind the pure income effect. The present paper will argue later that, though time lags may occur, they depend on cultural and structural factors and hence are of variable duration. Thus classification based on a time dimension is not particularly helpful in revealing the causality at work.

Figure 1 postulates that the nature and magnitude of the indirect effects, as well as their impact on the demand for children, are affected by the culture and the structure of the economy under study. That is, for a model like that outlined in Figure 1, the regression coefficients would differ from country to country and might even differ among regions within the same country. Examples of cultural and structural conditions that mediate between income and the demand for children are religious precepts, familial values, the roles of women and children in the labor market, the educational and inheritance systems, governmental policies affecting the expansion of consumer goods industries, and the availability of support systems for the aged and needy.

The Pure Income Effect

A pure income effect can only be observed after the income-demand for children relation has been purged of the impact of prices, tastes, attitudes, and other factors causally related to income. However, empirical studies cannot completely expurgate these related effects, if only because such variables as the value of time invested in children, tastes, and benefits from children are difficult to measure. Thus the pure income effect cannot be observed, and its perception rests largely on theoretical considerations.

Since children draw on household resources for their support and provide consumption utility (social and psychic satisfactions),[2] more children should be desired at higher incomes. Turchi (1975) has examined the validity of the alternative view that children are "inferior goods" (meaning that the optimal quantity declines with income). He shows that an increase in income may reduce the number of children desired only if (1) substitute goods or services are reasonably efficient in providing the social and psychic satisfactions of childrearing, and (2) these satisfactions are subject to satiation or to a low income elasticity of demand. He concludes that the numerous satisfactions of childrearing are not easily met by substitute activities, and that there is no reason to believe that they are characterized by a low income elasticity of demand. Of course, at higher incomes, people may prefer child quality (education) to child quantity. Likewise, if children are viewed as a source of productive services and old age support, then close substitutes may exist that may be preferred at higher incomes. However, these income-related differences in the demand for children may be viewed as resulting from changes in tastes and costs, and hence as indirect income effects; moreover, they pertain only to a small subset of the satisfactions yielded by children. Thus there is a strong presumption of a positive pure income effect.

Indirect Income Effects

Sources of Income Change

The relationship between income and fertility can be observed at the macro level by comparing average values of income and fertility across countries or smaller geographic subdivisions. It can also be observed at the micro level by comparing income and fertility across households.[3] At the macro level, and to a lesser extent at the micro level, income itself is an endogenous variable. The effect of income change may then depend on how income is changed and whose income is changed.

In examining the sources of income change (left side of Figure 1), the distinction between education and nonhuman capital is of particular importance. The Columbia-Chicago school views education as unique among the determinants of income change in that its influence on income operates entirely through the productivity of time. Thus, while it generates a positive income effect on the demand for children, it also raises the opportunity cost of household time. If the care and enjoyment of children are time-intensive relative to other goods and services demanded by consumers, as the Columbia-Chicago school postulates, the relative cost of children should increase and the demand decrease with education (Becker, 1965).[4] Since most childcare is provided by the mother and female siblings, women's education in particular should have a negative price effect on the demand for children (Willis, 1973), unless cheap household help can be hired; however, if education raises the value of women's time, the cost of hired female household workers should also rise, regardless of their education. Of course, the negative price effect may be attenuated if women's education makes for increased efficiency in childcare and housework (Leibowitz, 1975).

There is substantial empirical evidence to support this analysis: the response of fertility to changes in husband's income is generally positive, while the response to changes in wife's income is negative, or at least less positive than the response to husband's income. However, much of this evidence pertains to MDCs, and further testing of the theory in LDCs is required. The theory assumes that increments in female education can always be translated into increments in the value of women's work; it also assumes that childcare interferes significantly with market work. Both these propositions may hold only under some conditions in LDCs, for instance among urban populations or above some relatively high educational threshold. They are least likely to hold in rural areas where women tend to be engaged in agricultural labor, handicrafts, and unskilled service work, and husbands tend to make the key production decisions. In such settings, productivity is not necessarily enhanced by women's education. Needless to say, of course, education has additional negative effects on the demand for children that are independent of income change, for example via educational aspirations, access to the mass media, and the psychic costs of fertility control (Cochrane, 1979).

At the macro level, the accumulation of nonhuman capital should

raise income; at the same time the growth of household assets such as land, small businesses, cattle, tools, and equipment should raise the productivity of time in household enterprises. According to the Columbia-Chicago school, the positive income effect would then be accompanied by a negative price-of-time effect on fertility, stemming from the increased value of women's time. However, in household enterprises, capital accumulation and technological advances that raise the productivity of women's time also raise the productivity of children's time. As a result, the cost of children is reduced and the opportunity cost of educating them is raised, leading to both increased fertility and lower children's education. The overall price-of-time effect, then, considering all members of the household, depends among other things on the relative importance of women's and children's labor and need not be negative (Rosenzweig and Evenson, 1977; Rosenzweig, 1978).

Nonhuman and human capital differ in that the former affects income both directly (via rents, interest, etc.) and indirectly (via labor productivity, wage rates, and hours of work). Increases in nonwork income such as rents, interest, dividends, or transfer payments are unique in that they do not have a negative price-of-time effect on the demand for children. However, relatively few households in LDCs receive substantial amounts of such income. Therefore, empirical studies have seldom been able to measure the income effect net of price effects by relating this type of income to the demand for children.

Asset accumulation also operates on the demand for children through such goals as the desire to transmit an adequate inheritance or to meet social norms for dowries or bride-price. When this is the case, an increase in the value of asset holdings will relieve financial constraints on the demand for children and may also lower marriage age. Easterlin et al. (1974), for example, argues that, in the U.S., parents wanted their children to have as much land as they themselves owned. He shows that on the frontier, where land was freely available, or at least cheap, rural couples had more children than did those in the older settled areas. Causation may also run in the opposite direction in that children may add to wealth, although this reverse causal path is probably of secondary importance.

Another source of income change is technological advances. Technological advances raise income, thereby stimulating the demand for children. At the same time, the rate of return on capital is likely to be enhanced by technological advances, presumably inducing some shift in parental outlays from children to investments, particularly in household enterprises. Labor productivity and the value of time may also rise, unless the new technology substitutes capital for labor (as in some kinds of agricultural mechanization) and thereby adds to underemployment. The total effect of technological change on the demand for children may thus be positive or negative.

Technological advances and capital accumulation, in the very process of generating more income, transform the economy. A variety of new, better, and cheaper consumer goods will be manufactured at home; imports will also be facilitated by the expansion of export

industries. Moreover, the process of economic growth creates a need for a more literate and skilled labor force, leading to investments in educational facilities. It will be argued later that the emergence of these opportunities, in conjunction with income increases, enhances consumption and educational aspirations; changes in tastes in turn reduce the demand for children.

In sum, the forces that raise income in a developing country can have both positive and negative effects of their own on the demand for children, apart from their pure income effects. In one possible scenario, capital accumulation and technological advances combine to raise the productivity of educated and experienced labor so substantially that education rises and the demand for children declines on balance; this decline may be further reinforced by rising incentives to invest. In a different scenario, labor-saving technological changes and land fragmentation create underemployment among the poorer segments of the population. The slack labor demand then prevents significant increases in women's labor productivity, while creating pressure among the poor to use children in income-earning activities, however unrewarding.[5] At the same time, upper-income groups accumulate capital, allowing them to meet bequest and dowry targets even if they have many children In this scenario, high fertility may persist when income grows.

Consequences of Income Change

The consequences of income change are most appropriately observed at the household level, where they affect the consumer choice process. There is substantial agreement in the literature that a major consequence of income change (right side of Figure 1) is the rising cost of children. Duesenberry (1960) has pointed out that children share their parents' standard of living and that higher-income parents face stronger social norms favoring education than do lower-income parents. The Columbia-Chicago school places great emphasis on the rising cost of time. As noted above, to the extent that increased income is caused by increased labor productivity, the cost of time <u>necessarily</u> rises relative to the cost of goods. As a result, demand should shift from time-intensive to goods-intensive consumption. Child services are viewed as being time-intensive, although this presumption may not hold when children contribute substantially to market work and housework.

This line of reasoning also fails to consider that mothers may simply spend less time with their children when their wages rise, but still have the same number of children. Greater reliance on servants or young siblings, or simply less conscientious childcare, could make this option feasible. This problem is addressed by Becker and Lewis (1974). They argue that income increases enhance the desire for higher child quality and hence the cost of children. They postulate that Q, the demand for child quality (a concept similar to educational aspirations), is more income-elastic than N, the demand for child quantity, and that child quality is the product of education and the

mother's time inputs, together with market goods. They further assume that parents want all children (at least those of the same sex) to be of the same quality; thus an increase in child quantity raises the cost of quality, and an increase in child quality raises the cost of quantity. A rise in child costs that lowers N is then an inevitable consequence of income increases; indeed, the measured elasticity of N may even become negative.

However, it is not clear how valid these underlying assumptions are for LDCs. First, the demand for child quality may not be very income-elastic in low-income, traditional populations. Second, Sanderson (1974) questions the notion that parents will strive to invest the same amount of resources in all their children. This is supported by historical writings on China that speak of a tradition of educating one son, as well as by anthropologists studying various LDCs who claim that parents invest differently in their sons. On the other hand, data collected recently in Asia show great similarity in educational attainment among children of the same sex within a family (Wei, 1981).

A number of surveys in developing countries have asked questions about the "perceived cost of children" (Mueller, 1972; Arnold et al., 1975); these questions can provide a measure of the felt economic burden of children relative to the family's resources. At the micro level, the greater the perceived cost of children, the lower the desired fertility. In a number of countries, however, the perceived cost of children does not seem to rise with income, suggesting that ability to pay (the positive income effect) and the amount parents expect to spend on their children's upbringing (the negative cost and taste effects) roughly offset one another. In addition, the proportion of educational costs borne by parents themselves, though rising with income in a cross-section, may not rise as development proceeds over time; indeed, it may fall.

Becker and Lewis, along with other members of the Columbia-Chicago school, view the demand for child quality merely as a function of income and price, disregarding changes in tastes. In a more recent article, Stigler and Becker (1977) do address the latter issue, treating changes in tastes as changes in household technology or information costs. Using this approach, one might say that radio and TV are new technologies that reduce the cost and raise the quality of home entertainment, thereby increasing demand at the expense of other uses of money and time. Whether one calls this a change in household technology or a change in tastes is largely a semantic issue: a new household production function can always be substituted into the utility function for household commodities, yielding a new utility function for household goods and leisure. In effect, the Stigler/Becker argument boils down to the proposition that a "technology language" is more fruitful for formulating testable hypotheses about taste changes than, say, a "sociological language."[6] The present discussion will continue to refer to changes in tastes.

Figure 1 includes two taste variables--educational aspirations (or the preference for child quality) and consumption aspirations (or the

preference for consumer goods and services). At the macro level, rising income is associated with the appearance of new consumption and educational opportunities. The initial demand for new goods and services by households may then stem from higher incomes, along with relatively attractive prices (or, in the case of education, high rates of return). In addition, rising incomes promote contacts with a larger world, make new ideas and new opportunities more widely known, and raise people's sights. Assuming that consumer preferences are interdependent among families, the acquisition of watches, bicycles, more effective health care, or greater child quality by higher-income and urban families creates a demonstration effect, inducing a felt need for these goods and services among lower- and middle-income families. Demand should therefore rise more than reduced financial constraints or price changes alone would warrant; that is, preference functions should be modified at the expense of children (N) and other traditional goods.[7] Once higher consumption and educational aspirations have been acquired, they may then be passed on to the next generation, regardless of the economic fortunes of that generation, as Easterlin (1973) postulates. Thus income advances, together with the interfamily and intrafamily interdependence of tastes, may bring about a secular decline in the demand for children.

Negative price effects and changes in tastes are not mutually exclusive; they can combine to offset the positive pure income effect (Sanderson, 1976). It would seem that in LDCs the transformation of tastes associated with rising income is more extensive than in MDCs and represents a crucial link between income growth and the fertility decline (Freedman, 1970, 1976). If new aspirations and income are positively correlated in a cross-section of households, a negative correlation may be observed between income and fertility that reflects the impact of unmeasured taste differentials.

The economic returns to children play a much smaller role in the theoretical literature than their costs, perhaps because, in more developed countries, those returns have virtually disappeared. These returns are also difficult to measure. For LDCs, the argument (first developed by Leibenstein in 1957) that the benefits derived by parents from children diminish gradually when income rises seems to be widely accepted. The diminishing demand for unskilled child labor and rising educational aspirations are likely to reduce child labor force participation; moreover, if the demand for children is influenced by parents' need for old age support and assistance in emergencies, higher incomes and greater ability to save should reduce the economic advantages of a large family. In addition, at the macro level, income growth tends to be accompanied by the development of pension plans, and enables governments to afford social security and other welfare activities that can eventually substitute for assistance from children. A number of studies document that perceived economic benefits from children are negatively related to income and positively related to fertility (Mueller, 1972; Bulatao, 1979; Caldwell, 1978).

Two other consequences of income level are shown in Figure 1. In contrast to the consequences discussed so far, these tend to have a positive impact on the demand for children. First, the higher the

family's income, the greater should be its ability to save, its financial security, and its optimism about the future. As noted earlier, asset accumulation may encourage large families since it provides financial latitude and a more adequate inheritance, and may raise the value of children's labor in a family enterprise. Optimism about the family's future economic status is relevant if childbearing decisions are guided by long-term income prospects rather than current income alone. Second, income change may affect female and child labor force participation. In some LDCs, though not in all, female labor force participation, especially manual work, is viewed as being demeaning, and sometimes the same is true for children's work. Hence labor force participation by women (and sometimes children) is characteristic of the poor, but is avoided in the middle and upper income strata (except for a small, highly educated elite). India and Indonesia are examples of countries where such views are common; in Bangladesh and other Muslim countries, those women who can afford it adhere strictly to purdah, while poorer women often work in the fields. Assuming that at least some of the market work done by women is incompatible with childcare, the consequence may be an increase in the demand for children. On the other hand, a negative attitude toward child labor may reduce the benefits obtained from children's labor as income rises, reducing the perceived value of a large family.

In summary, if the indirect effects of rising income are considered along with the pure effects, the total impact on the demand for children may be either positive or negative, with a highly variable magnitude. In turn, the indirect effects depend on (1) the responsiveness to rising income of child costs, prices, consumption and educational aspirations, economic benefits attached to children, savings performance and perceptions of economic security, and labor force participation by women and children; and (2) the responsiveness of the demand for children to changes in these variables. It is clear that both of these conditions depend on the culture as well as the economic structure of the particular setting. The idea that national cultures strongly condition the income-demand for children relation does not imply that each time and place is virtually sui generis; it does imply that the research approaches of economists and noneconomists need to be integrated.

For policy purposes, an understanding of the indirect mechanisms and their strength in different economic and cultural settings is especially vital. For example, in countries where income remains low but a birth reduction is desired, policy interventions may substitute for the weak or missing indirect effects of higher income; where income is rising, the pronatal pure income effect may be counteracted by interventions that reinforce some of the antinatal indirect effects.

ALTERNATIVE INCOME MEASURES

Alternative income measures may cause variations in the income-demand for children relation. In this regard, two issues deserve particular attention: (1) the difference between current and permanent income,

and (2) the way income is adjusted for differences in the size and composition of the receiving unit.

Current vs. Permanent Income

Although available data usually refer to income in a particular year, the demand for children is probably influenced by past, current, and expected income. Even if fertility decisions are made sequentially, a commitment to the support of another child is likely to be based on longer-term income trends, past and expected. Temporary income changes (for example, those arising from extraordinary harvests) may have little influence on expectations of permanent income and hence on fertility. However, there are other reasons why they may have a stronger and more positive association with fertility than longer-term income changes. First, if changes in tastes and attitudes (for example, perceived benefits of children) are contingent on sustained income increases and a sustained transformation of the economy, neither temporary income nor very recent fluctuations would fully reflect negative indirect effects on the demand for children. Second, short-term income fluctuations may affect the timing of births. If favorable income developments encourage couples to go ahead with their childbearing plans and bad times lead to postponement, current income will show a more pronounced pure income effect than permanent or long-term income. The positive historical response of the birth rate to business cycle fluctuations illustrates this phenomenon.[8]

A cross-section of recipients of large current incomes at the household (and to a lesser extent country) level may contain a disportionate number of units with temporarily high incomes; the reverse may be true for small current incomes. Thus the measured elasticity of demand for children with respect to current income might be higher than the underlying elasticity with respect to permanent income.

Adjustments for Size and Composition of the Receiving Unit

If income is to be a measure of welfare or financial latitude, it has to be adjusted for the number of people it supports. A common solution to this problem is to measure income on a per capita basis. However, income per capita is partly dependent on the number of children in the household and the labor force participation of wives and children. Unless children are fully self-supporting, dividing income by family size biases the income-demand for children relation in a negative direction. Further, high fertility is likely to reduce the wife's contribution to income, thereby reinforcing this negative bias. The per capita income measure may also introduce a nonlinearity into the income-fertility relation (Boulier, 1981). In strict logic, household income per capita is an endogenous variable determined simultaneously with the demand for children (Conger and Campbell, 1978).

In an attempt to reduce the negative bias, some investigators have regressed fertility variables on income per adult or income per member of the labor force rather than on income per capita. Others have used husband's income as a proxy for permanent income, assuming that husband's income is independent of fertility. However, Cramer's (1980) work tentatively indicates that, in the U.S., husbands may work longer hours and increase their earnings when there is a new baby in the household; Simon (1977) presents some evidence suggesting that large families may induce farmers to work longer hours so as to exploit their land more fully. Relatively few studies of LDCs have investigated the income-fertility relation by means of simultaneous equation models.

EMPIRICAL FINDINGS ON THE INCOME-DEMAND FOR CHILDREN RELATION

Empirical studies must simplify some of the complexities involved in the income-demand for children relation. Researchers have to choose which variables to include and omit, as well as which units of analysis, data sources, locales, and statistical techniques to use. A wide spectrum of empirical results would therefore come as no surprise. The subsections below review in detail the available empirical work: macro-level studies (Table 1), household-level studies (Table 2), and studies that relate some measure of assets to fertility (Table 3). The studies reviewed use fertility rather than some measure of the demand for children as the dependent variable. Although the latter can be approximated by data on the desired or ideal number of children, it is often not clear whether such data respond to actual income or are contingent on desired income; thus the focus of the present discussion is the determinants of actual fertility.

Macro-Level Studies

Table 1 presents a representative list of macro-level studies that relate measures of income to measures of fertility in a multivariate context. The dependent variables used vary, but the most common are the crude birth rate and the general fertility rate. These variables are not ideal for the purpose at hand since they are affected by age distribution; moreover, they do not measure completed fertility. The most common income measure is per capita income for each country, although income per member of the labor force is a frequent alternative. The direction of the income-fertility relation revealed by these studies is sometimes positive and sometimes negative; most often, it is not statistically significant. Of the 15 regressions that yield a significant coefficient, the coefficient is negative in 11 cases, positive in 4.

Macro-level studies involve a number of difficulties that may explain their inconsistent results. For one thing, they are handicapped by the difficulty of obtaining comparable data for a

sufficiently large group of reasonably homogeneous countries. Studies including MDCs as well as LDCs and communist as well as noncommunist countries may show spurious relationships not present within the cluster of LDCs (this is demonstrated, for example, by Hazeldine and Moreland, 1977). Another problem is in specifying the functional relationship between income and fertility; most studies assume a linear relationship without justifying that choice; some others use a loglinear or log-log form.[9]

A further problem arises from the sensitivity of results to the controls used, given the collinearity between income and various other concomitants of development. Many of the studies cited in Table 1 were intended to investigate major determinants of fertility rather than the income-fertility relation. Because variables that are exogenous at the household level but endogenous at the country level are usually held constant to approximate household-level relationships, the various determinants of income discussed above tend to be controlled. Nevertheless, few models treat income as an endogenous variable and present reduced-form as well as structural coefficients. The possibility that fertility may affect per capita income, or may be determined simultaneously with income, is seldom considered in these studies. Several of the studies using simultaneous-equation models exhibit a positive, though not significant, income-fertility relation in contrast to the negative relation typical of the single-equation models. DaVanzo (1972) and Rosenzweig and Evenson (1977) make a distinction between male, female, and children's wages in their simultaneous-equation models (wages acting as proxy for income) and find fertility related positively to the male wage and negatively to the female wage, as the Columbia-Chicago school postulates.

Two strategies can be used to address the consequences of income change; one would control for as many consequences as possible in order to isolate a pure income effect; the other would control only variables exogenous to household decisions with the aim of measuring the total income effect--pure and indirect. The disadvantage of the latter strategy is that it does not reveal the intervening mechanisms by which income exerts its influence on fertility. Many studies adopt a hybrid approach and control for some, but not all, of the following: female labor force participation, child school attendance, newspaper circulation, and child mortality. Less frequently, they control for consumption aspirations, educational aspirations, or age at marriage, although all these are part of the complex of choices confronting the household when its income increases. Consequently, the income effect captured by these studies is neither the total nor the pure effect, but a mixture of the pure and indirect effects via these omitted variables. The likelihood that these omitted variables are sensitive to income change and on balance tend to reduce fertility may be a major reason for the predominance of negative income coefficients shown in Table 1.

In addition, the distinction between demand for children and fertility tends to be blurred in these models since they ignore supply-side influences. Among the studies listed in Table 1, only

TABLE 1 Macro-Level Studies of the Income-Fertility Relation in LDCs

Author, Date	Sample	Method	Fertility	Income	Sign	Other Variables Included
Adelman, 1963	37 MDCs and LDCs	OLS	Log livebirths by age	Log per capita income	+[a]	Percent out of agriculture, education*, population density
Bhattacharya, 1975[b]	52 MDCs and LDCs	OLS	CBR	Per capita income	+[c]	Rural-urban income inequality, infant mortality rate, education
DaVanzo, 1972	Chile 1960 25 provinces	SE	Children born to women by 5-year age groups (ages 30-49 shown here)	Median daily wage: Female Male	 - +	Male and female education*, child labor*, child mortality*, legal marriage, consensually married*, urban dummy, female labor force participation, male unemployment, sex ratio, child school attendance
Drakatos, 1969	10 major geographic regions of Greece	OLS	Birth rate	Per capita income	-* + -	Percent reproductive population* Percent reproductive population*, percent rural Percent reproductive population*, percent literate among those aged 10+
Ekanem, 1972	24 LDCs 17 MDCs	OLS	CBR	Per capita income for ages 10+	-	Percent illiterate, infant mortality rate, percent urban, percent labor force in agriculture*
Flegg, 1979[b]	60 MDCs and LDCs 47 LDCs 38 poor LDCs 60 MDCs and LDCs 47 LDCs	OLS OLS OLS SE SE	Log CBR	GDP per head	-* -* -* -* -*	Atkinson index[b], infant mortality rate, percent females illiterate[b], percent females working[b] Atkinson index, infant mortality rate, percent females illiterate, percent females working, Moslem, Asia or Africa
Friedlander and Silver, 1967	82 MDCs and LDCs 44 LDCs	OLS	Live births per married woman	Per capita income per person aged 15-64	- -*	Education[a], child mortality, population density, dependency ratio*
Gregory and Campbell, 1976	18 Latin American countries	OLS	CBR	Per capita income	+[a]	Female labor force participation[a], infant mortality rate, percent urban population[a], various interaction terms
Gregory et al., 1972	40 MDCs and LDCs	SE	CBR	Per capita income	+	Infant mortality rate, illiteracy rate*, tion rates, total labor participation rate, per capita energy consumption, population density, percent aged 15 to 50

Hazeldine and Moreland, 1977	82 MDCs and LDCs	OLS	Ln CBR	Ln per capita income	-	Ln percent population in agriculture*, ln infant mortality rate*
	29 African		Ln NBR		-*	Ln percent population in agriculture
	19 Latin American		Ln CBR		+*	Ln percent population in agriculture*
	11 Asian		Ln CBR		+	Ln percent population in agriculture, ln infant mortality rate*
Heer, 1966	41 MDCs and LDCs	OLS	GFR males	Per capita income per person aged 15-64	+	Newspaper circulation per 1,000, mortality of infants under age 1*, population density, percent increase in energy use*
Hicks, 1974[b]	Mexico 29 states	OLS	CEB	Per capita product	-	Arable land*, machinery per farm worker, percent population literate[a], life expectancy[a], indigenous population*, employment in agriculture*
			TFR		-	
Janowitz, 1971	57 MDCs and LDCs	OLS	Log births by age: 15-29	Log per capita income	+	Percent labor force not in agriculture, education*, population density*
			30-44		-	
			45-49		+	
Nerlove and Schultz, 1970	Puerto Rico 1950-60 75 small geographic regions	SE	CBR	Personal income per person of labor force age	+	Male and female education, child schooling, child labor*, child mortality*, female labor force participation, legal marriage*, consensual marriage, adult sex ratio, adolescent schooling, adult education, CDR lagged, unpaid family workers*, unemployment rate, percent labor force in agriculture, migration
Repetto, 1974[b]	64 MDCs and LDCs	OLS	Births per 1/2 population aged 15-64	Per capita income	-*	Newspapers per 1,000 population*, distribution of income*
Repetto, 1979[b]	45 MDCs and LDCs	SE	GRR	Per capita income	-	Gini coefficient[a], infant mortality rate, female literacy, news circulation
			Approx. GFR		+	
Rosenzweig and Evenson, 1977[b]	India districts	SE	Children aged 0-4 per woman	Field wages:		Average land holdings*, Kuznets index of land holding inequality*, land productivity[a], percent primary education for males and females, percent matriculated males and females, percent population rural
				Males	+	
				Females	-	
				Children	+	

TABLE 1 (continued2)

Author, Date	Sample	Method	Fertility	Income	Sign	Other Variables Included
Russett et al., 1964	38 MDCs and LDCs	OLS	CBR	Log GNP per capita	-*	Adult literacy*, income growth rates*, marriage rates*, percent Catholic
Schultz, 1969	Puerto Rico 1950-57, 75 municipalities	GLS single eq.	CBR	Median income of persons aged 15+	-[a]	CDR lagged*, education[a], female activity[a], family workers*, CBR lagged
Weintraub, 1962	30 MDCs and LDCs	OLS	Mean birth rate	Per capita income	+	Percent population in agriculture, infant mortality rate*
Winegarden, 1980[b]	36 LDCs	OLS	GFR	Ln GDP/population aged 15-64	+	Primary-secondary enrollment[a], income of poorest 2/5ths households, family planning dummy*, percent labor force in agriculture, life expectancy[a], life expectancy squared[a], population per nurse, percent labor force in agriculture minus percent income received by agriculture, percent gross fixed domestic investment in public sector, annual GDP growth rate
	Life expectancy: Over 49.7 29 LDCs	SE			-[d]	
	Under 49.7 7 LDCs	SE			+[d]	
Winegarden, 1981[b]	36 LDCs	OLS	GFR	GDP/population	+*	Income share of poorest 2/5ths households[a], life expectancy[a], life expectancy squared[a], school enrollment ratio[a], percent labor force in agriculture[a], family planning program by 1965*, Mauldin-Berelson index of gross effort to reduce fertility*, agriculture share of GDP, public sector share of gross fixed investment, annual rate of growth of GDP, population per nurse
		SE			+[d]	

* Statistically significant.
[a] Statistically significant in some specifications.
[b] Study also appears in another table.
[c] Tests of statistical significance not available.
[d] Reduced form coefficients.

those by Winegarden (1980, 1981) attempt to control for the availability and effectiveness of family planning programs in each country; in both of these articles, the measure used for this purpose shows a very significant negative coefficient.

Finally, few of the macro studies take account of income distribution. If the income-fertility relation is nonlinear at the household level (as is suggested by some of the results presented below), these studies may suffer from omitted-variable bias.

Micro-Level Studies

Table 2 gives a representative list of household-level studies. Most of these studies seem to be intended to measure the total income effect. Common controls are age of wife and/or duration of marriage, education of one or both parents, occupation, and infant or child mortality, variables which are presumably exogenous to the household. Although these studies tend to focus on the total income effect, most of the significant income coefficients are positive (16 out of 22); however, many nonsignificant coefficients once again appear. Kelley (1980) and Khan and Sirageldin (1979) offer the only simultaneous equation models; their studies, like others, show mixed results. Studies by Mueller and Cohn (1977) and by Anker (1977) control for such variables as educational aspirations, perceived benefits of children, and consumption aspirations in an attempt to approximate a pure income effect; both studies show a positive income-fertility relation. Other studies, by Anker and Knowles (1980) and Repetto (1979), hold constant a few attitudinal consequences of income change and obtain a mixture of positive and negative coefficients; supply-side influences again tend to be ignored.

It was argued earlier that the positive income effect may be overstated in household-level comparisons since these capture short-term as well as the more relevant long-term income variations. Another possible reason for the disparity between micro- and macro-level results is that the former relate to a more culturally and economically homogeneous environment. If the variance in aspirations, female labor force participation, age at marriage, and knowledge of and attitudes toward fertility control is smaller across households in one country than it is across many countries, the pure income effect should be stronger and the indirect effects weaker in the micro-level results. In that case, the measured income effect is more likely to be positive on balance in micro-level studies.

Encarnacion's study (1974) is of particular interest because he investigates the possibility that the direction of the income effect may depend on social and economic conditions. Dividing his Philippine data into subgroups by urban and rural residence, he finds the income-fertility relation to be inverse for urban and direct for rural areas. This urban relation is consistent with Ben-Porath's (1973) findings for urban wage earners in Israel, Anker and Knowles' (1980) findings for urban Kenya, Khan and Sirageldin's (1979) results for urban Pakistan (in the TSLS model only), and Schultz's (1981) results

TABLE 2 Micro-Level Studies of the Income-Fertility Relation in LDCs

Author, Date	Sample	Method	Fertility	Income	Sign	Other Variables Included
Anker, 1977	India, 11 rural villages 454 households	MCA	Ideal family size Completed family size	Income per adult	+[a] +[a]	Parent's education, percent economic benefit of children, felt economic burden, caste, development level of village, urban contact, ownership of consumer durables, perception of economic change, rooms per adult, husband's occupation, use of abstinence
Anker and Knowles, 1980[b]	Kenya, 1,888 married women Subgroups: Rural n = 1,605 Urban n = 283	OLS	CEB	Annual household income per adult	- + -*	Age*, age squared*, parents' education[c], urban residence[c], parents' siblings[c], wife's work experience[c], average child school enrollment[c], educational aspirations[c], migrant[c], child survival rate[c], family planning participation, polygamous[c], husband's residence[c], health, breastfeeding experience[c], land[c], livestock[c]
Ben-Porath, 1973	Israel, urban wage earners	OLS	CEB for women aged 40+	Husband's current earnings	-	Age of wife*, years married*, continent of birth, period of immigration, husband's schooling, wife's schooling*
Boulier, 1981[b]	Philippines 3,425 observations	OLS	CEB Living children	Husband's annual income	+* +*	Age of wife*, cumulative natural fertility*, percent births surviving, husband employed in agriculture*, education of wife[c], education of wife squared*
Canlas, 1978	Philippines nationwide (subsample, 2,352 observations)	OLS	CEB	Annual family income below subsistence: All Rural Urban Annual family income above subsistence: All Rural Urban	+* + + + - +	Age cohort*, age at marriage*, labor force participation[c], education[c]
Chalamwong et al., 1979[b]	Thailand 21 villages 840 farm households	OLS	CEB	Agricultural income Nonagricultural income	- +	Farm size*, ownership status*, land quality, age at marriage*, female education*, child labor participation

Chernichovsky, 1976[b]	India, 212 households	OLS	CEB	Total income (sub-sample n = 128)		+*	Ln mother's age*, mother's age at marriage*, mother literate, father's schooling[c], number of children died[c]
				Income source:			
				Agriculture		+*	
				Unskilled labor		+*	
				Skilled labor		-	
Cochrane et al., 1977[b]	Nepal 150 farms	OLS	Live births	Imputed farm income plus other income per family member		-	Marriage duration*, various measures of education[c], land worked per family member
Encarnacion, 1974	Philippines nationwide 7,237 households	OLS	Live births	Annual family income (Y- = below approx. median; Y+ = above approx. median)	All	-	Wife's age at marriage[c], duration of marriage*, duration of marriage squared*, wife's education
					Urban	-	
					Rural	+	
					Y-	+*	
					Y+	-	
					Urban Y-	+*	
					Urban Y+	-	
					Rural Y-	+*	
					Rural Y+	-	
Farooq, 1979	Nigeria, 1,021 observations urban women in South Western Nigeria	OLS	CEB	Husband's income		+*	Wife's education[c], wife's work experience*, polygamous, excess female CEB, child survival rate*, age of wife*, age squared*, above average living standard[c], Muslim[c], breastfed last child*, contraception attitudes and use, age at marriage*
			Desired family size			-*	
Kelley, 1980	Kenya, 3 urban areas, 401 households	SE	CEB	Household income			Savings, surviving children, child deaths*, age of household head, age of wife*, male[c] and female[c] education, tribal status, urbanization
				Child deaths exogenous		+*	
				Child deaths endogenous		+	
Khan and Sirageldin, 1979	Pakistan 1,024 married women	SE	Live births	Current monthly income			Child mortality[c], husband's education[c], wife's age*, age at marriage[c], husband's age, travel time to medical place, binary variables for wife literate[c], land owned*, house owned[c], nuclear family[c], child in school[c], wife in labor force[c], wife aware of family planning[c], income adequate[c], urban[c], child under five present
				Total sample		-	
				Urban		-*	
				Rural		+*	

TABLE 2 (continued2)

Author, Date	Sample	Method	Fertility	Income	Sign	Other Variables Included
McCabe and Rosenzweig, 1976	Puerto Rico approx. 3,000 households	OLS	CEB	Nonearnings income Predicted husband wage Predicted wife wage	- +* +*	Education of wife*, education of husband*, age of wife, age of wife squared
Mueller and Cohn, 1977	Taiwan islandwide 2,100 couples	MCA	Living children Ideal no. of children	Income per adult	+[a] +[a]	Wife's age, marriage duration, family structure, husband's education, wife's education
Repetto, 1979[b]	Puerto Rico 6,300 households	OLS	CEB	Income per person	-*	Age of wife*, age of wife squared*, income per capita squared*, number of children in excess of two*, neighborhood education level*, legal* or consensual[c] marriage, women employed*, percent children enrolled*, variance of income in husband's occupation[c], years of school completed by women*, neighborhood level fertility*
			Own children under 2 years		-*	
	Korea, 4,570 currently married women	OLS	CEB	Income per person	-*	Age at marriage*, preferred family size*, number of sons*, contraceptive use, years at current residence*, nonfamily paid employment, current age*, educational aspirations*, expected old age support*, respondent's education, husband's occupation
Rosenzweig, 1976	Philippines countrywide 8,434 households	OLS	Expected additional children	Husband's expected wage	-	Wife's age at marriage, wife's age*, living children*, wife's education, wife's education x age*, husband's education, husband's age, child mortality rate, wife's knowledge of contraception*, husband in farm work, wife's work experience, work experience x age*
Rosenzweig, 1978	Philippines countrywide 7,237 households	OLS	CEB	Husband's expected wage	-	Child's wage rate*, wife's schooling*, age*, husband's schooling, age*, farm residence, infant mortality rate*, religion, knowledge of contraception

*Statistically significant.
[b]Also appears in another table.
[a]No tests of statistical significance available.
[c]Significant in some specifications.

for husband's wages in urban Colombia. On the other hand, Kelley (1980) obtains a positive relation for urban Kenya and Farooq (1979) for urban Nigeria. Encarnacion's positive relation for rural areas is consistent with Anker's (1977) results for 11 Indian villages, Anker and Knowles' (1980) results for rural Nigeria, Schultz's (1977) for men's wages in rural Colombia, Khan and Sirageldin's (1979) for rural Pakistan, and Chernichovsky's (1976) for agricultural income and income from unskilled occupations in India. Chalamwong et al. (1979) find a negative relation in 11 Thai villages, and Cochrane et al. (1977) find the same for a sample of Nepalese farms; however, both of these studies control for farm size, which comes close to being a proxy for rural income.

One may conjecture that in traditional rural areas, the rich and the poor are less differentiated in tastes and attitudes than in urban areas, with their modern and traditional sectors. Hence the unmeasured negative indirect effects would be weaker in rural areas. In addition, negative price effects (via child costs and women's time) may be stronger in urban than in rural areas. Encarnacion (1974) provides a more general explanation by showing that the income-fertility relation is nonlinear. Dividing both his urban and rural samples into subgroups falling below or above approximate median income, he finds significant positive relationships for the groups below the median. This result was confirmed by Canlas (1978) with a later data set for the Philippines; Repetto (1979) shows a similar nonlinearity in his Puerto Rican data, although only age is controlled in this particular part of his analysis. The constraints on fertility in very low income populations might be partly biological. Both Anker (1978) and Winegarden (1980, 1981) find in macro-level studies that, at low levels of life expectancy, declining morbidity and mortality have a substantial positive effect on fertility. In addition, behavioral factors may make for a positive income-fertility relation in low-income groups; these might include limited contact with modernizing influences and hence a weak negative impact of rising aspirations on fertility. In some cultures, the shift of women from market work to domestic pursuits as income rises from very low levels might also make for a positive income-fertility relation. Repetto's (1979) analysis of Korean and Puerto Rican data indicates that the income-fertility relation is negative overall but becomes weaker as income rises. However, since Puerto Rico and Korea are at higher stages of development than the Philippines, these findings are not inconsistent with those of Encarnacion.

Three of the household-level studies, by Mueller and Cohn (1977, in Taiwan), by Anker (1977, in India), and by Farooq (1979, in Nigeria), separately analyze actual and ideal number of children as dependent variables. This experiment is of interest because ideal family size is perhaps closer to the demand for children than actual family size. The Taiwan and Indian studies show a positive relationship between income per adult and ideal number of children, the Nigerian one a negative relationship. A study by Rosenzweig (1976) for the Philippines, using expected additional children as the

TABLE 3 Studies of the Asset-Fertility Relation in LDCs

Author, Date	Sample	Method	Fertility	Asset Measure	Sign	Other Variables Included
Panel A. Macro-Level Studies						
Anker and Knowles, 1980[a]	Kenya 41 districts	GLS	TFR	Livestock per capita	+	Percent males and females literate, percent urban[b], ave. life expectancy[b], ave. life expectancy squared[b], percent married women sterile*, mean singulate age at marriage, percent women never married, percent widows, percent using family planning clinic
				Climate-adjusted agricultural land per person	-	
Kleinman, 1973[a]	Rural India	OLS	General or marital fertility	Cultivated acreage	+*	Family labor[b], labor force modern* or primary*, female labor force participation*, sex ratio[b]
				Land concentration	-*	
Merrick, 1978	Rural Brazil 155 regions	Path analysis	Births/1,000 married women	Relative land scarcity	-*	Literacy*, child survival, subsistence farming*, employment ratio in agriculture*
Stys, 1957	Southern Poland 20 villages	OLS	Average no. of children	Farm size	+[c]	None
Panel B. Micro-Level Studies						
Aghajanian, 1978	Rural Iran 25 villages 505 couples	MCA	CEB	Size of landholding	+[c]	Wife's age, wife's age at marriage, husband's education level, husband's occupation, wife's economic activity
Anker and Knowles, 1980[a]	Kenya 1,605 rural married women	OLS	CEB	Land	+*	Age*, age squared*, parents' education[b], parents' siblings[b], wife's work experience, average child school enrollment[b], educational aspirations[b], migrant, child survival rate[b], family planning participation, polygamous[b], husband's residence[b], health, breastfeeding experience[b], income[b], urban residence[b]
				Livestock	-	

Chalamwong et al., 1979[a]	Thailand 21 villages household data	OLS	CEB	Farm size Land quality	+* -	Ownership status*, child labor*, female education*, marriage age*, agricultural income, nonagricultural income
Chernichovsky, 1976[a]	N.E. Brazil 170 low-income households	OLS	CEB	Area of accessible land	+*	Mother's age*, mother's age at marriage*, infant mortality[b], extended family*, father literate*, mother's schooling, ownership of land
Cochrane et al., 1977[a]	Nepal 150 farms	OLS	Live births	Land worked per family member	-	Duration of marriage*, various measures of education[b], income
Hicks, 1974[a]	Mexico, 31 rural areas	OLS	CEB	Arable land Capital per farm worker	+* -	Per capita product, percent literate, indigenous population*, employed in agriculture*, life expectancy
Latif and Chowdhury, 1977	Bangladesh 2 villages 240 couples	OLS	CEB	Land owned	+*	Duration of marriage
McInnis, 1977	Upper Canada (1861) 1,200 households	OLS	Children	Farm size Percent acreage improved Land utilization	+* +* +	Mother's age*, urban influence*, period of settlement, town and village population, religion of head, birthplace of head
Rosenzweig and Evenson, 1977[a]	India 189 districts	SE	Children aged 0-4 per woman aged 15-44	Average landholding Land productivity	+* +*	Field wages of males[b], females[b], and children[b], Kuznets' index of landholding inequality*, percent males and females in primary education, percent males and females matriculating, percent rural

*Statistically significant.
[a]Also appears in another table.
[b]Significant in some specifications.
[c]Tests of statistical significance not available.

dependent variable, shows no significant relationship with husband's expected wage.

Assets and Demand

Table 3 presents empirical findings on the relationship between assets and the demand for children. All of these studies examine this relationship in an agricultural setting, where land is the major asset. This is a valuable feature of these studies if, as was conjectured earlier, income and wealth differences in such settings are only weakly associated with education, tastes, and other confounding influences. Measures of land quantity show a consistent positive relation to fertility, in most cases statistically significant. One exception is the macro-level analysis of 41 Kenyan districts by Anker and Knowles (1980); however, at the micro-level, the same study finds a significant positive land-fertility relation for rural Kenya. The only other exception is a small study by Cochrane et al. (1977) in rural Nepal where neither land nor income is statistically significant.

In two studies, by Chalamwong et al. (1979), and by Rosenzweig and Evenson (1977), land quality is also measured. It appears with a positive and significant coefficient in the latter study but is not significant in the former. Hicks (1977) includes farm machinery, and Anker and Knowles (1980) include livestock holdings; however, neither of these attempts to broaden the measure of rural assets yields significant results, probably because of the high correlation between land and other farm assets.

The finding that, in rural areas, landholdings (a major determinant of income) have a rather consistent positive effect on fertility supports the hypothesis of a positive pure income effect in these areas. However, other factors may be at work as well, such as a complementarity between land and children's labor, inheritance or dowry targets, and, in some places, lower female labor force participation among families with larger landholdings. At the same time, the negative indirect effects, including rising consumption and educational aspirations and diminishing benefits of children, seem to be weaker in rural than in urban areas.

INCOME INEQUALITY AND THE DEMAND FOR CHILDREN

Income inequality may affect the demand for children for two reasons. First, the income-demand for children relation may be nonlinear; that is, different income groups may have different demand responses to marginal income changes. In that case, the distribution of income changes among income groups affects the total change in demand. This can be called the nonlinearity effect. Second, the extent to which the income of the poor deviates from the mean income of a reference group, or the degree of inequality in general, may affect the uses to which income increases are put. This is called the relative income

effect (Birdsall, 1977). These two effects are described below, followed by a review of the empirical data on the general relationship between income inequality and fertility.

Nonlinearity

Nonlinearities may exist in both the pure and total income-demand for children relations. Indirect effects again are important. As was shown above, the total relation seems to depend on the level of income; this is depicted in Figure 2 (following Repetto, 1979). Over the range $Y_0 - Y_1$, income redistribution in favor of the poor would raise fertility. Over this low income range, the pure income effect is presumably quite strongly positive, while the negative indirect effects via the aspiration variables seem to be relatively weak, except among a small elite. Anker (1978) has shown that increases in education and industrialization, important preconditions for some of the negative indirect effects, accelerate at later stages of development. He has also shown that improved health conditions and lower female labor force participation may initially increase fertility as aggregate income rises from very low levels. Others have suggested that the high psychological and economic costs of fertility control impede an early decline in the demand for children (Easterlin, 1978).

By contrast, over the range $Y_2 - Y_3$, the income-fertility relation may be approximately U-shaped, so that a redistribution of income toward the poor will reduce fertility. There are two underlying behavioral explanations: (1) the positive pure income effect may level off at higher incomes; and (2) at later stages of development, the lower- and middle-income groups may be increasingly exposed and receptive to such effects of modernization as the taste for new consumer goods and educated children or the approval of contraception, whereas the upper income groups have already adopted

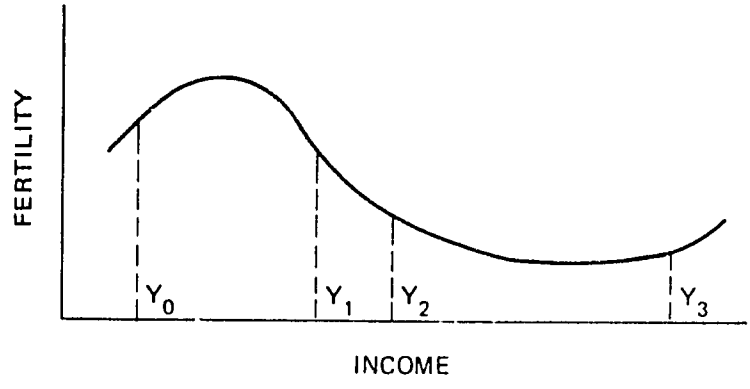

FIGURE 2 The Total Income-Fertility Relation

new behavior patterns. The total effect of income redistribution on the demand for children shifts from positive to negative at the inflection point between Y_1 and Y_2; there may be a linear range in this area. Repetto (1979) asserts that, in most developing countries, incomes fall in the $Y_2 - Y_3$ range. This assertion is crucial to his generalization that income redistribution lowers fertility. However, for many populous developing areas (rural South Asia, rural Africa), this assertion appears dubious. The assertion is also inconsistent with the predominance of positive income-fertility relations in Table 2. Puerto Rico and Korea, the two countries on which Repetto's research focuses, are relatively well off and modern among developing nations, and thus would seem to fit in the $Y_2 - Y_3$ range.

If the total income-demand for children relation has anything like the shape depicted in Figure 2, a positive regression coefficient should be expected for measures of income inequality in low-income populations, and a negative one in higher-income populations. However, as noted above, the strength of the direct and indirect income effects depends not only on the stage of economic development but also on cultural and structural factors. Therefore, the response of fertility to changes in income distribution is not as closely related to income level as Figure 2 implies.

The Relative Income Effect

As suggested earlier, consumption patterns are affected not only by the income and prices facing the household but also by the living standards of reference groups. If the demand for children is part of a larger pattern of consumption and time-use choices, fertility decisions should likewise be influenced by the income of reference groups. However, it is not known how people in LDCs choose reference groups; nor is the direction of the relative income effect self-evident. The more unequal the distribution of income, the greater the relative deprivation of the poor; thus the poor in societies with greater income inequality may forego children to emulate the consumption and educational standards of more affluent reference groups. Similarly, income inequality may be thought to foster people's consciousness of economic status and thereby the felt need for status-related expenditures, which in turn would compete with children for people's incomes. By contrast, Leibenstein (1974) assumes that growing income equality leads to status-differentiating expenditures, so that equality rather than inequality lowers fertility. Repetto (1979) reaches this conclusion by a different route: he believes that, in an egalitarian society, changes in tastes and attitudes (including small-family norms) spread more quickly through the social structure than in a society with greater economic inequality. Retherford (1979), following a similar line of reasoning, holds that cultural and socioeconomic homogeneity accelerate the fertility decline, while inequality delays it among the poor.

Empirical Data on Income Inequality and Fertility

In 1973, Kocher (1973) and Rich (1973) suggested that fertility is positively related to income inequality, a conclusion based largely on anecdotal comparisons of selected countries. Table 4 summarizes the small number of studies conducted since then that test this relation statistically. The macro-level models show more positive than negative regression coefficients for the inequality measure, as Kocher and Rich postulated. However, this evidence must be interpreted cautiously since these studies are subject to a number of methodological problems. First, a number of investigations combine samples of MDCs and LDCs, communist and noncommunist countries. Both Flegg (1979) and Repetto (1974) show that the exclusion of East European countries from intercountry comparisons weakens the measured positive relation between income and fertility. Further, at the macro-level, income inequality and fertility are part of a complex system of causal relationships that are inadequately addressed in most of these studies. Income inequality may affect fertility, but the reverse is also true. Although inequality may influence fertility indirectly via school attendance, child mortality, and female labor force participation, these intervening variables are also partly dependent on fertility (or population growth in the case of schooling). Repetto's (1979) attempt to estimate a simultaneous equation model reflecting this causal nexus shows the great difficulty involved in properly indentifying the key structural equations, given the available data.

The work of Winegarden is the most satisfactory methodologically. His sample is limited to LDCs (but the N is only 36). He reduces the bias inherent in income per capita at least partially by using income per person aged 15-64. In his 1980 model, fertility, life expectancy, school enrollment, and inequality are endogenously determined; in the 1981 model, fertility, inequality, life expectancy, and population growth are endogenous. In both studies, Winegarden finds no evidence that the direct, or first-order, effect of lessened inequality is lower fertility. Solving the model for the reduced form, he finds that mortality conditions play a crucial role in determining the inequality-fertility relation. At higher levels of life expectancy (e_0 greater than 49), inequality raises fertility; at lower levels, inequality is inversely related to fertility, primarily because of the complex negative feedback from mortality.

Winegarden's results for populations with low life expectancy receive some confirmation from a study by Rosenzweig and Evenson (1977) and another by Kleinman (1973), both analyzing interdistrict fertility differentials in rural India. These studies find a significant negative relation between land concentration and fertility.

There are apparently only three household-level studies that test the inequality-demand for children relation, two by Repetto (1979, for Puerto Rico and Korea) and a less ambitious one by Boulier (1981, for the Philippines). In these studies, the nonlinearity of the income effect is measured by income and the square of income. Repetto and Boulier obtain opposite results, possibly because the countries they

TABLE 4 Studies of the Income Distribution-Fertility Relation in LDCs

Author, Date	Sample	Method	Fertility	Inequality		Sign	Other Variables Included
Panel A. Micro-Level Studies							
Bhattacharya, 1975	52 MDCs and LDCs	OLS	CBR	$\frac{\text{urban } Y/P - \text{rural } Y/P}{Y/P}$		+[a]	Income per capita, infant mortality rate, education
Flegg, 1979	60 MDCs and LDCs	OLS	Log CBR	Log Atkinson index		+*	"Real" GDP per head*, infant mortality rate, percent females illiterate*, percent working females*
	47 LDCs	OLS				+*	
	38 poor LDCs	OLS				+*	
	60 MDCs and LDCs	SE				+*	Real GDP per head*, infant mortality rate, percent females illiterate*, percent working females*, Moslem, Africa or Asia
	47 LDCs	SE				+*	
Kleinman, 1973	Rural India 315 districts	OLS	General fertility rate	Land concentration		-*	Cultivated acreage*, family labor[b], labor force modern*, labor force primary*, female labor force participation*, sex ratio[b]
			Marital fertility rate			-*	
Repetto, 1974	64 MDCs and LDCs	OLS	Births per 1/2 population aged 15-64	Gini	linear	+*	Life expectancy*, newspapers/1,000 population*
					log	+*	Income per capita*, newspapers/1,000 population*
				Income share of wealthiest 3/5ths of households[c]	linear	+*	Life expectancy*, newspapers/1,000 population*
					log	+*	Income per capita*, newspapers/1,000 population*
Repetto, 1979	45 MDCs and LDCs	SE	GRR	Gini		+*	Infant mortality rate, female literacy, income per capita
			Fertility			+	Infant mortality rate, income per capita, news circulation

Rosenzweig and Evenson, 1977	India 189 districts	SE	Children aged 0-4 per woman	Kuznets' index of land inequality	-*	Field wages of males[b], females[b], and children[b], average landholdings*, land productivity*, male and female education, percent rural
Winegarden, 1980	36 LDCs	OLS	GPR	Income share of wealthiest 3/5ths of households[c]	-	None
		TSLS			+	Life expectancy*, life expectancy squared*, school enrollment ratio*, family planning dummy*, percent labor force in agriculture*, GDP/population aged 15-64
		SE			+[d]	Life expectancy, school enrollment ratio, ln GDP/population aged 15-64, population per nurse, annual rate of population growth, Moslem, family planning program, percent labor force in agriculture, percent work force in agriculture minus percent total income received by agriculture, percent gross fixed domestic investment in public sector, annual GDP growth rate
	29 LDCs ($e_0 > 49.7$)				+[d]	
	7 LDCs ($e_0 < 49.7$)				-[d]	
Winegarden, 1981	31 LDCs	OLS	GPR	Income share of wealthiest 3/5ths of households, 1965-73[c]	-*	Life expectancy*, life expectancy squared*, income per person aged 15-64*, school enrollment ratio*, percent labor force in agriculture*, family planning program by 1965*, Mauldin-Berelson index*
	36 LDCs	OLS			+	(Same as above excluding family planning program by 1965 and Mauldin-Berelson index)
	36 LDCs	SE			+[d]	Life expectancy, income per person aged 15-64, school enrollment ratio, percent labor force in agriculture, family planning dummy, agriculture share of GDP, public sector share of gross fixed investment, annual GDP growth rate, population per nurse
	$e_0 = 66.26$				+[d]	
	$e_0 = 48.44$				-[d]	

TABLE 4 (continued)

Author, Date	Sample	Method	Fertility	Inequality	Sign	Other Variables Included
Panel B. Micro-Level Studies						
Boulier, 1981	Philippines 3,425 observations	OLS	CEB	Husband's annual income	+*	Wife's age*, wife's education[b], wife's education squared*, husband's agricultural employment*, child survival rate, cumulative natural fertility schedule*
				Husband's annual income squared	-*	
			Living children	Husband's annual income	+*	
				Husband's annual income squared	-*	
Repetto, 1979	Puerto Rico 6,300 households	OLS	Children under two[e]	Income per person	-*	Age of woman*, age squared*, number of children in excess of two, neighborhood level education*, neighborhood fertility level (CEB)*, legal* or consensual marriage, woman employed*, percent children enrolled*, variance of income in husband's occupation, years school completed by woman*, Gini coefficient of neighborhood income
				Income per person squared	+*	
	Korea 4,570 married women	OLS recursive model	CEB	Income per person	-*	Age at first marriage*, contraceptive use, preferred family size*, educational aspirations for children*, old age support*, child mortality*, age*, percent living sons*, years at residence*, occupation, education of parents, employment experience, rural background, no. of siblings
				Income per person squared	+*	

Note: Each of these studies has already appeared in a previous table.

*Statistically significant.
[a]Tests of statistical significance not available.
[b]Statistically significant in some specifications.
[c]The variable actually used was "income share of the poorest 2/5ths of households." It was converted it to represent inequality for the sake of comparability. The sign on the coefficient of the explanatory variable has been reversed accordingly.
[d]Reduced form coefficients.
[e]A similar regression with CEB as the dependent variable and mean neighborhood CEB deleted yielded the same signs on the income variables.

study are at different stages of development. It is postulated above that inequality may depress the demand for children in the least developed countries and raise it in those which have made more progress. The disparate findings for the Philippines on the one hand and Puerto Rico and Korea on the other are consistent with this hypothesis.

However, these disparate findings may also have methodological origins. One problem is the treatment of female labor force participation and children's school enrollment as exogenous variables in Repetto's model. Another is the definition of income. As noted above, use of a per capita household income variable imparts a negative bias to the income-fertility relation. Boulier demonstrates that it can also introduce a spurious nonlinearity, and he therefore uses husband's income and the square of husband's income; Repetto shows that the nonlinearity bias is small in his Puerto Rican sample and uses per capita income.

The response of fertility to income inequality, as reflected in the empirical studies summarized in Table 4, is due to the combined impact of both the nonlinearity and relative income effects. Very few studies of developing countries focus specifically on the relative income hypothesis. In his analysis of Puerto Rican fertility at the household level, Repetto (1979) used the Gini index of inequality in the respondent's place of residence (presumably the relevant reference income) to test for a relative income effect; this index never comes close to statistical significance. Mueller and Cohn (1977) examined the effect of relative income on fertility in Taiwan and likewise found no consistent relation. Anker (1977) compared low-income Indian villages with only low-caste inhabitants to more affluent ones with both higher and lower castes. After controlling for household income and other household-level characteristics, he found that fertility was lower in the better-off, mixed-caste villages; in other words, the higher castes seemed to constitute a reference group promoting the diffusion of low-fertility norms. Clearly, more research is needed before any conclusions can be drawn about relative income effects in developing countries.

Conclusions About Income Inequality

Because the empirical work on the income inequality-fertility relation is meager, handicapped by insufficient data, and open to methodological criticisms, it does not generate firm conclusions about the impact of income redistribution on the demand for children. Tentatively, both theoretical and empirical analysis suggest that income-equalizing policies may have a positive effect on the demand for children in low-income, traditional populations with low life expectancy, and a negative effect in more progressive and affluent populations. However, this conclusion is based on the assumption that income redistribution is brought about by a direct lump-sum transfer of income. In reality, the living standards of the poor may be altered in a variety of ways having their own effects on fertility.

For example, either the creation of rural industries providing jobs for poor women or improved access to schooling for poor children would tend to raise the relative cost of children. By contrast, free nutrition programs or food price subsidies might lower this cost, especially if eligibility for such benefits were influenced by family size. Thus, the nature of the interventions used may be more crucial for the achievement of low fertility goals than the actual redistribution of income.

UNRESOLVED RESEARCH ISSUES

Because income change has numerous causes and consequences, this discussion has touched on many aspects of household behavior. In doing so, it has also touched on a number of unresolved research issues. These are summarized below.

1. There is a fair amount of evidence that the income-fertility relation is positive at low income levels and negative at higher ones. Two questions then arise: What level of income is the turning point in different societies? And why does the relationship change from positive to negative? To answer these questions, one must determine how the sources and consequences of income change differ in the two income ranges, and how the sensitivity of fertility varies with these differences.

2. Evidence has also been presented showing that the land-fertility relation is positive in developing countries. It must then be asked whether this relation has a turning point as well, that is, whether it becomes negative for large holdings. Further, why is the relation positive over the observed range? Research might explore the effect of farm size on hours worked by women and children, actual and expected age at marriage, parents' bequest and dowry targets, educational aspirations, expectations of assistance from children, urban contacts, and the like.

3. The economic theory of fertility was formulated for economies where the large majority of people are wage and salary earners and labor markets function reasonably well; it needs to be modified for economies where there is underemployment, most people are self-employed, and labor demand beyond family enterprises may be limited to certain age/sex groups and seasons of the year. Empirical work on such settings is needed; in particular, an autarchical model (Rosenzweig, 1979) should be used to study the demand for children in farm households.

4. To define the behavioral links between inequality and fertility, research should focus on the role of relative income, on reference groups for various income classes, and on the diffusion of such innovations as longer female education, contraception, and low-fertility norms. Research is also needed on the diffusion of new consumer desires that compete with children, such as radio and television, higher education for children, savings, and investments in the family's farm or business. Of particular relevance is the question of how these diffusion processes are related to income change.

5. This discussion has alluded to the relation between wage and income changes on the one hand and female labor force participation on the other, and between the latter and fertility. The responsiveness of the hours spent by wives in income-earning activities to changes in husbands' earnings and in their own labor productivity has been investigated quite thoroughly for MDCs, but much less adequately for LDCs. The assumption that increased market work by women reduces the family's demand for children is likewise not well substantiated for LDCs. More research is needed to determine under what conditions the negative price-of-time effect reduces fertility, and under what conditions it does not.

6. The measurement of tastes remains a challenge to social scientists. If better measures could be devised, studies of changes in tastes--the conditions under which they occur and their consequences for fertility--might provide valuable new insights. Of particular importance to the present discussion are tastes for educated children, for newer and better consumer goods, for leisure, and for nonworking wives.

7. As noted above, the theoretical literature views the desire for child quality and quantity as competing for family resources. Hence the desire for child quality is seen as instrumental in reducing the income elasticity of demand for child quantity. The applicability of this idea to LDCs must be investigated. Is the demand for child quality income-elastic at all levels of income, or only after some threshold has been reached? How much is the demand for child quality influenced by rates of return on education, educational levels of reference groups, or costs of education? Under what circumstances do parents strive to give the same education to all their children of the same sex, and under what conditions are they satisfied to educate only one (or two) sons?

PROPOSITIONS

The following propositions summarize the major points made in the foregoing discussion.

1. The relation between permanent income and the demand for children is very likely to be positive, once the effects of other variables causally linked to income are held constant. This can be called the <u>pure</u> income effect.

This is a theoretical proposition, since the pure income effect cannot be readily observed. It assumes that children provide many important social and psychic satisfactions to parents, that these satisfactions cannot be efficiently obtained by other expenditures, and that they do not have a low income elasticity of demand. Under these conditions, the possibility that children are "inferior goods" can be ruled out. Some empirical support for this proposition is found in numerous studies showing husband's income to be positively related to fertility; husband's income may be viewed as a proxy for permanent income, reasonably free of negative price-of-time effects. However, most of the relevant studies relate to the U.S. rather than

developing countries.

2. In rural areas of developing countries, the amount of land owned per family or per household has a positive relation to fertility.

Empirically, the land effect is more consistently positive than the income effect in studies dealing with developing countries. This finding is important because, in rural areas, land is a good proxy for permanent income, and is much more easily measured. Moreover, the negative effect of variations in tastes and aspirations, which is difficult to control statistically, is less likely to be a confounding influence in rural than in urban areas. However, because the positive land-fertility relation may reflect a number of factors other than income, such as the complementarity between land and child labor or the bequest motive, further research is needed on this proposition.

3. Empirical studies do not show a consistently positive or negative effect of income on fertility, and often the measured relation is not statistically significant. This does not mean that income is unrelated to the demand for children; rather, the sources and consequences of income growth seem to have positive and negative effects of their own on the demand for children. Thus the total impact of income growth may be positive or negative on balance, depending on the strength of these indirect effects.

This proposition is central to the present paper and is further elaborated in Propositions 4 through 11. It implies that the income-demand for children relation can be fully understood only in the context of a carefully designed causal model.

4. At the macro level, the effect of changes in income on the demand for children depends partly on the source of income change, that is, on the positive or negative influences inherent in that source. The most important source-dependent influence on the demand for children is the price of time, which may be raised by education, lowered by labor-saving technological change, raised by asset accumulation, or lowered by land fragmentation.

This proposition derives from the economic theory of the household, and some of its aspects have received a good deal of attention in empirical studies. It has been found repeatedly that women's wages have a smaller (or more negative) effect on fertility than men's. However, this evidence for a negative price of time effect pertains primarily to MDCs. There has also been little attempt to link the price of time to income sources other than education. The likelihood that, in household enterprises, capital growth and technological change will raise the value of children's time concurrently with that of women requires more attention, because these two changes would have opposite effects on the demand for children.

5. The greater the contribution of women's labor to household income, the lower will be the demand for children. The labor supply and productivity of women depends not only on education, technology, and access to productive capital, as is the case for men, but also on impediments to labor force participation and equal opportunity created by the particular culture and economic structure.

Although this proposition has been advanced frequently, empirical studies show it to be more generally valid for the highly developed

societies of Europe and North America than for the developing countries. This proposition, like Proposition 4, derives theoretical support from the work of the Columbia-Chicago school in that it depends on a negative effect of high wages and labor productivity on the demand for children. However, there seem to be at least five further assumptions involved: (a) that childcare is performed largely by women; (b) that the rearing and enjoyment of children is more time-intensive than alternative consumer satisfactions; (c) that female work roles are viewed with approval and confer a status at least equal to the raising of a large family; (d) that women cannot combine childrearing and income-earning activities without a good deal of stress; and (e) that no acceptable "mother substitutes" are available, such as young female siblings or grandparents whose efficiency in market work in LDCs would be low. Although there is ample evidence everywhere for the first assumption, the others seem to hold only under some conditions. They should therefore account for some of the observed disparities in the relation between women's income-earning activities and the demand for children.

6. Income increases raise the economic cost of children, thereby offsetting, or more than offsetting, some of the pure positive income effect.

The rising value of parents' time associated with income advances is one reason for the rising cost of children; others include the growing desire for child quality, the higher standard of living enjoyed in well-to-do homes, and the reduced need for assistance from children in old age and in emergencies. These rising costs (or declining benefits) accompanying income increases are not likely to be fully offset by the rising value of children's labor in self-employed households, partly because inexperienced and uneducated (child) labor becomes less useful when production becomes more sophisticated. This proposition has a solid theoretical foundation and some empirical support. However, the various components of the costs and benefits involved are difficult to measure, and have not been incorporated explicitly in most income-fertility studies.

7. Income increases facilitate changes in tastes, particularly educational aspirations (the taste for high-quality children) and consumption aspirations (the felt need for new and better consumer goods). If the negative feedback from rising aspirations to the demand for children is strong enough, it may offset or more than offset the positive pure income effect.

This proposition is controversial because, as noted above, the measurement of tastes or aspirations has received little attention from social scientists. In most fertility models, tastes are an omitted variable. Economists tend to justify this omission by assuming that tastes are given rather than dependent on the development process, and hence on income. The demographic transition in LDCs cannot be analyzed adequately in the context of a static model; more research on changes in tastes, their origin, and their consequences for the demand for children is needed.

8. In some cultures, income increases may cause declining female labor force participation and facilitate adherence to customs of

female seclusion such as purdah. That is, the demand for the traditional "housewife-mother" role may be so highly income-elastic that it outweighs work incentives stemming from rising female wages. Where this is the case, the demand for children should rise when economic conditions for poor couples improve.

There is considerable evidence, especially from Asian countries and from urban areas, that female labor force participation is negatively related to husband's income.

9. Income increases should enhance parents' ability to save, their financial security, and their optimism about the future. These consequences of income change should reinforce the positive income effect.

This proposition is based on theoretical considerations. It is closely related to Proposition 1, since it assumes that parents who have more financial latitude will want more children. Empirical confirmation is sparse because savings and such attitudinal variables as feelings of financial security and optimism are difficult to measure.

10. Culture and economic structure are important intervening variables; they affect the degree to which child costs, educational and consumption aspirations, and women's labor market behavior respond to rising income, and they influence the impact of these variables on the demand for children. Since they vary between research sites and over time, the balance of positive and negative indirect effects of rising income cannot be predicted with any degree of exactitude.

This proposition complements Proposition 3 because it further explains the inconsistent statistical data on the income-demand for children relation. The proposition also points to the need for case studies focusing on distinctive characteristics of the culture and economy that seem to produce a positive income-demand for children relation in some settings and a negative one in others.

11. In developing countries, income advances are most likely to have a positive total impact on the demand for children in low-income, rural populations with low life expectancy; they are more likely to have a negative effect overall in relatively high-income, urban populations with high life expectancy.

This proposition is supported by statistical studies, although the evidence is not entirely consistent. It can be rationalized in terms of the differences in sources and consequences of income change between these two kinds of settings. In particular, the consequences of a given income change are probably weak until a threshold of income has been reached, after which more rapid changes occur in the cost of children, in educational and consumption aspirations, and in health care.

12. At the household level, fertility is a nonlinear function of income; therefore, at the aggregate level, the distribution as well as the average level of income is significant.

This proposition is closely related to Proposition 11, since it is assumed that, at very low levels of income, fertility rises with income, and that it falls at higher levels. There is probably little disagreement on the general shape of this relationship. The

unresolved questions concern the level of income at which the turning point occurs and the factors that influence the location of this point in different countries. These questions can only be clarified by further studies assessing the consequences of income change at different levels of income and linking the demand for children explicitly to these consequences.

13. At low levels of income, a redistribution of income from rich to poor is likely to raise the demand for children; the reverse is true at higher income levels, assuming a lump-sum transfer of income. However, since income redistribution may be achieved by a variety of means, the assumption of a lump-sum transfer is too limited. In practice, the effect of a redistribution of income on fertility depends on the specific interventions by which the living standard of the poor is raised.

The first part of this proposition follows from Propositions 11 and 12. Some tentative support can be found in the empirical literature; however, few studies deal with income distribution and fertility, and some of those are marred by methodological shortcomings. The relation between source of income change and its consequences is dealt with in Proposition 4.

14. If consumer preferences are assumed to be interdependent, a family's income status relative to that of reference groups should affect the demand for children. However, the direction of this effect cannot be determined a priori and has not been investigated sufficiently in LDCs to warrant any predictions.

This proposition essentially calls for future research on diffusion processes and relative income effects.

NOTES

1. An alternative concept, "full income," has been used to advantage in some of the theoretical literature. Full income is equal to the resource endowment of the household multiplied by the market rates of return that these resources can command. These resources include, in addition to capital and time devoted to economic pursuits, leisure, housework, and childcare time valued at market wage rates (i.e., opportunity cost). Thus full income extends the concept of welfare to encompass such satisfactions as leisure and childrearing. It has the further important advantage of making the size of income independent of labor/leisure and labor/childcare choices. Nevertheless, the present discussion will be simplified by addressing only the traditional concept of income, mainly because this is the only one used in empirical investigations of the income-fertility relation. Moreover, full income is difficult to measure when many resources are not used at all in market production or are used only in household enterprises, so that their rates of return cannot be observed. Further, the concept of full income is meaningful only when there is no involuntary unemployment or underemployment, an untenable assumption for many developing countries.

2. For an attempt to identify and measure these social and psychological satisfactions, see Hoffman (1973) and Bulatao (1979).
3. In principle, the income-fertility relation can also be observed in time series. However, the data available for developing countries so far have not permitted this approach.
4. The assumption that child services are more time-intensive than most other goods and services is a key tenet of the Columbia-Chicago school. However, a number of economists have questioned the generality of this assumption (see Turchi, 1975; Schultz, 1981).
5. Rosenzweig (1978) suggests that the supply curve of child labor may be backward-bending in the Philippines.
6. We are indebted for this point to an anonymous reviewer.
7. An example may be the growing taste for educated children, even in the face of falling rates of return to education in many LDCs.
8. The Butz/Ward argument that cyclical increases in economic activity raise women's earnings and hence affect fertility countercyclically has limited relevance in LDCs, since women who work in household enterprises face less conflict between economic work and child care than those who work in offices and factories.
9. Bollen and Entwisle (1981) show that a logarithmic form provides a better fit than a linear one, and a quadratic exponential form a still closer fit. They also argue that a quadratic exponential specification most adequately reflects the historic or ideal shape of the demographic transition.

BIBLIOGRAPHY

Adelman, I. (1963) An econometric analysis of population growth. American Economic Review 53:314-339.

Aghajanian, A. (1978) Fertility and family economy in the Iranian rural communities. Journal of Comparative Family Studies 9:119.

Ahluwalia, M. S. (1976) Inequality, poverty and development. Journal of Development Economics 3:307-342.

Anker, R. (1977) The effect of group level variables in a rural Indian sample. Journal of Development Studies 14:63.

Anker, R. (1978) An analysis of fertility differentials in developing countries. Review of Economics and Statistics 60:58-69.

Anker, R., and J. C. Knowles (1980) Human Fertility in Kenya. World Employment Programme Research Population and Labour Policies Programme. Draft Monograph. International Labour Organization, Geneva.

Arnold, F., R. A. Bulatao, C. Buripakdi, B. J. Chung, J. T. Fawcett, T. Iritani, S. J. Lee, and T.-S. Wu (1975) The Value of Children: Introduction and Comparative Analysis, Vol. 1. Honolulu: East-West Population Institute.

Becker, G. (1965) A theory of the allocation of time. Economic Journal 75:493-517.

Becker, G., and H. G. Lewis (1974) Interaction between quantity and quality of children. Pp. 81-90 in T. W. Schultz, ed., Economics of the Family. Chicago: University of Chicago Press.

Ben-Porath, Y. (1973) Economic analysis of fertility in Israel: Point and counterpoint. Journal of Political Economy 81:S202-S233.

Bhattacharya, A. K. (1975) Income inequality and fertility: A comparative view. Population Studies 29:5.

Birdsall, N. (1977) Analytical approaches to the relationship of population growth and development. Population and Development Review 3:63-102.

Blake, J. (1968) Are babies consumer durables? Population Studies 22:5-25.

Bollen, K. A., and B. Entwisle (1981) Economic Development and Fertility: A Lesson in Functional Form Misspecification. Working Paper 81-7. Population Studies Center, University of Michigan, Ann Arbor, Mich.

Boulier, B. L. (1981) Income Distribution and Fertility Decline: A Skeptical View. Paper presented at the International Union for the Scientific Study of Population Seminar on Interrelationships Between Demographic Factors, Ahmedabad, India.

Bulatao, R. A. (1979) On the Nature of the Transition in the Value of Children. Paper No. 60-A. Honolulu: East-West Population Institute.

Caldwell, J. C. (1978) A theory of fertility: From high plateau to destabilization. Population and Development Review 4:553.

Canlas, D. B. (1978) A quantitative study of fertility and wife's employment in the Philippines: 1973. The Philippine Economic Journal #36 17(1 and 2):88-121.

Chalamwong, Y., M. Nelson, and W. Schutjer (1979) Variation in Land Availability and Human Fertility Among Thai Rice Farmers. Paper presented at the annual meeting of the Population Association of America, Denver.

Chernichovsky, D. (1976a) Some Socio-Economic Aspects of Fertility Behavior in Northeast Brazil: A Note. Population and Human Resources Division, World Bank, Washington, D.C.

Chernichovsky, D. (1976b) Fertility Behavior in Developing Economies: An Investment Approach. Paper presented at International Union for the Scientific Study of Population Seminar on Household Models of Economic-Demographic Decision-Making, Mexico City.

Coale, A. J. (1973) Demographic transition reconsidered. Pp. 53-72 in International Population Conference, Liege 1973, Vol. 1. Liege: International Union for the Scientific Study of Population.

Cochrane, S. H. (1979) Fertility and Education: What Do We Really Know? Baltimore, Md.: The Johns Hopkins University Press.

Cochrane, S. H., B. G. Baidya, and J. Hay (1977) Memo on Fertility in the Parsa Pretest in Rural Nepal. Division on Population and Human Resources, World Bank, Washington, D.C.

Conger, D. J., and J. M. Campbell, Jr. (1978) Simultaneity in the birth rate equation: The effects of education, labor force participation, income and health. Econometrica 46:631.

Cramer, J. C. (1980) The effects of fertility on husbands economic activity: Evidence from static, dynamic, and nonrecursive models. Pp. 151-182 in J. Simon, ed., Research in Population Economics, Vol. 2. Greenwich, Conn.: JAI Press.

DaVanzo, J. (1972) The Determinants of Family Formation in Chile, 1960: An Econometric Study of Female Labor Force Participation, Marriage, and Fertility Decisions. R-830-AID. Santa Monica, Calif.: Rand Corporation.

Drakatos, C. G. (1969) The determinants of birth rate in developing countries: An econometric study of Greece. Economic Development and Cultural Change 17:596.

Duesenberry, J. (1960) Commentary on "An economic analysis of fertility" by G. S. Becker. In Demographic and Economic Change in Developed Countries. Universities National Bureau Conference Series 11. Princeton, N.J.: Princeton University Press.

Easterlin, R. (1973) Relative economic status and the American fertility swing. Pp. 170-223 in E. Sheldon, ed., Family Economic Behavior: Problems and Prospects. Philadelphia, Pa.: J.B. Lippincott.

Easterlin, R. (1978) The economics and sociology of fertility: A synthesis. In C. Tilly, ed., Historical Studies of Changing Fertility. Princeton, N.J.: Princeton University Press.

Easterlin, R., G. Condran, and G. Alter (1974) Farms and farm families: The North in 1860. In T. Hareven and M. Vinovskis, eds., Demographic Processes and Family Organization. Princeton, N.J.: Princeton University Press.

Ekanem, I. I. (1972) A further note on the relation between economic development and fertility. Demography 9:383-398.

Encarnacion, J. (1974) Fertility and labor force participation: Philippines 1968. Philippine Review of Business and Economics 11:113.

Epstein, T. S. (1962) Economic Development and Social Change in South India. Manchester: Manchester University Press.

Farooq, G. M. (1979) Household Fertility Decision-Making in Nigeria. Revised version of the Population and Employment Working Paper No. 75. International Labour Organization, Geneva.

Flegg, A. T. (1979) The role of inequality of income in the determination of birth rates. Population Studies 33:457-477.

Freedman, D. S. (1970) The role of consumption of modern durables in economic development. Economic Development and Cultural Change 19:25-48.

Freedman, D. S. (1976) Mass media and modern consumer goods: Their suitability for policy interventions to decrease fertility. Pp. 356-425 in R. G. Ridker, ed., Population and Development: The Search for Selective Interventions. Baltimore, Md.: The Johns Hopkins University Press.

Friedlander, S., and M. Silver (1967) A quantitative study of the determinants of fertility behavior. Demography 4:30-70.

Gregory, P. R., and J. M. Campbell (1976) Fertility interactions and modernization turning points. Journal of Political Economy 84(4, Part 1):835.

Gregory, P. R., J. M. Campbell, and B. Cheng (1972) A cost-inclusive simultaneous equation model of birth rates. Econometrica 40:681-688.

Hazeldine, T., and R. S. Moreland (1977) Population and economic growth: A world cross section study. Review of Economics and Statistics 59:253.

Heer, D. M. (1966) Economic development and fertility. Demography 3:423.

Hicks, W. W. (1974) Economic development and fertility change in Mexico. Demography 11:407-421.

Hoffman, L. W., and M. L. Hoffman (1973) The value of children to parents. Pp. 19-76 in J. T. Fawcett, ed., Psychological Perspectives on Population. New York: Basic Books.

Janowitz, B. S. (1971) An empirical study of the effects of socioeconomic development on fertility rates. Demography 8:319-330.

Kelley, A. C. (1980) Interactions of economic and demographic household behavior. Pp. 403-470 in R. A. Easterlin, ed., Population and Economic Change in Developing Countries. Chicago: University of Chicago Press.

Khan, M. A., and I. Sirageldin (1979) Education, income, and fertility in Pakistan. Economic Development and Cultural Change 27:519-547.

Kleinman, D. S. (1973) Fertility variation and resources in rural India, 1961. Economic Development and Cultural Change 21:679-696.

Kocher, J. E. (1973) Rural Development, Income Distribution and Fertility Decline. New York: Population Council.

Latif, A., and N. Chowdhury (1977) Land ownership and fertility in two areas of Bangladesh. Bangladesh Development Studies 5:239-246.

Leibenstein, H. (1957) Economic Backwardness and Economic Growth. New York: John Wiley and Sons.

Leibenstein, H. (1974) An interpretation of the economic theory of fertility: Promising path or blind alley? Journal of Economic Literature 12:457-479.

Leibowitz, A. (1974) Education and home production. American Economic Review 64:243-250.

Leibowitz, A. (1975) Education and the allocation of women's time. Pp. 171-198 in F. T. Juster, ed., Education, Income and Human Behavior. New York: McGraw-Hill.

MacDonald, M., and E. Mueller (1975) The measurement of income in fertility surveys in developing countries. Studies in Family Planning 6:22-28.

McCabe, J. L., and M. R. Rosenzweig (1976) Female employment creation and family size. Pp. 322-355 in R. G. Ridker, ed., Population and Development: The Search for Selective Interventions. Baltimore, Md.: The Johns Hopkins University Press.

McInnis, R. M. (1977) Childbearing and land availability: Some evidence from individual household data. Pp. 201-227 in R. D. Lee, ed., Population Patterns in the Past. New York: Academic Press.

Merrick, T. W. (1978) Fertility and land availability in rural Brazil. Demography 15:321.

Mueller, E. (1972) Economic motives for family limitation. Population Studies 26:383-403.

Mueller, E. (1976) The economic value of children in peasant agriculture. Pp. 98-153 in R. G. Ridker, ed., Population and Development: The Search for Intervention. Baltimore, Md.: The Johns Hopkins University Press.

Mueller, E., and R. Cohn (1977) The relation of income to fertility decisions in Taiwan. Economic Development and Cultural Change 25:325-347.

Nerlove, M., and T. P. Schultz (1970) Love and Life Between the Censuses: A Model of Family Decision Making in Puerto Rico 1950-1960. RM-6322-AID. Santa Monica, Calif.: Rand Corporation.

Pollak, R. A. (1978) Endogenous tastes in demand and welfare analysis. American Economic Review 68:374-379.

Repetto, R. (1974) The relationship of the size distribution of income to fertility, and the implications for development policy. Appendix A in T. King, et al., Population Policies and Economic Development. Baltimore, Md.: The Johns Hopkins University Press.

Repetto, R. (1979) Economic Equality and Fertility in Developing Countries. Baltimore, Md.: The Johns Hopkins University Press.

Retherford, R. D. (1979) A theory of rapid fertility decline in homogeneous populations. Studies in Family Planning 10:61-67.

Rich, W. (1973) Smaller Families Through Social and Economic Progress. Washington, D.C.: Overseas Development Council.

Rosenzweig, M. R. (1976) Female work experience, employment status, and birth expectation: Sequential decision-making in the Philippines. Demography 13:339-356.

Rosenzweig, M. R. (1978) The value of children's time, family size, and non-household child activities in a developing country. Pp. 331-347 in J. Simon, ed., Research in Population Economics, Vol. 1. Greenwich, Conn.: JAI Press.

Rosenzweig, M. R. (1979) Household and Non-Household Activities of Youths: Issues of Modelling, Data and Estimation Strategies. Mimeo. International Labour Organization Workshop on Children and Employment, Geneva.

Rosenzweig, M. R., and R. Evenson (1977) Fertility, schooling, and the economic contribution of children in rural India: An econometric analysis. Econometrica 45:1065.

Russett, B. M., H. R. Alker, Jr., K. W. Deutsch, and H. D. Lasswell (1964) World Handbook of Political and Social Indicators. New Haven, Conn.: Yale University Press.

Sanderson, W. C. (1974) Economic Theories of Fertility: What Do They Explain? Working Paper No. 36. National Bureau of Economic Research, New York.

Sanderson, W. C. (1976) On two schools of the economics of fertility. Population and Development Review 2:469-477.

Schultz, T. P. (1969) An economic model of family planning and fertility. Journal of Political Economy 77:175.

Schultz, T. P. (1981) Economics of Population. Reading, Mass.: Addison-Wesley Publishing Co.

Simon, J. (1969) The effect of income on fertility. Population Studies 23:327-342.

Simon, J. (1976) Income, wealth, and their distribution as policy tools in fertility control. Pp. 36-76 in R. G. Ridker, ed., Population and Development: The Search for Selective Interventions. Baltimore, Md.: The Johns Hopkins University Press.

Simon, J. (1977) The Economics of Population Growth. Princeton, N.J.: Princeton University Press.

Sirageldin, I. A., D. Norris, and M. Ahmad (1975) Fertility in Bangladesh: Facts and fancies. Population Studies 29:207-215.

Stigler, G. J., and J. S. Becker (1977) De gustibus non est disputendum. American Economic Review 67:76-90.

Stys, W. (1957) The influence of economic conditions on the fertility of peasant women. Population Studies 11:136.

Turchi, B. (1975) The Demand for Children: The Economics of Fertility in the United States. Cambridge, Mass.: Ballinger Publishing Co.

Wei, S. P. (1981) The Effect of Family Structure on Siblings' Status Achievement: The Case of Taiwan. Unpublished Ph.D. dissertation. University of Michigan, Ann Arbor, Mich.

Weintraub, R. (1962) The birth rate and economic development: An empirical study. Econometrica 30:812.

Willis, R. J. (1973) A new approach to the economic theory of fertility behavior. Journal of Political Economy 81(2, Part 2):S14.

Winegarden, C. R. (1980) Socioeconomic equity and fertility in developing countries. Economist (Leiden) 128:530-557.

Winegarden, C. R. (1981) Income Redistribution as a Means of Reducing Fertility: Econometric Evidence for a Contrary View. Mimeo. University of Toledo, Toledo, Ohio.

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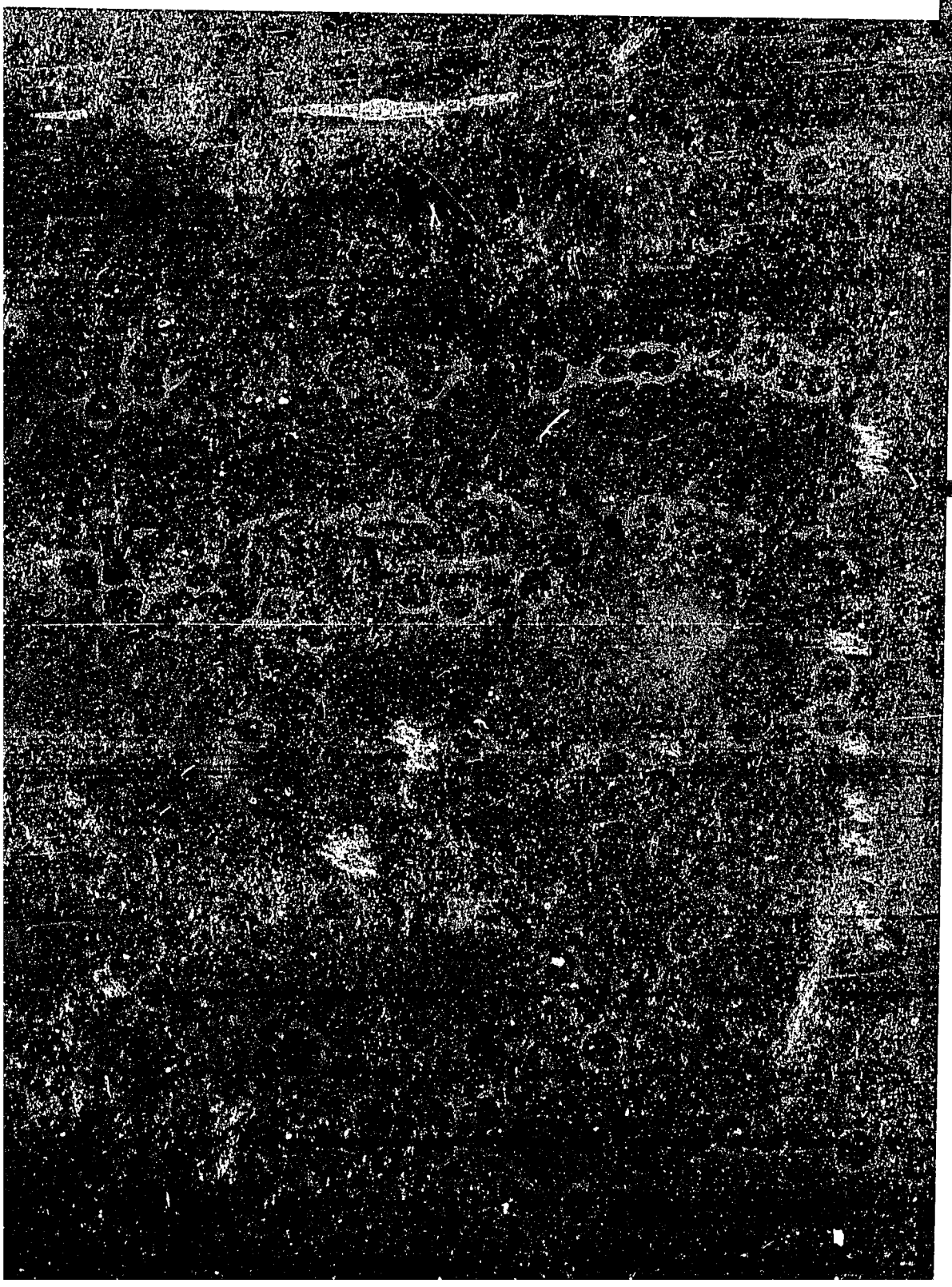

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Report No. 15B

Determinants of Fertility in Developing Countries:

A Summary of Knowledge
Part B

Edited by
Rodolfo A. Bulatao and Ronald D. Lee
with Paula E. Hollerbach and John Bongaarts

Panel on Fertility Determinants
Committee on Population and Demography
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NOTICE: The project that is the subject of this report was approved by the Governing Board of the National Research Council, whose members are drawn from the councils of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The members of the panel responsible for the report were chosen for their special competences and with regard for appropriate balance.

This report has been reviewed by a group other than the authors according to procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

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PREFACE ix

INTRODUCTION

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Chapter 19

FERTILITY REGULATION AND ITS COSTS: A CRITICAL ESSAY

Albert I. Hermalin*

INTRODUCTION

This paper investigates the motivation for and the costs of fertility control as determinants of fertility regulation, which is one part of the conceptual framework guiding these volumes. On occasion it will be necessary to touch on other parts of the framework as well, such as supply and demand, social and economic structure, and individual socioeconomic characteristics; at other times the relationship of fertility control to actual fertility will be addressed. Though often not designed with the present framework in mind, a large number of empirical studies treat topics relevant to this discussion, such as the levels, patterns, and correlates of contraceptive use and abortion; the effectiveness, costs, and safety of specific contraceptive methods; and the efficacy of family planning programs and other policies in regulating fertility. The strategy adopted here is to hew closely to the framework as a base from which to review such research and to derive implications for future efforts. Though this strategy may prove less comprehensive than some alternatives, it should provide a more systematic overview. A number of topics receiving only brief attention here are treated in more detail in subsequent chapters, and these will be noted. In addition, a brief summary of major trends and data sources will be provided for readers who may not be familiar with these materials.

*This paper has benefited from suggestions by Ronald Freedman, Mark Montgomery, and four anonymous reviewers. Portions of this paper reflect ideas that have emerged from ongoing collaborative research with Barbara Entwisle and William M. Mason. None of the aforementioned are responsible for remaining deficiencies. Mary Scott provided valuable assistance in preparing the manuscript.

BASIC CONCEPTS

The conceptual framework for these volumes attributes to each couple a demand for some number of surviving children; this demand serves as a reference point for assessing the sufficiency of their supply (or likely number of surviving children) at any given point. Once supply reaches or exceeds the desired number, the couple is motivated to some degree to control their fertility. Whether they do so or not is influenced by the means of fertility regulation available and their costs. The latter include economic costs (monetary and time), social-opinion costs (the possibility of violating existing social norms and facing sanctions), and health and psychic costs (the results of trying something new that may be to some degree risky or unpleasant). These costs are a function of both individual and social-structural characteristics: a couple's economic position, social standing, and other traits partly determine their regulation costs; at the same time, a community[1] may raise or lower costs by encouraging or discouraging use of control methods, by affecting their accessibility, and by establishing pricing mechanisms. Even in its narrowest sense, therefore, the study of regulation costs must involve both individual- and community-level characteristics.

The influence of social organization, however, extends beyond costs. Social, economic, cultural, and environmental factors influence both the demand for and the supply of children for a couple and therefore influence motivation to control. Demographic transition theory is a theory of societal change, not of individual accounting. Changes in social and industrial structure, levels of literacy, and urbanization are viewed as providing inducements for reducing family size and thus sharply lowering the desired number of children (see, e.g., Coale, 1973; Lee and Bulatao, in these volumes). At the same time, social control is viewed as important in regulating the supply of children through customs and norms affecting such behaviors as age at marriage, widow remarriage, postpartum abstinence, and breastfeeding (see Freedman, 1975, and Lesthaeghe, 1980, for general discussion and specific examples).

Figure 1 shows a basic model of the fertility-determining factors outlined above. A number of observations on this model will serve to frame the remainder of this discussion.

First, the model posits two sets of exogenous or predetermined variables:

- <u>socioeconomic-structural factors</u>--including such elements as level of development; family planning program policy and inputs; community social organization; and norms, laws, and customs governing abortion, breastfeeding, and marriage.
- <u>individual characteristics</u>--including socioeconomic status (e.g., education), biological elements (e.g., fecundity), and demographic characteristics (age, marital status, and so on).

These two sets of variables have direct effects only on demand, supply, and regulation costs; these in turn determine directly or

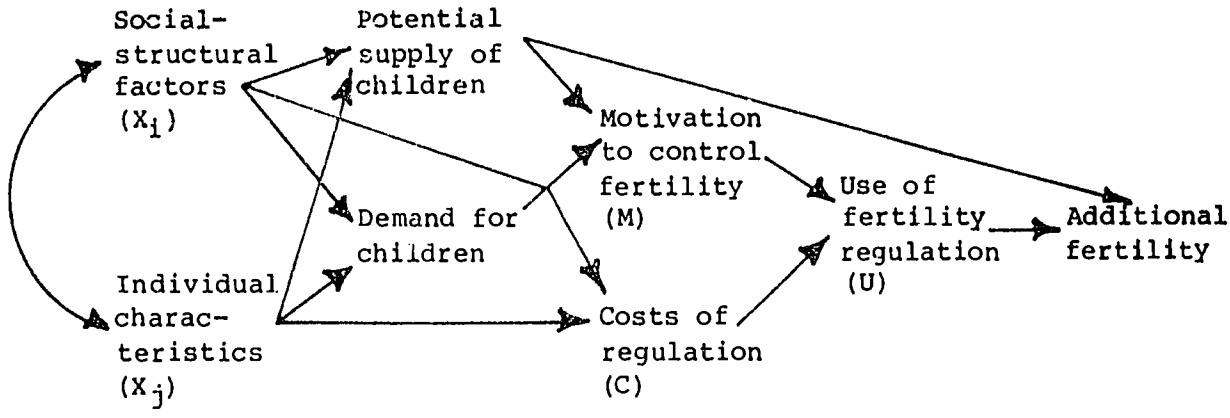

FIGURE 1 Basic Model of Factors Determining Additional Fertility

indirectly the remaining variables--motivation to control, fertility regulation, and fertility. The exogenous variables influencing demand and supply, and therefore motivation to control, need not be the same as those that influence costs. The model is block-recursive: variables can be affected only by those to their left.

Second, demand and supply define rather than cause motivation to control. As stated earlier, if supply exceeds demand, motivation is presumed to exist; if supply is less than demand, motivation is absent. From this standpoint, supply and demand are components of motivation; once they have been measured, the degree of motivation is known. Thus motivation does not mean "determination" or "resolve" in the usual sense of those words. An important implication is that the exogenous factors are determinants of motivation only if they are determinants of supply or demand.

Third, the difference between potential supply and actual fertility in the model is worth noting. Potential supply is the number of surviving children a woman would have without parity-specific regulating behavior. This reflects levels of natural fertility (see Bongaarts and Menken, in these volumes; Knodel, in these volumes) and infant and child mortality. If no fertility regulation has taken place, a woman's actual number of surviving children is equal to her potential supply. The two measures diverge with regulation to an extent determined by its duration and effectiveness. With regulation, therefore, potential supply is not observable individual by individual, though it is possible to estimate it for a population and assign values to individuals.

If a woman's reproductive life is viewed prospectively, the model states that she will continue to have children until the number living reaches the number desired. From that point on, assuming that the desired number remains fixed, she will be motivated to control her fertility by some means. Thus the model assumes that all fertility regulation behavior will be for the purpose of limiting rather than spacing births. (There are of course many reasons for spacing not recognized in the model.) When a cross section is examined, so that

there are women at each stage of the reproductive process, the problem of relating supply to demand and measuring motivation is more difficult since a woman may have already used a method of fertility control. These problems and limitations will be taken up more fully below.

Fourth, although it is possible in principle to estimate the entire structural model, a number of studies, including this one, focus on selected parts. Some studies (like the preceding chapters in these volumes) concentrate on the determinants of supply and demand. Others analyze the relationship between fertility regulation and fertility. One example is Bongaarts' (1982) analysis of the proximate determinants of aggregate variation in fertility. Other studies include attempts to estimate fertility rates as a function of contraceptive prevalence (Nortman and Hofstatter, 1980; Bongaarts and Kirmeyer, 1982) and analyses that emphasize the effect of family planning program acceptance on fertility. Other evaluations of family planning investigate the chain from socioeconomic structure to regulation costs to fertility regulation, or the relationship between program inputs (an aspect of costs) and level of fertility regulation. Some of these evaluation studies are reviewed in a later section. It is also possible to concentrate on reduced forms, that is, to study the relationship between a given endogenous variable and the exogenous or predetermined variables. Examples would be investigations into the social structural and individual determinants of contraceptive use, breastfeeding, and so on. However, even when only a portion of the model is being estimated, attention to the whole model is useful in selecting and operationalizing variables and in choosing the appropriate estimation technique.

The portion of the model to be emphasized here is sketched in Figure 2. Interest will center on studies that examine how motivation to control and regulation costs combine to determine the level and means of fertility regulation, as well as on the exogenous variables (individual and structural) that determine the levels of motivation and costs.

Fifth, the model portrayed by Figures 1 and 2 is from the standpoint of the individual or couple, but it includes social-

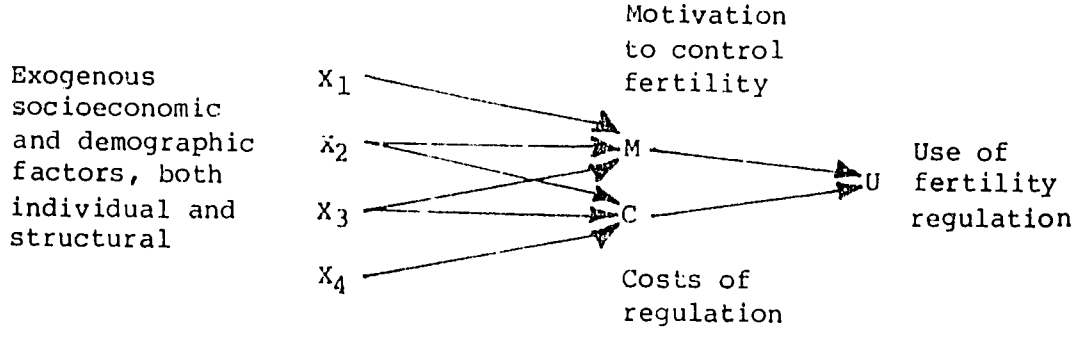

FIGURE 2 Basic Model of Factors Affecting Fertility Regulation

structural or aggregate variables as one set of exogenous factors. Many of these have implications for individual-level characteristics. For example, the number and location of family planning clinics, an aggregate variable, will largely determine the accessibility of services to the individual. Whether this aspect of cost is best measured from an individual or aggregate viewpoint, however, is a question to be taken up below.

Although the issues posed by an individual model may also be addressed at the aggregate level, an aggregate model is likely to be quite different in character. At the aggregate level there is not the same type of supply-demand equilibration as that posited for the family level. Rather, what is observable are levels and trends in vital rates and other key demographic measures (e.g., birth rates, death rates, growth rates, age structure, migration patterns, unemployment levels), and a host of economic and development indices such as rates of capital investment and social service expenditures. These are the inputs into policies and programs. The actions taken will affect family demographic behavior to some degree, but may coincide either poorly or well with the economic and demographic circumstances of most families. A clear example is the decision to launch a family planning program: insofar as that decision arises from consideration of aggregate demographic factors, concordance with family-level motivation is an open question. From this viewpoint, policymakers may decide to launch a family planning program after there is considerable popular motivation for fertility control (possibly relying on survey estimates of the level of popular motivation in designing the program), or program initiation may precede the development of significant motivation. The point here is that data and models exist at both levels, and it is important to be clear about the referent to ensure proper analysis and inference.

The remainder of this paper is organized as follows. The next section reviews data on the prevalence of contraception and other means of fertility regulation. The following section addresses motivation to control and discusses various issues in motivation analysis; the next section treats regulation costs in a parallel fashion. This is followed by discussion of a series of issues connected with estimating the model in Figure 2, and an examination of the choice of means of fertility regulation. Special attention is then given to the family planning programs and their evaluation, and some new lines of attack are discussed. The final section presents major points and conclusions.

LEVELS OF THE USE OF FERTILITY REGULATION

This section briefly outlines the patterns and trends in fertility regulation, sketching the broad contours and directing the reader to sources of additional detail. Contraceptive prevalence--the proportion of married women of reproductive age practicing contraception at some point in time--can be estimated from appropriate surveys or from program service statistics in combination with census

data. Though the concept is straightforward, there can be various comparability problems in measures because of the contraceptive methods included, the definition of the base population, and the estimation techniques (see Nortman and Hofstatter [1980:90-93] for a succinct discussion of these problems). In general, care must be exercised in comparing estimates from service statistics with survey data, particularly if a significant portion of use arises from the private sector or through traditional methods of contraception. With the advent of the World Fertility Survey (WFS) and the Contraceptive Prevalence Surveys (Lewis and Novak, 1982), which provide high-quality and generally comparable data, greater reliance has been placed on surveys for prevalence estimates. Figure 3 presents data by type of method on the proportion of currently married women who are using contraception, as established through 20 WFS surveys covering the period 1974-78. These data reveal a considerable range in prevalence--from 2 percent in Nepal to 64 percent in Costa Rica. More extensive tables for developing countries, combining estimates of prevalence from various sources, are presented by Larson (1981) and Nortman and Hofstatter (1980:Table 21). Those studies also provide comparisons with a number of developed countries. Several developing societies have prevalence rates well above 50 percent, at par with the European countries at the lower end of the developed-country distribution. At the same time, rates below 10 percent are still found in a sizeable number of developing countries. Nortman and Hofstatter (1980) also provide statistics over time for many countries. These reveal very rapid increases in prevalence in less than a decade for a number of countries, including Colombia, Hong Kong, Malaysia, Mauritius, Mexico, the Philippines, Taiwan, Thailand, and Singapore.[2] It should be noted that most of the data now available pertain to the mid to late 1970s, and there may have been significant gains since then in a number of countries.[3]

From the method distributions shown in Figure 3 and other sources (see Larson, 1981; Nortman and Hofstatter, 1980), several generalizations emerge:

- In many countries, a high proportion of users rely on modern means. In 15 of the 20 countries in Figure 3, two-thirds of users were using such means (sterilization or modern reversible methods).
- Generally, increases in contraceptive prevalence have been accompanied by shifts to more modern techniques. In this connection, the rapid rise in the use of female sterilization in some countries is noteworthy (see Population Reports [1978] for a detailed review and bibliography).
- Despite these trends and patterns, there is very little correlation between the overall prevalence rate and the proportion of users relying on traditional methods. Stated otherwise, there are countries at different levels of prevalence that show heavy reliance on traditional methods, just as there are countries at different levels of prevalence that show heavy reliance on modern methods.[4] The implications of these patterns will be pursued in a later section.

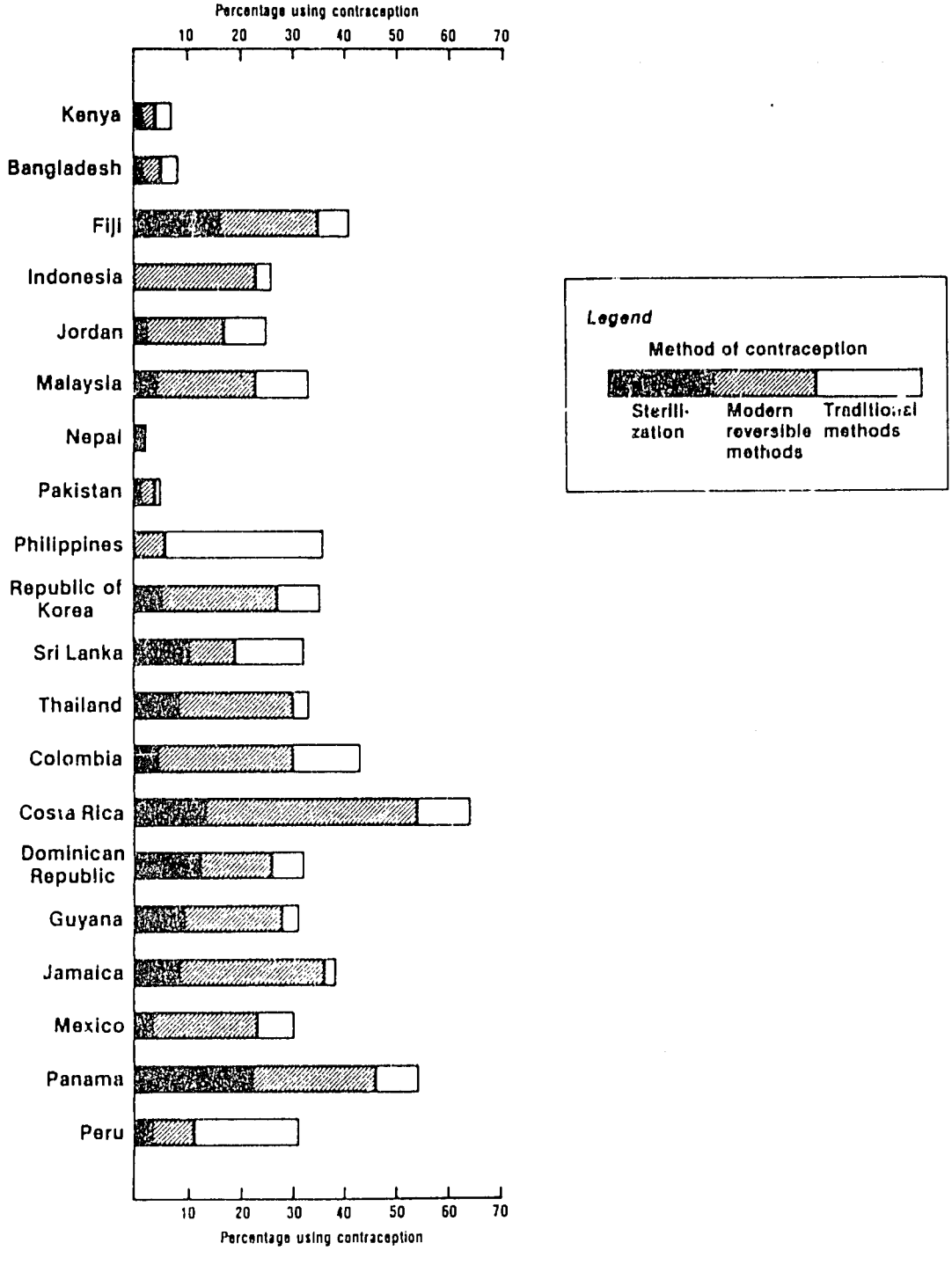

FIGURE 3 Percent of Currently Married Women Using Contraception, by Type of Method, 1974-78: 20 WFS Countries

Note: Modern reversible methods include chemical and mechanical means of contraception; traditional methods include rhythm, withdrawal, abstinence, douche, and "folk" methods.

Source: United Nations (1981:Figure 1).

Data on the incidence of abortion are generally available only for those legally performed, and countries maintaining statistics are only a subset of those in which such abortions take place. Data for 27 countries over time are presented in Tietze (1981:Table 2). Some speculative estimates of worldwide and country-specific levels have attempted to incorporate the large number of illegal abortions (e.g., People, 1978:18); these studies are reviewed by David (in these volumes).[5]

The degree to which breastfeeding is used to regulate fertility will be taken up in a later section. On the prevalence of breastfeeding, comparative data from WFS studies are given in Ferry (1981) and Population Reports (1981). These data show that a very high proportion of children (above 80 percent) are breastfed in nearly all the countries, with the likelihood and duration of breastfeeding generally higher in Asia and Africa than in Latin America and the Caribbean.

MOTIVATION TO CONTROL FERTILITY

This section addresses motivation for fertility regulation: its measurement, its interrelations with contraceptive use and with various socioeconomic and demographic characteristics, and its use as an independent variable and a dependent variable in multivariate analyses.

Measurement of Motivation to Control

Measuring motivation to control requires measures of demand and supply. The most common approach to measuring demand is through respondent reports (McClelland, in these volumes). Two alternative techniques for measuring motivation are frequently used:

1. Obtaining a direct answer to a question of the form, "Do you want another child sometime?" Though the answer reflects future demand, it also taps whether supply has reached or exceeded demand. For this reason, the response has often been used as a direct measure of motivation to control.

2. Obtaining the number of children that is desired or ideal, in answer to a question like, "If you could choose exactly the number of children to have in your whole life, how many would that be?"[6] This number may be compared with the actual number of living children or another indicator of supply. If the actual number of living children equals or exceeds the desired number, motivation to control fertility may be presumed; if the desired number exceeds the actual, motivation is presumed to be absent.

Much of the early analysis of these questions addressed contentions that women in developing countries could not meaningfully express their preferences or motivations (Hauser, 1967; Knodel and Prachuabmoh, 1973; McClelland, in these volumes). To this end, such analyses compared the two measures of motivation discussed above, and

systematically related them to contraceptive use or fertility. The comparisons generally showed good consistency between the two measures. Hermalin et al. (1979:77) show that, in Taiwan, 90 and 86.5 percent of responses were consistent in 1967 and 1970, respectively. Palmore and Concepcion (1981) present a consistency range of 73 to 91 percent for the two measures for 10 WFS countries.

Relating the measures to behavior also demonstrated they were meaningful. Freedman et al. (1975), using longitudinal data for Taiwan, showed that a live birth occurred within three years to only 13.5 percent of those who said they wanted no more children in 1967, and to 75 percent of those who said they wanted more. This was true despite the fact that 45 percent of those who did not want more children were not using contraception in 1967. The low fertility among those wishing to cease childbearing was achieved in part by a high level of abortion (33 per 100 pregnancies between 1967 and 1970 were aborted) and by subsequent adoption of contraception. Of those who wanted no more children but were not using contraception in 1967, 45 percent were using contraception by 1970. When the same sample was studied in 1974, only 22 percent of those who wanted no more children in 1967 had had a live birth, as contrasted with 85 percent for those who wanted more (Hermalin et al., 1979). This degree of consistency between intentions and outcomes is comparable to that observed in the United States at the same time (Hermalin et al., 1979:Table 10; Westoff and Ryder, 1977; see also McClelland, in these volumes; Pullum, in these volumes).

The concept of desired number of children, one component of motivation, has been further refined by a model in which each woman has an underlying preference function that associates some utility with each possible number of children (Terhune and Kaufman, 1973). A question on desired family size may elicit the modal value of this function (Pullum, 1980:10). However, if this preference function is flat or nearly so in the vicinity of the mode (indicating relative indifference across this range), this important characteristic will not be revealed in an attempt to elicit a single number for desired children (Pullum, 1980).

Theory and measurement issues related to preference functions have been most extensively developed by Coombs et al. (1975), who hypothesize separate single-peaked utility functions for number of children and for sex preference (defined as preferred number of boys minus preferred number of girls). They operationalize these functions through rankings of family sizes and sex compositions, paying attention not only to first but also to subsequent choices. The scale values produced by the method--which can be incorporated into a typical fertility questionnaire--have been shown to be highly predictive (see, e.g., Coombs, 1979, for Taiwan).[7] These scales are essentially refined measures of the demand for children (McClelland, in these volumes). They can be used as an adjunct in studies that explore the role of motivation to control, but they cannot be combined directly with values for supply of children to produce a single measure of this motivation.

Less attention has been paid to measures of supply or potential

family size. One approach is that of Easterlin and Crimmins (1981). To obtain a measure of a household's natural fertility, they first regress children ever born on a fertility control variable and a series of other proximate determinants of fertility. Then they use the equation to estimate natural fertility with the fertility control variable set to zero. Finally, this estimate is multiplied by the household's ratio of living children to children ever born to produce the estimate of potential family size.

Easterlin and Crimmins use this measure of supply, together with desired family size as a measure of demand, to predict fertility control. Unfortunately, their measure of fertility control--years since first use of contraception or abortion--is the same measure used in the equation for natural fertility, introducing some circularity.

An alternate approach to estimating potential family size is presented by Boulier and Mankiw (1980), who use the natural-fertility schedule developed by Coale and Trussell (1974) to estimate the supply of births. This approach would avoid circularity, but at present produces the same value for all women of a given age.

Proper temporal ordering between the measures of motivation and fertility control must be observed. Indications of motivation based on wanting more children or the comparison of actual and desired numbers of children are as of the time of the survey and thus should be predictive of current or future use of deliberate control methods. (The effect of prior use on actual number of children, however, must be considered, as discussed below.) One would not expect these measures to be closely associated with the number of years since control was adopted, for example, because they do not take into account the effectiveness with which control methods have been exercised. Among couples who adopted at the same time in the past, some will greatly exceed their desired number because of ineffective practice, while others will be at their desired number because of efficient use. The current difference between actual and desired numbers cannot distinguish the fact that these couples had equal motivation in the past.

Interrelation between Socioeconomic and Demographic Variables and Contraceptive Use

Given the very recent development and continuing limitations of household-level measures of supply, most of the work that can be cited on the correlates of motivation to control actually involves only measures of wanting more children or comparison of actual and desired numbers. Concepcion (1981) has analyzed the relationship between desire for more children and a number of socioeconomic and demographic characteristics. For 18 WFS countries, she shows that the proportion wanting no more children is positively related to age, family size, and marital duration. There is a less clear-cut pattern of desire for more children with education and urban-rural residence among women 25 to 34 (Concepcion, 1981:Tables 10 and 11). In many countries, those with less education are more likely to want no more children; in a few

countries the relationship was the reverse; and occasionally the pattern was curvilinear. In most countries, urban women were more likely than rural to want no more children, although this pattern was reversed in several countries. This mixture of patterns can probably be traced to differentials in age at marriage among socioeconomic and residence groups in the different countries, and consequent differences in stage of family building among the women in this age group.

A number of studies have examined the relationship of desire for more children to contraceptive use, though relatively few have examined the relationship to other forms of fertility control. The WFS data facilitate comparisons across countries. Table 1, taken from a United Nations (1981b) report, presents the percentage of exposed women currently using contraception by education and by whether they want more children for 17 countries (see also Concepcion, 1981:Table 20). A number of patterns emerge:

- In each of the countries, current use of contraception is higher among exposed women who want no more children tnan among those who want more.
- The range in use across countries among those wanting no more is considerable, from a low of 8 percent in Nepal to a high of 84 percent in Costa Rica. There is also considerable intercountry variation in use among those wanting more. The proportion using contraception for spacing (i.e., those who want more children) tends to be higher in countries where use among limiters is higher.[8]
- Differentials in use between those who do and do not want more children persist within educational categories in each of the countries. At the same time, contraceptive use increases with education, both among women who want more children and among those who do not. In 10 of the 17 countries, more than 3 out of 4 women who want no more children and have 10 or more years of schooling are using contraception, and in four others the proportion is between 60 and 75 percent.

Estimating the Effect of Motivation

Multivariate analyses involving motivation to control have often been carried out without sufficient attention to an underlying model, thereby generating confusion about the relationship between motivation and fertility regulation. This section attempts to clarify the issues involved in using motivation as both a dependent and an independent variable.

Figures 1 and 2 indicate that socioeconomic, demographic, and other factors do not directly affect fertility regulation. Instead they affect motivation and costs, and their relation to fertility regulation depends on these links. That is, the correlation between one such variable, X_1, and use of fertility regulation will be a function of the effects (i.e., path or standardized regression

coefficients) of motivation and costs on use and the correlations of X_1 with motivation and costs. Symbolically, the observed correlation between X_1 and use should be

$$p_{UM}r_{X_1M} + p_{UC}r_{X_1C} \qquad (1)$$

where p_{UM} and p_{UC} are the path coefficients to use from motivation and costs, respectively, and r_{X_1M} and r_{X_1C} are zero-order correlations.

The model in Figure 2 can be tested by comparing the actual or observed correlations between the X_1 variables and use against those expected from expression (1). The absence of reasonable correspondence would signify (a) deficient measurement of the motivation and cost variables; (b) relatedly, the failure of the M and C measures to capture aspects of motivation or cost embedded in the X_i variables; or (c) deficiencies in the model. Of course, it is never easy to disentangle these competing possibilities, and several different tests are rarely sufficient to dispose of the issue.

In fact, direct empirical tests of Figure 2 have not been attempted. A common approach is a hierarchical decomposition of the explained variance, in which socioeconomic and demographic variables are entered first and motivation (e.g., desire for more children) entered next, and the percentage of additional variance explained by motivation compared with that explained by the other variables (United Nations, 1981b:Table 24; Johnson-Acsadi and Weinberger, 1982:Table 3; Palmore and Concepcion, 1981:Table 1; Cleland et al., 1979[9]). This is not an appropriate test. One such study shows, for example, that across 11 WFS countries, the desire for more children, when entered after six other variables, explains only 1 to 3 percent of the variance in current contraceptive use, although it explains 1 to 10 percent of the variance when entered alone (Palmore and Concepcion, 1981). This type of result is not surprising. Insofar as the variables entered first in a hierarchical analysis largely determine motivation or costs (like the X_i variables of Figure 2), one would expect them to overlap considerably with motivation or costs in the variance they explain. Hence there may be little net contribution from the motivation variable if it is entered later. Using analysis of covariance, however, Palmore and Concepcion also show that multivariate adjustment for the six variables does not affect the differentials in contraceptive use between those who do and do not want more children. These results tend to confirm the model: taken together they show that a number of demographic and socioeconomic factors appear closely related to desire for more children, but in addition, within each category of these factors, those who want no more children use contraception more frequently than those who want more. Table 1, which shows differentials in use within education categories, illustrates the second part of this statement.

TABLE 1 Percent of Exposed Women Currently Using Contraception, by Education and Desire for More Children: Selected WFS Countries

Country and Desire for More Children	Total	Years of Education Completed				
		0	1-3	4-6	7-9	10
Africa						
Kenya						
Wants more[a]	7	4	5	9	12	19
Wants no more	21	15	18	25	38	(48)
Asia and Oceania						
Bangladesh						
Wants more	3	2	3	4	9	
Wants no more	14	10	18	21	44	
Fiji						
Wants more	35	27	31	33	35	40
Wants no more	69	70	74	69	64	77
Indonesia						
Wants more	26	21	29	29	35	46
Wants no more	53	48	55	62	75	89
Jordan						
Wants more	22	8	15	25	33	61
Wants no more	59	41	69	73	78	84
Korea, Republic of[b]						
Wants more	17	10	11	13	19	28
Wants no more	56	49	51	54	61	69
Malaysia						
Wants more	34	17	29	39	44	55
Wants no more	52	41	54	58	73	82
Nepal						
Wants more	--	--	4		13	
Wants no more	8	8	(24)		(30)	
Pakistan						
Wants more	1	1	--	5	(12)	(15)
Wants no more	15	13	(29)	26	(38)	(61)
Sri Lanka						
Wants more	13	5	11	20	27	35
Wants no more	54	38	47	55	64	73
Thailand						
Wants more	29	22	(18)	29	(27)	49
Wants no more	56	46	55	57	(73)	(82)

TABLE 1 (continued)

Country and Desire for More Children	Total	Years of Education Completed				
		0	1-3	4-6	7-9	10
Latin America						
Colombia						
Wants more	45	18	30	52	71	73
Wants no more	56	33	49	67	79	86
Costa Rica						
Wants more	71	(44)	61	73	76	76
Wants no more	84	71	80	88	89	94
Dominican Republic						
Wants more	25	8	13	27	46	59
Wants no more	57	36	52	63	77	(85)
Guyana[c]						
Wants more	29	(19)	18	23	27	63
Wants no more	45	40	46	46	44	(67)
Panama						
Wants more	50	(24)	29	47	64	61
Wants no more	74	51	59	75	84	85
Peru						
Want more	33	7	20	41	58	63
Wants no more	46	21	38	62	72	82

Note: Figures in parentheses are based on 20 to 49 cases. Dashes indicate still fewer cases.

[a]Including undecided.
[b]Education categories are none, less than primary, primary graduate, secondary graduate, and above.
[c]Women who attended secondary school or higher but for whom the number of years completed was not stated are included in the 7-9 category.

Source: United Nations (1981b:Table 20).

Studying the Determinants of Motivation

To this point, the discussion has focused on motivation as an independent variable. To explore issues relating to the study of the determinants of motivation, it is convenient to use a series of regression equations. For simplicity, a linear additive form is assumed, though this will not always be the optimum specification, and error terms are omitted.

Because potential supply of children is so difficult to measure, the actual number of children is often used instead; the measure of motivation would then be actual minus desired number of children (treated as an interval scale). This creates certain problems, however, as will now be shown.

Assume that actual number of children (A) is a function of education (X_1, reflecting health and nutritional factors) and marital duration (X_2), whereas desired number of children (D) is affected by education and husband's occupation (X_3). This model is not meant to be complete or fully realistic; the aim is merely to illustrate the range of variables that could affect motivation (for a detailed discussion of variables affecting desired number of children, see Pullum, in these volumes).

$$A = a_1 + b_1X_1 + b_2X_2 \tag{2}$$

$$D = a_2 + c_1X_1 + c_2X_3 \tag{3}$$

Then motivation to control, measured by A - D, would be

$$A - D = (a_1 - a_2) + (b_1 - c_1)X_1 + b_2X_2 - c_2X_3 \tag{4}$$

This last equation is of the nature of a reduced form, omitting the intervening demand and supply variables.

It is not unusual for analysts to overlook the underlying model represented in equations (2) and (3) and include actual number of children as a determinant of motivation in equation (4). This produces an equation of the form

$$A - D = a + d_1X_1 + d_2X_2 + d_3X_3 + d_4A \tag{5}$$

A appears on both sides of the equation, and A - D necessarily increases with A. Thus, when motivation to control, as measured in this manner, is regressed on actual number of children, a strong positive effect is expected. Furthermore, it has been assumed that the X_i variables include the determinants of A (see equation 2) and that explicitly including this variable is redundant and could produce meaningless results. If one assumes that demand and potential supply are fixed early in the marriage and are invariant thereafter, there is no reason to introduce actual fertility on the right-hand side of equation (5). For example, economists often make this assumption, and their models of demand focus on relatively time-invariant socioeconomic characteristics of a couple (see, e.g., Boulier and Mankiw, 1980, and references they provide). The alternative sequential view--that demand and potential supply change over the reproductive life cycle (Namboodiri, 1972; in these volumes)--is more complex. Desired number of children would be a function of actual fertility, and actual fertility a function of desired numbers. This might be the case, for instance, if couples did attempt to achieve their goals, but also adjusted these goals or rationalized them if they failed.[10] In such cases, either several measures of desired

numbers over time or a simultaneous equations model would be needed. This further complicates the equation for motivation to control, as represented by A - D.

A primary conclusion to be drawn from the discussion in this section is that the independent variables chosen as determinants of motivation to control must be selected with clear attention to the framework of Figure 1. The independent variables should be those which determine demand and supply. If A - D is used as a measure of motivation, actual fertility should not be included as a determinant. If A - D is used and a sequential model of preferences is assumed, the reciprocal influence between desires and actual fertility will have to be taken into account. Longitudinal data or a simultaneous equations model may be needed. Other implications of the sequential framework for studying the determinants of motivation do not appear well developed at present. The problems of simultaneity or reciprocal effects and model identification are even more troublesome when one considers the determinants of fertility regulation, pointing up the need for better measures of motivation. Since this aspect of the model involves measures of regulation costs as well as motivation, further discussion of this issue will be postponed to a later section.

COSTS OF FERTILITY REGULATION

This section focuses on the costs of fertility control, which together with motivation comprise the primary determinants of the adoption of fertility regulation. The following subsections classify the elements of the concept of costs and illustrate their measurement, and then provide a critical assessment of measurement and analytic issues.

Conceptualization and Classification of Costs

A useful preliminary distinction can be made between measurable costs and costs that might be considered infinite or almost infinite, or constraints. In an influential article, Coale (1973) has posited three prerequisites for a sustained decline in marital fertility:

1. Fertility must be within the calculus of conscious choice . . . .
2. Reduced fertility must be advantageous . . . .
3. Effective techniques of fertility reduction must be available . . . . Procedures that will in fact prevent births must be known.

The third prerequisite suggests that a method of fertility regulation must exist and be available to some degree within a society before it is meaningful to consider measuring its costs. For example, the absence of a reversible coitus-free male method of contraception is a constraint or an absolute barrier to this means of fertility regulation; similarly, the absence of female sterilization from a

country might be properly considered a constraint.[11]

Potentially measurable costs might be broadly classified into economic, health, and subjective costs. Economic costs include the monetary and time costs of gaining information about and access to a method of fertility regulation. Health costs include major as well as minor side effects of methods. Subjective costs encompass cultural, social, personal, perceived health, and psychic factors. Figure 4 elaborates on this typology. Some of the cost elements listed have been studied systematically (Schearer, in these volumes), but many have not, particularly the subjective ones. Bogue (in these volumes) reviews some of the literature relevant to each of the subjective costs and uses a 1980 Egyptian survey to assess the saliency of each one. On the basis of both their prevalence and impact, Bogue

FIGURE 4 Classification of Costs of Fertility Regulation

Economic Costs
- Monetary costs of obtaining information and using a technique
- Time costs of obtaining information and using a technique

Health Costs
- Major side effects
- Minor side effects

Subjective Costs
- Threats to cultural norms
  - Nonconformity with religious and moral beliefs
  - Social disapproval and fear of sanctions
- Threats to social adjustment
  - Disharmony in the extended family
  - Unconventional communication about sex between spouses
  - Discord between spouses
  - Undermining family status or security
- Threats to personal adjustment
  - Adoption of "inner control" or "efficacy"
  - Change in self-perception and family role
  - Loss of enjoyment of children
  - Threat to sexual adjustment
- Psychic threats to physical and mental health
  - Temporary discomfort (i.e., side effects)
  - Fear of permanent damage to health
  - Fear of infant death
  - Shyness toward gynecological examination
  - Anxiety over contraceptive failure
- Psychologistics: Perceived accessibility of contraceptive services

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Sources: Easterlin (1975); Schearer (in these volumes); Bogue (in these volumes).

concludes that the most important subjective costs are social disapproval, difficulties of communication between spouses, the need for "inner control," changes in self-perception and one's family role, temporary discomfort, fears of permanent health damage, and anxiety over possible contraceptive failure.

The aspect of cost that has received the most systematic and longstanding attention is the level and distribution of knowledge of contraceptive methods, representing the net result of expenditures by individuals and public and private providers of services. Knowledge of contraceptive methods was a standard topic in family planning KAP (knowledge, attitude, and practice) surveys and was incorporated into the WFS. Table 2 shows the percentages of ever-married women in 20 WFS countries who had heard of specific contraceptive methods. Comparisons with earlier KAP surveys for selected countries generally show substantial increases, suggesting that there has been a major change in a relatively short span of time. The relative uniformity in knowledge across these countries can be contrasted with the differentials in prevalence of contraceptive use (shown in Figure 3 for the same countries). Such a comparison indicates that knowledge can explain only a small part of the variation in prevalence.[12] Thus, although knowledge can be viewed as setting an upper bound on prevalence, it is not a good predictor of actual levels of use.

Whether a woman has heard of a specific method is only one aspect of the cost of information; recognition of its name need not imply that the woman knows what the method looks like, how to use it, what it costs, or where to obtain it. There has been increased concern with questions like these, including knowledge of an outlet for contraceptive services and various characteristics of that outlet, such as perceived distance, travel time, means of transportation, and degree of contact. This line of research seeks to capture more of the economic cost elements involved in obtaining contraceptive information (Lewis and Novak, 1982; Rodriguez, 1977).[13]

United Nations (1981b:Table 3) data for nine WFS countries show several countries where a high proportion of women who know of a method also know of an outlet, but in other countries this is not the case. There is much greater variation in knowledge of an outlet than in knowledge of a method across these nine countries. Rodriguez's (1978) analysis of individual accessibility in five countries (Colombia, Costa Rica, Korea, Malaysia, and Nepal) shows that current use of efficient contraception tends to rise with increased perceived availability (measured as time to an outlet) in four out of five cases; however, this relationship is weakened when controls are introduced for demographic and socioeconomic characteristics. Most of the reduction is due to controlling urban-rural residence, reflecting the strong relationship between perceived accessibility and place of residence. Rodriguez also shows the reverse effect: differentials in contraceptive use by place of residence and education are reduced after controlling for perceived availability. Thus his analysis suggests some independent effect of perceived availability on use. Lewis and Novak (1982), on the other hand, find few differences between users and nonusers of contraception in Thailand and Costa Rica

TABLE 2 Percent of Ever-Married Women Who Had Heard of Specific Contraceptive Methods: Selected WFS Countries

Country	Number of Women[a]	Any Method	Any Modern Method[b]	Any Traditional Method[b]	Female Sterilization	Male Sterilization	Pill	Injection	IUD	Condom	Foam, Diaphragm, etc.	Rhythm	Withdrawal	Abstinence	Douche	Other
Africa																
Kenya[c]	8,100	88	84	70	54	14	74	55	49	40	20	50	25	45	12	2
Asia and Oceania																
Bangladesh	6,515	82	80	49	53	51	64	--	40	21	10	28	15	12	31	5
Fiji	4,928	100	100	87	96	40	98	50	97	83	41[d]	57	56	57	--[d]	5
Indonesia	9,155	77	75	34	11	8	71	17	50	41	5	12	7	13	3	28
Jordan	3,611	97	97	81	79	19	96	--	76	51	21	50	54	33	20	55
Korea, Rep. of	5,430	97	97	68	66	84	94	5	91	75	5	58	37	25	27	2
Malaysia	6,318	92	90	61	73	34	87	48	40	52	26	38	30	30	--	21
Nepal	5,940	23	22	6	13	16	12	0	6	5	0	0	0	5	0	1
Pakistan	4,952	75	75	4	7	2	63	13	48	14	7	0	0	2	0	1
Philippines	9,268	94	94	79	75	70	90	--	86	88	40	66	65	36	21	4
Sri Lanka	6,808	91	90	56	82	38	79	43	62	51	11	44	20	31	9	3
Thailand	3,820	97	96	55	87	70	92	71	86	48	22	32	22	36	17	1
Latin America																
Colombia	3,302	96	95	74	72	38	90	71	82	60	56	56	47	28	41	9
Costa Rica[e]	3,037	100	100	91	94	67	98	88	91	91	71	81	67	31	60	7
Dominican Republic	2,256	98	98	75	95	30	91	68	78	72	60	43	56	--	47	12
Guyana	3,616	95	95	71	79	22	78	38	79	73	45	46	48	32	36	10
Jamaica	2,765	98	98	78	88	40	95	87	84	90	67	39	59	38	43	3
Mexico	6,255	90	89	63	68	38	83	68	75	42	28	48	47	--[f]	38	4
Panama[e]	3,203	99	98	86	93	65	95	26	89	76	56	66	61	35	62	4
Peru	5,639	82	78	69	60	19	63	61	42	40	31	55	40	24	47	11

[a]Unless otherwise indicated, women are under 50 or 15-49, ever-married or in a union.
[b]Modern methods include sterilization, the pill, injection, the IUD, the condom, and female vaginal methods (diaphragm, foam, other spermicides). Other methods are counted as traditional.
[c]Based on all women aged 15-50.
[d]Douche included with foam.
[e]Based on women aged 20-49.
[f]Included with "other."

Source: United Nations (1981:Table 2), citing Vaessen (1980:16) and standard recode tapes. Data obtained spontaneously and by direct probes, but not all methods were probed in all countries, and no probes were used in Pakistan (Vaessen, 1980).

as regards perceived availability: knowledge of a source, travel time, or travel mode. Perceived availability among nonusers alone does vary as expected by residence and education, being generally high in urban areas and among the more educated. Though this analysis suggests little effect of perceived availability on use in these two countries, a more detailed analysis is needed to establish this finding conclusively.[14]

Availability, as well as other costs, involve a wide array of market and nonmarket factors. There is no common denominator for combining these cost factors; only a few can be expressed in monetary or time units. In addition, it should be clear that some elements of cost (such as price, and time and distance to an outlet) can vary with the specific method considered, whereas others (such as social climate, family considerations, and other subjective costs) may be common to all methods. A number of other critical issues in the measurement and analysis of costs are pursued in the next subsection.

Issues in the Measurement and Analysis of Costs

This section presents three related assertions about the measurement and analysis of costs:

1. There is an inherent simultaneity of effects between most elements of costs, as usually measured, and contraceptive use; this simultaneity confounds analysis of the relationships involved and limits program or policy inferences.
2. Many elements of costs, though by no means all, can be viewed as functions of program or macro characteristics, rather than of individuals.
3. The inference to be drawn from assertions (1) and (2) is that multilevel analysis involving both individual (i.e., micro) and program or macro variables can produce useful insights into the relationships between costs and contraceptive use. This type of analysis can also provide policymakers with direct guidance on future program directions.

The question of simultaneity between survey measures of costs and contraceptive use arises because contraceptive use affects reported knowledge and attitudes, which are in turn taken to affect current use. Since earlier knowledge and attitudes cannot be established from a cross-sectional survey, the inherent simultaneity cannot be unraveled in this way. This means that analyses incorporating current knowledge and attitudes as determinants of use are likely to produce biased and misleading conclusions. The problem is well stated by Easterlin and Crimmins (1981:20) in their analysis of the effect of motivation and costs on fertility regulation. They use as a measure of regulation costs the "number of methods of fertility control known to the respondent and reported without special prompting," but point up the problem in using this measure as a determinant of regulation:

> One would like data that . . . antedate the actual decision on fertility regulation, because one consequence of a decision to use control is likely to be a positive shift in users relative to nonusers with regard to both knowledge of methods and favorableness of attitudes.

Their subsequent finding that methods known predicts to years since adoption of contraception may then be explained by the reverse effect they describe. This latter direction of influence seems plausible given Immerwahr's (1981:Table 10) analysis for Sri Lanka (one of the two countries used by Easterlin and Crimmins), which shows a considerable degree of shifting from the first method adopted to other methods. Similarly, the relationships identified by Bogue (in these volumes) between attitudes and use could be due as much to the effect of use on reported attitudes as to the reverse.

One solution to this problem is to carry out individual-level longitudinal analysis in which knowledge, attitudes, and other aspects of costs, as well as contraception behavior, can be traced over time. This type of design is very costly and not without problems of maintaining the panel, avoiding contaminated responses, and the like. However, in settings where there is ongoing contact with users, such as in clinic-provided services or in integrated maternal and child health/family planning programs, it may be possible to conduct baseline surveys of adopters to establish their knowledge and relevant attitudes, and then provide mechanisms for gathering follow-up information on continuation and pregnancy.

A more satisfactory and feasible approach stems from the second assertion presented above: that many elements of cost can be viewed as characteristics of communities or areas. In describing market costs, Szykman (1982:322) states that

> the effective cost of fertility regulation is determined primarily by the availability of contraceptive information, of contraceptive services, of contraceptive method mix, of access to outlets in terms of time, distance, transportation, frequency, etc., of medical follow-up, and of course, by the price of individual contraceptive methods.

These are essentially program or macro characteristics for which the same value could be assigned to each community or small geographic cluster. The same may be done for the social and cultural factors included under subjective costs in Figure 4: social norms and values can be treated as characteristics of aggregates.

How might these macro variables be measured to avoid the problem of simultaneity? Contraceptive availability may be taken as an example. Individual perceptions of availability are usually obtained from survey questions, but macro-level measures of actual availability can be derived by counting the number of outlets serving a community, measuring the distance from some central spot to each outlet, and the like. Of course, there are reciprocal interrelationships between perceived and actual availability: perceived availability helps

translate the macro characteristic of actual availability into the micro behavioral response of contraceptive use; actual availability, individual attributes, and prior experience with birth control methods will all influence perceived availability. Nevertheless, both actual and perceived availability can be separately measured, and measures of community availability are not determined by individual contraceptive use.

Analyzing actual community availability has an additional advantage: program administrators derive more guidance from actual rather than perceived availability. Low community availability may signal to program administrators the need for more outlets. Low perceived availability may do the same, but only if this perception accords with reality; otherwise, the appropriate policy response is probably more publicity and outreach.

As an example, Entwisle et al. (1982a) derived a measure of actual availability from the distance between a rural village and the nearest health center, obtained by field supervisors as part of the second round of the Thailand Contraceptive Prevalence Survey. They used this, rather than perceived availability, in predicting contraceptive use. The authors hypothesize positive relationships between the probability of contraceptive use and education, the desire for no more children, and actual availability. An additional feature of their analysis was that the strength of micro relationships, such as the effects of desire for more children and education on use, was hypothesized to depend on the level of community availability. Such interactions are discussed further in a later section. It might be noted here, however, that the results of their analysis were generally in conformity with the hypotheses.

The logic of this framework, and the analysis of community-level costs, might be extended to include other factors such as method mix, price levels, type of services provided, and related items, insofar as these vary from community to community. The type of data needed may already exist in the records of the family planning program and private providers, or they might have to be obtained by a special effort. The cost of the latter should not be great since the data are needed only for the communities that are sampled as part of the fertility survey. It is also possible in some cases to aggregate individual survey data to obtain measures of social norms and values that are part of the regulation cost structure. This potential is illustrated by Casterline's (1981) WFS analysis, which uses the level of contraceptive use in a community as an aggregate variable to predict intention to use in the future among never users. Casterline argues that the community's level of use reflects its norms about contraception and will therefore affect expressions of future intentions. His findings confirm this expectation in some countries but not in others. This logic can be extended to other cost elements; for example, one can test whether the intentions of never users are a function of the proportion of users reporting side effects, perceived conflicts of family planning with norms or religious beliefs, and so on.

ESTIMATING THE BASIC MODEL

The framework for fertility regulation shown in Figure 2 involves a simple three-variable problem; as just discussed, however, measurement of motivation to limit and regulation costs introduces complications.

The Easterlin and Crimmins (1981) study discussed above comes closest to using the three-variable model. The regression of their fertility-control variable--years since first use--on the motivation and costs measures shows the expected pattern: motivation is positively related to fertility control, whereas cost is negatively related (i.e., greater knowledge, signifying lower costs, has a positive effect on control). As to magnitude, the standardized coefficients indicate greater explanatory power for motivation, even though the costs coefficient may be biased upward due to its ex post character.

Few other studies have used the three-variable model directly. In the absence of direct measures of costs, it is common to regress a measure of fertility regulation (e.g., current use or nonuse of contraception) on motivation and a series of socioeconomic and demographic variables. The measure of motivation frequently used is the difference between actual and desired number of children. This common approach may be represented as

$$U = a_3 + e_1(A - D) + e_2A + e_3X_1 + e_4X_2 \qquad (6)$$

where U is a measure of regulation use; X_1 and X_2 are socioeconomic or demographic characteristics, say, marital duration and education; and A and D are as previously defined.

Following Figure 2, it may be argued that any independent variable included in addition to motivation to limit must be justified as a proxy for cost.[15] For example, education might be justified on the grounds that better-educated women are likely to have more knowledge of contraception and lower psychic and monetary costs than less-educated women. Though actual fertility (A) is often included separately on the right-hand side, there seems to be little justification for this, since it is already embedded in the motivation variable.

The most serious problem associated with the equation is that it ignores the reciprocal influence of contraceptive use on actual fertility: past contraceptive use affects current actual fertility at the same time that actual fertility affects current use. Thus, among other difficulties, the coefficient of motivation estimated from a single equation like this will be biased because actual fertility is part of the motivation variable.

A better model of contraceptive use would involve an improved measure of motivation using potential supply instead of actual fertility, as well as an explicit measure of costs. The supply and demand measures may be entered separately, as in

$$U = a_4 + g_1PS + g_2D + g_3C \qquad (7)$$

or combined into a single motivational variable, as in

$$U = a_5 + g_4(PS-D) + g_5C \qquad (8)$$

When A is used in place of PS, the coefficients should be different unless actual fertility is equal to potential supply. This might be so, to a close approximation, only in a country where contraceptive use is relatively recent, so that most users adopted for the first time in the open interval. In this case, if adoption is indeed recent, actual fertility at the time of the survey will be little affected by prior contraceptive use, but will be determined directly by supply, i.e., by a couple's natural fertility and experience with child mortality. However, this criterion may be difficult to satisfy. Tables 3 and 4 show that more ever users adopted since the last birth in Taiwan (two-thirds of ever users) than in Sri Lanka (one-half), despite the latter program being more recent and producing much lower prevalence. The difference appears to be due in large part to the relatively widespread use of rhythm in Sri Lanka,

TABLE 3 Percent of Ever Users Adopting After Last Birth, 1972: Taiwan

Current Parity	No. of Married Women	Percent Ever Users	Percent of Ever Users Adopting After Last Birth: Total	Years Married: 0-4	5-9	10-14	15+
One	545	34	82	--	--	--	--
Two	935	62	74	--	--	--	--
Three	1,288	81	67	52	63	73	80
Four	1,076	87	67	--	53	63	81
Five	620	88	66	--	50	60	73
Six	275	87	60	--	--	44	70
Seven+[a]	169	83	60	--	--	--	--
Total	5,133[b]	72[b]	68				

Note: Dashes indicate few or no cases in the cell.

[a]Approximated by proportion of women with seven or more births who first used after six births.
[b]Includes data for 225 nulliparous women.

Source: Adapted from Siddiqui (1979:Tables III-2 and III-5).

TABLE 4 Percent of Ever Users Adopting After Last Birth, by Age, 1975: Sri Lanka

Age	No. of Ever Users	Percent
Under 25	337	67
25-29	563	52
30-34	626	51
35-39	569	50
40-44	384	52
45-49	311	42
Total	2,790	52

Note: Percentage was determined by tabulating number of living children when contraception was first used by current number of living children. Cases in which the former variable equalled or exceeded the latter were assumed to adopt after the last birth.

Source: Tabulated from WFS standard recode tape.

reported quite frequently at low parities (Immerwahr, 1981:Table 9). In both countries, there also appears to be a trend toward adoption earlier in the reproductive cycle (Table 3 and Immerwahr, 1981:Tables 7 and 8), which would make actual fertility diverge even more from potential supply as younger cohorts enter reproductive age. Thus, even where there is close correspondence between actual fertility and supply at one point in time, they may diverge rapidly; with more widespread adoption of contraception, the assumption of equality will therefore become less tenable. This means that continued use of actual fertility in place of potential supply will produce increasingly biased coefficients. On the other hand, the difficulties of estimating supply have already been noted.

The model of fertility control assumes that couples adopt contraception to limit family size; insofar as there is widespread use for spacing, one would not expect motivation to limit to distinguish users from nonusers. Table 1 shows that in 10 of 17 countries, one-quarter or more of the women who want more children are using contraception, presumably for spacing. To the extent that this use expands, the power of the model to distinguish users from nonusers

will diminish, and new models incorporating the determinants of adoption for spacing will be needed. Of course, it may be argued that, as contraceptive use becomes sufficiently widespread, interest in predicting use will disappear; most likely, the problem will be reconceptualized to focus on other facets of use, such as when contraception is adopted, the specific methods adopted, and the effectiveness of use.

CHOICE OF MEANS OF FERTILITY REGULATION

The simple model of fertility control explored here has for the most part assumed that some form of contraception (including sterilization) will be chosen as the regulating mechanism. This need not be the case. Couples may attempt to influence any of the following:

- Factors affecting exposure to intercourse
  - Voluntary abstinence
  - Coital frequency
- Factors affecting exposure to conception
  - (Contraception and sterilization)
  - Duration of breastfeeding
- Factors affecting gestation
  - Voluntary abortion

Omitted from this list are the formation and dissolution of unions, since decisions about these are generally not expected to be influenced by the desire to regulate fertility (cf. Bongaarts and Menken, in these volumes).[16]

Of the factors in the list, voluntary abstinence in its various forms (nonsystematized, calendar rhythm, etc.) is generally treated as a traditional and behavioral means of contraception and will be similarly treated here. (Postpartum abstinence, in particular, is an important factor in childspacing in some parts of Africa [Page and Lesthaeghe, 1981].)

Relatively little is known about coital frequency and the extent to which it is systematically varied to control childbearing. Data from the United States (Westoff, 1974) show higher coital frequency among couples using highly effective means of contraception, and, among contraceptive users, higher frequency for those intending to delay than for those wishing to prevent a birth. These data also reveal that, among nonusers not wishing to have another child at the moment, coital frequency is much lower among women intending no more children than among those intending to have more. This suggests some reduction in frequency among those desiring to reduce the probability of conception. Similar data and analyses for developing countries do not appear to be available.[17]

There is growing evidence that women do prolong their duration of breastfeeding to increase the length of the birth interval. This evidence is based on an observed inverse relationship between use of contraception and duration of breastfeeding that suggests these two

behaviors are partial substitutes for each other (Jain and Bongaarts, 1981; Millman, 1982; Johnson-Acsadi and Szykman, 1981). By introducing controls available from WFS data, Jain and Bongaarts (1981) show that this relationship is not spurious (see also Millman, 1982). They argue, however, that breastfeeding is used mainly to regulate birth intervals rather than to help limit family size, because duration of breastfeeding was not systematically related to parity in the eight countries. This may not be a conclusive test: other things being equal, women who breastfeed for a shorter period will have higher parity, thereby masking any trend to lengthen breastfeeding at higher parities. Millman (1982) treats this issue by directly introducing a motivation variable into her analysis for Taiwan, and finds generally that, after controlling for contraceptive use, those who wished to stop childbearing breastfed longer than those who intended future births. Of course, the hypothesis that women alter their breastfeeding behavior to regulate fertility can only be sustained if women are aware of breastfeeding's fertility-inhibiting effects. Aside from numerous subjective reports, systematic data on this point are scarce, with few surveys attempting measures of women's awareness.[18] A more sensitive line of questioning on this topic and replication across countries are needed. Also needed is more research on the extent to which breastfeeding contributes to the lack of contraceptive use among a portion of women wanting more children.[19]

Abortion has been an important and widespread means of fertility regulation in both developed and developing societies. Legal restrictions in many places and the social stigma associated with its practice have greatly limited the range and accuracy of both aggregate and individual-level data. As a result, it is difficult to mount careful comparative studies of the interrelationships between contraception and abortion. Studies cited by David (in these volumes) indicate that women highly motivated to limit family size use both contraception and abortion, and that experience with one type of fertility regulation contributes to experimentation with the other (see also Freedman et al., 1975). David's review of trends in Chile reveals a case in which, under an intensive family planning program, contraceptive use increased sharply and abortion decreased.

In addition to the means of fertility regulation listed above, there is a wide choice among contraceptive methods. As noted earlier, modern methods predominate among 20 WFS countries; moreover, in countries for which time-series data exist, modern methods represent an increasing proportion of total use (United Nations, 1981b:26). Nevertheless, there is little correlation between the overall prevalence rate and the proportion of users relying on traditional methods. It is interesting to note that, in a number of developed countries, traditional methods account for a higher proportion of total use than in most of the developing countries shown in Figure 3 (Larson, 1981:Table 2); at the same time, there were substantial shifts toward modern methods among the developed countries in the 1965-75 period (Leridon, 1981:Table 8). Among couples in the developed countries, the safety, convenience, and effectiveness of modern methods were attractive alternatives to the traditional methods

they had been using; to many couples in the developing countries, these features were probably necessary for them to initiate fertility regulation. The availability, and in many places the promotion, of modern methods appear instrumental in reducing costs to the point where significant gains in prevalence can occur.

THE ROLE OF FAMILY PLANNING PROGRAMS AND COMMUNITY CHARACTERISTICS IN FERTILITY REGULATION

The present analysis has focused on fertility regulation largely from the viewpoint of the individual woman or couple. However, the model set forth in Figure 1 assigns a role to various community or societal mechanisms, and it was argued above that many components of costs are usefully viewed as macro characteristics. This section focuses on the role of the macro variables--family planning programs and community characteristics--in fertility regulation.

Family planning programs represent the major social innovation designed to accelerate contraceptive use and reduce fertility in developing countries. On the scope and nature of programs, major sources of comparative data have been the various editions of Population and Family Planning Programs (e.g., Nortman and Hofstatter, 1980). Topics covered include governmental positions on population growth and family planning; legal and *de facto* regulations related to family planning methods; indicators of inputs into family planning programs, covering data on funds, personnel, and facilities; and indicators of program output, including data on acceptors by method, characteristics of acceptors, and estimates of prevalence by private and public sectors. Another important source of information on governmental policy in relation to fertility and family planning, as well as other demographic factors, has been the monitoring reports of the United Nations, initiated after the 1974 U.N. World Population Conference in Bucharest (United Nations, 1980, 1981a). These reveal, for example, that, as of 1978, 73 percent of the 116 countries surveyed supported (directly or indirectly) access to modern methods of birth control (United Nations, 1980:Table 19). Nortman and Hofstatter (1980:Table 5) indicate that over 90 percent of the developing world's population resides in countries that support family planning to reduce population growth or promote health. Family planning delivery systems have been undergoing rapid change in recent years with the greater promotion of commercial retail sales, the integration of family planning services with primary health care and development programs, and the increased emphasis on community-based distribution systems. These and other trends are reviewed in the report of the International Conference on Family Planning in the 1980s (1981:Annex).

The present discussion examines various approaches for evaluating family planning programs, with the goal of ascertaining how to analyze their role in the model (see also Ross, in these volumes; Mauldin, in these volumes; Retherford and Palmore, in these volumes). Programs may facilitate the adoption of fertility regulation both by

TABLE 5 Techniques for Measuring Family Planning Program Effects, Cross-Classified by Type of Effect and Type of Data

Technique	Type of Effect Analyzed			Type of Data Employed			
					Nonprogram Variables		
	Program Effect	Non-program Effect	Total Effect	Program Vari-ables	Socio-economic	Demo-graphic	Bio-logical
Standardization	-	-	X	-	O	X	-
Trend Analysis	I	X	X	-	-	X	-
(Standard) Couple Years of Protection	X	-	-	X	-	X	O
Analysis of Reproductive Process	X	-	-	X	-	X	X
Component Projection	X	-	-	X	-	X	O
Simulation	X	-	-	X	-	X	X
Experimental Design and Matching Studies	X	X	X	X	O	O	-
Multivariate Areal Analysis	X	X	X	X	X	X	O

Note:
X = Effect or data explicitly involved.
I = Effect obtained implicitly.
O = Data of this type occasionally employed or potentially employable.
- = Effect or data not generally part of technique.

Source: Hermalin (1982a).

strengthening motivation to limit and by reducing regulation costs. The latter influence is the more obvious and has received more attention, particularly in the earlier phases of many programs. By providing information about contraception, opening up convenient service points, subsidizing purchase of various methods, and legitimizing their use, programs reduce a number of the monetary and psychic costs described earlier. Programs may also strengthen motivation by promoting lower family-size norms, thus furthering an interest in fertility regulation at earlier stages of reproduction, or encouraging those undecided about stopping at a given parity to do so (Freedman, 1979; Knodel and Debavalya, 1978).

When the effects of a program are evaluated, there is usually no attempt made to identify its relative contribution to reducing costs and strengthening motivation; interest tends to center on a program's ultimate contribution to reducing fertility. Concern with this issue has led to the development of a number of evaluation techniques (Chandrasekaran and Hermalin, 1975; United Nations, 1978, 1979b); the eight major ones are listed in Table 5, by type of effect and type of data required (Hermalin, 1982a). The middle four techniques estimate only fertility reduction deriving directly from supplies and services provided by the program, basically through accounting procedures that start with the number of couples served by the program; make use of the length and effectiveness of contraceptive use; and take account of a number of other factors, such as a woman's age, the risks of secondary sterility and marital dissolution, overlap between postpartum amenorrhea and contraceptive use, and potential fertility (the fertility that acceptors would have in the absence of the program). These four methods do not take into account the role of socioeconomic development in heightening motivation or in reducing costs.

Other methods incorporate this factor, and several attempt to separate program from nonprogram effects or to estimate the total effect from all sources. Two of these--standardization and trend analysis--rely on demographic data. The former attempts to disentangle the role of marital fertility from the roles of age structure and marital status in fertility changes. Since a program affects only marital fertility, standardization sets a limit on the fertility change arising from it. Trend analysis also relies on demographic data, but by using time series and some strong assumptions, provides an estimate of both program and nonprogram effects. The essential method is to project fertility trends prior to the start of a program, and to contrast this with the actual trend after the program started. The first trend is assumed to capture underlying socioeconomic processes, and the difference between the two trends provides an implicit measure of the added effect of the program.

Both nonprogram and program effects can be measured explicitly by the last two techniques in Table 5, experimental design and multivariate areal analysis. The basic idea of the former is to assign family planning programs randomly to administrative areas within a country. After several years, the difference in fertility between program and nonprogram areas should indicate the program

effect; if initial fertility levels are known, an estimate of nonprogram effects can also be derived. Practical problems, such as contamination between test and control areas and the need to distinguish short- from long-term effects, come into play in carrying out a specific design (Cuca and Pierce, 1977; Phillips et al.,1982; Stinson et al., 1982). In areal multivariate analysis, data are needed for administrative areas on both program inputs and nonprogram factors thought to influence fertility. The effect of the program is tested by determining the relationship between program factors and fertility across the areal units, after taking into account the socioeconomic factors involved. Typically, regression analysis will be used to estimate the effects of each independent variable in the model, thus providing measures of program and specific nonprogram effects (Hermalin, 1979).

The use of these different techniques has spurred theoretical and empirical research on reconciling their results. An important distinction should be made between gross and net program effects. When gross effects are assessed, a program receives credit for all acceptors from the public sector, including those who switched from a private source and, hypothetically, those who might have used a private source if a public source were not available; at the same time, those who were motivated by the program to adopt contraception but who choose a private source are not included (this is often referred to as the catalytic impact of a program). Net program effect seeks to isolate more precisely the program's contribution to fertility regulation through its enhancement of motivation and reduction of costs. Of the techniques considered, trend analysis, multivariate areal analysis, and experimental design can produce estimates of net effect, while the remaining methods yield gross estimates (see also Bongaarts, forthcoming). Empirical research on cross-method variance has consisted of applying the different techniques to the same setting to determine whether they yield similar inferences about program impact (United Nations, 1978, 1982; Potter, 1981; Hermalin, 1982b). These studies indicate that a major source of variation across methods (connected in part to the distinction between gross and net effects) is the level of potential fertility used explicitly or implicitly by each technique. Continuing research should eventually establish reasonably narrow bounds for program effects.

These techniques were developed to evaluate family planning programs within specific countries. A number of analyses have also looked at program effects cross-culturally. The major approach is a modification of areal multivariate analysis, with countries as the units of analysis; measures of program strength[20] and indices of socioeconomic development as the independent variables; and a measure of fertility or fertility change as the dependent variable (Mauldin and Berelson, 1978; Hernandez, 1981; Cutright and Kelly, 1981). These studies show a distinct effect of family planning programs on fertility, but variation in magnitude. In describing the limitations of such analyses, Hermalin (1979) notes that results are likely to be sensitive to differences in conceptual models, operational

definitions, and techniques of estimation. Thus, establishing narrow bounds for program effects cross-culturally remains elusive.

The availability of comparable fertility data for many countries in the World Fertility Survey and the Contraceptive Prevalence Surveys has presented some new possibilities for measuring program effects. One of these has been the development of a prevalence model for estimating gross program effect. Bongaarts and Kirmeyer (1982) and Bongaarts (forthcoming) regress nationwide fertility measures, such as total fertility and total marital fertility rates, on prevalence of contraceptive use. These equations, together with Bongaarts' modeling of fertility according to proximate determinants, permit the derivation of gross program effects and births averted from the prevalence of program contraception, the prevalence of contraception from nonprogram sources, the crude birth rate, and population size. Bongaarts has also extended this model to provide age-specific and method-specific results.

The availability of comparable surveys also permits the use of multilevel analysis, combining data on individuals with that on communities or countries. This is a general strategy with a large number of possible applications. Although this section has focused on ultimate effects on fertility, many of the immediate and intermediate goals of a country's program can be profitably investigated.[21] As noted earlier, multilevel analysis can be used to determine the effect

FIGURE 5 Outline of Multilevel Model for Studying Effects of Family Planning Programs on Desired Number of Children

Dependent variable (individual-level)	Desired number of children
Independent variables (individual-level)	Wife's eduction Husband's occupation Wife's labor force status Childhood residence Age
Independent variables (community-level)	Program inputs (IEC efforts, or personnel and facilities) Modernization (electricity, educational facilities, health facilities, etc.) Communication (movies, television, etc.) Distance to nearest city Region
Major interactions	Program input x education Program input x labor force status Modernization x education Communications x education

TABLE 6 Hypothesized Relationship Between Family Planning Program Effort and Socioeconomic Development on Micro Relationships

	Family Planning Program Effort			Socioeconomic Development			
Micro Relationship	Weak	Strong	Correlation[a]	Low	Moderate	High	Correlation[a]
Effect of Education on Motivation	Strong Positive	Weak Positive	Negative	Weak Positive	Strong Positive	Weak Positive	Negative[b]
Effect of Education on Use	Strong Positive	Weak Positive	Negative	Moderate Positive	Strong Positive	Weak Positive	Negative[b]
Effect of Motivation on Use	Weak Positive	Strong Positive	Positive	Weak Positive	Moderate Positive	Strong Positive	Positive

[a]Predicted correlation between macro characteristic and micro relationship.
[b]Assumes that most countries will be at moderate to high levels of socioeconomic development.

of contraceptive availability and other dimensions of costs on contraceptive use. A similar strategy can be used to explore a program's effect on demand for children and hence on motivation, using a design along the lines shown in Figure 5. The analysis is carried out by regressing the dependent variable on the individual- and community-level independent variables and hypothesized interactions between the two. Coefficients of the interaction terms would be of particular interest. One might hypothesize, for example, that the relationship between education and number of children will differ in communities with high versus low information-education-communication (IEC) efforts: successful IEC might reduce the desired number of children to a greater extent among the less-educated than among the more-educated.

Another illustration of this technique suitable for cross-country analysis might be given. Assume a simplified model in which contraceptive use depends on motivation and education (as a proxy for costs), and in which the system is affected by two global variables--family planning program effort and socioeconomic development. Table 6 presents hypotheses about the relationship among education, motivation, and use at different levels of the macro-variables. For example, given the role of family planning programs in strengthening motivation and reducing costs, countries with a strong program could be expected to show a greater effect of motivation on use and a weaker effect of education. Similarly, level of development, which strengthens motivation to limit and makes contraceptives more widely available, can be expected to have the same effects. A curvilinear effect of development on the education-motivation relationship is hypothesized: at low levels of development, few people in any educational strata will be motivated to restrict childbearing; with more development, clear socioeconomic differentials will occur, attenuated as development proceeds further. Preliminary tests with 15 WFS countries and a set of earlier KAP data (derived from Freedman and Coombs, 1974) generally support these hypotheses.[22]

A particular strength of multilevel analysis, therefore, is that it encourages the formulation of hypotheses about interactions like these. It thus helps operationalize some of the ideas presented by Retherford and Palmore (in these volumes) on the way regression coefficients might be expected to change with the diffusion of fertility regulation. It also provides ideas to test with the clustered samples that Potter (in these volumes) recommends for investigating social and community mechanisms. This form of analysis can also provide important insights for family planning program administrators in determining the efficacy of specific program procedures.

CONCLUSION

This review has chosen a rather narrow framework from which to explore the question of fertility regulation. Rather than touch on the multitude of studies that address one or another part of the

regulation process, it has exploited a rather simple paradigm. This paradigm is widely recognized, but is frequently ignored in the actual execution of research. This contributes to a state of disarray within the field and a lack of systematic progress. The present investigation of the paradigm connecting regulation costs and motivation to limit with the use of fertility regulation has detected a number of areas where improvements are needed. These include methods of measuring motivation that avoid introducing simultaneities with contraceptive use; improved conceptualization and measurement of costs, recognizing that many of the components are global or macro in character; and modes of analysis that incorporate both individual and community (or country) variables.

The potential utility of the model presented here should not obscure its weaknesses. The model is likely to become increasingly dated with the growing availability and use of effective contraception in developing countries. The increasing practice of spacing will attenuate the relation between desire for more children and contraceptive use; interest will center more on when couples decide to limit childbearing than on whether those who want no more children are using contraception. One might therefore expect that increasing attention will be focused on the study of childspacing, and on the determinants of the total number of children desired.

NOTES

1. The term community is used throughout to refer to both limited geographical areas within which a major share of people's activities and meaningful interactions take place, and larger aggregations such as regions and nations whose policies may influence individual behavior. Where necessary, the specific level of aggregation will be noted.
2. This list does not attempt to be exhaustive. A thorough analysis would reveal other examples of sharp increases. Overall, it appears that some 15 countries have increased their prevalence rates by 20 points or more in a decade or less.
3. Data on contraceptive prevalence for earlier time points are presented in Watson and Lapham (1975), for circa 1973; Freedman and Coombs (1974), for 1966-71; and United Nations (1979a), for 1963-71.
4. A number of studies provide basic data derived from the World Fertility Survey on the relationship between contraceptive use and various demographic and socioeconomic characteristics (Sadik, 1981; United Nations, 1981b; Lightbourne, 1980; Carrasco, 1981). A compilation of data for developing and developed countries on one traditional method, periodic abstinence, including estimates over time, is presented in Population Reports (1981a:Table 4).
5. The legal status of abortion in each country as of mid-1980 is given in Tietze (1981:Table 1). This review indicates that 9 percent of the world's population lived in countries where abortion was prohibited without exception, 19 percent where it was

permitted only to save a woman's life, 10 percent where it was permitted on broader medical grounds, 24 percent where social and economic factors could be taken into account, and 38 percent where abortion was available on request. Between 1976 and 1980, about 40 jurisdictions extended the grounds for abortion, while 6 made legal access more restrictive.

6. This is the form basically employed by the WFS (Singh, 1980). Alternative wordings are given in Population Council (1970). See also Knodel and Prachuabmoh (1973) and Szykman (1982) for discussions of alternate concepts such as ideal and expected number of children and relevant references. Pullum (1980) also contains a useful bibliography on this topic.
7. The method is based on psychological unfolding theory. The independence and additivity of the scales can be established, justifying the use of conjoint measurement. Responses are generally meaningful and consistent.
8. United Nations (1981b:52) reports a correlation of over 0.8 between proportions using among those wanting more and among those wanting no more.
9. The Cleland et al. (1979) analysis does not involve the motivation variable but describes in detail the hierarchical approach.
10. Pullum presents data for Sri Lanka showing that the number of children women report as ideal rises directly with their actual number. He argues that this association is due to rationalization as well as to implementation of preferences, therefore justifying an analysis in the form of equation (5). Jejeebhoy (1981), on the other hand, shows that when cohorts in Taiwan are traced across successive surveys, there is a surprisingly high persistence of stated preferences, indicating for these women a minimum of rationalization. The degree to which desired numbers are adjusted or rationalized in the course of family building cannot be determined conclusively from a single cross-sectional survey. Pullum (1980) advocates resorting to ancillary as well as survey data. For example, he suggests that heavy rationalization is plausible if stated preferences rise with actual number of children, if final fertility is in excess of the number desired, and if the country's fertility rates suggest natural fertility or there is little efficient contraception. He advocates including actual fertility as a determinant of desired number in such cases; this would be used as a control or intervening variable, as illustrated in equation (4), so that the effects of the other variables would be net of this bias. For cases where it cannot be determined whether there is heavy rationalization or implementation of preferences, Pullum suggests restricting the analysis to women of short marital duration; for these women, little rationalization would have occurred, and preferences can therefore be treated solely as a function of socioeconomic variables and appropriate demographic controls.
11. Technically, measurable costs could be involved in such a case if the wealthy few could travel elsewhere to obtain this method.

12. It would be more correct to contrast knowledge with ever use of contraception rather than with current use; however, since these two measures of use are highly correlated, the overall relationship would not change much. The lack of relationship between knowledge and use on the aggregate level does not, of course, preclude a relationship at the individual level. Nevertheless, where the overall knowledge in a country is very high, one would not expect much relationship, as confirmed by Sadik (1981).
13. Terminology in this area appears to be evolving. Rodriguez uses "availability" for knowledge of a source, and "accessibility" for time, distance, and means of transport to that source. Lewis and Novak define "availability" as including both effective knowledge of a source (whether couples have sufficient knowledge about a source to obtain contraception if they so desire) and proximity (travel time, travel mode, and convenience). They regard availability as one aspect of general accessibility, which also includes such factors as costs, quality of services, availability of medical personnel, and adequacy of supplies.
14. It is interesting that in the one country studied by both Rodriguez and Lewis and Novak--Costa Rica--Rodriguez finds no effects of accessibility on use. Additional analysis can be found in Brackett (1981).
15. Given weak measures of motivation, some of the independent variables must be justified as reducing measurement error, explaining systematic variation, or capturing the intensity of motivation, if the latter were a concept in the model.
16. Infanticide, though not a method of fertility control, has been used to regulate the consequences of fertility in a number of societies at certain stages of development (see Scrimshaw, in these volumes).
17. Muangman et al. (1973) report data for a suburb of Thailand showing very similar distributions of coital frequency between those using and not using contraception; however, these tabulations do not control for age or other factors. Questions on coital frequency have been included in surveys done in several African countries, as well as in Colombia and the Philippines, but results are not yet available.
18. In a 1967-68 Taiwan survey, women were asked, "Can a woman get pregnant while breastfeeding?" The 22 percent of married women answering "No" provide a minimum estimate of those who might use breastfeeding to influence fertility, since many others who answered "Yes" are likely to be aware that breastfeeding lessens the likelihood of contraception without affording absolute protection. In the Fiji World Fertility Survey (Fiji, Bureau of Statistics, 1976:514), a question on the efficacy of breastfeeding was included among those on knowledge and use of contraceptive methods. Among ever-married women, 50 percent reported hearing of this method, but less than 7 percent reported ever using it. Lactation was also included as a method of contraception in the Paraguay Contraceptive Prevalence Survey (Morris et al., 1978).

Butz and Habicht (1976:215) cite a Guatemalan study indicating that three-quarters of mothers believed lactation postpones a new conception. Questions on knowledge of the effect of breastfeeding were also included in the Malaysian Family Life Survey (Butz and DaVanzo, 1978).

19. The substitution of breastfeeding for contraception may help explain why a significant portion of women who say they want no more children are not using contraception--the so-called unmet need for birth control, of considerable current interest (Westoff, 1978). However, Szykman's (1982) analysis suggests that breastfeeding may account for only a small portion of the unmet need. For an unidentified WFS country, he shows that 58 percent of women who wanted no more children and were not using contraception were breastfeeding, but only half of them intended to contracept in the future. He interprets this as indicating that many of the motivated breastfeeding women did not associate their breastfeeding with fertility regulation.
20. An index of program strength or effort was developed by Lapham and Mauldin (1972) using 15 programmatic criteria. This index has been widely used, most notably by Mauldin and Berelson (1978), who provide values for 94 countries circa 1970. Despite the availability of such an index, however, there are many facets of family planning program inputs that are not well measured (Mauldin and Lapham, 1982).
21. Ross (in these volumes) describes the gains possible by improving contraceptive continuation--one intermediate goal. A general review of program objectives is given by Chandrasekaran and Freymann (1965).
22. Some evidence that program effort and socioeconomic development interact in their effect on these micro relationships has been found in a large-scale comparative analysis of WFS data (Entwisle et al., 1982b).

BIBLIOGRAPHY

Bongaarts, J. (1982) The fertility inhibiting effects of the intermediate variables. Studies in Family Planning 13:179-189.

Bongaarts, J. (forthcoming) The concept of potential fertility in the evaluation of the fertility impact of family planning programs. In Proceedings of the Third Expert Group Meeting on Methods of Measuring the Impact of Family Planning Programmes on Fertility, Geneva. New York: United Nations.

Bongaarts, J., and S. Kirmeyer (1982) Estimating the impact of contraceptive prevalence on fertility: Aggregate and age-specific versions of a model. In A. I. Hermalin and B. Entwisle, eds., The Role of Surveys in the Analysis of Family Planning Programs. Liege: Ordina.

Boulier, B. L., and N. G. Mankiw (1980) An Econometric Model of the Demand, Supply, and Regulation of Fertility. Paper presented at the annual meeting of the Population Association of America, Denver.

Brackett, J. W. (1981) The role of family planning availability and accessibility in family planning use in developing countries. Pp. 19-49 in World Fertility Survey Conference 1980, Record of Proceedings, Vol. 2. Voorburg: International Statistical Institute.

Butz, W. P., and J. DaVanzo (1978) The Malaysian Family Life Survey: Summary Report. R-2351-AID. Santa Monica, Calif.: Rand Corporation.

Butz, W. P., and J.-P. Habicht (1976) The effects of nutrition and health on fertility: Hypotheses, evidence, and interventions. In R. G. Ridker, ed., Population and Development. Baltimore, Md.: The Johns Hopkins University Press.

Carrasco, E. (1981) Contraceptive Practice. WFS Comparative Studies, No. 9. London: World Fertility Survey.

Casterline, J. B. (1981) Community Effects on Fertility Intentions: The Effect of Aggregate Levels of Contraceptive Use on Individual Intentions to Use. WFS Technical Papers 1703. London: World Fertility Survey.

Chandrasekaran, C., and M. W. Freymann (1965) Evaluating community family planning programs. In M. C. Sheps and J. C. Ridley, eds., Public Health and Population Change. Pittsburgh, Pa.: University of Pittsburgh Press.

Chandrasekaran, C., and A. I. Hermalin, eds. (1975) Measuring the Effect of Family Planning Programs on Fertility. Liege: Ordina.

Cleland, J. G., R. J. A. Little, and P. Pitaktepsombati (1979) Illustrative Analysis: Socio-Economic Determinants of Contraceptive Use in Thailand. WFS Scientific Reports, No. 5. London: World Fertility Survey.

Coale, A. J. (1973) The demographic transition. Pp. 53-72 in International Population Conference, Liege 1973. Liege: International Union for the Scientific Study of Population.

Coale, A. J., and T. J. Trussell (1974) Model fertility schedules: Variations in the age structure of childbearing in human populations. Population Index 40:185-257.

Concepcion, M. B. (1981) Family formation and contraception in selected developing countries: Policy implications of WFS findings. Pp. 197-260 in World Fertility Survey Conference 1980, Vol. 1. London: World Fertility Survey.

Coombs, C. H., L. C. Coombs, and G. H. McClelland (1975) Preference scales for number and sex of children. Population Studies 29:273-293.

Coombs, L. C. (1979) Prospective fertility and underlying preferences: A longitudinal study in Taiwan. Population Studies 33:447-455.

Cuca, R., and C. S. Pierce (1977) Experiments in Family Planning: Lessons from the Developing World. Baltimore, Md.: The Johns Hopkins University Press.

Cutright, P., and W. R. Kelly (1981) The role of family planning programs in fertility declines in less developed countries, 1958-1977. International Family Planning Perspectives 7:145-151.

Easterlin, R. A. (1978) The economics and sociology of fertility: A synthesis. In C. Tilly, ed., Historical Studies of Changing Fertility. Princeton, N.J.: Princeton University Press.

Easterlin, R. A., and E. M. Crimmins (1982) An Exploratory Study of the 'Synthesis Framework' of Fertility Determination with WFS Core Questionnaire Data. Paper prepared for the International Union for the Scientific Study of Population International Population Conference, Manila.

Entwisle, B., A. I. Hermalin, P. Kamnuansilpa, and A. Chamratrithirong (1982a) A Multilevel Model of Family Planning Availability and Contraceptive Use in Rural Thailand. Population Studies Center Research Report. Ann Arbor, Mich.: University of Michigan.

Entwisle, B., A. I. Hermalin, and W. Mason (1982b) Socioeconomic Determinants of Fertility Behavior in Developing Nations: Theory and Initial Results. Washington, D.C.: National Academy Press.

Ferry, B. (1981) Breastfeeding. WFS Comparative Studies, No. 13. London: World Fertility Survey.

Fiji, Bureau of Statistics (1976) Fiji Fertility Survey 1974, Principal Report. London: World Fertility Survey.

Freedman, R. (1975) The Sociology of Fertility. New York: Irvington Publishers.

Freedman, R. (1979) Theories of fertility decline: A reappraisal. Social Forces 58:1-17.

Freedman, R., and L. Coombs (1974) Cross-Cultural Comparisons: Data on Two Factors in Fertility Behavior. New York: Population Council.

Freedman, R., A. I. Hermalin, and M.-C. Chang (1975) Do statements about desired family size predict fertility? The case of Taiwan, 1967-1970. Demography 12:407-416.

Hauser, P. (1967) Family planning and population programs--a book review article. Demography 4:397-414.

Hermalin, A. I. (1979) Multivariate areal analysis. Pp. 99-111 in The Methodology of Measuring the Impact of Family Planning Programmes on Fertility, Manual IX. New York: United Nations.

Hermalin, A. I. (1982a) Techniques for measuring family planning program effects on fertility. In J. Ross, ed., International Encyclopedia of Population. New York: The Free Press.

Hermalin, A. I. (1982b) Issues in the comparative analysis of techniques for evaluating family planning programmes. In Evaluation of the Impact of Family Planning Programs on Fertility: Sources of Variance. New York: United Nations.

Hermalin, A. I., R. F. Freedman, T.-H. Sun, and M.-C. Chang (1979) Do intentions predict fertility? The experience in Taiwan, 1967-74. Studies in Family Planning 10:75-95.

Hernandez, D. J. (1981) A note on measuring the independent impact of family planning programs on fertility declines. Demography 18:627-634.

Immerwahr, G. (1981) Contraceptive Use in Sri Lanka. WFS Scientific Reports, No. 18. London: World Fertility Survey.

International Conference on Family Planning in the 1980s (1981) Family Planning in the 1980s. New York: United Nations Fund for Population Activities, International Planned Parenthood Federation, and Population Council.

Jain, A. K., and J. Bongaarts (1981) Socio-biological factors in exposure to childbearing: Breastfeeding and its fertility effects. Pp. 255-302 in World Fertility Survey Conference 1980, Record of Proceedings, Vol. 2. Voorburg: International Statistical Institute.

Jejeebhoy, S. J. (1981) Cohort consistency in family size preference: Taiwan, 1965-73. Studies in Family Planning 12:229-232.

Johnson-Acsadi, G. G., and M. Szykman (1981) Selected Characteristics of Exposed Women Wanting No More Children and Not Using Contraceptives. Paper prepared for the International Union for the Scientific Study of Population Seminar on the Analysis of the WFS Family Planning Module, Genting Highlands, Malaysia.

Johnson-Acsadi, G. G., and M. B. Weinberger (1982) Factors affecting use and non-use of contraception. Pp. 51-84 in A. I. Hermalin and B. Entwisle, eds., The Role of Surveys in the Analysis of Family Planning Programs. Liege: Ordina.

Knodel, J., and N. Debavalya (1978) Thailand's reproductive revolution. International Family Planning Perspectives and Digest 4:34-49.

Knodel, J., and V. Prachuabmoh (1973) Desired family size in Thailand: Are the responses meaningful? Demography 10:619-637.

Lapham, R. J., and W. P. Mauldin (1972) National family planning programs: Review and evaluation. Studies in Family Planning 3(3).

Larson, A. (1981) Patterns of Contraceptive Use Around the World. Washington, D.C.: Population Reference Bureau.

Leridon, H. (1981) Fertility and contraception in 12 developed countries. Family Planning Perspectives 13:93-102.

Lesthaeghe, R. (1980) On the social control of human reproduction. Population and Development Review 4:527-538.

Lewis, G. L., and J. A. Novak (1982) An approach to the measurement of availability of family planning services. Pp. 241-278 in A. I. Hermalin and B. Entwisle, eds., The Role of Surveys in the Analysis of Family Planning Programs. Liege: Ordina.

Lightbourne, R. E. (1980) Urban-Rural Differentials in Contraceptive Use. WFS Comparative Studies, No. 10. London: World Fertility Survey.

Mauldin, W. P., and B. Berelson (1978) Conditions of fertility decline in developing countries. Studies in Family Planning 9:89-147.

Mauldin, W. P., and R. J. Lapham (1982) Measuring the input of family planning programs. In A. I. Hermalin and B. Entwisle, eds., The Role of Surveys in the Analysis of Family Planning Programs. Liege: Ordina.

Millman, S. (1982) Breastfeeding in Taiwan: A Study of Change. Unpublished Ph.D. dissertation. University of Michigan, Ann Arbor, Michigan.

Morris, L., J. E. Anderson, R. S. Monteith, R. Kriskovich, J. Shoemaker, and O. Frutos (1978) Contraceptive prevalence in Paraguay. Studies in Family Planning 9:272-279.

Muangman, D., R. G. Burnight, and P. J. Donaldson (1973) Contraception and coital frequency. Asian Journal of Medicine 9:127-128.

Namboodiri, N. K. (1972) Some observations on the economic framework for fertility analysis. Population Studies 26:108-206.

Nortman, D., and Hofstatter, E. (1980) Population and Family Planning Programs, 10th ed. New York: Population Council.

Page, H. J., and R. Lesthaeghe, eds. (1981) Child-Spacing in Tropical Africa: Traditions and Change. London: Academic Press.

Palmore, J. A., and M. B. Concepcion (1981) Desired family size and contraceptive use. Pp. 513-542 in World Fertility Survey Conference 1980, Vol. 2. London: World Fertility Survey.

People (1978) Abortion. People 5:4-21.

Phillips, J. F., W. S. Stinson, S. Bhatia, M. Rahman, and J. Chakraborty (1982) The demographic impact of the family planning: Health services project in Matlab, Bangladesh. Studies in Family Planning 13:131-140.

Population Council (1970) A Manual for Surveys of Fertility and Family Planning: Knowledge, Attitudes, and Practice. New York: Population Council.

Population Reports (1978) Voluntary sterilization: World's leading contraceptive method. Population Reports, Series M, Number 2.

Population Reports (1981a) Periodic abstinence: How well do new approaches work? Population Reports, Series I, Number 3.

Population Reports (1981b) Breastfeeding, fertility, and family planning. Population Reports, Series J, Number 24.

Potter, R. G. (1981) The Analysis of Cross-Method Variance in Assessing Family Planning Programme Effects on Fertility. Paper prepared for the International Union for the Scientific Study of Population, International Population Conference, Manila.

Pullum, T. W. (1980) Illustrative Analysis: Fertility Preferences in Sri Lanka. WFS Scientific Reports, No. 9. London: World Fertility Survey.

Rodriguez, G. (1977) Assessing the Availability of Fertility Regulation Methods: Report on a Methodological Study. WFS Scientific Reports, No. 1. London: World Fertility Survey.

Rodriguez, G. (1978) Family planning availability and contraceptive practice. International Family Planning Perspectives and Digest 4:100-115.

Sadik, N. (1981) Use of family planning services. Pp. 565-595 in World Fertility Survey Conference 1980, Vol. 2. London: World Fertility Survey.

Siddiqui, M. K. (1979) The Initiation of Contraception in Taiwan. Unpublished Ph.D. dissertation. University of Michigan, Ann Arbor, Michigan.

Singh, S. (1980) Comparability of Questionnaires. WFS Comparative Studies, No. 2. London: World Fertility Survey.

Stinson, W. S., J. F. Phillips, M. Rahman, and J. Chakraborty (1982) The demographic impact of the contraceptive distribution project in Matlab, Bangladesh. Studies in Family Planning 13:141-148.

Szykman, M. (1982) The concept of demand for family planning and its measurement. Pp. 313-337 in A. I. Hermalin and B. Entwisle, eds., The Role of Surveys in the Analysis of Family Planning Programs. Liege: Ordina.

Terhune, K. W., and S. Kaufman (1973) The family size utility function. Demography 10:559-618.

Tietze, C. (1981) Induced Abortion, A World Review, 4th ed. New York: Population Council.

United Nations (1978) Methods of Measuring the Impact of Family Planning Programmes on Fertility: Problems and Issues. New York: United Nations.

United Nations (1979a) Factors Affecting the Use and Non-Use of Contraception. Population Studies No. 69,ST/ESA/SER.A/69. New York: United Nations.

United Nations (1979b) The Methodology of Measuring the Impact of Family Planning Programmes on Fertility, Manual IX. New York: United Nations.

United Nations (1980) World Population Trends and Policies 1979 Monitoring Report, Volume II, ST/ESA/SER.A/70/Add.1. New York: United Nations.

United Nations (1981a) Report on Monitoring of Population Policies. ESA/P/WP.69. New York: United Nations.

United Nations (1981b) Variations in the Incidence of Knowledge and Use of Contraception: A Comparative Analysis of World Fertility Survey Results for Twenty Developing Countries. New York: United Nations.

United Nations (1982) Evaluation of the Impact of Family Planning Programs on Fertility: Sources of Variance. New York: United Nations.

Vaessen, M. (1980) Knowledge of Contraceptive Methods. WFS Comparative Studies, No. 8. London: World Fertility Survey.

Watson, W. B., and R. J. Lapham (1975) Family planning programs: World review 1974. Studies in Family Planning 6:205-322.

Westoff, C. F. (1974) Coital frequency and contraception. Family Planning Perspectives 6:136-141.

Westoff, C. F. (1978) The unmet need for birth control in five Asian countries. International Family Planning Perspectives and Digest 4:9-18.

Westoff, C. F., and N. B. Ryder (1977) The predictive validity of reproductive intentions. Demography 1:431-453.

World Fertility Survey (1978) Sri Lanka 1975, First Report. Department of Census and Statistics, Ministry of Plan Implementation. London: World Fertility Survey.

Chapter 20

BIRTH CONTROL METHODS AND THEIR EFFECTS ON FERTILITY

John A. Ross

Among fertility determinants, none has a more direct effect on individual fertility than the use of birth control. Moreover, none has undergone a greater transformation over the past two decades: the de facto practice of birth control has increased dramatically in many developing countries, and this has itself resulted in changed traditional attitudes and new legitimated behavior.

Birth control covers contraception, including sterilization, and abortion. The prevalence of these methods is examined below, followed by a discussion of the relationship between their prevalence and patterns of acceptance and continuation. Next is an analysis of the use-effectiveness of the various methods, and a general discussion of the links between birth control and fertility. Finally, some propositions are presented relating to birth control and fertility change and to technological concerns.

PREVALENCE OF BIRTH CONTROL METHODS

Contraception

Levels

Recent summaries (Nortman, 1980; forthcoming) give data on the prevalence of contraceptive use for 31 countries (Table 1): in 23 of these countries, the level of use falls above 20 percent; among these, the level in 19 falls above 30 percent.

The eight largest developing countries, which together make up two-thirds of the developing world, show a spread in contraceptive use, with Bangladesh, Pakistan, and probably Nigeria at the low end, at 12 percent or below; Brazil perhaps next in line; India between 20 and 30 percent; and Mexico, Indonesia,[1] and probably China above 30 percent.

The smaller developing countries are very much scattered in their prevalence levels. A clear pattern can be discerned only by region: sub-Saharan Africa is far below Asia and Latin America; the Middle East and North Africa are also below, though Tunisia, Egypt, and Turkey are modest exceptions. Within Asia, Burma (besides the large

TABLE 1 Contraceptive Prevalence in Developing Countries: Percentage of MWRA Practicing Contraception, by Source of Supply, for Latest Year with Available Data

Prevalence Range, Country, and Year	Both Sectors	Public Sector	Private Sector
Below 10 Percent			
Ghana, 1978	4	4	0
Pakistan, 1980	6	u	u
Kenya, 1975	7	u	u
1979	u	7	u
10 to 19 Percent			
Bangladesh, 1977	9	u	u
1980	12	u	u
Zimbabwe, 1978	14	u	u
Paraguay, 1977	16	8	8
Guatemala, 1978	18	u	u
Egypt, 1979	17	u	u
1981	19	10	9
20 to 29 Percent			
Tunisia, 1977	20	17	3
El Salvador, 1976	22	7	15
1978	20	u	u
India, 1975	u	16	u
1979	u	23	u
1981	u	23	u
Jordan, 1976	24	u	u
30 to 49 Percent			
Peru, 1977	31	u	u
Guyana, 1975	32	u	u
Indonesia, 1976	26	u	u
1979	29	24	5
1981	u	36	u
Malaysia, 1974	33	u	u
1979	36	17	19
1981	42	26	16
Dominican Republic, 1976	24	13	11
1977	31	10	21
1978	38	13	25[a]
Fiji, 1978	38	34	4
Turkey, 1978	38	u	u

TABLE 1 (continued)

Prevalence Range, Country, and Year	Both Sectors	Public Sector	Private Sector
Thailand, 1975	27	19	8
1979	39	34	5
1981	u	52	u
Mexico, 1973	13	1	12
1978	40	19	21
1979	38	20	18
Sri Lanka, 1975	30	u	u
1977	41	u	u
Colombia, 1974	31	u	u
1978	46	u	u
Philippines, 1974	15	u	u
1979	37	16	21
1981	48	27	21
50 Percent or More			
Mauritius, 1975	56	52	4
1979	53	50	3
1981	51	39	11
Panama, 1976	54	u	u
Korea, 1975	34	27	7
1978	49	25	24
1980	55	30	25
Costa Rica, 1976	34	u	u
1978	64	26	38
1981	65	25	41
Taiwan, 1974	55	21	34
1979	66	35	31
1981	70	47	23
Singapore, 1974	60	u	u
1978	71	53	18
Hong Kong, 1975	57	29	28
1979	79	46	33

Note: MWRA is an acronym for married women of reproductive age, generally 15-44; u indicates unavailable.

[a]Private-sector figure extrapolated from 21 percent estimate for 1977.

Source: Nortman (1980, forthcoming).

countries of Bangladesh and Pakistan) is very low; within Latin America, Bolivia and Ecuador are similarly low. There are no special patterns by size of country, religion, or political type, although the Mauldin and Berelson (1978) analysis does show a regular increase in prevalence with more advanced social setting, as well as with greater program strength.

Age and Family Size

This section briefly discusses data on age produced recently for a relatively large set of countries by a common calculation procedure based chiefly on World Fertility Survey (WFS) data (Bongaarts and Kirmeyer, 1980; see their Appendix for a description of data imputation procedures and sources other than WFS). This study yields a model schedule of the proportions using contraception, with each figure representing an average of the values for that age in 26 countries (Table 2). The shape of this schedule was found to parallel the average shape in both high- and low-use countries; that is, as Nortman (1980:19) also observes on WFS data for 8 countries, the pattern by age seems insensitive to the overall level of prevalence.

Family size, on the other hand, is different: lower-parity women stand at relatively higher levels of use in countries with high overall prevalence (Nortman, 1980; Carrasco, 1980). A similar pattern would have been expected to emerge in the age data: younger couples should have higher levels of use in countries with higher overall prevalence. This pattern is in fact supported by Carrasco's (1980:18, Fig. 5) analysis of WFS data. It is possible that the age data are

TABLE 2 Model Schedules of Age-Specific Contraceptive Use Rates

Age	Proportion Using Contraception	Index
15-19	.194	60
20-24	.295	92
25-29	.375	116
30-34	.423	131
35-39	.418	130
40-44	.335	104
45-49	.211	66
Mean	.322	100

simply complicated by differences in age at marriage and birth intervals.

There is an almost universal tendency for both the average age and family size of program acceptors to decline over time (Ross, 1979). This occurs regardless of contraceptive method examined (including sterilization), program strength, program duration, chronological period examined, or geographic region. This trend cannot be explained by saturation of the upper age and parity groups due either to their higher acceptance and continuation rates, or to graduation of younger users into those groups (Ross and Potter, 1980). A likely hypothesis is that, over time, younger couples with fewer children have developed much greater interest in contraception and hence have accepted at higher rates, raising their proportion of the total.

Method and Sector

It is clear that few developed or developing countries achieve a high prevalence level without heavy reliance on the pill (Table 3). Japan is an interesting exception; the pill is also conspicuously absent in India and Sri Lanka, and minor in the Philippines, Taiwan, and Peru. After the pill, sterilization has the highest prevalence in a surprising number of countries, often outranking the IUD.

Nothing very definitive is known about differences in prevalence between the private and public sectors, although in Table 1, the private sector leads in three countries and the public sector in twelve. However, in fourteen countries the relative levels are unknown and in two are equal. The factors controlling the private-public division are thought to be quite diverse, including in particular variations among countries in methods offered by the two sectors. Moreover, the private sector might more accurately be termed the "nonprogram" sector, since it covers such dissimilar components as small shops, pharmacies, midwives, and doctors. This of course adds to the difficulties of gathering reliable data and analyzing use patterns.

General Trends

In a number of countries, a substantial rise in contraceptive prevalence can be traced over time. Although survey documentation is available only at irregular intervals, the proportion of couples using modern contraceptive methods has risen sharply from minimal levels in the early 1960s. In some countries, repeat surveys show a continuation of this trend over the past few years. In addition, China is thought to have rapidly increased its prevalence of use (though comprehensive figures are not available), a trend that the present drive toward the one-child family must be reinforcing. Thus, from a historical standpoint, a 15- to 20-year period has seen a fundamental and far-reaching transformation in much of Asia and Latin America.

TABLE 3 Percentage of MWRA Using Specified Contraceptive Method, for Countries with Available Data

Country and Year	All Methods	IUDs	Orals	Sterilization	Other
Africa					
Egypt, 1975	21	9	11	0	1
Mauritius, 1978	53	2	34	0	17
1981	51	3	30	0	18
Tunisia, 1971	12	5	3	1	3
1977	17[a]	6	5	6	1
Zimbabwe, 1979	14	0	11	0	3
Asia					
Fiji, 1974	40	4	8	16	12
1978	38	5	10	17	6
Hong Kong, 1976	72	3	25	19	25
1981	80	2	32	19	27
India, 1976[a]	17	1	--	13	3
1979	23	1	1	20	1
1981[a]	23	1	--	20	2
Indonesia, 1979	24	7	15	1	1
1981[a]	36	10	23	1	2
Jordan, 1976	24	2	11	2	9
Korea, Rep. of, 1978	49	10	7	17	15
1980	55	10	8	20	17
Malaysia, 1979	36	1	24	6	5
1981	42	1	17	5	19
Philippines, 1979	37	2	6	4	25
1981	48	4	16	3	24
Singapore, 1970	45	2	38	0	5
1978	71	3	17	22	29
Sri Lanka, 1975	33	5	2	10	16
1977	41	5	3	18	15
Taiwan, 1979	66	27	7	16	16
1981	70	25	6	20	19
Thailand, 1979	39	5	23	11	0
1981[a]	52	5	31	16	--
Turkey, 1978	38	3	6	0	29
Latin America					
Colombia, 1976	42.6	8.5	13.3	4.2	16.6
1978	46	8	17	8	13
Costa Rica, 1978	64	5	25	15	19
1981	65	6	23	19	19

TABLE 3 (continued)

Country and Year	All Methods	IUDs	Orals	Steril-ization	Other
Dominican Rep., 1975	31	3	8	12	8
1977	31	3	8	12	8
El Salvador, 1976	22	2	7	10	3
1978	34	3	9	18	4
1980	20	2	4	14	0
Guatemala, 1978	18	1	6	6	5
Jamaica, 1975	38	2	18	8	10
Mexico, 1978	40	6	17	7	10
1979	38	6	15	9	8
Panama, 1976	53.9	3.7	17.0	21.6	11.6
Paraguay, 1977	16	2	7	2	5
Peru, 1977	30.7	1.3	4.1	2.9	22.4
Developed Countries					
Belgium, 1975-76	87	3	32	6	46
France, 1972	64	1	11	0	52[b]
1978	79	9	31	5	34[b]
Hungary, 1977	73[c]	9	36	0	28[b]
Japan, 1975	61	5	2	3	51[d]
Netherlands, 1975	75	4	50	5	16
Poland, 1972	57	1	2	0	54[b]
U.S.A., 1973	70	7	25	16	22
1976	68	6	22	19	21

Note: Dash indicates unknown.

[a]Public sector only.
[b]Predominantly withdrawal.
[c]The base is married women aged 15-39.
[d]Predominantly condom users.

Source: Nortman (forthcoming).

On the other hand, it must be remembered that a number of individual countries, many of them small, located in Africa, and lacking in data, are as yet at low prevalence levels and show little upward movement; in addition, among the eight largest developing countries, Pakistan, Bangladesh, and Nigeria remain at low levels. Overall, however, 70 percent of the developing world is above 10 percent prevalence, with a large proportion well above that. Although absolute levels are significant, perhaps more so is the rapidity of

change in such major populations as China, Indonesia, and others of important size such as Mexico, Colombia, Korea, and Thailand. Equally significant is the fact that essentially all this change has occurred within a two-decade period, and much of it within one decade.

Sterilization

Sterilization has undergone a rapid increase to substantial levels in a number of countries (Ross and Huber, 1982). One study (Henry et al., 1980) of worldwide prevalence estimates about 62 million currently sterilized women; of these, 50 million are in the developing regions, with 46 million in Asia (including China). Another review (Lubell and Frischer, 1980) estimates 90 million couples sterilized for contraceptive purposes as of 1978, with China contributing 36 million, India 22 million, and the United States 12 million. Although such figures necessarily contain an element of guesswork, they may be taken as the best efforts of knowledgeable observers to combine judgment with the available data.

A surprising number of countries approach or exceed one-fifth of couples of reproductive age sterilized. Various compilations of country estimates have been made (Nortman and Hofstatter, 1980; forthcoming; Klinger, 1979; Rochat et al., 1979; Ross and Huber, 1982). Table 3 shows the share of all contraception that belongs to sterilization, while Table 4 gives age detail; both tables give estimates of the overall proportion sterilized. The two tables reflect different sources and dates. Using the later (higher) figure where the tables disagree, countries in the 15-22 percent range include Costa Rica, El Salvador, Panama (and Sao Paulo, Brazil, not shown) in Latin America, and India, Korea, Sri Lanka, Taiwan, Thailand, Fiji, Singapore, and Hong Kong in Asia. The figure for China given above of 36 million represents roughly 22 percent of married women of reproductive age (MWRA) in that country.

Table 4 also documents the greater frequency of female than male sterilization: an average of 86 percent of all cases are female in the nine Asian and Latin American countries showing information. Another review (Sardon, 1979) looks specifically at this sex division (as of 1976) and finds the same high female proportions in most countries except in India (25 percent). (Bangladesh at 29 percent and Nepal at 33 percent are also low, but few couples are sterilized in those countries.) Factors contributing to this pattern include improvements in the simplicity, effectiveness, and cost of female sterilization techniques. Of course, vasectomy is the lowest-cost and simplest technique of all; however, public access to it is often limited because of national program decisions, which may in turn reflect real or perceived cultural concerns.

Again, age and family-size patterns are only incidental to the present discussion. However, some data in Table 4 are relevant. In most countries reviewed, the proportion sterilized by age peaks in the range 35-44 and then falls at 45-49. However, for the number of living children (not shown), the proportion rises regularly with few

TABLE 4 Percentage of Currently Married Women (or Their Husbands) Contraceptively Sterilized, by Age of the Woman

Country and Year	Age of Woman: Under 24	25-34	35-44	45-49	All Ages	Wife Sterilized	Husband Sterilized
Asia and Oceania							
Bangladesh, 1975	0.4	0.7	1.9	0.3	0.7	--	--
Fiji, 1974[a]	0.6	9.4[b]	23.6[c]	21.8[d]	14.9	14.9	0.0
Indonesia, 1976	0.0	0.2	0.5	0.3	0.2	--	--
Rep. of Korea, 1974[e]	0.2	3.8	7.3	4.6	4.7[e]	1.6	3.1
Malaysia, 1974	0.3	2.9	6.2	3.1	3.5	3.1	0.4
Nepal, 1976	0.2	2.1	2.4	1.2	1.5	1.5	0.1
Pakistan, 1975[a]	0.0	0.5	1.9	2.6	0.9	--	--
Sri Lanka, 1975	1.6	10.4	12.3	5.6	8.9	8.4	0.5
Thailand, 1975	1.7	8.7	11.4	5.3	7.6	5.6	2.0
Latin America							
Colombia, 1976	0.6	4.0	6.2	2.2	3.6	3.4	0.2
Dominican Rep., 1975	2.2	14.0	15.3	7.6	9.9	9.8	0.1
Costa Rica, 1976	--	4.3[f]	16.9[c]	15.6[d]	11.7	10.9	0.8
Panama, 1976	--	6.9[f]	12.6[c]	29.2[d]	18.3	--	--
Mexico, 1976	0.7	2.4	4.9	2.8	2.6	--	--
Europe							
Belgium, 1976	0.5	2.2	4.6	--	2.7	2.3	0.4
France, 1978	0.9	2.8	7.5	--	4.4	4.3	0.1
Great Britain, 1976	3.0	14.0	22.0	7.0	14.0	7.0	7.0
Hungary, 1977	0.4	1.1	1.7[g]	--	1.0	1.0	0.0
Netherlands, 1975	0.5	4.4	8.6	5.2	4.2	2.0	2.2
Norway, 1977[a]	0.2	4.0	11.9	--	6.3	4.0	2.3
North America							
United States, 1976	3.7	16.4	23.5	--	16.1[h]	--	--

Note: Dash indicates unavailable.

[a]Includes those sterilized for medical reasons.
[b]For women aged 25-29.
[c]For women aged 30-39.
[d]For women aged 40-49.
[e]The 1980 survey indicates that the prevalence of sterilization has increased to 20 percent since 1974. See Table 3.
[f]For women aged 20-29.
[g]For women aged 35-39.
[h]Inconsistent with Table 3, but retained here to accompany the age-specific information.

Source: Klinger (1979).

exceptions, reaching especially high levels in the 5+ group, although whether this figure would decline within this open-ended category is not clear.

Abortion

Though abortion is quite prevalent, it is probably not fruitful to estimate its overall ranking relative to such methods as the pill or withdrawal. Such rankings change sharply from country to country; moreover, where abortion is illegal, it may still be important without close estimates being possible, and where it is legal, it is usually quite important but may nevertheless be underreported.

Abortion is now legal in much of the developed world and, because legalized in China and India, in much of the developing world as well, although it is prohibited in many individual countries (David, in these volumes; Tietze, 1979:7-17). In general, however, it can seldom be ignored, and in numerous countries it is important for fertility reduction. Two kinds of data are available on the prevalence of abortion. First, abortion levels and trends, limited to relatively reliable country-specific data, are compiled in Tietze (1981; forthcoming); data for countries of particular interest are reprinted here in Table 5. Second, Huber (1974:57), using relaxed reporting criteria, estimated comprehensive worldwide abortion figures for 1971. This study, prepared for the Internacional Planned Parenthood Foundation (IPPF), is based on questionnaire replies from country informants, as well as on available ancillary information. The resulting world total of 55 million abortions is a relatively high estimate; indeed, it equals something like half of all births. Klinger's (1969) estimate of 30 million is a more conservative world figure. It must be reiterated that data on abortions are notoriously difficult to obtain, and that the officially reported number of legal abortions worldwide (chiefly in developed countries) is only about four million. Comprehensive estimates are based on judgmental extrapolation from these and other, softer figures. Although the resulting picture is necessarily speculative, the official figures are obviously far from the mark; for example, they omit the USSR and China.

Based on the original IPPF study and the Tietze compilation, the general picture is as follows. The greatest prevalence of abortion appears to be in China, in Japan, and in both Eastern and Western Europe. Among other large countries, the USSR probably has high abortion prevalence and the United States has experienced a large apparent increase in abortions since the Supreme Court decision of 1973, although it is unclear to what extent this represents a substitution for previously illegal abortions. India has increased from a tiny reported base; the abortion ratio is still very low. For the other large countries--Indonesia, Bangladesh, Pakistan, Brazil, Nigeria, and Mexico--either there has been little increase, or little is known. (For a detailed discussion of country-specific abortion data, see David, in these volumes.)

ACCEPTANCE AND CONTINUATION

In general, the prevalence of use (P) of the various birth control methods is simply the product of the acceptance rate (A) and the mean continuation (C): $P = AC$. For example, if 10 percent of couples accept each year, and mean continuation is two years, then 20 percent will be using at any one time, once the program has settled down into a "steady state." Thus prevalence rises in direct proportion either to the acceptance rate or to mean continuation.

However, continuation is usually not measured as a mean, but as the life table proportion still using at one or two years. This is a distribution measure and is related to prevalence quite differently. Under the usual formula $R = ae^{-rt}$, a is the proportion not terminating immediately, e is the natural logarithm base 2.718, r is the annual termination risk, t is the number of years, and R_1 is, for example, the proportion continuing at one year. The mean duration of continuation C is simply a/r. Recalling that $P = AC$ and rearranging the formula[2], $Aa/(\ln a - \ln R_1)$. Prevalence still rises in direct proportion to the acceptance rate A, but it rises exponentially with R_1. When R_1 improves five points, from .50 to .55 (letting a = .95), mean continuation rises from 1.48 to 1.74 years, and prevalence improves by only 17 percent; however, when R_1 moves from .80 to .85, continuation rises from 5.53 years to 8.54 years, and prevalence jumps by 55 percent. These prevalence gains with improvements in life table continuation are not usually appreciated, nor is the disproportion in the gains at stake in the upper range.

The actual country improvements in prevalence noted above are due variously to increases in both acceptance and continuation and in both private and public sectors. Direct documentation for increased acceptance is provided by Nortman and Hofstatter (1980). As they have shown, annual acceptance in the stronger programs has risen to well above 10 percent of couples, and has been sustained year after year at that level. Continuation has also increased, although this is due chiefly to a better method mix rather than to improvements in the continuation of each method. Prevalence has risen more quickly for the efficient methods than for the traditional inefficient ones; this reflects in part the success of several national programs with sterilization, as well as some sterilization increases in the private sectors.

Continuation rates vary greatly by method and by country, as well as by local and personal characteristics. They rise regularly by age and number of living children. They are also higher for rural women, and for those terminating childbearing rather than spacing births. Different clinics show different continuation rates (Snowden, 1972). Finally, continuation of any particular method seems shorter where alternatives are easily available, as in urban settings and among the better educated.

A few other broad conclusions about continuation can be drawn. First, the ranking of methods by continuation is sterilization, IUD, and pill: within any one country and acceptor subgroup, the IUD is

TABLE 5 Number of Legal Abortions, Abortion Rates, and Abortion Ratios: Selected Areas, Years, and Characteristics

Area, Year, and Characteristics	Number of Abortions[a]	Abortion Rate per 1,000		Abortion Ratio per 100	
		Total Population	Women 15-44	Live Births[b]	Known Pregnancies[c]
China[d,e]					
1971	3,910,100	4.7	21.6	12.8	11.3
1972	4,813,500	5.6	25.8	19.3	16.2
1973	5,110,400	5.8	26.6	20.9	17.3
1974	4,984,600	5.6	25.1	21.2	17.5
1975	5,084,300	5.6	24.9	24.2	19.5
1976	6,570,300	7.1	31.2	36.1	26.5
1977	5,229,000	5.6	24.2	32.3	24.4
1978	5,528,000	5.5	24.8	31.8	24.1
Cuba					
1968	28,500	3.4	16.7	11.7	10.5
1969	46,100	5.5	26.6	19.2	16.1
1970	70,500	8.2	40.2	28.3	22.1
1971	84,800	9.8	47.4	33.6	25.2
1972	100,000	11.3	54.9	42.2	29.7
1973	112,100	12.4	60.3	52.3	34.3
1974	131,500	14.3	69.5	66.4	39.9
1975	126,100	13.5	65.3	66.2	39.8
1976	121,400	12.8	61.0	68.1	40.5
1977	114,800	12.0	55.9	72.4	42.0
1978	110,400	11.3	52.1	75.7	43.1
1979	106,500	10.9	48.8	76.0	43.2
1980	104,000	10.7	47.1	76.1	43.2
Hong Kong					
1973	200	0.05	0.2	0.2	0.2
1974	600	0.14	0.6	0.7	0.7
1975	1,000	0.24	1.1	1.3	1.3
1976	2,200	0.49	2.3	2.7	2.6
1977	3,800	0.84	3.9	4.8	4.6
1978	5,500	1.2	5.4	6.7	6.3
1979	7,000	1.5	6.7	8.4	7.7
1980	9,400	1.9	8.6	10.4	9.8
1981	10,600	2.1	9.5	12.0[f]	10.7

TABLE 5 (continued)

Area, Year, and Characteristics	Number of Abortions[a]	Abortion Rate per 1,000		Abortion Ratio per 100	
		Total Population	Women 15-44	Live Births[b]	Known Pregnancies[c]
India[g,h,i]					
1973	24,300	0.04	0.2	0.1	0.1
1974	44,800	0.08	0.4	0.2	0.2
1975	97,800	0.16	0.8	0.4	0.4
1976	214,200	0.35	1.7	0.9	0.9
1977	278,900	0.44	2.1	1.3	1.3
1978	247,000	0.38	1.8	1.2	1.2
1979	317,700	0.48	2.2	1.5	1.5
1980	358,000	0.53	2.5	1.7	1.7
Japan[g]					
1950-54	827,400	9.7	40.7	41.4	29.3
1955-59	1,135,800	12.5	52.2	69.5	41.0
1960-64	983,600	10.4	41.9	59.8	37.4
1965-69	780,200	7.8	30.3	43.3	30.0
1970	732,000	7.1	28.0	37.5	27.3
1971	739,700	7.1	28.2	36.4	26.7
1972	732,600	6.8	27.6	35.3	26.1
1973	700,500	6.4	26.3	34.0	25.4
1974	679,800	6.2	25.5	34.6	25.7
1975	671,000	6.0	25.2	35.3	26.1
1976	664,100	5.9	24.9	37.2	27.1
1977	641,200	5.6	24.1	35.4	26.1
1978	618,000	5.4	23.3	36.8	26.9
1979	613,700	5.3	23.1	37.8	27.4
1980	598,100	5.1	22.5	37.7[f]	27.4
Japan (adjusted)[j]					
1955	2,790,000	31.1	131.9	164.3	62.2
1960	3,150,000	33.5	138.1	197.2	66.3
1965	2,750,000	27.8	108.6	174.7	63.6
1970	2,780,000	26.6	104.9	142.5	58.8
1975	2,250,000	20.1	84.2	120.5	54.7

TABLE 5 (continued)

Area, Year, and Characteristics	Number of Abortions[a]	Abortion Rate per 1,000: Total Population	Abortion Rate per 1,000: Women 15-44	Abortion Ratio per 100: Live Births[b]	Abortion Ratio per 100: Known Pregnancies[c]
Korea, Republic of					
1961	104,000	4.1	19.5	10.5	9.5
1962	127,000	4.9	23.3	13.1	11.6
1963	152,000	5.7	27.2	16.1	13.9
1964	191,000	7.0	33.3	20.8	17.3
1965	223,000	7.9	37.9	24.8	19.9
1966	252,000	8.8	41.9	29.3	22.7
1967	264,000	9.0	42.9	29.8	23.0
1968	293,000	9.8	46.4	33.9	25.3
1969	315,000	10.3	48.8	35.8	26.3
1970	331,000	10.6	50.1	37.0	27.0
Seoul, 1969-71	93,000	--	64.1	64.3	39.1
Other Urban, 1969-71	124,300	--	70.0	59.2	37.2
Rural, 1969-71	127,100	--	37.2	23.2	18.8
Seoul, 1977-78	480,000	--	235.0	330.0	76.7
Singapore[g,k]					
1970	1,900	0.9	4.1	4.2	4.1
1971	3,400	1.6	7.2	6.9	6.5
1972	3,800	1.8	7.7	7.5	7.0
1973	5,300	2.4	10.4	11.5	10.3
1974	7,200	3.2	13.6	17.2	14.6
1975	12,900	5.7	23.5	31.9	24.2
1976	15,500	6.8	27.5	37.7	27.4
1977	16,400	7.1	28.3	42.8	30.0
1978	17,200	7.4	28.9	42.8	30.0
1979	17,000	7.2	27.7	41.8	29.5
1980	18,200	7.5	28.4	--	--
Tunisia[l]					
1966	1,400	0.3	1.5	0.6	0.6
1967	1,300	0.3	1.4	0.6	0.6

TABLE 5 (continued)

Area, Year, and Characteristics	Number of Abortions[a]	Abortion Rate per 1,000		Abortion Ratio per 100	
		Total Population	Women 15-44	Live Births[b]	Known Pregnancies[c]
1968	2,200	0.5	2.4	1.1	1.1
1969	2,900	0.6	2.9	1.5	1.5
1970	2,700	0.5	2.7	1.4	1.4
1971	3,200	0.6	3.0	1.7	1.7
1972	4,600	0.8	4.2	2.2	2.1
1973	6,500	1.2	6.0	3.4	3.3
1974	12,400	2.2	10.9	6.3	5.9
1975	16,000	2.8	13.7	7.8	7.2
1976	20,300	3.5	17.1	9.8	9.0
1977	21,200	3.6	17.2	10.3	9.4
1978	21,000	3.5	16.5	10.3[f]	9.4
1979	19,200	3.1	14.6	--	--

Note: Dash indicates unavailable. Some figures have fewer decimal places because of differences in the original data sources.

[a]All numbers rounded. Because of rounding, components may not add to totals. Data for most recent periods may be subject to revision.
[b]Six months later.
[c]Live births plus legal abortions.
[d]Chen (1982).
[e]Completeness of reporting of abortions and of births not determined.
[f]Ratio computed per 100 births in same calendar year(s), not six months later.
[g]Reporting incomplete.
[h]Abortions performed under the National Family Planning Program.
[i]Fiscal years ending 31 March.
[j]Estimates adjusted for underreporting by Muramatsu (in Tietze, 1981:13; forthcoming).
[k]Including the private sector.
[l]"Social" abortions performed under the National Family Planning Program.

Source: Tietze (1981; forthcoming), except for Korea, which is from Tietze (1979). See these sources for full references to original data sources.

superior to the pill in continuation (although the pill has better acceptance), even when stated motivation (spacing or stopping) is the same (Sivin, 1974). An overview of IUD and pill continuation rates (Table 6) documents both the broad trends across countries and the IUD advantage. The latter rests on its fewer side effects and the fewer personal or other reasons given for discontinuation; this reflects in turn the IUD's asset of automatic continuation during ambivalent motivation.

It must be stressed that, apart from sterilization, no single method of contraception has more than an average continuation of 1-3 years. However, there are two factors to consider here. Around a low mean of continuation for a particular method, there is still a substantial proportion on the high side, and appreciable numbers of acceptors of each method do find it satisfactory and use it for a long time. Second, given the availability of several methods, couples will try more than one; thus couple continuation is superior to method continuation. In combination, these two features are highly significant: each method tends to find its own market, and the more methods offered, the higher the overall proportion protected.

On the other hand, method-specific continuation must not be neglected. A program's administrative costs rise greatly for methods requiring constant resupply or reservicing. For example, when mean continuation is one year rather than four, a program must recruit four

TABLE 6 Oral Contraceptive and IUD Discontinuation Rates by Reason, for Selected Developing Countries: Median Percentages

	Oral Contraceptives		IUDs	
Reason	12 months	24 months	12 months	24 months
Pregnancy	3.5(9)	5.3(5)	2.3(20)	3.6(13)
Expulsion	--	--	8.3(19)	10.4(12)
Planned pregnancy	5.2(8)	6.6(5)	1.1(8)	2.6(6)
Medical and side effects	30.6(8)	35.9(4)	18.3(19)	19.3(8)
Personal or Other	18.7(10)	19.2(4)	2.9(12)	4.6(8)
All reasons	54.7(10)	71.3(5)	33.8(20)	43.5(13)

Note: Each figure is a median across studies with relevant data. Number of studies is given in parentheses.

Source: Abstracted by Mauldin (1978) from Kreager (1977).

times the number of acceptors each year to maintain the same prevalence level. Thus as continuation rises above the low range, there are vast administrative gains.

However, no mass program is known to have succeeded in raising its method-specific continuation rates. Although continuation appears to improve when acceptors receive early reassurance (Chan, 1971), this is not easily accomplished: the costs of arranging mass home visits for this purpose are prohibitive, and one experiment indicates that calling acceptors back to the clinic for an early check up (at one or two weeks) and reassurance can actually generate more removals (Bang, 1971). Most large programs can affect mean continuation only by shifting acceptors to the IUD and sterilization, although a counter tendency occurs as acceptors come from progressively younger age groups and smaller families.

A danger is that strong pressures for high acceptance rates can damage continuation rates. This involves a trade-off as regards couple years of protection, which rise with higher acceptance rates but fall with lower continuation rates. In the early Korean program, rapidly rising targets hurt continuation rates for the acceptor cohorts of 1966 and 1967; however, the additional acceptances were numerous enough to produce a net gain in use time. The pill may be especially sensitive to the "quality" of acceptance. In the 1973 Indonesian program, intensive recruitment campaigns were used toward the end of the fiscal year to meet targets. Follow-up surveys showed little deterioration in the IUD continuation rate for campaign acceptors, but substantial damage to the pill rate (Sullivan et al., 1974), reflecting the pill's easy start-easy stop character. Indonesia, incidentally, shows overall continuation rates that are probably the highest of any major program (Suyono, 1977; Nurhajati et al., 1977); these appear to be related to the very powerful community support mechanisms in much of Java.

Overall acceptance and prevalence both appear to rise when there are more method choices. It seems clear that with the differences among principal methods, each tends to find its own subgroup of satisfied users. If sterilization were the only method available, few younger couples would use it; if only the pill were available, many women who found it unsuitable would try the IUD if they could. Each method adds a further layer of users, at least within some overall limit set by other determinants such as the dispersion of program service points or broader social factors.

USE-EFFECTIVENESS

The use-effectiveness of a birth control method is defined as the proportionate reduction it achieves in the monthly chance of conception. As an example, the normal monthly risk of conceiving for a healthy cohabiting couple is generally given as about 20 percent; if the IUD has a use-effectiveness of .95, it will reduce this monthly risk to 1 percent.

In practice, only two items are empirically measured, and rarely

on the same couples. First, the monthly chance of conception is estimated from the delay to pregnancy experienced by newly married couples in societies where they are considered to start intercourse only after marriage; sometimes it is measured for couples just terminating contraception deliberately in order to have a desired pregnancy. Both groups are free of lactation effects, but both may contain a few who at the start of the study are unknowingly sterile. Second, the failure rate, the actual proportion of method users who become pregnant during use, is observed in a different group of women. These rates may reflect extraneous factors like coital frequency, which decreases with age. Use-effectiveness is then estimated from these two sets of data from separate samples.

Most literature on use-effectiveness concerns the United States and Britain. Vaughan et al. (1977, 1980) and Trussell and Menken (1980) discuss methodology and give recent estimates (see also Table 1 in Bongaarts, 1978). Hatcher (1982) references much of the better literature and gives both theoretical and typical failure rates, also based mainly on Western data, for an extensive list of contraceptive methods.

Some developing country data are provided in Bongaarts and Kirmeyer (1980). They drew upon Philippine data for direct use-effectiveness estimates, comparing the pregnancy rates reported by users of each method to the standard of pregnancy rates reported for comparable nonusers. Although this method corrects for many confounding variables, it is of course subject to the self-selection process that affects the particular method used, including no method. The values turn out as follows: sterilization, 1.00; IUD, 0.95; pill, 0.90; and other methods, 0.70. Overall values of use-effectiveness for 22 countries were then calculated by weighting these figures by the proportions using each method (Table 7). Rates for most countries are in the eighties, the precise level reflecting only the method mix in that country. It should be noted that the Philippine figure for the pill, 0.90, is below the 0.99 usually quoted; this reflects the behavioral component in regularity and strictness of use. The same observation applies to the "other methods" category, which includes methods that can theoretically give nearly complete protection but in actual practice do not.

The relation of use-effectiveness to fertility reduction is complex. Of two methods that are otherwise equivalent, the one with superior use-effectiveness will of course prevent more births, and there are probably disproportionate gains as use-effectiveness enters the upper range. Nevertheless, calculation of the difference is not straightforward (Bongaarts and Kirmeyer, 1980). As a guide to the development of new contraceptive technology, it can be argued (Berelson, 1976, 1978) that present methods (including sterilization, the IUD, the pill, and the injectable) already have such high use-effectiveness that further gains will be small. On the other hand, the final contribution of any new method will depend heavily upon its use-effectiveness, which besides contributing to its fertility effect also determines the need for abortion backup.

TABLE 7 Estimates of Use-Effectiveness of Contraception for 22 Developing Countries

Country	Year	Use-Effectiveness	Country	Year	Use-Effectiveness
Bangladesh	1975	.82	Malaysia	1974	.85
Colombia	1976	.84	Mexico	1976	.86
Costa Rica	1976	.86	Nepal	1976	.94
Dominican Republic	1975	.89	Pakistan	1975	.83
Guatemala[a]	1972	.87	Panama	1976	.90
Hong Kong	1978	.86	Peru	1977	.78
Indonesia	1976	.87	Philippines	1976	.78
Jamaica	1976	.84	Sri Lanka	1975	.84
Jordan	1976	.84	Syria	1973	.87
Kenya	1976	.75	Thailand	1975	.91
Lebanon[a]	1976	.83	Turkey	1968	.80

[a]Refers to subnational unit.

Source: Bongaarts and Kirmeyer (1980).

LINKS TO FERTILITY

Clearly, many forces and conditions affect fertility levels and trends. Moreover, proximate causes are in turn always affected by other, secondary causes. Thus although contraception, abortion, lactation, and marriage age are the primary fertility determinants (Bongaarts, 1978),[3] the forces controlling each of these must in turn be examined. As these secondary forces recede from the proximate determinants, they approach the more remote social and economic matrix, and analysts differ considerably as to which part of these claims they prefer to examine. Logically, it is possible to cut through the resultant methodological difficulties by examining the potential effect on fertility of removing a particular set of factors. Thus one might ask what would have happened to fertility in the developing world without modern birth control methods and without the implementing programs that they made possible. To restate the question, what would the course of fertility have been with the cumbersome contraceptive technology of 1960, and without the distribution systems, both public and private, that modern contraception inspired (such as rural distribution of the pill by nonmedical personnel)? Although such hypothetical questions cannot be finally answered, reasonable conclusions must be drawn as a basis for ongoing administrative decisions and the allocation of large resources. The principal conclusions about linkages between fertility

control methods and fertility rates are traced below.

Since the early 1960s, a large body of literature has been concerned with the fertility effects of contraception, sterilization, and abortion. Some of this literature is at the individual level, focusing on how birth control interferes with the reproductive process and modifies the normal probabilities of childbearing. Some of the literature assesses the actual reduction of fertility among acceptors in a family planning program. Finally, some assesses program effect upon fertility of the general population; however, because investigators' aims and methods vary widely, no single typology is altogether satisfactory. (The problem of disentangling program from nonprogram effects is treated by Mauldin, in these volumes.)

This section focuses primarily upon the general effects of contraceptive prevalence on fertility reduction. General reviews of this literature, including summaries of results, are found in Ross et al. (1972), Forrest and Ross (1978), Ross and Forrest (1978), and United Nations (1978, 1979, 1982). The U.N. references reflect collaborative work over a period of several years between the U.N. Population Division and the IUSSP Committee for the Analysis of Family Planning Programs (and its predecessor Committee on Demographic Aspects of Family Planning Programs); the last source contains major country case studies, each of which applies several methods of analysis. Table 8 presents the chief methods that are possible and describes their principal characteristics. Also, Ross (1975) describes the approaches used in estimating the future fertility effects of programs in a number of actual national plans.

Much, although by no means all, of this literature rests on (a) counts of acceptors and (b) their continuation rates, projected to give (c) the number using contraception at various points in the future (according to calendar year, by time elapsed since acceptance, or simply by the mean period of use per acceptor). Corrections are entered to the projected use time to allow for periods not at risk of conception, and potential fertility rates are applied. However, dissatisfaction with this methodology has grown because of measurement problems and conceptual difficulties with acceptors, continuation, potential fertility, and other quantities. Moreover, with time, certain imponderable factors emerge in national programs that offer several contraceptive methods, often in competition with the private sector. Many acceptors circulate in and out of the user group, switch methods, and experience intervening pregnancies and births, all of which undercuts assumptions in the methodology described.

As a result, an alternative approach has received increasing attention. This approach works directly from prevalence levels, without asking what acceptance schedules and continuation rates stand behind those levels. This approach has gained impetus from the growth of surveys, notably the increasing cross-national standardization of data from the World Fertility Survey series and the series of contraceptive prevalence surveys of the Centers for Disease Control and the Westinghouse organization. Of course, these survey estimates of prevalence have their own methodological problems.

Summarized here is that part of the prevalence-based literature

which has carried the analytic approach farthest. First, Berelson (1974) discovered a very close correlation between contraceptive prevalence and crude birth rates (CBR) over a number of countries. With the most recent international data (32 countries; see Nortman and Hofstatter, 1980), the relationship can be represented as CBR = 46.9 - 42U, where U is the proportion of married women of reproductive age using contraception. Thus if there are no users, the CBR averages 46.9; if half are using, it falls to 25.9, a 45 percent decline. There is remarkably small scatter about the least squares line, reflected in the R^2 value of 0.91.

Recognizing that the CBR responds not just to contraceptive use but also to other factors, Bongaarts and Kirmeyer (1980) developed refined correlations to eliminate the confounding effects of the age distribution, the proportions married, and the duration of lactation. Abortion was assumed absent since the 22 developing countries studied were believed to have only minimal abortion rates. For these countries, the relation of the total fertility rate (TFR), which frees the picture of age-structure effects, is TFR = 7.30 - 6.42U. Thus, with no users, the rate is 7.30 (natural fertility); if half use, the TFR is 4.09, a reduction of 44 percent (R^2 of 0.72).

A comparable equation was developed for the total marital fertility rate (TMFR)[4], with other refinements introduced to remove the effect of lactation. The result is an "adjusted total marital fertility rate": TMFRA = 15.25 - 13.71U. This calculation estimates that natural fertility would be 15.25 with marriage at age 15, no lactation, and no abortion. As before, the result is that if half are using contraception, the rate will fall by 45 percent. These calculations are repeated for each age group separately.

Although the CBR and TFR equations can be used to estimate a country's fertility level directly, a more precise approach is given for estimating not fertility levels, but rather the proportionate decline in a fertility rate of interest as prevalence rises. Three cases are treated. First, if only prevalence changes (not marriage pattern or lactation), the fertility decline remains proportionate to the rise in prevalence, discounted for imperfect use-effectiveness. The new fertility rate will then equal the old rate multiplied by the ratio $(1 - .899\ U_2)/(1 - .899\ U_1)$, where U_1 is the initial proportion of users and U_2 the later proportion. Separate equations are given for the various age groups. Second, if both prevalence and use-effectiveness change, but nothing else does, the ratio of the two fertility rates (at time 1 and time 2) is now as follows:

$$\frac{1 - e_2U_2/0.927}{1 - e_1U_1/0.927}$$

Third, more complex procedures are used in the case where lactation and marriage patterns also change, although the first case above can often be used because the effects of these changes tend to cancel one another out over the countries examined. Again, all of these procedures are treated on an age-specific basis. This work breaks new

TABLE 8 Methods for Studying the Effect of Family Planning Programs on Birth Rates

Method Characteristics	Decomposition of Crude Birth Rate Change	Correspondence Between Program Activity and Fertility Change	Matching Studies	Experimental and Control Areas	Multiple Regression Across Areal Units	National Effects of Births Averted among Acceptors	Simulation
Subjects	Total population or subgroup.	Total population or subgroup.	Total population (matched areas) or acceptors (matched individuals).	Total population or subgroup.	Total population or subgroup.	Total population, subgroup, or acceptors.	Total population or acceptors.
Use of controls	No	No	Post hoc matching may approximate controls.	Yes	Only statistical controls.	No	Not applicable
Separate estimates for roles of other factors	Yes: age distribution, nuptiality, program vs. private contraceptive source.	No	No	No	Yes: both demographic and socioeconomic factors.	No	Yes: demographic factors.
Data requirements	Age distribution of women of childbearing age; percent married by age; marital age-specific fertility rates; contraceptive use by supply source.	Fertility and program data for time periods, geographical areas, or population subgroups.	Measures for matching variables; fertility measures.	Measures to establish initial similarity; fertility and program measures.	Extensive: program strength; fertility measures; other demographic and socioeconomic measures by area.	Fertility or pregnancy measures for acceptor and comparison experience; methods accepted; reproductive process measures.	Extensive

Complexity of design	Simple	Simple	Intermediate	Simple	Complex	Complex	Complex
Advantages	Simple calculations. Good first step. Isolates effect of marital fertility change.	Few statistical assumptions.	Uses independent comparison group. Controls many confounding variables.	Independent comparison group. Areal basis. Controls many confounding variables.	Can separate program effect from socioeconomic factors. Covers both direct and indirect effects.	Subjects available through program. Links acceptance and continuation to fertility. Estimates program effect on whole country.	Useful exploratory tool. Full population component framework.
Limitations	No direct link between program activity and fertility change. Data by age groups often unavailable. Program-private division may not reflect true relative contributions.	Hard to rule out competing explanations.	Unavailability of data for matching. Contamination dangers. Hard to control for motivation, leadership. Lack of nonprogram match areas in national programs.	Contamination dangers. Small numbers of areas. Equivalence of areas hard to achieve. Political and practical problems in execution.	Poor data availability. Complexity of data manipulation and interpretation. Unclear temporal implications of cross-sectional data. Small numbers of units.	Often omits indirect program effects. Uncertainty in estimation of "expected" acceptor fertility.	Extensive data needs and data manipulation requirements. Numerous assumptions for unavailable data.

Source: Forrest and Ross (1978). Illustrative applications and references for each method are given in the source.

ground, and is both empirically based and analytically imaginative. Although the question of the potential fertility of users is treated only implicitly, that is perhaps an acceptable trade-off for the special advantages provided by these methods.

An especially noteworthy study (Mauldin and Berelson, 1978) focuses specifically on program effect. Its methodology is rich, and it is the most recent and comprehensive in country coverage. Data for 94 developing countries are subjected to not one but several multivariate techniques, giving results that closely parallel the trends visible in simple cross-tabulations. Countries with stronger social settings (i.e., that are more developed) have experienced sharper fertility declines than countries with weaker social settings; those with stronger family planning programs have experienced sharper declines than those with weaker or no programs; and those fortunate enough to have been strong on both have experienced by far the sharpest declines (Mauldin, in these volumes, Table 4). Direct fertility reduction over the short term is more easily achieved by manipulating the program variables than the social setting, which tends to be rather intractable to the direct influence of population specialists within a country.

PROPOSITIONS

The propositions below are grouped in two general areas: the influence of birth control methods on fertility levels, and potential effects of technological developments on future fertility reduction.

Influence of Birth Control on Fertility

1. Existing birth control methods do not achieve full potential in fertility reduction. No current method has both high acceptability and long continuation; moreover, younger couples, having the highest potential fertility, tend to choose methods with shorter continuation, while older couples, with lower potential fertility, tend to chose methods with longer continuation, such as the IUD or sterilization. Because no current method offers both high acceptability and long continuation to all couples, existing motivation to control fertility is not fully translated into action.

2. In spite of these limitations, a good deal of evidence has accumulated on the response of fertility levels to the use of birth control. Empirically and theoretically, the relationship between increased prevalence of use and decreased fertility has been established. This relationship is independent of the influence of age structure, abortion, lactation, and marriage pattern, and holds over a range of developing countries.

3. A distinction is properly made between method and program effects: a program can try to change motivation as well as offer implementing methods. On the other hand, in practice, the working propositions behind much of the research have concerned the combined

effects of both. Moreover, the breakthroughs in methods generated those in programs; both occurred in the early to mid-1960s, when the IUD appeared and the cost of the pill fell enough to permit mass distribution. In fact, method and program effects cannot be separated: the methods do not work in a vacuum, and the programs could not exist without the methods. Some propositions related to these effects are given below, based in part on Ross et al. (1972).

3.1. Multiple regression analyses and other multivariate techniques indicate that areas with stronger program activity or higher acceptance rates tend to have larger decreases in fertility. These results appear across small areas, such as in Taiwan, and across larger units such as Indian states and entire countries.

3.2. Comparisons between program and nonprogram areas of roughly equivalent character have shown larger fertility declines in the program areas. The two kinds of areas are not strictly matched, so that the role of uncontrolled influences must be considered; nevertheless, the results suggest program effects. Similar effects are indicated by formal matching of areas as units, as well as by other studies in which correspondence is found between the timing of program activity and unusual fertility declines. Further program effects have been found in designs using experimental and control areas.

3.3. At the individual level, fertility declines among program acceptors have been greater than among nonacceptors matched for other characteristics; acceptors also experience lower fertility after acceptance than before, and persist in these lower levels. It should be noted that in some programs, acceptors who terminate the initial method or become pregnant while using it resort to supplementary contraception or abortion to keep their postacceptance fertility low. Some of this contraception is program-provided, and some is not. This supplementary birth control is not included in a number of studies which calculate that a first segment of IUD or pill use averts less than one birth, and that sterilization generally averts more than two.

4. In national data, the high proportions of couples using contraception, together with the large role of marital fertility declines in changing crude birth rates, suggest that contraceptive use (often largely program-provided) has been an important cause of fertility decline in a number of countries. Moreover, age patterns correspond: age groups with higher acceptance and prevalence rates have shown greater fertility declines.

Potential Effects of Technological Developments on Fertility

The revolution in contraceptive technology over the past 20 years has fundamentally changed the field. Among the older methods, the condom and vasectomy remain important; however, even they have been generally eclipsed by the pill, the IUD, simplified female sterilization, and simplified early abortion. The injectable method is also important in selected locations and in parts of the private sector. In addition to the new technology, a vast body of research in reproductive physiology

and contraceptive development has appeared since 1960. Thus permanent gains have been made, and while attention is often fixed upon the unfortunate shortcomings of the available methods, in a historical perspective it is their revolutionary strengths that stand out. The propositions below address some of the most important aspects of technological developments in birth control methods, present and future.

5. The pill is clearly in first place in acceptability, and sterilization in continuation; the IUD is intermediate in both categories. All three are high in use-effectiveness. Abortion is important both as a backup for contraceptive failure and as a primary birth control method. The condom and other traditional methods are sometimes used as the preferred choice, but more often as a fall-back in lieu of something more suitable. It is worth noting that, in countries where all major methods are readily available, each attracts a substantial group of users. This probably reflects the fact that no perfect method exists, and that, despite the new technology, different people in different circumstances must continue to search for a least unsatisfactory method.

6. As regards future advances, the focus should be on the demographic, not just the biomedical, aspects of contraceptive technology. The propositions below, condensed from two treatments by Berelson (1976, 1978), address some guidelines for such a focus.

6.1. It has been demonstrated by several family planning programs that the introduction of a new contraceptive method does not merely substitute for current methods, but adds a new layer of users. Thus improved technology can have a significant impact by attracting those to whom available choices are somehow unacceptable.

6.2. Several innovations in contraception are being explored; these include implants, vaccines, once-a-month pills, biochemical sperm suppression, and preidentification of ovulation, as well as improvements in current methods. However, such innovations take quite some time before being ready for mass use: usually 5-10 years for methods like those now being clinically investigated, approximately double that for those in the laboratory development stage, and still longer for those undergoing basic research.

6.3. Once developed, some innovations will not work; those that do can still be expected to present certain problems, just as current methods do. These problems may be not only medical, but also religious, cultural, and political.

6.4. Contraceptive technology can have demographic impact in three basic areas: effectiveness, or fewer failures in use; acceptability, or more initial users; and continuation, or longer duration of use. Of these, the latter two are especially significant, particularly in light of the high effectiveness already attained by current methods. As an example, an increase in continuation of 10 percent could have an impact equal to doubling the low acceptance rates in several developing countries with large populations.

6.5. Two current methods--sterilization and abortion--have recently undergone significant improvement. Fuller use of these improved methods in current family planning programs could have

greater demographic impact than most new or improved methods now being developed.

6.6. Given current technology and program efforts, many developing countries are likely to reach a crude birth rate of 20 by the year 2000. However, many others lack the technology, programs, and social conditions to make this possible. In such countries as Bangladesh, Pakistan, Nigeria, and other large Moslem and Black African nations, improved technology, if properly adapted to cultural conditions, might make a critical contribution.

NOTES

1. Indonesia is at 36 percent as of early 1981 as estimated from program service statistics.
2. The general formula is $C = a/r = at/(\ln a - \ln R_t)$. This simplifies to $C = a/(\ln a - \ln R_1)$ when t is one year. If a can be assumed to be 1.0, then $C = 1/r = t/(-\ln R_t)$.
3. It may be noted in passing that in the more developed countries, fertility within marriage is largely controlled by contraception and abortion, not by breastfeeding. In general, age at marriage is somewhat earlier in the developing countries.
4. This is the sum of the age-specific marital fertility rates from age 15 to 49, and in concept is realized only for women married during that entire period. The rate at 15-19 is difficult to measure accurately; therefore the value for each country was set at .75 times the 20-24 rate.

BIBLIOGRAPHY

Altman, D. L., and P. T. Piotrow (1980) Social marketing: Does it work? Population Reports, Series J, No. 21.

Baer, E. C., and B. Winikoff, eds. (1981) Breastfeeding: Program, policy, and research issues. Studies in Family Planning 12:123-206.

Bang, S. (1971) Korea: The relationship between IUD retention and check-up visits. Studies in Family Planning 2:110-112.

Berelson, B. (1974) World Population: Status Report 1974. Reports on Population/Family Planning 15.

Berelson, B. (1976) The Impact of New Technology. In The Royal Society, Contraceptives of the Future. A Royal Society Discussion organized by R. V. Short and D. T. Baird. (Also appears in Proceedings Royal Society of London, Series B 195:25-35.

Berelson, B. (1978) Demographic Requirements of Fertility Control Technology: 15 Propositions. A PIACT Paper. Program for the Introduction and Adaptation of Contraceptive Technology, Seattle, Washington.

Berelson, B., W. P. Mauldin, and S. J. Segal (1980) Population: Current status and policy options. Social Science and Medicine 14C:71-97.

Bongaarts, J. (1978) A framework for analyzing the proximate determinants of fertility. Population and Development Review 4:105-132.

Bongaarts, J., and S. Kirmeyer (1980) Estimating the Impact of Contraceptive Prevalence on Fertility: Aggregate and Age-Specific Versions of a Model. Center for Policy Studies Working Paper No. 63. New York: Population Council.

Buchanan, R. (1975) Breastfeeding: Aid to infant health and fertility control. Population Reports, Series J., No. 4.

Campbell, A., and B. Berelson (1971) Contraceptive specifications: Report on a workshop. Studies in Family Planning 2:14-19.

Carrasco, E. (1980) Contraceptive Practice. WFS Comparative Studies, Cross National Summaries No. 9. London: World Fertility Survey.

Chan, K. C. (1971) Hong Kong: Report of the IUD reassurance project. Studies in Family Planning 2:225-233.

Chen, P. C. (1982) Evolution of China's birth planning policy. Pp. 205-219 in World Population and Fertility Planning Technologies. Washington, D.C.: Office of Technology Assessment.

Coleman, S. J. (1978) Induced Abortion and Contraceptive Method Choice among Urban Japanese Marrieds. Unpublished PhD dissertation. Columbia University, New York.

Conservation Foundation (1953) The Physiological Approach to Fertility Control: Report of the Conservation Foundation Working Group on Fertility Control. New York: Conservation Foundation.

Foreit, J. R., M. E. Gorosh, D. G. Gillespie, and C. G. Merritt (1978) Community-based and commercial contraceptive distribution: An inventory and appraisal. Population Reports, Series J, No. 19.

Forrest, J. D., and J. A. Ross (1978) Fertility effects of family planning programs: A methodological review. Social Biology 25:145-163.

Freedman, R., and B. Berelson (1976) The record of family planning programs. Studies in Family Planning 7:1-40.

Greep, R. O., M. A. Koblinsky, and F. S. Jaffe (1976) Reproduction and Human Welfare: A Challenge to Research. Cambridge, Mass.: MIT Press.

Hatcher, R. A., G. Stewart, F. Stewart, F. Guest, N. Josephs, and J. Dale (1982) Contraceptive Technology 1982-1983, 11th ed. New York: Irvington Publishers.

Henry, A., W. Rinehart, and P. Piotrow (1980) Reversing female sterilization. Population Reports, Series C, No. 8.

Huber, S. C. (1974) World survey of family planning services and practice. In Survey of World Needs in Population. London: International Planned Parenthood Federation.

Klinger, A. (1969) Demographic aspects of abortion. Pp. 1153-1164 in International Population Conference, London. London: International Union for the Scientific Study of Population.

Klinger, A. (1979) International comparative data on sterilization, infertility, sterility. Summarized in S. E. Khoo, The Prevalence and Demographic Analysis of Sterilization. IUSSP Papers No. 17. Liege: International Union for the Scientific Study of Population.

Kreager, P. (1977) Family Planning Drop-outs Reconsidered: A Critical Review of Research and Research Findings. Research for Action No. 3. London: International Planned Parenthood Federation.

Lubell, I., and R. Frischer (1980) The international status of voluntary surgical contraception and its implications for national health programs. In M. E. Schima and I. Lubell, eds., Voluntary Sterilization: A Decade of Achievement. New York: Association for Voluntary Sterilization.

Mauldin, W. P. (1978) Experience with Contraceptive Methods in Less Developed Countries. Paper presented at the National Academy of Sciences' Symposium on Contraceptive Technology, Washington, D.C. (Also a Working Paper of the Population Council, Center for Policy Studies, New York.)

Mauldin, W. P., and B. Berelson (1978) Conditions of fertility decline in developing countries, 1965-75. Studies in Family Planning 9:89-147.

Nortman, D. (1980) Empirical Patterns of Contraceptive Use: A Review of the Nature and Sources of Data and Recent Findings. Paper prepared for an IUSSP Seminar on The Use of Surveys for the Analysis of Family Planning Programmes, Bogota.

Nortman, D., and E. Hofstatter (1980) Population and Family Planning Programs: A Compendium of Data through 1978, 10th ed. New York: Population Council.

Nurhajati, J. Teachman, and J. Parsons (1977) Sources of Bias in the Indonesian Quarterly Acceptor Survey and Their Adjustment. Monograph No. 18. Jakarta: National Family Planning Coordinating Board.

Polgar, S.. and J. F. Marshall (1976) The search for culturally acceptable fertility regulating methods. In Culture, Natality, and Family Planning. Monograph 21. Chapel Hill, N.C.: Carolina Population Center, University of North Carolina.

Rochat, R., L. Morris, and J. E. Anderson (1979) Using contraceptive prevalence surveys to study the demographic impact of contraceptive sterilization in Latin America. Summarized in S. E. Khoo, The Prevalence and Demographic Analysis of Sterilization. IUSSP Papers No. 17. Liege: International Union for the Scientific Study of Population.

Ross, J. A. (1975) Acceptor targets. Pp. 55-91 in C. Chandrasekaran and A. I. Hermalin, eds., Measuring the Effect of Family Planning Programs on Fertility. Dolhain, Belgium: Ordina Editions.

Ross, J. A. (1979) Declines in the age and family size of family planning programme acceptors: International trends. Studies in Family Planning 10:290-299.

Ross, J. A., and J. D. Forrest (1978) The demographic assessment of family planning programs: A bibliographic essay. Population Index 44:8-27.

Ross, J. A., and D. Huber (1982) Vasectomy: Acceptance and Prevalance in Developing Countries. Paper prepared for the conference on Vasectomy, cosponsored by the Ministry of Plan Implementation and the World Federation of Health Agencies for the Advancement of Voluntary Surgical Contraception, Colombo, Sri Lanka.

Ross, J. A., and R. Potter (1980) Changes in acceptors' and users' ages: A test of an explanatory mechanism. Population Studies 34:367-380.

Ross, J. A., A. Germain, J. Forrest, and J. Van Ginneken (1972) Findings from family planning research. Reports on Population/Family Planning No. 12.

Sardon, J. P. (1979) World patterns of sterilization. Summarized in S. E. Khoo, The Prevalence and Demographic Analysis of Sterilization. IUSSP Papers No. 17. Liege: International Union for the Scientific Study of Population.

Sivin, I. (1974) Contraception and Fertility Change in the International Postpartum Program. New York: Population Council.

Snowden, R. (1972) Social and personal factors involved in the use-effectiveness of the IUD. Pp. 74-81 in A. Goldsmith and R. Snowden, eds., Family Planning Research Conference: A Multidisciplinary Approach. Amsterdam: Excerpta Medica.

Sullivan, J., W. Bahrawi, H. Suyono, and A. Hartoadi (1974) Contraceptive Use-Effectiveness in Mojokerto Regency, East Java. Monograph No. 9. Jakarta: National Family Planning Coordinating Board.

Suyono, H. (1977) Some Preliminary Calculations on Contraceptive Use Rates in Indonesia. Monograph No. 17. Jakarta: National Family Planning Coordinating Board.

Tietze, C. (1979) Induced Abortion: 1979, 3rd ed. A Population Council Fact Book. New York: Population Council.

Tietze, C. (1981) Induced Abortion: A World Review, 1981, 4th ed. A Population Council Fact Book. New York: Population Council.

Trussell, J., and J. Menken (1980) Life Table Analysis of Contraceptive Use-Effectiveness. Paper prepared for an IUSSP Seminar on The Use of Surveys for the Analysis of Family Planning Programmes, Bogota.

United Nations (1978) Methods of Measuring the Impact of Family Planning Programmes on Fertility: Problems and Issues. Population Division, Population Studies No. 61, ST/ESA/SER.A/61. New York: United Nations.

United Nations (1979) The Methodology of Measuring the Impact of Family Planning Programmes on Fertility, Manual IX. Population Division, Population Studies No. 66, ST/ESA/SER.A/66. New York: United Nations.

United Nations (1982) Sources of Variance in Family Planning Evaluation Methodology. U.N. Publication ST/ESA/SER.A/76. Forthcoming.

Vaughan, B., J. Trussell, J. Menken, and E. Jones (1977) Contraceptive failure among married women in the United States, 1970-1973. Family Planning Perspectives 9:251-258.

Vaughan, B., J. Trussell, J. Menken, E. Jones, and W. Grady (1980) Contraceptive efficacy among married women aged 15-44 years. Vital and Health Statistics, Series 23, No. 5.

Chapter 21

MONETARY AND HEALTH COSTS OF CONTRACEPTION

S. Bruce Schearer

INTRODUCTION

This paper reviews current knowledge about the costs of contraceptive use.[1] These fall into two broad categories: monetary and health costs. For purposes of this review, contraceptive methods are classified according to 14 basic categories, as shown in Figure 1. Included within these categories are nearly 100 contraceptive drugs and devices marketed under more than 600 brand names (Kestelman and Kleinman, 1976).[2] The discussion below focuses first on monetary and then on health costs, surveying the available data, examining the relationship between these costs and contraceptive use, and suggesting areas for further research.

MONETARY COSTS OF CONTRACEPTION

The relationship between monetary costs and contraceptive use is difficult to define empirically because of the complexities involved. First, there are basically four components of these costs: costs of production (generally including development costs), of related services required for use, of distribution of products and services, and of gaining access. Second, it is often difficult to distinguish who pays these costs, and thus to determine how they vary among different settings and socioeconomic groups. The subsections below review the nature of the various costs, who pays them, and how they affect contraceptive use.[3]

Nature of Monetary Costs

Most contraceptive methods require the use of some consumable product; among the techniques listed in Figure 1, only withdrawal, unsystematized abstinence, and prolonged breastfeeding do not. Production costs will depend on a number of components: materials used, the actual production process and related overhead, added charges to provide a profit, added charges to compensate those having rights to the technology involved, and charges added to recover

FIGURE 1 Principal Categories of Contraceptive Methods

Behavioral Methods

Withdrawal and related techniques
Abstinence (unsytematized; calendar rhythm; temperature rhythm; cervical mucus methods; symptothermal rhythm)
Prolonged breastfeeding
Postcoital douching

Drugs and Devices

Oral contraceptives (standard dosage; low-dose regimens)
Progestin-only minipill oral contraceptives
Injectable contraceptives (monthly; 2-monthly; 3-monthly; implants)
Postcoital pills
Intrauterine devices (inert; drug-releasing)
Vaginal spermicides (foams; creams; jellies; tablets; suppositories)
Vaginal barrier devices (diaphragms; cervical caps)
Condoms

Sterilization

Vasectomy
Female sterilization (laparotomy; minilaparotomy; laparoscopy; culdoscopy)

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research and development costs. Those components will vary considerably depending on the particular product; in general, however, the latter three components are frequently greater than costs of materials and production.

Many birth control methods require related services, such as formal instruction required for use of one of the systematized versions of abstinence or of the vaginal diaphragm. Many methods require medical services, such as insertion of an IUD, screening of a potential oral contraceptive user, or surgery to perform a sterilization. The costs of these services vary widely depending on the particular techniques employed, the nature of the provider, and the type of health or other service delivery system involved.

Costs of providing related services are often closely associated with those of maintaining sources of supply, or distribution costs. These costs generally include promotional, informational, or marketing activities; maintenance of facilities and staff; personnel training; and costs of mananging and planning the program, including program research and evaluation. In general, there are two sources of supply: the private and the public sectors. The former includes profit-making individuals, institutions, and organizations; the latter includes those engaged in not-for-profit activities, both governmental

and voluntary agencies. When the source of supply is private, distribution costs are added to production and service costs and charged to the user. In fact, these can comprise the better part of the user's total cost (Sollins and Belsky, 1970; Westinghouse Population Center, 1974; Black 1973; Farley and Tokarski, 1975). When the source of supply is public-sector health and family planning programs, these costs at most comprise a nominal cost to the user (Nortman and Hofstatter, 1980).

Finally, the costs of gaining access to sources of supply include travel to these sources and opportunity costs such as loss of income. Such costs to users vary inversely with the availability of products and services. When availability is limited, the relationship is negative: the more limited the supply of products and services, the higher the cost of locating, reaching, and waiting to receive services from a source; when availability is high, the cost of access decreases until it reaches constant minimum.

Magnitude of Costs in the Private and Public Sectors

The monetary costs of contraceptive use will be borne differently depending on the source of the products and services. When the source is private, most costs are paid by the user. When the source is public, on the other hand, the majority of these costs are paid through funds obtained from government revenues, foreign aid, and private philanthropic contributions.[4] These two categories of cost-bearing are discussed below.

Private-Sector Costs

Costs to users for contraceptive products and services provided through private-sector channels in twenty developing countries in 1980 are shown in Table 1 and Appendix Tables 1 and 2. Although there is some substantial variation, generally these costs are remarkably similar in most developing countries. Ignoring extreme cases, yearly costs are also comparable for different methods, ranging from $23.00 to $34.00 for the four most popular methods (the pill, the IUD, the condom, and female sterilization). These prices can be substantial compared to local per capita income levels in some countries. As indicated in Table 2, the cost of a year's supply (or its equivalent) varies from a low of 0.3 percent of average annual per capita income for oral contraceptives in Mexico to a high of 28.1 percent for spermicides in Zaire, but averages in most developing countries from 1 to 5 percent of annual per capita income.

From the data in Table 1 and Appendix Table 1, it is possible to estimate the cost of providing a population with contraceptive products and services exclusively through private channels. A typical proportional use of different methods is assumed. For example, if the method mix were assumed to be 50 percent pill, 10 percent IUD, 10 percent condom, 5 percent spermicide, 5 percent injection, 8 percent

TABLE 1 Yearly Cost of Contraception Obtained Through Private-Sector Channels (1980 U.S. dollars)

Country	Oral Contraceptives[a]	IUDs[b]	Condoms[c]	Spermicides[d]	Injectables[e]	Female Sterilization[f]	Vasectomy[f]
Bangladesh	16.64	--	--	--	--	6.59	2.03
Brazil	8.19	49.00	27.60	14.40	20.64	151.61	68.75
Colombia	10.40	18.45	27.60	--	8.64	24.11	17.68
Dominican Rep.	33.15	26.10	34.80	27.60	27.48	28.57	35.71
Egypt	5.98	20.16	22.80	8.40	--	20.71	25.93
El Salvador	46.80	18.60	--	--	62.40	33.14	20.00
Guatemala	29.25	14.00	39.60	16.80	16.92	25.00	14.29
Indonesia	17.94	12.64	14.40	--	14.04	17.14	3.47
Jamaica	22.62	15.00	--	26.40	48.00	26.86	24.86
Jordan	15.99	39.12	40.80	31.20	34.32	57.74	43.00
Kenya	46.02	18.45	42.00	39.60	45.48	--	--
Korea, South	13.26	18.56	12.60	16.80	--	10.13	10.13
Madagascar	26.39	--	57.60	27.60	33.72	--	--
Mexico	5.33	--	19.20	13.20	--	--	--
Morocco	32.50	25.16	20.40	--	--	--	--
Nigeria	90.74	29.68	97.20	57.60	151.32	--	--
Panama	25.74	14.00	30.00	57.60	72.00	42.86	25.00
Philippines	15.60	9.79	22.20	30.00	18.72	--	--
Thailand	16.25	--	--	8.40	--	22.14	12.86
Zaire	46.15	35.50	32.40	13.20	35.52	12.68	--
Average, all countries	26.19	22.76	33.82	29.86	42.09	34.23	23.36

[a]Cost of supplies only; any prescription fees or medical examination costs not included.
[b]Includes cost of device, insertion, and (except for Nigeria), one follow-up visit and assumes an average use of 2.5 years.
[c]Cost of supplies only; assumes use of 120 pieces per year.
[d]Cost of supplies only; diaphragm not included; assumes use of 120 applications per year.
[e]Cost of supplies only; includes both monthly and 3-monthly regimens; any prescription fees, medical examination costs or fees for injection not included.
[f]Includes all costs; assumes an average use of 7.0 years.

Source: This table is based on a study described in Note 3. Costs in this table are 12-month costs based on the price data in Appendix Table 1.

TABLE 2 Percentage of Income Required to Obtain One-Year's Supply of Contraceptives from Private-Sector Channels

Country	Average Annual Per Capita Income, 1979 (U.S. dollars)	Oral Contra-ceptives	IUDs	Condoms	Spermi-cides	Injec-tables	Female Sterili-zation	Vasec-tomy
Bangladesh	100	16.6	--	--	--	--	6.5	2.0
Brazil	1,690	4.8	2.8	1.6	0.8	1.2	8.9	4.0
Colombia	1,010	1.0	1.8	2.7	--	0.8	2.3	1.7
Dominican Rep.	990	3.3	2.6	3.5	2.7	2.7	2.8	3.6
Egypt	460	1.3	4.3	4.9	1.8	--	4.5	5.6
El Salvador	670	6.9	2.7	--	--	9.3	4.9	2.9
Guatemala	1,020	2.8	1.3	3.8	1.6	1.6	2.4	1.4
Indonesia	380	4.7	3.3	3.7	--	3.6	4.5	0.9
Jamaica	1,240	1.8	1.2	--	2.1	3.8	2.1	2.0
Jordan	1,180	1.3	1.5	3.4	2.6	2.9	4.8	3.6
Kenya	380	12.1	4.8	11.0	10.4	11.9	--	--
Korea, South	1,130	1.1	1.6	1.1	1.4	--	0.8	0.8
Madagascar	290	9.1	--	19.8	9.5	11.6	--	--
Mexico	1,590	0.3	--	1.2	0.8	--	--	--
Morocco	740	4.3	3.4	2.7	--	--	--	--
Nigeria	670	13.5	4.4	14.5	8.5	22.5	--	--
Panama	1,350	1.9	1.0	2.2	4.2	5.3	3.1	1.8
Philippines	600	2.6	1.6	3.6	5.0	3.1	--	--
Thailand	590	2.7	--	--	1.4	--	3.7	2.1
Zaire	260	17.7	13.6	12.4	28.1	13.6	4.8	--

Note: The cost of a one-year supply of each method is taken from Table 1. See footnotes to Table 1 to determine which costs are included.

female sterilization, 2 percent vasectomy, and 10 percent other nonpharmacologic methods, then the yearly average per capita cost of contraception at current prices would amount to $22.17 (Farley and Tokarski, 1975; Westinghouse Population Center, 1974; Sollins and Belsky, 1970).

These costs reflect nearly all of the charges users pay for these methods. However, in the case of oral and injectable contraceptives, any fees charged for examinations, prescriptions, or injections are not included. Service-related costs for these and other methods appear in Appendix Table 2.

It must be stressed that none of these cost data reflect the cost of gaining access to supplies and services. These costs will be negligible for users with ready access to private sources of supplies and services. In fact, however, this is not the case for many people living in developing countries. In these countries, legal and cultural restrictions often limit private-sector provision of contraception (Farley and Tokarski, 1975; Westinghouse Population Center, 1974; Sollins and Belsky, 1970; UNFPA, 1976). Moreover, the commercial infrastructure in rural areas is often weak, and physicians and public health care facilities often sparse. Thus private-sector supplies and services are often quite limited in rural areas and urban slums in most developing nations; this is particularly true for methods requiring medical procedures, such as IUD insertion or sterilization. As a result, users often incur substantial additional costs of locating, traveling to, and obtaining access to private sources of supply, as discussed below.

In general, the various monetary costs of contraceptives obtained in the private sector appear not to have risen significantly over time (Sollins and Belsky, 1970; Farley and Tokarski, 1975; see Table 1 and Appendix Table 1). Only modest increases have occurred over the past decade, and these have been more than offset by inflation and rising income levels.[5]

Public-Sector Costs

The overall cost of providing contraceptives through public family planning programs is generally calculated by dividing total yearly program costs by one of two measures: the annual number of all clients served by the program, or the calculated number of clients that receive a full year's use of contraceptive services and supplies from the program (see Tables 3 and 4). This latter measure, usually referred to as couple-years-of-protection, is the most comprehensive, and is the most comparable with the costs discussed above for private-sector channels. However, as noted above, numerous methodological problems make it difficult to quantify the monetary costs of public family planning programs.[6] For example, the budgeted cost of family planning programs usually does not include significant resources supplied by external sources (Simmons, 1973; Reardon et al., 1974; Nortman, 1981). Consequently, exhaustive analysis of cost components is generally required to obtain accurate

TABLE 3 Monetary Costs of Contraception Provided by Public-Sector Family Planning Programs (U.S. dollars in year indicated)

Country (Region)	Reference	Date of Findings	Cost of Supplies and Services for All Methods Combined: Per New Acceptor	Per Couple-Year of Protection
Indonesia	Rahardgo and Resse (1972)	1968	80.90	48.51
		1970	25.61	17.85
		1972	9.59	4.48
Thailand (Chiang Mai)	Baldwin (1978)	1977	--	7.15
Thailand	Chen (1981)	1979	--	14.39[a]
Colombia	Bailey and Correa (1975)	1973	6.28	10.84
	Ojeda et al. (1981) (clinic program)	1977	--	8.24
		1978	--	10.68
		1979	--	14.42
		1980	--	15.27
India (Narangual)	Reinke (1981)	1974	17.73	29.91[b]
Haiti	Bordes et al. (1981)	1980	24.73	40.72
Zaire	Blumenfeld (1981)	1973-76	37.26[b]	20.84[c]
United States	Correa et al. (1972)	1968	--	42.03
	Reardon et al. (1974)	1972	89.80	78.40

Note: The table provides costs for all methods combined. Correa et al. (1972) provide these costs per couple-year of protection for particular methods in the United States: oral contraceptives, 49.81; IUD, 36.11; and spermicides, 41.27. Reardon et al. (1974) give these costs: oral contraceptives, 72.70; IUD, 97.40; diaphragm, 71.00; female sterilization, 224.70; and vasectomy, 48.40. Similar costs for England, 1972, are provided by Trussell (1974): oral contraceptives, 15.78; IUD, 15.05; condoms, 14.75; diaphragm, 17.19; spermicides, 20.44; and vasectomy, 32.86.

[a]Total costs, calculated from Table 1, plus commodity costs from Chen (1981).
[b]Calculated using data and method provided in Reinke (1981:13).
[c]Average cost for those areas cited in Blumenfeld (1981: Table 3), couple-years of protection calculated as 12 times the cost per contraception-month.

TABLE 4 Cost of Contraceptives from Public-Sector Family Planning Programs[a] (1980 U.S. dollars)

Country	Oral Contraceptives[b] (per cycle)	IUDs[b] (device and insertion)	Condoms (per piece)	Diaphragms (device and initial fit)	Spermicides (per application)	Injectables[b] (per month)	Female Sterilization[b]	Vasectomy
Bangladesh	Free	.00-7.10	.00-.01	Not available	.00-.02	Free	Free	Free
Brazil	Free	Unknown	Free	Free(limited availability)	Unknown	Unknown	Free(limited availability)	Free(limited availability)
China, P. R.	Free	Free	Free	Unknown	Free	Free	Free	Unknown
Colombia	.04-.30	.00-3.38	.09	Not available	Not available	Not available	4.50-11.25	4.50-11.25
Dominican Rep.	Free	Free	Free	Not available	Free	Not available	5.15	1.00-45.00[c]
Egypt	.07-.26	Free	.05-.07	Not available	.02	Not available	Free	Free
El Salvador	.00-.40	.00-3.00	.00-.04	2.00	Unknown	.00-1.20	Free	Free
Guatemala	.25	1.00-5.00	.02	Unknown	.02-.04	1.25	.00-30.00	.00-30.00
Indonesia	Free	Free	Free	Unknown	Unknown	Free	8.00[d]	Unknown
Jamaica	Free	Free	.00-.05	Free	Free	Free	Free	Free
Jordan	.00-.34	.00-3.44	.09	Free	Not available	Not available	51.60	Unknown
Kenya	Free	Free	Free	Free	Free	Unknown	Free	Unknown
Korea, South	.16-.24	.00-2.83	.02-.04	Unknown	Unknown	Unknown	22.50	15.00
Madagascar	1.20	Not available	Free	2.43	.09	1.06	Unknown	Not available
Mexico	.00-.28	Unknown	.10	Unknown	.05-.09	Unknown	Unknown	Unknown
Morocco	Free	Free	Free	Free	Free	Not available	Free	Not available
Nepal	Free	Free	.00-.01	Not available	Free	Free	Free	Free
Nigeria	.58	1.55	.06	Not available	.09	1.96	Unknown	Unknown
Panama	.00-1.00	.00-5.00	.00-.08	Free	.09	5.25	25.00	Not available
Philippines	Free	Free	Free	Unknown	Unknown	Not available	Free	Free
Thailand	.00-.45	1.00	.02-.10	Not available	.06	.25	.00-7.50	.00-2.50
Vietnam	Free	Free	Free	Not available	Not available	Unknown	4.00-4.50	4.00
Zaire	Free[e]	Free[e]	Free	Free[e]	Free	Free[e]	42.25	Unknown

[a]Including publicly subsidized commercial retail sales programs.
[b]Prices may vary by brand, type of product, type of device, or type of procedure.
[c]Price depends on ability of client to pay.
[d]Not officially a program method, but government subsidizes privately performed procedures for some low income women.
[e]A fee of 3.55 is charged for a clinic visit.

Source: The study upon which this table is based is described in Note 3.

estimates of total program costs.

Because of these methodological problems, estimates of costs vary widely. The data in Table 3, along with the findings reviewed by Gillespie et al. (1981) and Robinson (1979), indicate that it costs most public family planning programs in developing countries between 10 and 30 1980 U.S. dollars to provide a year's worth of contraceptive supplies and services to one client. (Costs are higher in the United States and England.) Although this is a very rough estimate, it does suggest that the monetary costs of contraception provided by public-sector family planning programs do not differ markedly from those of private-sector sources.

It should be noted that most family planning programs do not seek to defray these costs by charging fees to clients. Table 4 shows the fees charged to clients by family planning programs in 23 developing countries in 1980. Even where fees are charged, in almost all instances except for sterilization and contraceptive injections, prices are very low compared to the private-sector retail prices listed in Table 2 and Appendix Table 1.

Components of Costs in the Public and Private Sectors

The monetary costs to users can be broken down into the four basic components described above. Although these general categories are the same for contraceptives in both the private and public sectors, there are some important differences in emphasis.

Cost data for the manufacture of contraceptive products by private companies are generally proprietary information. However, some estimates of these costs can be made by examining the lowest prices for which products are sold when most or all of the costs associated with distribution and promotion are excluded. (The data in Table 1 cannot be used because they include distribution costs.) This is generally the case when private companies sell bulk contraceptives under a competitive bidding system to a public-sector procurement agency, such as the Agency for International Development of the U.S. Government or the United Nations Fund for Population Activities. Under these circumstances, the "ex-factory" price of one month's supply of oral contraceptives, including packaging, can be as little as $0.15 to $0.25 (Newman, 1980; Badham, 1978). IUDs range from $0.10 to about $1.00, depending on the particular type (Population Council, 1979; Badham, 1978). The basic manufactured cost of most types of vaginal spermicides and condoms ranges from $0.01 to $0.05 per application or device (Newman, 1980; Badham, 1978). Although costs of some types of specialized sterilization equipment, such as a fiber-optic laparoscope, can be in the thousands of dollars, this type of equipment is reused for many years, not only for sterilizations, but also for other medical procedures; thus the cost per procedure is small. Therefore, although there may be some exceptions, the basic manufactured cost of contraceptive products is generally low. When only the basic cost of manufacturing is considered, a year's supply or equivalent use ranges from a few cents to under $2.00 for most

available products.

Appendix Table 2 provides data on the prices of contraceptive services provided by the private sector in developing countries. These price data include not only the direct cost of the service itself, but also charges arising from the operation and maintenance of the service delivery system. These include staff time, profit for the service, and the general costs of maintaining the service.

As noted above, costs arising from distribution, including marketing, account for the better part of the total price of most contraceptive products sold in the private sector.[7] It is possible to estimate these costs by subtracting the manufacturing cost from the total price of the product. Using the above estimates for manufacturing costs and the data in Appendix Table 1 and Table 1, distribution costs for oral contraceptives can be estimated to comprise about 90 percent of their total average retail cost.[8] As Appendix Table 1 indicates, the overall prices of contraceptives obtained in the private sector are remarkably uniform from country to country. Since manufacturing costs do not vary widely, it can be assumed that there is a common basic cost structure for these private services among developing countries, although there does appear to be some depression of costs in the lowest-income countries.

As noted above, the costs of gaining access to supplies from retail outlets can be substantial; however, the actual monetary value of these costs is not well documented (Rodriguez, 1977, 1978; Brackett, 1980; Foreit and Gorosh, 1978; Morris et al., 1981). One study indicated that many people living in rural areas of India, Panama, and Turkey must pay over $1.00 U.S. to travel to and from a retail source (Rodriguez, 1977); for methods such as the pill requiring regular resupply, annual travel costs could therefore total $10 or more. For many rural people, substantial cost is involved in the time required to travel to and from the nearest source.[9] Moreover, these trips sometimes prove in vain: outlets can be out of stock when customers arrive to purchase their supplies (Farley and Tokarski, 1975). Additional costs are associated with learning about sources in places where supplies are only sparsely available; in some areas of Bangladesh and Korea, for example, as many as three-quarters of the people do not know where they can obtain supplies and services (Foreit and Gorosh, 1978).

Relationship of Monetary Costs to Contraceptive Use and Fertility

The negative relationship between contraceptive prevalence and fertility levels is well established, both empirically and theoretically (Nortman amd Hofstatter 1980; Morris et al., 1981; Anderson and Morris, 1981; Ross, in these volumes). The theoretical analyses demonstrate that the effect of contraceptive use on fertility varies according to the mix of methods employed: the effect is greater in populations using higher proportions of more effective methods--oral contraceptives, injectables, IUDs, and

sterilization--than in those using less effective methods (Bongaarts and Kirmeyer, 1980). Consequently, two issues are raised that determine the impact of the monetary costs of contraception on fertility: the extent to which these costs influence overall levels of use, and the extent to which they influence the mix of methods used by different populations. These two issues are discussed below for developed and developing countries.

Effects of Monetary Costs in Developed Countries

In developed countries, where the majority of contraceptive products and services are obtained from private sources, the monetary cost of contraception amounts to a relatively small fraction of per capita income. At prevailing price levels, overall use in most of these countries stands at nearly the maximum level consistent with very low levels of fertility (Menken et al., 1979; Dunnell, 1979; Leridon, 1981). Although price differences may influence selection of methods or particular brands of products, cost appears to have virtually no impact on overall levels of contraceptive use.

The impact of cost on the mix of methods also seems minimal in these countries. The most costly method, female sterilization, has been rapidly increasing in popularity despite the high fees involved (Family Planning Perspectives, 1980a; Dunnell, 1979). The new copper-bearing intrauterine devices, which cost about double the price of older polyethylene models, have rapidly attained major shares of the IUD market in North America and Europe (Power, 1981). In short, other factors that determine choice of method (such as effectiveness, convenience, safety, and acceptability to one's partner) seem to be far more important than monetary cost.[10]

Since monetary costs have little or no impact either on overall levels of use or on the mix of methods, their influence on fertility in developed countries can be assumed to be negligible.

Effect of Monetary Costs in Developing Countries

It is clear that there is some negative effect of monetary costs on both levels of contraceptive use and the mix of methods in developing countries.

The largest effect is an indirect one: in contrast to developed countries, private-sector distribution channels for contraceptives do not reach the bulk of the population in most developing countries. Private-sector sources have little interest in establishing marketing and distribution channels in areas where they believe their volume of sales is likely to be low, such as rural areas and the poor, marginal areas of cities (Business International, 1978; Westinghouse Population Center, 1974; Folch-Lyon et al., 1981; Chen, 1981). As a result, private sources of supply serve only part, sometimes only a small part, of the population in Third World countries (Business International, 1978; Sollins and Belsky, 1970; Morris et al., 1981).

While this limitation is offset in those countries with active family planning programs, in most developing nations the high costs of these public programs have limited the extent of their coverage, as well as the range of methods they can afford to provide. As a result, because of cost, restricted access still constitutes a substantial barrier to the use of contraceptives in most developing nations (Rodriguez, 1978; Schearer and Fincancioglu, 1981; Morris et al., 1981; Anderson and Morris, 1981). This results in increased levels of fertility in many developing nations (Kendall, 1979; Rodriguez, 1978; Morris et al., 1981; Anderson and Morris, 1981; Westoff, 1981).

The second way in which monetary costs influence contraceptive usage in developing countries is by directly discouraging use of methods, even where they are available, because of their high costs to the potential users. Unfortunately, little is known about the extent of this direct effect of costs. On the one hand, some economists have claimed that the monetary costs of contraception constitute real barriers to contraceptive use for many individuals in developing countries (Enke and Hickman, 1976; Correa, 1975; Mertaugh, 1980). Prices charged by the private sector for nearly all products and associated services appear to be well in excess of what the poorest laborers and subsistence farmers can afford in developing countries.

On the other hand, there is evidence that prevailing commercial prices may not be a substantial deterrent to contraceptive use among very large segments of the population in many Third World countries. It appears that, at prevailing price levels, many couples in developing countries may regard the direct monetary costs of contraception as negligible in comparison with other, more basic factors related to social and economic aspirations and family size. The fraction of the population that obtains supplies from private sources even when public programs offer alternative free or low-cost supplies is quite large in many developing nations (Nakamura and Fonesca, 1979; Morris et al., 1981). Few people cite the cost of contraception as a barrier to use (Nakamura and Fonesca, 1979; Folch-Lyon et al., 1981; Morris et al., 1981); in a number of experimental programs, price has not proved to be an important determinant of contraceptive use (Wang, 1974; Folch-Lyon et al., 1981; Committee on Family Planning, 1973; Cross River Study, Ministry of Health, 1981). Social marketing programs indicate a substantial purchasing capacity even among low-income groups in rural areas (Altman and Piotrow, 1980); in some market tests, it has been demonstrated that even low-income groups often prefer to purchase contraceptive products rather than receive them free of charge (Reddy and Murthy, 1977; Talwar, 1980; Folch-Lyon et al., 1981).

This issue is a matter of some importance: if people's ability to pay for contraception is higher than is generally believed, private sources of supply may be capable of serving much larger segments of the population than they now do. Also, public family planning programs may be able to effect savings through charging for services and by reducing overlap of services in areas where private sources are available. Additional research is therefore urgently needed,

especially in view of increasing financial pressures on these public programs.

HEALTH COSTS OF CONTRACEPTION

As a consequence of extensive epidemiological research over the past decade, much is now known about the nature and incidence of both minor and long-term adverse health effects of contraceptive drugs and devices, and sterilization and abortion procedures. Although most of the available methods of birth control cause some risk to health, all confer at least partial protection against pregnancy, which of course carries its own risks (see Tietze, 1979; Chen et al., 1979; Tomkinson et al., 1979; Hatcher et al., 1980; Office of Technology Assessment, 1982; Bruce and Schearer, 1979).[11] Assessing the costs of contraception involves the complex task of weighing risks against benefits. The following section of this paper focuses exclusively on health costs of contraception (and, in the case of a few methods, direct health benefits unrelated to fertility); the effects of these costs on contraceptive use and fertility are then examined.

Nature and Magnitude of Health Costs

Although there is generally no clearcut biological separation between minor and more lasting adverse health effects of contraception, the following descriptions of the health costs of various birth control methods distinguishes minor side effects, serious health effects, and potential hazards for purposes of discussion. Methods are discussed in the order listed in Figure 1, excluding the three little-used methods noted earlier.

Withdrawal and Related Techniques No adverse health effects are known to be associated with male or female orgasm with the penis outside the vagina, either in conjunction with withdrawal of the penis during intercourse just prior to male orgasm (coitus interruptus) or in conjunction with oral, anal, or masturbatory sexual practices. Historically, a wide variety of gynecological, urological, neurological, and psychiatric disorders have been attributed to the practice of withdrawal; however, no objective data exist to justify these claims. Masters and Johnson have demonstrated that a progression of complex physiological changes from early excitation through plateau and orgasm to final resolution occurs in the female during normal coitus (Masters and Johnson, 1964). These findings have led to new speculation that coitus interruptus on a regular basis might result in observable physiological consequences in women (Calderone, 1970:437-438); thus far, however, these speculations remain unstudied and undocumented.

Abstinence No adverse health effects are known to be associated with sexual abstinence, including systematized forms of sexual

abstinence (the latter includes calendar rhythm, temperature rhythm, mucus method, and symptothermal rhythm, which is a combination of the first three). However, psychological stress is common. Some evidence points to a possible health risk to the children of couples practicing rhythm, especially versions that permit intercourse only after ovulation has occurred. One study found an elevated incidence of congenital abnormalities in children accidentally conceived during practice of the strict version of temperature rhythm (Jongbloet, 1971). Animal studies suggest that "overripe" eggs fertilized at extended periods after ovulation do exhibit an abnormally high frequency of chromosomal abberations (Orgebin-Crist, 1973; O'Ferrall, 1973). However, data on this potential side effect are too limited to be conclusive.

Prolonged Breastfeeding Prolonged breastfeeding in malnourished women may cause health problems arising from nutritional depletion. It is possible that trauma to the mother's nipple can occur after the infant's teeth emerge. If breastfeeding provides the sole source of food beyond infancy, malnutrition of the child can result.

Postcoital Douching This ineffective folk method of contraception can cause minor and, in extreme cases, serious irritation of vaginal tissues, depending on the solution used. (See the section below on vaginal spermicides for pertinent discussion of douching with these substances.)

Oral Contraceptives The most popular reversible method of birth control, oral contraceptives, is believed also to be the most extensively studied medication ever marketed. As summarized in Figure 2 and Table 5, oral contraceptives have been associated with a wide variety of minor side effects, as well as a number of serious health hazards. For many of these, data are sufficient to demonstrate a direct causal relationship with oral contraceptive use. Just to what extent these adverse health effects are due to biased reporting and to what extent they are due to the medication is uncertain, since women who use oral contraceptives may be more concerned about their health and may notice and report general health problems more frequently than nonusers. The serious side effects listed in Table 5 are less susceptible to biased reporting than are minor side effects, but are difficult to measure and establish because of their infrequent occurrence. Six serious adverse health effects have been conclusively connected to the use of oral contraceptives--stroke, heart attack, deep vein thromboses and pulmonary embolism, supervicial thromboses, hypertension, and benign tumors of the liver (Vessey, 1980; Slone et al., 1981; see references in Figure 2); two other serious effects have been the subject of conflicting findings--gallbladder disease and kidney infection. Studies cited in Table 5 indicate that about 1 of 500 (0.2 percent) of users in Western countries is likely to experience one of the potentially life-threatening side effects each year; an additional 0.9 percent is likely to develop hypertension, kidney infections, or superficial or unspecific thromboses. An

FIGURE 2 Minor Side Effects Reported to be Associated with Oral Contraceptive Use

Side Effects	Sources
Nausea	a,b,c,d,e,f,g
Weight change (usually gain, but in some cases loss)	c,h,i
Breast tenderness and other signs of fluid retention	c,f,h,i
Spotty darkening of skin (sometimes permanent)	a,b
Rashes and itching	a,i,j
Breakthrough menstrual bleeding and spotting	b,d,e,f,j,i,k,l
Decreases in menstrual flow	a,b,d,e,g,i,j
Menstrual cramping	c,i
Acne (usually reduced, but stimulated in some women)	a,b
Fatigue, mood changes, depression, nervousness	a,d,e,g,h,i,m
Headaches	a,d,e,f,g,h,i,j,n
Change in sex drive (usually increased, but decreased in some women)	a,d,h,i
Abdominal swelling and cramping	a
Vaginal yeast infections, itching, and discharge	a,i,o,p
Chronic ulcerations of the cervix	a,b,j
Hayfever and related allergies	a,j
Urinary tract infections (usually without symptoms)	a,j,q
Sensitivity of skin to light	a
Delay in return of menstruation following cessation of use	a,j,m,r
Delay in return of fertility following cessation of use	a,j,m,r

Sources:
[a]Royal College of General Practitioners (1974)
[b]Sanhueza et al. (1979)
[c]Talwar and Berger (1977)
[d]Brat (1976)
[e]Ingemanson et al. (1976)
[f]Rudel et al. (1978)
[g]WHO (1980a)
[h]Hunton (1976)
[i]Briggs (1977)
[j]Vessey et al. (1976)
[k]Talwar et al. (1977)
[l]Bounds et al. (1979)
[m]Huggins (1977)
[n]Bourdais (1977)
[o]Spellacy et al. (1971)
[p]Soepari (1978)
[q]Takahashi and Loveland (1976)
[r]Vessey et al. (1978)

estimated 2 out of every 1,000 oral contraceptive users are hospitalized annually as a result of these side effects (see Table 5; Ramcharan et al., 1976, 1980; Vessey, 1978), while about 2 out of every 10,000 users die (see Table 5; Royal College of General Practitioners, 1981b).

The morbidity and mortality rates associated with serious side

TABLE 5 Serious Side Effects Associated with the Use of Combined Oral Contraceptives

Side Effect	Excess Morbidity or Mortality per Year per 100,000 Users		
	Diagnosis	Hospitalizations	Deaths
Stroke	31[a]	35[b]	9.7[c]
Deep-vein thrombosis or pulmonary embolism	91[a]]		
Superficial or unspecified thrombosis	125[a]]	70[b]	3.4[c]
Heart attack and other non-rheumatic heart disease	17[c]	17[c]	8.0[c]
Gallbladder disease (surgically confirmed)	79[d]	79[b,d]	--
Kidney infection	383[a]	--	--
Benign liver tumor	1[e,f]	1[e,f]	0.1[e]
Hypertension	406[a]	--	1.7[e]
Total	1,133	202	22.9

Sources:
[a]Royal College of General Practitioners (1974).
[b]Vessey (1978).
[c]Royal College of General Practitioners (1981b).
[d]Boston Collaborative Drug Surveillance Program (1973).
[e]Rooks (1979a, 1979b).
[f]Nissen et al. (1979a, 1979b).

effects are overall averages applicable to white, Western women. Incidences of serious health problems vary widely among this group, depending on age, smoking habits, degree of inherent biological risk for cardiovascular disease, and, for some side effects, length of use. Among older women, heavy smokers, and those susceptible to vascular diseases, much higher rates of adverse health effects occur (Royal College of General Practitioners, 1981b). The incidence of many of the minor side effects associated with oral contraceptives decreases after the first several months of use; the risk of some of the serious side effects, however, increases with length of use, and in some cases produces irreversible damage to health (Nissen et al., 1979a, 1979b; Rooks et al., 1979a, 1979b; Royal College of General Practitioners, 1981b; Slone et al., 1981).

Biological susceptibility to adverse health effects of oral

contraceptives has led to wide-scale screening of potential users. Obesity, high blood pressure, high cholesterol or triglyceride concentrations in the blood, and previous history of vascular disease are among the factors believed to increase the risk of circulatory system side effects. (Mann and Inman, 1975; Royal College of General Practitioners, 1974, 1981b; Vessey and Mann, 1978; Krueger et al., 1980; Mann 1978; Mann et al., 1976; Ory, 1977; Stolley, 1977; Vessey, 1980; Shapiro et al., 1979).

Most of the side effects associated with oral contraceptives have been shown to be dose-related (Royal College of General Practitioners, 1974, 1981b; Inman et al., 1970; Stolley et al., 1975). Increased use of low-dose combined oral preparations should lower the incidence of side effects somewhat. Studies have shown that a reduction in the estrogen component of 25-60 percent reduces the incidence of various estrogen-related side effects by a roughly equivalent amount (Royal College of General Practitioners, 1974; Inman et al., 1970, Stolley et al., 1975). The amount of progestin also needs to be reduced to lower the incidence of some vascular side effects (Kay, 1980; Meade et al., 1980). Additional epidemiological data will be required to evaluate the long-term health effects of the new low-dose combined oral contraceptive preparations.[12]

A number of potential hazards of oral contraceptives have been ruled out in recent years as a result of ongoing investigations. These include diabetes, infertility following extensive periods of use, and increased incidence of birth abnormalities following discontinuation of use[13] (Wingrave et al., 1979, 1980; Vessey et al., 1978, 1979b; Hull et al., 1981; Huggins, 1977; Coulam et al., 1979; Ramcharan et al., 1980; Rothman and Louk, 1979; Royal College of General Practitioners, 1974, 1976). However, a number of potential health effects remain to be determined. These include various forms of cancers, abnormalities of vision, effects on the immune system and on resistance to some types of infectious disease, and effects on nursing infants. Cancer, in particular, is of concern. A recent report from one of the two major British studies indicates a possible though uncertain association of breast cancer with use of oral contraceptives (Royal College of General Practitioners, 1981a); two recent small-scale case-controlled studies have shown a higher risk of breast cancer among two types of populations using this method (Jick et al., 1981b; Pike et al., 1981). Recent findings from the second major British study and the only comparable U.S. study indicate a possible direct association between long-term oral contraceptive use and cancer of the cervix (Harris et al., 1980; Swan and Brown, 1980).

It must be stressed that the serious side effects reviewed above emerge from studies conducted among Western women, and their applicability to women in developing countries is uncertain. Susceptibility to a disease varies markedly with social and economic setting, climate, nutrition, genetic constitution, and a variety of other factors. Diseases involving blood clotting or arteriosclerotic disorders are rare in developing countries, while many parasitic and infectious diseases endemic to these settings are virtually absent in developed countries. Without controlled epidemiological studies

conducted in developing countries, informed judgments about the long-term health consequences of oral contraceptive use in these settings cannot be made (Nordberg and Atkinson, 1979; Ratnam and Prasad, 1979; Toppozada, 1979; WHO, 1980a).

A number of studies have identified health benefits of oral contraceptive use. These include reduction in breast cysts and benign breast disease (Royal College of General Practitioners, 1974; Vessey, 1978, 1979; Vessey et al., 1976; Ory et al., 1974, 1976); reduction in both benign and malignant cysts and tumors of the ovaries (Royal College of General Practitioners, 1974; Vessey, 1979; Vessey et al., 1976; Newhouse et al., 1977; McGowan et al., 1979; Casagrande et al., 1979; Ramcharan et al., 1980); reduction in rheumatoid arthritis (Royal College of General Practitioners, 1974, 1978); reduction in menstrual disorders (Royal College of General Practitioners, 1974; Vessey et al., 1976); and reduction in iron deficiency anemia (Royal College of General Practitioners, 1974). The savings in morbidity and hospitalization for these health problems is substantial; the reduction in iron deficiency anemia, which results from less menstrual blood loss among oral contraceptive users, is a potentially significant benefit for those women whose diets are inadequate. In addition, as yet inconclusive evidence points to important health benefits of oral contraceptives in two other areas: a reduction in endometrial cancer (Weiss and Sayvetz, 1980; Kaufman et al., 1980a; Ramcharan et al., 1980) and a reduction in the incidence of pelvic inflammatory disease (Royal College of General Practitioners, 1974; Vessey et al., 1976; Vessey, 1978; Senanayake and Kramer, 1980; Eschenbach et al., 1977; Ryden et al., 1979; Osser et al., 1980).

Intrauterine Devices Like oral contraceptives, intrauterine devices have undergone extensive study during the past two decades. More than 100 IUDs have been developed and tested, and at least a dozen different types are being used in different settings today; all share similar minor and serious side effects. In addition, recently introduced devices that release small quantities of drugs within the uterus have some actual and potential side effects of their own related to the medication they release. In the United States, it has been estimated that a total of 2 to 10 deaths per million users per year are associated with IUDs (Vessey, 1978; Kahn and Tyler, 1975c); overall hospitalization rates are estimated to be roughly 1,000 times higher (Vessey, 1978; Kahn and Tyler, 1975a; Jennings, 1974).

The three most common side effects of all IUDs are spontaneous expulsion of the device by the uterus, pain in the pelvic area, and excessive menstrual or intermenstrual bleeding. Expulsion has no direct adverse effect, but may result in an accidental pregnancy if it goes unnoticed. Almost all women fitted with an IUD experience increased bleeding and pain immediately following the insertion of the device. Although these effects in most users subside within a month or two, increased menstrual flow, often at double normal levels, remains a permanent feature of this mode of contraception for as many as 10-25 percent of all users (Edelman et al., 1979; Guillebaud et al., 1976; Liedholm et al., 1975; WHO, 1980a). This side effect is

regarded only as an annoyance by many IUD users; however, it does cause a higher incidence of anemia in women using this method (Vessey et al., 1976; WHO, 1980a; Guillebaud, 1979). It has been estimated that, depending on the type of IUD, between 1 and 10 out of every 1,000 IUD users annually require hospitalization to treat excessive bleeding (Tietze, 1970; Vessey et al., 1976; Kahn and Tyler, 1975a).

In addition to these three common side effects, a number of relatively rare but potentially more serious effects have been documented. These include perforation of the uterus; pelvic inflammatory disease (PID), sometimes associated with subsequent infertility; ectopic pregnancy; and other complications of pregnancy. Of these, the most prevalent is PID (see Table 6). Nearly one-third of all IUD-related hospitalizations involve some pelvic infection (Kahn and Tyler, 1975a; Jennings, 1974), and half of all deaths connected with IUD use in the United States since 1966 have been related to this kind of infection (Kahn and Tyler, 1975c; Jennings, 1974; Dreishpoon, 1975; Cates et al., 1976). Since oral contraceptives, the diaphragm, and the condom protect against PID, the relative risk for IUD users is much higher.

Although the rates of PID associated with IUD use are relatively high, mortality rates associated with infection and IUDs in developed countries are very low--in the range of 3 deaths per million IUD users per year (Kahn and Tyler, 1975c; Jennings, 1974). Studies comparable to those in Table 6 are not available from developing countries; however, in standard clinical trials of IUDs, the observed rates of PID are not markedly different in developed and developing countries.

The data in Table 6 indicate that young, nulliparous women who use an IUD have a much higher risk of contracting PID than do older or parous IUD users. However, this may not be due to a differential effect of the IUD on these two populations, but rather to the much greater incidence of multiple sexual partners among the high-risk group, a factor that is known to greatly increase PID risk. Because of this observed higher risk, however, health authorities in many countries are advising against the use of the IUD in young women who have not yet had children, not only because of the risk of infection itself, which can give rise to chronic pelvic pain and subsequent ectopic pregnancies, but especially because of the risk of consequent infertility (Physicians' Desk Reference, 1980; Guillebaud, 1979; Gray, in these volumes).

Although the risk of developing most forms of PID as a result of IUD use appears not to rise with increasing duration of use, one very rare form of infection does seem to increase with extended use. Recent research indicates that actinomyces-related PID may be caused by calcium build-up, especially on non-copper bearing plastic IUDs, after long periods of use (Boon et al., 1981; Gonzalez, 1981; Sparks, 1981; Duguid et al., 1980; Family Planning Perspectives, 1980b; Contraceptive Technology Update, 1981a).

Another rare type of infection is associated with IUD use: acute infection during pregnancy with an IUD in place, accompanied by abortion and sepsis. The observed incidence of this complication is

TABLE 6 Summary of Major Epidemiological Studies of IUDs and Pelvic Infection

Study	Type of Investigation	Risk of Hospitalization for Pelvic Inflammatory Disease	
		Relative Risk	Excess Incidence Per 1,000 Users
Burkman et al. (1980)	case control	1.6 fold	--
Eschenbach et al. (1977)	case control	4.4 fold (9.0 fold in nullipara)	--
Falkner and Ory (1976)	case control	5.1 fold	--
Gray (1976)	reassessment of 1976 Westrom data	7 to 8 fold in nullipara; 0.0 in others	--
Kahn and Tyler (1975a)	cross-sectional survey	--	0.4-2.8 per 1,000
Kaufman et al. (1980b)	case control	7.9 fold	--
Lippes (1975)	case control	1.9 fold	--
Targum and Wright (1974)	case control	9.3 fold	--
Thaler et al. (1978)	case control	3.3 fold	--
Vessey et al. (1981c)	prospective cohort	5.5 fold (10.5 fold for acute PID; 2.5 fold for chronic PID)	1.68 per 1,000
Westrom et al. (1976)	case control	3.0 fold (7.0 fold in young nullipara)	--
Wright and Laemmle (1968)	retrospective cohort	6.9 fold	56.6 per 1,000

very low, with mortality estimated at less than 3 deaths per million IUD users per year (Kahn and Tyler, 1975c; Jennings, 1974; Cates et al., 1976). Moreover, the incidence for IUDs currently in use is even lower, since a high proportion of the cases of this infection are known to have occurred with one particular IUD, the Dalkon Shield, which is no longer being marketed (Jennings, 1974; Cates et al., 1976; Edelman et al., 1979). Also, since the condition only occurs when an IUD is in place during pregnancy, both physicians and users are now removing the device in instances of accidental pregnancy.

Other complications of pregnancy are more frequent when an IUD is in utero during gestation. In addition to the elevated incidence of infected spontaneous abortions, the rate of common spontaneous abortions is about three times greater for IUD-bearing women than for pregnant women with no IUD (Kahn and Tyler, 1975a; Vessey et al., 1976; Edelman et al., 1979). There is also a higher incidence of premature labor, premature rupture of the amniotic membranes, and hemorrhage when an IUD is present during pregnancy (Kahn and Tyler, 1975a; Dreishpoon, 1975; Vessey et al., 1979b). Removal of the device increases the risk of spontaneous abortion, but greatly reduces the other risks (Dreishpoon, 1975; Edelman et al., 1979; Vessey et al., 1979b).

One other potential complication associated with pregnancies resulting from IUD contraceptive failure has been documented. It is known that the IUD is more effective in preventing normal uterine pregnancies than the rare pathological pregnancies that sometimes occur in the Fallopian tubes, ovaries, or abdomen (Tietze, 1970; Ory, 1981; Vessey et al., 1979a; Edelman et al., 1979). As a result, the proportion of these ectopic pregnancies is high among IUD contraceptive failures, and the risk increases to very high levels--about 1 in 10--for long-term users (Tietze, 1970; Vessey et al., 1979a; Ory, 1981; Edelman et al., 1979).

Injectable Contraceptives Controlled epidemiological studies have not been carried out for injectable contraceptives. Injectables contain high doses of one of the two drugs used in oral contraceptives. Such relatively minor side effects as headache, nausea, dizziness, nervousness, depression, menstrual pain, breast discomfort, acne, and others listed in Figure 2 for oral contraceptives are reported by 2 to 4 out of every 10 women using injectable contraceptives (Nash, 1975; Fraser and Weisberg, 1981; WHO, 1981), and the incidence of each of these minor side effects and the extent of their association with the medication are uncertain; however, these effects have not been clearly documented as they have for oral contraceptives. It is clear that these types of contraceptives give rise to menstrual bleeding irregularities in the vast majority of users and cause appreciable weight gain among a small proportion of users (Nash, 1975; Fraser and Weisberg, 1981; WHO, 1981a, 1981b; Gray, 1979, 1980). About 1 out of every 200 women using injectable contraceptives experiences very heavy menstrual bleeding that can place her at risk of developing anemia. In 1 to 5 out of every 1,000 users, bleeding is sufficiently severe to require

hospitalization and surgical treatment (Report to USAID, 1980; IPPF Medical Bulletin, 1980; Fraser and Weisberg, 1981; Parveen et al., 1977). On the other hand, reduced menstrual bleeding is experienced by a large proportion of users (Report to USAID, 1980).

It is known that the return of both menstruation and fertility is delayed after cessation of use of this method in a large proportion of women using the most popular injectable contraceptive, Depo-Provera. These delays are much longer and more frequent than those observed among past oral contraceptive users. Fertility appears to be recovered eventually in virtually all users, but data on this issue are not conclusive (Fraser and Weisberg, 1981; Nash, 1975; Pardthaison et al., 1980). If injectable contraceptives are accidentally given to pregnant women or if pregnancy occurs during use, there is concern that abnormalities in fetal development could result (Fraser and Weisberg, 1981).

Beyond this effect, little is known about the serious hazards and comparative safety of injectable contraceptives. Among the side effects that might be expected are effects on liver function, blood pressure, and cardiovascular disease. As with oral contraceptives, carcinogenicity is of potential concern, since the drugs employed in injectable contraceptives have been shown to stimulate the formation of cancer in animals. Although there is no evidence of this effect in humans (Greenspan et al., 1980; Fraser and Weisberg, 1981), it remains of particular concern for the monthly and three-monthly varieties, which use different types of progestins that exhibit strong tumorogenic action (Fraser and Weisberg, 1981; Hearings Before the Select Committee on Population, 1978; Report to USAID, 1980; IPPF Medical Bulletin, 1980).

Again as in the case of oral contraceptives, injectable contraceptives provide some significant health benefits to users. Among the large proportion of users who experience decreased menstrual bleeding, the risk of anemia is reduced (Report to USAID, 1980). Preliminary evidence also suggests some reduction in the incidence of vaginal infections among users (Toppozada et al., 1979).

Vaginal Spermicides, Vaginal Barrier Devices, and Condoms Barrier contraceptives--spermicides, the diaphragm and cervical cap, and the condom--cause no known disease or mortality. The principal minor adverse health effect associated with these methods is vaginal or cervical erosion in users of vaginal barrier devices arising from mechanical abrasion. This effect is generally rare and mild among diaphragm users, but more frequent and severe among those using the cervical cap (Patanelli, 1981). There are also rare instances of allergic reactions to the rubber or dusting powder used in condoms and diaphragms, and the chemicals present in spermicides and diaphragms (Belsky, 1975; Wortman, 1976b; Coleman and Piotrow, 1979; Lalu, 1957). Some types of spermicides cause a sensation of warmth in the vagina as they are dissolving, but this is not associated with any adverse effect on vaginal tissues. Recently, it has been realized that some of the chemicals in spermicides are likely to be absorbed through penile or vaginal tissues into the bloodstream (Connell, 1979;

Chvapil et al., 1980; Food and Drug Administration, 1980). However, little is known about the toxicity of these chemicals, and they are used only intermittently, so that significant health hazards do not seem highly likely. In the case of spermicidal jellies and creams used in conjunction with the diaphragm, actual clinical data over seven years of observation have revealed no associated illness or disease (Vessey et al., 1976). Spermicidal agents could also have an adverse effect on fetal development either in women who become pregnant while using them or among ex-users (Jick et al., 1981a); however, studies to date have not provided conclusive evidence on this question.

Like oral and injectable contraceptives, barrier contraceptives also offer some health benefits. Diaphragm users have a reduced incidence of pelvic inflammatory disease and, possibly, cervical cancer (Vessey et al., 1976; Vessey et al., 1981c; Wright et al., 1978). Condom users are partially protected against venereal diseases (Cutler, 1975; Ledger, 1974; Berger et al., 1975), a protective effect that can also reduce the risk of pelvic inflammatory disease and subsequent infertility.

Vasectomy Few side effects, minor or serious, have been shown to be caused by vasectomy. Adverse effects associated with the surgical procedure are generally minor and infrequent. The rate of surgical complications, both major and minor, associated with vasectomies ranges widely from less than 1 per 1,000 procedures to over 122 per 1,000; an average for nearly 25,000 vasectomies of 47 complications per 1,000 procedures has been reported (Wortman, 1975; Pichai et al., 1981). Hematoma, infection, and epididymitis make up the bulk of these complications (Wortman, 1975; Schmidt, 1975; Davis, 1980); most can be treated without hospitalization.

It has been well established that different classes of antibodies against sperm are produced as a result of vasectomy in about 50 percent of cases, probably as a result of sperm granulosa formation following the procedure (Berendes and Crozier, 1975; Ansbacher et al., 1975). More recently, it has been shown that men also develop autoimmune antibodies to tissue antigens other than sperm (Mathews et al., 1976). It has also been found that vasectomy gives rise to autoimmune diseases and related secondary effects, including heart disease, in some species of animals (Alexander et al., 1974; Alexander and Clarkson, 1978; Clarkson and Alexander, 1979). However, despite very extensive and careful study, no disease or pathology of any kind has been found to date in men who have been vasectomized for up to several years (Mathews et al., 1976; Goldacre et al., 1978; Berendes and Crozier, 1975; Ansbacher et al., 1975). Longer-term follow-up studies are continuing in both the United States and Great Britain.

Female Sterilization In contrast to vasectomy, which entails an extremely simple surgical procedure, female sterilization has traditionally been associated with a significant risk of injury and death because it requires a major surgical procedure. This is true of the newer endoscopic and minilaparatory methods, as well as tubal

ligation either by laparotomy or the vaginal approach.

Major and minor side effects associated with abdominal tubal ligation vary significantly depending on when in pregnancy the procedure is carried out. Data from developed countries indicate that postoperative complications and morbidity are very high when sterilization is undertaken in conjunction with delivery by Cesarean section (Shepard, 1974), and may be even more frequent when sterilization is carried out at the time of induced abortion. Both postpartum and interval abdominal tubal ligation are associated with much lower incidences of surgical morbidity and postoperative complications (Shepard, 1974; Dusitsin et al., 1980). The most common complications following such surgery include postoperative hematoma, vaginal bleeding, other hemorrhage, thrombophlebitis and thromboembolism, transient excess blood loss, and a variety of local and systemic infections and abscesses. The reported incidence of morbidity and/or complications following vaginal tubal ligation is about the same as that for abdominal tubal ligation; however, a greater proportion of the complications associated with vaginal tubal ligation are of a more serious nature (Shepard, 1974). Conventional laparotomy coupled with tubal ligation is associated with a significant risk of death--in the range of 2.5 deaths per 10,000 procedures (Presser, 1970). Both laparoscopic sterilization and sterilization by minilaparotomy are associated with much lower rates of complications and morbidity, as well as much lower mortality (Shepard, 1974; Phillips, 1980; McCann, 1978; Wortman, 1976a; Mumford et al., 1980; McCann and Cole, 1980; WHO, 1980; Vitoon, 1976). Although these rates may be slightly higher when the procedure is performed in outlying areas in developing countries or when tubal rings are used, minilap complications are generally less severe than those associated with laparoscopy and less dependent on the skill of the operator. Two other endoscopic techniques, hysteroscopy and culdoscopy, are associated with much higher rates of complication and are consequently little used (Darabi et al., 1978; WHO, 1980a).

Little is known about long-term complications or side effects that might result after surgery. The only serious complication of concern is the possibility of ectopic pregnancy in instances where the sterilization procedure has not been fully effective. There is evidence that menstrual bleeding disorders occur more frequently following sterilization; however, the severity and extent of this side effect is not well documented (Shepard, 1974; Rioux, 1980; Noble, 1978).

Effects of Health Costs on Contraceptive Use and Fertility

Like monetary costs, health costs affect fertility in two ways: through their effect on overall levels of contraceptive use, and through their effect on the mix of methods used. These effects are discussed below for developed and developing countries.

Effect of Health Costs in Developed Countries

The overall level of contraceptive use in developed nations is little affected by the fact that some methods can cause both minor and serious health problems. It is possible, however, that contraceptive use might fall and fertility rise accordingly if the hazards of a major contraceptive method such as the pill, female sterilization, or vasectomy were to become widespread and serious enough to discourage its use in a country where it is extremely popular.

Many of the most widely used contraceptive methods cause actual or potential serious health problems in substantial numbers, although small proportions, of users. Awareness of this among people of childbearing age, health workers, and policymakers does decrease the use of particular contraceptive methods and thereby influence the prevailing mix of methods in a number of ways.

First, occurrence of a side effect can cause discontinuation of use. On the other hand, since serious side effects occur at worst among only about 1.0 to 0.001 percent of users annually, the impact of direct discontinuation on overall levels of use is small. Method switching also allows contraceptive use to remain high despite side effects.

Second, serious side effects can reduce the use of particular methods if they cause regulatory authorities to restrict their availability. Although the health risks of contraceptives are appreciably outweighed by the risks of pregnancy for most women, in the case of oral contraceptives, this calculus of costs versus benefits has become increasingly unfavorable for older women and those who smoke (Tietze and Lewit, 1980; Ory, 1979; Vessey, 1978). Similarly, the tradeoff between the cost of potential infertility at older ages and the benefit of effective contraception at younger ages has become increasingly unfavorable for the IUD in recent years. At both the formal level of national health regulations and the informal level of medical practice, such restrictions substantially curtail the use of oral contraceptives, IUDs, and injectable contraceptives in Western countries (see prescription information for oral contraceptives and IUD products in the Physicians' Desk Reference, 1981; see also Contraceptive Technology Update, 1981b; Guillebaud, 1979). Quantitative estimates of this reduction in potential use, however, have not been made.

Third, serious side effects can discourage initial use of a particular contraceptive method by altering perceptions of its benefits and costs. In developed countries, especially the United States, this effect has increased in recent years as public knowledge about the hazards of different types of contraceptives has risen (Blake, 1977; Jones et al., 1980; Bruce and Schearer, 1979). This has reduced the use of more hazardous methods--oral contraceptives, IUDs, and injectable contraceptives--while increasing the use of less hazardous ones--sterilization, the diaphragm, spermicides, and condoms. Although the extent of these changes is not known quantitatively, sales data, market surveys, and other limited surveys do indicate a substantial shift in usage in these directions (Colen,

1978; Family Planning Perspectives, 1980a, 1980b; Torres et al., 1981; Aved, 1981; Power, 1981).[14]

Of course, fully objective knowledge about the health hazards of contraceptives does not exist; thus the perceptions of both individuals and policymakers play a large role in their assessments of these costs. These perceptions are sometimes unrelated to scientific knowledge. Several studies have shown that press reports and other publicity focusing on serious health hazards of contraceptives have resulted in sharp, though sometimes temporary, declines in the use of particular methods (Jones et al., 1980; Badarocco et al., 1973).

As for minor side effects, the way these influence selection and continuing use of particular methods is not well understood. Evidence does suggest that, on the whole, women in developed countries have a high tolerance for minor side effects. Although, as noted above, there has been a trend toward discontinuation of oral and injectable contraceptives and the IUD, this seems to be due to concern not about short-term side effects, but about long-term health hazards (Potts et al., 1975). Thus, although minor side effects clearly influence the selection and continued use of different methods, they do not appear in themselves to be major determinants of contraceptive use in developed nations.[15]

It is not yet known whether the shift away from more hazardous methods now being observed in developed countries will affect fertility. However, two factors strongly suggest that any effect will be negligible. First, much of the shift away from the highly effective oral contraceptive and IUD methods has been toward a still more effective method--sterilization (Family Planning Perspectives, 1980a; Dunnell, 1979). Second, the use of abortion has been increasing in developed nations during recent years (Tietze, 1979, 1981).

However, the fact remains that major shifts in the mix of contraceptive methods can occur as a result of health hazards. If very serious new adverse findings about major methods such as oral contraceptives, intrauterine devices, or sterilization were to emerge and cause elimination of two or more of these methods (especially if coupled with restrictions on the availability of abortion), the result could be appreciable rises in fertility, at least until new technology became available. In view of current uncertainties about the long-term effects of oral contraceptives on cancer, IUDs on fertility, and vasectomy on autoimmune disease, as well as the current political climate in many countries regarding abortion, these possibilities cannot be disregarded.

Effect of Health Costs in Developing Countries

In contrast to developed countries, where objective knowledge about the serious side effects of contraceptives appears to exert a strong influence on the mix of methods, evidence suggests that such knowledge exerts only a weak influence on method selection and, indirectly, on the overall prevalence of contraceptive use in developing countries.

Serious health hazards strongly restrict the levels of use of particular methods in Western nations through drug regulatory policies and related screening requirements. Although some limitations of this kind also occur in developing countries, the effect is much weaker. Many developing countries do adopt the same screening and prescription requirements to minimize the serious risks of contraceptives; however, they generally lack adequate medical resources to implement these requirements. In many countries, prescription and screening requirements have been relaxed in recent years, greater use is being made of paramedical personnel for such screening, public health services are expanding, and contraceptives are readily available without screening or authorization despite legal prescription requirements.

In addition, drug regulation is usually less formalized and rigorous in developing than in developed countries, and contraceptive products are more easily approved. For example, injectable contraceptives, which have not yet been approved for general use in most Western countries, are registered and marketed in well over 70 developing countries (Fraser and Weisberg, 1981). In part, this easier approval results from a lack of the technical capacity and data required for comprehensive review of these products (Cook et al., 1981). However, it also reflects the widely held perception of health authorities that the health costs of contraceptive use observed in developed nations may not apply to developing country populations, and that, in any case, such costs are offset by the benefits of controlling fertility and avoiding the high health risks associated with childbearing in these settings (Potts et al., 1978; Atkinson et al., 1974; Kahn and Huber, 1978; Rochat et al., 1978; Fathalla, 1977).

In addition to these differences, the effect of objective knowledge of serious side effects on individual decisions about contraceptive use appears very limited in developing countries. In most Third World nations, levels of knowledge about science, health, and family planning are very low among the majority of people. Information about the serious health hazards of different contraceptives is much less widely publicized and much less widely emphasized in either private medical services or public family planning programs (see e.g., WHO, 1980b).

On the other hand, although objective information about serious health hazards may not play a large role in contraceptive use, fears about serious health problems undoubtedly do. These fears are widespread and often in direct conflict with objective knowledge about such effects. In Mexico, for example, many men and women believe oral contraceptives cause cancer in users and birth defects in children conceived after the method has been stopped (Folch-Lyon et al., 1981). Due to misconceptions about reproductive anatomy, illiterate women sometimes fear that IUDs can become lost within the body (Shedlin and Hollerbach, 1981; Hollerbach, 1980). These fears, rather than knowledge of actual hazards, reduce both the overall practice of contraception and the selection of particular methods in developing countries (Folch-Lyon et al., 1981; Shedlin and Hollerbach, 1981; Hollerbach, 1980).

These fears can also intensify the impact of minor side effects on levels of contraceptive use. For methods that cause numerous minor side effects--oral contraceptives, IUDs, and injectable contraceptives--many more users abandon the method in developing than in developed countries. Discontinuation-of-use rates for these three methods range from 20 to 80 percent per year in developing countries, with mean rates of about 40 percent for oral contraceptives and 30 percent for IUDs; roughly one-third of those stopping use say they are doing so because of minor side effects (Kreager, 1977; Mauldin, 1979). The impact of minor side effects on use is intensely subjective. With strong family planning counseling, client support, and community endorsement of birth control methods, minor side effects may not be a major obstacle to contraceptive use (Tsu, 1980). In most developing country settings, however, these ideal conditions are not present. Although survey research has not extensively examined this issue, limited data indicate that substantial numbers of women in developing countries who want no more children avoid contraceptives because of fear of side effects (see Table 7). This impact of fear of side effects on contraceptive use can have a significant effect on fertility. The extent of this impact varies considerably from country to country and within countries, depending on the proportion not using contraception and not wishing to have more children.[16]

As family planning programs are extended more widely in developing countries and as levels of contraceptive use increase, it is likely that fears of side effects will be attenuated. Indeed, the effect of greater knowledge and experience on reducing fears of contraception may be a major reason for the very rapid increase in levels of use in most developing nations over the past decade (Kendall, 1979; Morris et al., 1981). On the other hand, it is also likely that this diffusion of information and services will ultimately exert a negative impact on usage, at least for those methods known to cause serious health problems. Thus, it appears likely that over the short term, very

TABLE 7 Percentage of All Married Women of Reproductive Age Who Are Not Using Contraception Mainly Because of Fear of Side Effects

Country and Region	Year	Percent	Country and Region	Year	Percent
Brazil			Guatemala	1978	19
Piaui State	1979	36	Korea, South	1979	11
Sao Paulo State	1978	31	Mexico	1978	9
Colombia	1978	11	Panama	1979	31
Costa Rica	1978	27	Thailand	1978	60
El Salvador	1978	24	Tunisia (Jendouba)	1979	28

Source: Morris et al. (1981).

substantial increases in contraceptive use will result from a decline in subjective fears and the associated impact of minor side effects. Over the long run, however, the importance of serious objective health hazards is likely to increase, both at the individual and at the national drug-regulating and policymaking levels, creating a situation closely analogous to that which exists now in developed countries.

PROPOSITIONS

The following propositions summarize the major points raised in the above discussion.

1. There are basically four components of the monetary costs of contraception: costs of development and production, of related services required for use, of distribution of products and services, and of gaining access.

2. The monetary costs of contraceptive use will be borne differently depending on the source of the products and services. When the source is private, most costs are paid by the user. When the source is public (e.g., health clinics and family planning programs), most costs are paid through funds obtained from government revenues, foreign aid, and philanthropic contributions.

2.1. Costs arising from distribution, including marketing, account for the better part of the total price of most contraceptive products sold in the private sector.

2.2. The overall monetary costs of contraceptives obtained in the private sector are remarkably uniform from country to country. Since manufacturing costs do not vary widely, it can be assumed that there is a common basic structure for distribution costs among developing countries.

2.3. In general, the monetary costs of contraceptives obtained in the private sector appear not to have risen significantly over time.

2.4. In general, the monetary costs of contraception provided by private and public sources do not differ markedly, although they are borne differently.

3. The negative effect of contraceptive use on fertility is well documented. The precise nature of this effect varies with the mix of methods used--whether more or less effective. Thus the monetary costs of contraception will affect fertility through both overall levels of use and method mix.

3.1. In developed countries, the effect of monetary costs on both overall use and method mix is apparently minimal. Therefore, the impact of these costs on fertility levels in these countries is also minimal.

3.2. Monetary costs have a greater effect in developing countries. The apparent inability of significant numbers of people to afford contraceptives discourages private firms from extending their marketing and distribution activities beyond higher-income to rural areas and the marginal areas of cities, where income is typically lower. This greatly limits availability of contraceptives through private channels.

3.3. The relatively low availability of contraceptives from private sources in developing countries in turn requires large expenditures of public funds to provide contraception through family planning programs. In many countries, however, the coverage of these programs is limited, in significant measure because of insufficient public revenue to cover their costs. Thus, except in those countries with very active family planning programs, contraceptive use is decreased and fertility increased because the monetary costs of contraception substantially reduce the availability of supplies and services.

3.4. However, people's ability to pay for contraceptives may be higher than is generally believed. Evidence indicates a substantial price elasticity for contraceptives among all but the poorest segments of society in many developing countries. Further study is needed on this issue, since private sources of supply may be capable of serving much larger portions of the population than they now do. Also, savings may be possible by reducing the overlap of services that result when full-scale family planning programs are established in areas where private services are available because it is believed that high private costs will discourage use.

4. All birth control methods provide at least partial protection against pregnancy. However, these benefits (in the form of reduced personal fertility and avoidance of the potential adverse effects of pregnancy and childbirth, especially in developing countries) must be weighed against the minor side effects and major health hazards of most contraceptive methods.

5. Like monetary costs, health costs of contraception affect fertility through both overall levels of use and mix of methods.

5.1. In developed countries, awareness of potential serious health effects influences the mix of methods by reducing use of those with the most severe effects (oral and injectable contraceptives and the IUD). Short-term side effects do not appear to have a significant influence on patterns of use.

5.2. The effect of these shifts away from more hazardous methods on fertility levels in developed countries is probably negligible: much of the shift has been toward an even more effective method--sterilization--and the use of abortion has been increasing in these countries.

5.3. In developing countries, knowledge of the serious health hazards of contraceptives has a much weaker effect on both overall use and mix of methods. On the other hand, fears about these effects do have a significant negative impact. These fears both prevent initial use of methods and intensify the impact of minor side effects on discontinuation of use.

5.4. The impact of such fears of contraceptive use on fertility levels varies from country to country and within countries, depending on the proportion not using contraception and not wishing to have more children. Diffusion of knowledge and experience through increased use of contraception in a society and through provision of information and supportive services by family planning programs can substantially reduce these fears. However, over the long term, this greater

knowledge will eventually have a negative effect on the use of those methods known to have serious health effects, as has occurred in developed countries.

NOTES

1. Abortion techniques, which are the subject of another paper, will not be included in this analysis (see David, in these volumes).
2. Since the prevalence of use of methods in three of these categories--postcoital douching, minipill oral contraceptives, and postcoital contraceptives--is extremely limited, these categories will not be discussed in detail in this paper.
3. In 1980, the author conducted a questionnaire of 99 professional staff members of the Population Council, the United Nations Fund for Population Activities, the Ford Foundation, and the United States Agency for International Development located in 46 developing countries. Respondents were asked to provide data on the prices charged to consumers for contraceptive products and services; these data were obtained directly from local pharmacies, physicians, and family planning service outlets. By June 1981, responses had been received from 29 respondents in 23 developing countries. After clarification of ambiguous responses by telephone and letter, these data were used as the basis for Tables 1-3 and Appendix Tables 1 and 2.
4. On the average, about 40 percent of the total monetary costs of contraception provided through public-sector channels in developing countries is borne by the developing country governments themselves, about 50 percent is borne by foreign aid from developed nations, and about 10 percent is borne by private charitable contributions, mainly from foundations located in the United States. These proportions differ widely from country to country, as do the proportions of total local governmental revenues devoted to public family planning programs (Office of Technology Assessment, in press).
5. Although survey data are not available, reports from those familiar with family planning programs suggest that the price of IUDs may have risen much more significantly during the last decade. Major new technical innovations in this method, adding significantly to its manufacturing costs, could help to explain these cost increases; however, market factors appear responsible for a major share.
6. These problems have been reviewed recently in depth at an International Workshop on Cost Effectiveness Analysis and Cost Benefit Analysis in Family Planning Programs held on August 17-20, 1981 at The Johns Hopkins University. The reader is referred to papers prepared for presentation at this workshop, as well as to Kelly, 1971; Simmons, 1971, 1973; Agarwala, 1971; Correa et al., 1972; Lawrence et al., 1973; Reardon et al., 1974; Trussell, 1974; Haran, 1979; Chamie and Henshaw, 1981; Nortman, 1981.

7. It should be noted that the yearly average costs described include few if any expenditures for public information, education, or promotional activities. In contrast to public family planning programs, private sources avoid direct public contact and instead concentrate their marketing and advertising on the medical professionals, pharmacists, and others involved in drug distribution (Farley and Tokarski, 1975; Black, 1973; Business International, 1978).
8. In seven countries, this figure is as low as 50-65 percent for some brands of pills; in a few it is much higher, rising to as much as 97 percent in Nigeria. Although there has been some study of the cause for these variations in range, much more detailed empirical analysis of the pertinent market conditions is needed to explain them.
9. More than one-half hour of travel time is required for 26 percent of rural Thai users, 46 percent of rural Indian users, 27 percent of rural Panamanian users, 34 percent of rural users in Sao Paulo State, Brazil, and 44 percent of rural Turkish users (Rodriguez, 1977; Foreit and Gorosh, 1978; Nakamura and Fonesca, 1979).
10. Although monetary costs associated with private-sector sources of supply may affect contraceptive decision making for some of the poorest segments of the population in some developed countries, this impact is cushioned by social welfare programs in most instances.
11. In addition to direct deleterious health effects, adverse effects of pregnancies arising as a consequence of a method's incomplete effectiveness can also be considered (see Hatcher et al., 1980; Office of Technology Assessment, 1982, Bruce and Schearer, 1979). However, the present discussion will not address this risk.
12. Their short-term effects have been extensively studied, revealing an increase in the incidence of menstrual bleeding irregularities, but decreases in other minor side effects (Sanhueza et al., 1979; Talwar and Berger, 1977; Talwar et al., 1977; Brat, 1976; Rudel et al., 1978; Ingemanson et al., 1976).
13. There is inconclusive evidence, however, that birth abnormalities may be increased if conception occurs during or within the first few weeks after cessation of use of oral contraceptives (Kasan and Andrews, 1980; Harlap et al., 1979).
14. Although it is difficult to demonstrate conclusively that this shift results from serious health costs and the public's perception of them, the body of evidence cited above indicates that health costs play a major role. It should also be noted, however, that numerous other factors enter into personal assessments of the risks and benefits of contraceptive use in a highly complex, individualized manner, and that, for many individuals, some of these other factors appear to have greater weight than health risks (Kee and Darroch, 1981; Hollerbach, 1980; Miller, 1979; Folch-Lyon et al., 1981).

APPENDIX TABLE 1 Retail Prices of Contraceptive Products from Private-Sector Outlets (1980 U.S. dollars)

Country	Average Monthly per Capita Income	Oral Contraceptives (per cycle)	IUD (device only)	Condom (per piece)	Diaphragm (device only)	Spermicides (per application[a])	Injectables (per month's supply[b])
Bangladesh	7.75	1.28	--	--	--	--	--
Brazil	123.50	0.56-0.70	35.00-70.00	.14-.33	14.70-17.50	.07-.17	1.44-2.00
Colombia	64.50	0.56-1.04	2.25-22.50	.23	--	--	0.72
Dominican Rep.	74.75	1.65-3.45	8.00-12.50	.25-.33	6.50-15.00	.14-.33	1.63-2.95
Egypt	40.41	0.46	6.89	.19	--	.04-.09	--
El Salvador	51.25	1.20-6.00	3.00-10.00	--	2.00-10.00	--	1.20-9.20
Guatemala	72.41	2.25	15.00	.33	--	.06-.22	1.25-1.58
Indonesia	26.66	1.13-1.62	12.80-15.00	.08-.16	--	--	1.17
Jamaica	130.00	1.04-2.44	--	--	2.23	.22	4.00
Jordan	--	1.19-1.27	10.32-17.20	.23-.46	12.04	.06-.46	2.86
Kenya	25.75	3.00-4.08	12.01-17.88	.31-.40	13.73-14.30	.16-.51	3.79
Korea, South	79.16	0.78-1.26	0.78-1.26	08-.13	--	.12-.15	--
Madagascar	18.20	1.74-2.32	--	.48	--	.23	2.59-3.04
Mexico	96.66	0.41	--	.16	--	.08-.13	--
Morocco	47.50	2.50	8.00-12.00	.17	--	--	--
Nepal	8.83	0.58-1.12	--	--	--	--	--
Nigeria	33.25	6.98	9.80-23.28	.81	12.05-23.28	.48	12.61
Panama	104.16	1.98	10.00	.25	3.30-11.94	.47-.49	6.00
Philippines	38.25	0.42-2.00	13.60	.07-.30	--	.15-.34	1.56
Thailand	34.33	0.50-2.00	--	--	--	.05-.10	--
Zaire	12.33	3.55	3.55-53.25	.18-.36	--	.61	2.96
Mean, all countries	54.48	1.96	18.38	.27	3.93	.24	2.93

Note: Excludes publicly subsidized products. Prices vary by brand of product and type of outlet.

[a]Defined as one foaming tablet or liquefying suppository, 6.4 g. of contraceptive jelly or cream, or 1.3 g. of contraceptive foam.
[b]One month's supply is calculated on the basis of three months' effective action.

Source: The study upon which this table is based is described in Note 3.

APPENDIX TABLE 2 Prices Charged for Contraceptive Services by Private Physicians, Clinics, and Hospitals (1980 U.S. dollars)

Country	IUD		Diaphragm			
	Insertion	Follow-up Visit	Initial Fitting	Follow-up Visit	Female Sterilization	Vasectomy
Bangladesh	--	--	--	--	35.50-56.80	7.10-21.30
Brazil	50.00-500.00[a]	--	52.40	17.50	122.50-2,000.00	262.50-700.00
Colombia	6.75-22.50	6.75-22.50	--	--	112.50-225.00	67.50-180.00
Dominican Rep.	30.00-60.00	10.00	15.00-20.00	10.00	100.00-300.00	200.00-300.00
Egypt	14.50-72.50[a]		--	--	73.00-218.00	145.00-218.00
El Salvador	20.00-40.00	10.00	10.00-14.00	10.00	184.00-280.00	120.00-160.00
Guatemala	10.00-24.00	10.00	--	--	150.00-200.00	100.00
Indonesia	12.00	4.80	--	--	120.00	24.30
Jamaica	11.60-37.30	8.70	5.80-21.00	--	174.00-203.00	174.00
Jordan	51.60-130.20	6.88-10.32	17.20	6.88	120.40-688.00	258.00-344.00
Kenya	21.45	10.72-14.30	21.45	10.72-14.30	--	--
Korea, South	19.20-27.20	1.60-3.20	--	--	47.25-94.50	47.25-94.50
Morocco	12.13	2.91	--	--	--	--
Nigeria	48.50	--	29.10	--	--	--
Panama	25.00[a]	--	--	--	200.00-400.00	100.00-250.00
Philippines	--	5.44	--	--	--	--
Thailand	25.00	--	--	--	60.00-250.00	30.00-150.00
Zaire	35.50	28.40	--	--	88.75	--
Mean, all countries	30.79	9.87	23.31	11.38	239.71	163.53

Note: Data provided only for products not subsidized by publicly funded commercial retail sales programs. Prices vary depending upon brand of product and type of outlet.

[a]Including follow-up.

Source: The study upon which this table is based is described in Note 3.

15. The strength of placebo effects observed for contraceptives and the difficulty of disentangling both the objective and perceived threat of serious health hazards from the occurrence of minor side effects suggests that minor side effects can have some impact on use. When anxiety about serious health effects is high, minor side effects can trigger a decision to discontinue use or avoid a particular method.
16. In Thailand, for example, although 47 percent of the married, reproductive-age women are not using contraception, only about one third of these are sexually active, fecund, and want no more children. Of this group, those who directly state they use no method because of fear of side effects amount to 9 percent of the overall reproductive-age, married population. Assuming that 10 percentage points in contraceptive practice results in roughly one less live birth per women on the average, fears about the health effects of contraception in Thailand increase the total fertility rate by at least one (Morris et al., 1981).

BIBLIOGRAPHY

Agarwala, S. (1971) The measurement of costs and benefits of different methods of family planning. Pp. 41-51 in Aspects of Population Policy in India. New Delhi: Council for Social Development.

Alexander, N., and T. Clarkson (1978) Vasectomy increases the severity of diet-induced atherosclerosis. Macaca Fascicularis Science 201:538-541.

Alexander, N., B. Wilson, and G. Patterson (1974) Vasectomy: Immunological effects on Rhesus monkeys and men. Fertility and Sterility 25:149-156.

Altman, D., and P. Piotrow (1980) Social marketing--does it work? Population Reports, Series J:393-436.

Anderson, J., and L. Morris (1981) Fertility differences and the need for family planning services in five Latin American countries. International Family Planning Perspectives 7:16-21.

Andolsek, L. (1975) The Ljublijana IUD experience: Ten years. Pp. 205-216 in F. Hefnawi and S. Segal, eds., Analysis of Intrauterine Contraception. New York: North Holland/American Elsevier.

Ansbacher, R., B. Williams, and D. Mumford (1975) Vas ligation: Sperm antibodies. Pp. 189-195 in J. J. Sciarra, C. Markland, and J. J. Speidel, eds., Control of Male Fertility. New York: Harper and Row.

Atkinson, L., R. Castadot, A. Cuadros, and A. Rosenfield (1974) Oral contraceptives: Considerations of safety in non-clinical distribution. Studies in Family Planning 5:242-249.

Aved, B. (1981) Trends in contraceptive method of use by California family planning clinic clients aged 10-55, 1976-1979. American Journal of Public Health 71:1162-1164.

Badarocco, M., M. Vessey, and P. Wiggins (1973) The effect of the statement by the Committee on Safety of Drugs Concerning Oral Contraceptives Containing Oestrogens on the contraceptive practices of women attending two family planning clinics. Journal of Obstetrics and Gynecology of the British Commonwealth 80:353-356.

Badham, D. (1978) Quantities and Dollar Values of Contraceptives Purchased by WHO, 1976-78. Personal communication, March 28.

Bailey, J., and J. Correa (1975) Evaluation of the Profamilia rural family planning program. Studies in Family Planning 6:148-155.

Baldwin, B. (1978) The McCormick family planning program in Chiang Mai, Thailand. Studies in Family Planning 9:300-313.

Belsky, R. (1975) Vaginal contraceptives--a time for reappraisal? Population Reports, Series H:37-75.

Berendes, H., and R. Crozier (1975) Vasectomy research program of the Center for Population Research. Pp. 164-168 in J. J. Sciarra, C. Markland, and J. J. Speidel, eds., Control of Male Fertility. New York: Harper and Row.

Berger, G., L. Keith, and W. Moss (1975) Prevalence of gonorrhea among women using various methods of contraception. British Journal of Venereal Diseases 51:307.

Black, T. (1973) Rationale for the involvement of private sector marketing institutions in family planning in Africa. Studies in Family Planning 4:25-32.

Blake, J. (1977) The pill and the rising costs of fertility control. Social Biology 24:267-280.

Blumenfeld, S. (1981) Cost Analysis of the Danfa (Ghana) Project Family Planning Component. Paper prepared for International Workshop on Cost-Effectiveness Analysis and Cost-Benefit Analysis in Family Planning Programs, The John Hopkins University, Baltimore, Md.

Bongaarts, J. (1978) A framework for analyzing the proximate determinants of fertility. Population and Development Review 4:105-132.

Bongaarts, J., and S. Kirmeyer (1980) Estimating the Impact of Contraceptive Prevalence on Fertility, Aggregate and Age-Specific Versions of a Model. Paper presented at the IUSSP Seminar on Use of Surveys for Analysis of Family Planning Programmes, Bogota, Colombia.

Boon, M., R. Kirk, and G. de Graaff (1981) Psammoma bodies and some opportunistic infections detected in cervical smears of women fitted with an IUD. Contraceptive Delivery Systems 2:231-236.

Bordes, A., J. Allman, J. Revson, and A. Verly (1981) Household Distribution of Contraceptives in Rural Haiti: The Results and Costs of the Division of Family Hygiene's Experimental Project. Paper prepared for the International Workshop on Cost-Effectiveness Analysis and Cost-Benefit Analysis in Family Planning Programs, The John Hopkins University, Baltimore, Md.

Boston Collaborative Drug Surveillance Program (1973) Contraceptives and venous thromboembolic disease, surgically confirmed gallbladder disease and breast tumors. Lancet 1:1399-1404.

Bounds, W., M. Vessey, and P. Wiggins (1979) A randomized double-blind trial of two low dose combined oral contraceptives. British Journal of Obstetrics and Gynecology 86:325-329.

Bourdais, J. P., P. Delavierre, O. Bourdais-Varenne, and J. Hureau (1977) Headache and the O.C. Seminaires Hospitaliare de Paris 53:425-432.

Brackett, J. (1980) The Role of Family Planning Availability and Accessibility in Family Planning Use in Developing Countries. Paper presented at World Fertility Survey Conference, London.

Brat, T. (1976) Four years overall experience with a new low estrogen low progestin O.C. Acta Obstetrica Gynecologica Scandanavia Supplement 54:67-70.

Briggs, M. H. (1977) Combined oral contraceptives. Pp. 253-282 in E. Dizfalusy, ed., Regulation of Human Fertility. Copenhagen: Scriptor.

Bruce, J., and S. B. Schearer (1979) Contraceptives and Common Sense: Conventional Methods Reconsidered. New York: Population Council.

Burkman, R., and the Women's Health Study (1980) Association between intrauterine device and pelvic inflammatory disease. Obstetrics and Gynecology 57:269-276.

Business International (1978) International Factfinding Study: Private Sector Marketing of Contraceptives in Eight Developing Countries. Study prepared for the Population Council. New York: Business International.

Calderone, M. (1970) Editor's note on coitus interruptus. Pp. 437-438 in M. S. Calderone, ed., Manual of Family Planning and Contraceptive Practice. Baltimore, Md.: The Williams and Wilkins Co.

Casagrande, J. T., E. W. Louie, M. C. Pike, and S. Roy (1979) Incessant ovulation and ovarian cancer. Lancet 11:170-173.

Cates, W., Jr., H. Ory, R. Rochat, and C. Tyler (1976) The intrauterine device and deaths from spontaneous abortion. New England Journal of Medicine 295:1155-1159.

Chamie, M., and S. Henshaw (1981) The costs and benefits of government expenditures for family planning programs. Family Planning Perspectives 13:117-124.

Chen, K. M. (1981) The Cost-Effectiveness of a Community-Based Social Marketing Project in Thailand: The Family Planning Health and Hygiene Project. Paper prepared for the International Workshop on Cost-Effectiveness Analysis and Cost-Benefit Analysis in Family Planning Programs, The John Hopkins University, Baltimore, Md.

Chen, L., M. Gesche, S. Ahmed, A. Chowdhury, and W. Mosley (1979) Maternal mortality in rural Bangladesh. Studies in Family Planning 5:334-341.

Chvapil, M., C. Eskelson, V. Stiffel, J. Owen, and W. Droegemueller (1980) Studies on nonoxynol-9. II. Intravaginal absorption, distribution metabolism, and excretion in rats. Contraception 22:325-339.

Clarkson, T., and N. Alexander (1979) Effect of long-term vasectomy on the occurrence and extent of arteriosclerosis in rhesus monkeys fed monkey chow. Federation Proceedings 38(part 2):1346.

Coleman, S., and P. Piotrow (1979) Spermicides--Simplicity and safety are major assets. Population Reports, Series H:77-120.

Colen, G. (1978) Article in The Washington Post, January 25.

Committee on Family Planning (1973) Taiwan Population Studies Summaries. Study No. 55 and unnumbered study, "Free Offer." Taichung, Taiwan: Taiwan Provincial Department of Health.

Connell, E. (1979) Vaginal contraception: Current FDA status. Pp. 221-223 in G. Zatuchni, A. Sobrero, J. Speidel, and J. Sciarra, eds., Vaginal Contraception, New Developments. New York: Harper and Row.

Contraceptive Technology Update (1981a) Actinomyces in IUD users: Management, prevention sparks controversy. Contraceptive Technology Update 2:29-32.

Contraceptive Technology Update (1981b) Updated contraindications to combined Ocs. Contraceptive Technology Update 2:39.

Cook, R., J. Strand, and S. B. Schearer (1981) Contraceptives and Drug Regulation: An International Perspective. PIACT Paper, Program for the Introduction and Adaptation of Contraceptive Technology, Seattle, Wash.

Correa, H. (1975) Population, Health, Nutrition and Development. Lexington, Mass: Lexington Books.

Correa, H., V. Parrish, and J. Beasley (1972) A three-year longitudinal evaluation of the costs of a family planning program. American Journal of Public Health 62:1647-1657.

Coulam, C. B., J. F. Annegers, C. F. Abboud, E. R. Laws, and L. T. Kurland (1979) Pituitary adenoma and oral contraceptives: A case-control study. Fertility and Sterility 31:25-28.

Cross River Study, Ministry of Health (1981) The Calabar Rural Maternal and Child Health Family Planning Project 1975-1980 Final Report. Calabar, Nigeria: Cross River State Ministry of Health.

Cullberg, G., and B. Larsson (1979) Some adverse effects of copper IUDs. Acta Obstetrica Gynecologica Scandanavia 58:87.

Cutler, J. (1975) Prevention of V.D.--Returning to the birth control devices of the past. Medical Opinion October:4-10.

Darabi, K., K. Roy, and R. Richart (1978) Collaborative study on hysteroscopic sterilization procedures: Final report. Pp. 81-101 in J. Sciarra, G. Zatuchni, and J. Speidel, eds., Risks, Benefits, and Controversies in Fertility Control. New York: Harper and Row.

Davis, J. (1980) Risks and benefits of vasectomy. Pp. 260-266 in L. Koth, ed., The Safety of Fertility Control. New York: Springer Publishing.

Davis, K., and J. Blake (1956) Social structure and fertility: An analytic framework. Economic Development and Cultural Change 4:211.

Dreishpoon, I. H. (1975) Complications of pregnancy with an intrauterine contraceptive device in Situ. American Journal of Obstetrics and Gynecology 121:412-413.

Duguid, H., D. Parratt, and R. Traynor (1980) Actinomyces-like organisms in cervical smears from women using intrauterine contraceptive devices. British Medical Journal 281:534.

Dunnell, I. K. (1979) Family Formation, 1976 Office of Population Censuses and Surveys, Social Survey Division, Her Majesty's Stationery Office (HMSO), London.

Dusitsin, N., S. Varakamin, P. Ningsanen, S. Chalapati, and B. Boonsiri (1980) Postpartum tubal ligation by nurse-midwives and doctors in Thailand. Lancet 1:638-639.

Edelman, D., G. Berger, and L. Keith (1979) Intrauterine Devices and Their Complications. Boston: G. Kitall.

Enke, S., and B. Hickman (1976) Offering bonuses to reduce fertility. Pp. 191-210 in M. Keely, ed., Population, Public Policy and Economic Development. New York: Praeger.

Eschenbach, D. A., J. P. Harnisch, and K. K. Holmes (1977) Pathogenesis of acute pelvic inflammatory disease: Role of contraception and other risk factors. American Journal of Obstetrics and Gynecology 128:838-850.

Falkner, W., and Ory, H. (1976) Intrauterine devices and acute pelvic inflammatory disease. Journal of the American Medical Association 235:1851-1853.

Family Planning Perspectives (1980a) 1.1 million sterilizations were performed in 1978; Six in ten were to women. Family Planning Perspectives 12:113.

Family Planning Perspectives (1980b) Bacterial infection from actinomyces, though rare, is found to be a problem among some IUD users. Family Planning Perspectives 12:306-307.

Farley, J., and S. Tokarski (1975) Legal restrictions on the distribution of contraceptives in the developing nations: Some suggestions for determining priorities and estimating impact of change. Columbia Human Rights Law Review 6:415-446.

Fathalla, M. (1977) Safety of the Pill. Paper presented at 2nd Regional Conference on Village and Household Availability of Contraceptives, Tunis, Tunisia.

Folch-Lyon, E., L. de la Macorra, and S. B. Schearer (1981) Focus group and survey research on family planning in Mexico. Studies in Family Planning 12:409-432.

Food and Drug Administration, Department of Health and Human Services (1980) Part V. Vaginal contraceptive drug products for over the counter human use; establishment of a monograph; proposed rulemaking. Federal Register 45(242):82014-82049.

Foreit, J., and M. Gorosh (1978) Community-based and commercial contraceptives distribution: An inventory and appraisal. Population Reports, Series J:1-29.

Fraser, I., and E. Weisberg (1981) A comprehensive review of injectable contraception with special emphasis on depot medroxyprogesterone acetate. The Medical Journal of Australia, Special Supplement, Vol. 1, No. 1.

Gillespie, D., M. Mamlouk, and K. M. Chen (1981) Cost-Effectiveness of Family Planning: Overview of the Literature. Working Draft. Paper prepared for International Workshop on Cost-Effectiveness Analysis and Cost Benefit Analysis in Family Planning Programs, The John Hopkins University, Baltimore, Md.

Goldacre, M., M. Vessey, J. Clarke, and M. Heasman (1978) Record linkage study of morbidity following vasectomy. Pp 567-579 in F. Lepou and H. Crozier, eds., Vasectomy: Immunologic and Pathophysiologic Effects in Animals and Man. New York: Academic Press.

Goldzieher, J., L. Moses, E. Averkin, C. Scheel, and B. Tabler (1971) A placebo controlled doubleblind crossover investigation of side effects attributed to oral contraceptives. Fertility and Sterility 22:609-623.

Gonzalez, E. (1981) Calcium deposits on IUDs and infection. Journal of the American Medical Association 245:1625.

Gray, R. (1976) Pelvic inflammatory disease and intrauterine contraceptive devices. Lancet 2:521.

Gray, R. (1979) Norethisterone oenanthate as an injectable contraceptive. British Medical Journal 1:343.

Gray, R. (1980) Patterns of bleeding associated with the use of hormonal contraceptives. Pp. 14-19 in E. Diczfalusy, I. Fraser, and F. Webb, eds., Endometrial Bleeding and Steroidal Contraception. England: Pitman Press.

Greenspan, A., R. Hatcher, M. Moore, M. Rosenberg, and H. Ory (1980) The association of depomedroxyprogesterone acetate and breast cancer. Contraception 21:563:569.

Guillebaud, J. (1979) The safety of intrauterine devices. Studies in Family Planning 10:174-177.

Guillebaud, J., J. Bonnar, J. Morehead, and A. Mathews (1976) Menstrual blood loss with intrauterine devices. Lancet 1:21-24.

Haran, E. (1979) An optimization model for the allocation of resources in family planning programs. Socioeconomic Planning Sciences 13:13-20.

Harlap, S., P. Shiono, F. Pellegrin, M. Golbus, R. Bachman, J. Mann, L. Schmidt, and J. Lewis (1979) Chromosome abnormalities in oral contraceptive breakthrough pregnancies. Lancet 8130:1342-1343.

Harris, I. R. W. C., L. A. Brinton, R. H. Cowdell, D. C. G. Skegg, P. G. Smith, M. P. Vessey, and R. Doll (1980) Characteristics of women with dysplasia or carcinoma in situ of the cervix uteri. British Journal of Cancer 42:359.

Hatcher, R., G. Stewart, F. Steward, R. Guest, D. Schwartz, and S. Jones (1980) Contraceptive Technology: 1980-1981. New York: Irvington Publishers.

Hearings Before the Select Committee on Population (1978) The Depo-Provera Debate. U.S. House of Representatives. Washington, D.C.: U.S. Government Printing Office.

Hollerbach, P. (1980) Factors That Determine the Appropriateness of New Technologies to Consumer Needs. Paper prepared for the Office of Technology Assessment of the U.S. Congress. Population Council, New York.

Huggins, G. R. (1977) Contraceptive use and subsequent fertility. Fertility and Sterility 28:603-612.

Hull, M., D. Brownham, P. Savage, and J. Jackson (1981) Normal fertility in women with post-pill amenorrhea. Lancet 8234:1329-1332.

Hunton, M. (1976) A retrospective survey of over 1,000 patients on O.C. in a group practice. Journal of the Royal College of General Practitioners 26:538-546.

Ingemanson, C. A., M. Jagerhorn, J. Zizala, B. Nilsson, and G. Zader (1976) Preliminary results from a Swedish multicenter trial of a new low dose comined O.C. Acta Obstetrica Gynecologica Scandanavia Supplement 54:71-75.

Inman, W. H. W., M. P. Vessey, B. Westerholm, and A. Engelund (1970) Thromboembolic disease and the steroid content of oral contraceptives. A report to the Committee on Safety of Drugs. British Medical Journal 2:203-209.

International Planned Parenthood Federation Medical Bulletin (1980) IPPF International Medical Advisory Panel Meeting - October 1980; Injectable Contraception. IPPF Medical Bulletin 14:1-3.

Jennings, J. (1974) Report of Safety and Efficacy of the Dalkon Shield and other IUDs. Mimeo prepared by the ad hoc Obstetric-Gynecology Advisory Committee (to the U.S. Food and Drug Administration).

Jick, H., A. Walker, K. Rothman, J. Hunter, L. Holmes, R. Watkins, D. D'Ewart, A. Danford, and S. Madsen (1981a) Vaginal spermicides and congenital disorders. Journal of the American Medical Association 245:1329-1332.

Jick, H., A. Walker, R. Watkins, D. D'Ewart, J. Hunter, A. Danford, S. Madsen, B. Dinan, and K. Rothman (1981b) Oral contraceptives and breast cancer. American Journal of Epidemiology 112:577.

Jones, E., J. Beniger, and C. Westoff (1980) Pill and IUD discontinuation in the United States, 1970-1975: The influence of the media. Family Planning Perspectives 12:293-300.

Jongbloet, P. (1971) Month of Birth and Gametopathy. Pp. 62-79 in Mental and Physical Handicaps in Connection with Overripeness Ovopathy. Leiden: H.E. Stenfert Kroese, N.V.

Kahn, A., and D. Huber (1978) Safety of Contraceptive Practice as Compared to Non-Contraception. FRP Technical Report No. 7. Bangladesh Fertility Research Programme, Dacca, Bangladesh.

Kahn, H., and C. Tyler (1975a) IUD related hospitalizations, United States and Puerto Rico, 1973. Journal of the American Medical Association 234:53-56.

Kahn, H., and C. Tyler (1975b) IUD insertion practices in the United States and Puerto Rico. Family Planning Perspectives 7:209-212.

Kahn, H., and C. Tyler (1975c) Mortality associated with the use of IUDs. Journal of the American Medical Association 234:57-59.

Kasan, P., and J. Andrews (1980) Oral contraception and congenital abnormalities. British Journal of Obstetrics and Gynecology 87:548.

Kaufman, D., S. Shapiro, D. Slone, L. Rosenberg, O. Meittinen, P. Stolley, R. Knapp, T. Leavitt, Jr., W. Watring, N. Rosenchein, J. Lewis, Jr., D. Schottenfeld, and R. Engle (1980a) Decreased risk of endometrial cancer among oral contraceptive users. New England Journal of Medicine 303:1045-1047.

Kaufman, D., S. Shapiro, L. Rosenberg, R. Monson, O. Mettinen, P. Stolley, and D. Sloane (1980b) Intrauterine contraceptive device use and pelvic inflammatory disease. American Journal of Obstetrics and Gynecology 136:159-162.

Kay, C. R. (1980) The happiness pill? Journal of the Royal College of General Practitioners 30:8-19.

Kee, P. K., and R. Darroch (1981) Perception of methods of contraception: A semantic differential study. Journal of Biosocial Sciences 13:209-218.

Kelly, W. (1971) A Cost-Effectiveness Study of Clinical Methods of Birth Control: With Special Reference to Puerto Rico. New York: Praeger.

Kendall, M. (1979) The world fertility survey: Current status and findings. Population Reports, Series M:73-104.

Kestelman, P., and R. Kleinman, eds. (1976) Directory of Contraceptives. London: International Planned Parenthood Federation.

Kreager, P. (1977) Family Planning Drop-Outs Reconsidered. London: International Planned Parenthood Federation.

Krueger, D., S. Ellenberg, S. Bloom, B. Calkins, C. Maliza, D. Nolan, R. Phillips, J. C. Rios, I. Rosin, R. B. Shekelle, K. Spector, V. Stadel, P. Stolley, and M. Terris (1980) Fatal myocardial infarction and the role of oral contraceptives. American Journal of Epidemiology 111:655-674.

Lalu, P. (1957) Une glossite. Maroc Medical 36:487.

Lawrence, C., A. Mundigo, and C. Revelle (1973) Analysis of allocation of resources in family planning programs. Management Science 20:520-531.

Ledger, W. (1974) Relationship of pelvic infection to various types of contraception. Clinical Obstetrics and Gynecology 17:79-81.

Leridon, H. (1981) Fertility and contraception in 12 developed countries. International Family Planning Perspectives 7:70-78.

Liedholm P., G. Rybo, N. O. Sjoberg, and L. Solvell (1975) Copper IUD influence on menstrual blood loss and iron deficiency. Contraception 12:317.

Lippes, J. (1975) Infection and the IUD: A Preliminary Report. Contraception 12:103.

Luukkainen, T., N. Nielson, K. G. Nygren, T. Pyorala, and A. Kosenen (1979) Randomized comparison of clinical performance of two copper releasing IUDs, Nova-T and Copper-T 200, in Denmark, Finland, and Sweden. Contraception 19:1-9.

Mann, J. (1978) Oral contraception and myocardial infarction in younger women: Data from countries other than the United States. In J. Sciarra, G. Zatuchni, and T. Speidel, eds., Risks, Benefits, and Controversies in Fertility Control. New York: Harper and Row.

Mann, J., and W. Inman (1975) Oral contraceptives and death from myocardial infarction. British Medical Journal 2:245-248.

Mann, J. I., R. Doll, M. Thorogood, M. P. Vessey, and W. E. Waters (1976) Risk factors for myocardial infarction in young women. British Journal of Preventive and Social Medicine 30:94-100.

Masters, W., and V. Johnson (1964) Sexual response: Anatomy and physiology. Pp. 460-473 in C. W. Lloyd, ed., Human Reproduction and Sexual Behavior. Philadelphia: Lea and Febiger.

Mathews, J., D. Shegg, M. Vessey, M. Konice, E. Holborow, and J. Guillebaud (1976) Weak autoantibody reactions to antigens other than sperm after vasectomy. British Medical Journal 2:1359-1360.

Mauldin, W. P. (1979) Experience with contraceptive methods in developing countries. Pp. 50-104 in Contraception: Science, Technology, and Application. Washington, D.C.: National Academy of Sciences.

McCann, M. (1978) Laparoscopy versus minilaparotomy. Pp. 68-80 in J. Sciarra, G. Zatuchni, and J. Speidel, eds., Risks, Benefits, and Controversies in Fertility Control. New York: Harper and Row.

McCann, M., and L. Cole (1980) Laparoscopy and minilaparotomy: Two major advances in female sterilization. Studies in Family Planning 11:119-127.

McGowan, L., L. Parent, W. Lednar, and H. Norris (1979) The woman at risk for developing ovarian cancer. Gynecological Oncology 7:325-344.

Meade, T., G. Greenberg, and S. Thompson (1980) Progestogens and cardiovascular reactions associated with oral contraceptives and a comparison of the safety of 50 and 30 μg oestrogen preparations. British Medical Journal 280:1157-1161.

Menken, J., J. Trussell, K. Ford, and W. Pratt (1979) Experience with contraceptive methods in developed countries. Pp. 24-44 in Contraception: Science, Technology, and Application. Washington, D.C.: National Academy of Sciences.

Mertaugh, M. (1980) Factors Influencing the Demand for Children and Their Relationships to Contraceptive Use. Paper prepared for the Office of Technology Assessment of the U.S. Congress. Population Council, New York.

Miller, W. (1979) Psychosocial aspects of contraception. In Contraception: Science, Technology, and Application. Washington, D.C.: National Academy of Sciences.

Mishell, D., Jr. (1975) The clinic factor in evaluating IUDs. Pp. 27-36 in F. Hefnawi and S. Segal, eds., Analysis of Intrauterine Contraception. North Holland, The Netherlands: American Elsevier.

Morris, L., G. Lewis, D. Powell, J. Anderson, A. Way, J. Cushing, and G. Lawless (1981) Contraceptive prevalence surveys: A new source of family planning data. Population Reports, Series M:161-200.

Mumford, S., P. Bhiwandiwala, and F. Chi (1980) Laparoscopic and minilaparotomy female sterilization compared in 15,167 cases. Lancet 2:1066.

Nakamura, M., and J. Fonesca (1979) Sao Paulo State Contraceptive Prevalence Survey. Final Report. Pontifica Universidade Catolica de Campanas. Campinas, Brazil.

Nash, H. (1975) Depo-provera: A review. Contraception 12:377-393.

Newhouse, M., R. Pearson, J. Fullerton, E. Boeson, and H. Shannon (1977) A case control study of carcinoma of the ovary. British Journal of Preventive and Social Medicine 31:148-153.

Newman, D. (1980) Personal communication.

Nissen, E., S. Nissen, and D. R. Kent (1979a) Liver neoplasia and oral contraceptives. Pp. 176-184 in J. Sciarra, G. Zatuchni, and J. Speidel, eds., Risks, Benefits, and Controversies in Fertility Control. New York: Harper and Row.

Nissen, E., D. Kent, and S. Nissen (1979b) Role of oral contraceptive agents in the pathogenesis of liver tumors. Journal of Toxicological and Environmental Health 5:231-254.

Noble, A. (1978) Female sterilization: Long term effects. Pp. 102-107 in J. Sciarra, G. Zatuchni, and J. Speidel, eds., Risks, Benefits, and Controversies in Fertility Control. New York: Harper and Row.

Nordberg, O., and L. Atkinson (1979) Evaluation of the Safety of Modern Contraceptives in Developing Countries. PIACT Paper, Seattle, Wash.

Nortman, D. (1981) Measurement of Family Planning Program Inputs in Different Program Structures. Center for Policy Studies Working Paper. Population Council, New York.

Nortman, D., and E. Hofstatter (1980) Population and Family Planning Programs, 10th ed. New York: Population Council.

O'Ferrall, G. (1973) Effect of varying the time of artificial insemination in relation to ovulation or conception and prenatal losses in the rabbit. Biology of Reproduction 9:338-342.

Office of Technology Assessment (1982) World Population and Fertility Planning Technologies: The Next 20 Years. Washington, D.C.: U.S. Government Printing Office.

Ojeda, G., J. Anedeo, and A. Monroy (1981) Cost Per Couple-Year-of-Protection: The Case of Profamilia, 1977-1980. Paper prepared for Internatonal Workshop on Cost-Effectiveness Analysis and Cost-Benefit Analysis in Family Planning Programs, The Johns Hopkins University, Baltimore, Md.

Orgebin-Crist, M. (1973) Sperm age: Effects on zygote development. Pp. 85-93 in W. A. Uricchio and M. K. Williams, eds., Natural Family Planning. Washington, D.C.: The Human Life Foundation.

Ory, H. (1977) Association between oral contraceptives and myocardial infarction: A review. Journal of the American Medical Association 237:2619-2622.

Ory, H. (1979) The risks and benefits of fertility control. Pp. 110-121 in Contraception: Science, Technology and Application. Washington, D.C.: National Academy of Sciences.

Ory, H. (1981) Ectopic pregnancy and intrauterine contraceptive devices: New perspectives. Obstetrics and Gynecology 57:137-144.

Ory, H., and the Boston Collaborative Drug Surveillance Program (1974) Functional ovarian cysts and oral contraceptives: Negative association confirmed surgically. Journal of the American Medical Association 228:68.

Ory, H., P. Cole, B. MacMahon, and R. Hoover (1976) Oral contraceptives and reduced risk of benign breast diseases. New England Journal of Medicine 249:419-422.

Osser, S., B. Gullberg, P. Liedholm, and N. Sjoberg (1980) Risk of pelvic inflammatory disease among intrauterine-device users irrespective of previous pregnancy. Lancet 1:386-388.

Pardthaison, T., R. Gray, and E. McDaniel (1980) Return of fertility after discontinuation of depot medroxyprogesterone acetate and intrauterine devices in Northern Thailand. Lancet 1:509-511.

Parveen, L., A. Chowdhury, and Z. Choudhury (1977) Injectable contraception (medroxyprogesterone acetate) in rural Bangladesh. Lancet 5:946-948.

Patanelli, D. (1981) Personal communication based on data obtained in studies funded by the National Institute for Child Health and Human Development.

Paulson, N., and M. Kao (1977) Cervical perforation by the copper-7 intrauterine device. Obstetrics and Gynecology 50:621.

Phillips, J. (1980) Complications in laparoscopy. Pp. 247-259 in L. Koth, ed., The Safety of Fertility Control. New York: Springer Publishing.

Physicians' Desk Reference (1981) Oradell, N.J.: Medical Economics Company.

Pichai, B., R. Banterng, D. Visit, K. Bhankasame, T. Wiset, S. Yod, W. Somsak, and D. Nikorn (1981) Comparison of vasectomy performed by medical students and surgeons in Thailand. Studies in Family Planning 12:316-317.

Pike, M., B. Henderson, J. Casagrande, I. Rosario, and G. Grady (1981) Oral contraceptive use and early abortion as risk factors for breast cancer in young women. British Journal of Cancer 43:72-76.

Piotrow, P., and C. Lee (1974) Oral contraceptives: 50 million users. Population Reports, Series A:1-28.

Piotrow, P., W. Rinehart, and J. Schmidt (1979) IUDs--Update on safety, effectiveness, and research. Population Reports, Series B:49-100.

Population Council (1979) Five Intrauterine Devices for Public Programs. New York: Population Council.

Potts, M., T. Van der Vlugt, P. Piotrow, L. Gail, and S. Huber (1975) Advantages of orals outweigh disadvantages. Population Reports, Series A:29-52.

Potts, M., J. Speidel, and E. Kessel (1978) Relative risks of various means of fertility control when used in less developed countries. Pp. 28-51 in J. Sciarra, G. Zatuchni, and J. Speidel, eds., Risks, Benefits, and Controversies in Fertility Control. New York: Harper and Row.

Power, R. G. (1981) Personal communication.

Presser, H. (1970) Voluntary sterilization: A world view. Reports on Population/Family Planning 5:1-36.

Rahardgo, P., and T. Reese (1972) A cost-effectiveness analysis. Technical Report Series, Monograph No. 3. National Family Planning Coordinating Board, Jakarta, Indonesia.

Ramcharan, S., F. Pellegrin, and E. Hoag (1976) The occurrence and course of hypertensive disease in users and nonusers of oral contraceptive drugs. Pp. 1-15 in The Walnut Creek Study, Vol. II. U.S. Department of Health, Education, and Welfare Public No. (NIH) 76-563. Washington, D.C.: U.S. Department of Health Education, and Welfare.

Ramcharan, S., F. Pellegrin, R. Ray, and J. Hsu (1980) The Walnut Creek Contraceptive Drug Study, Vol. III. U.S. Department of Health, Education and Welfare Public No. (NIH) 76-563. Washington, D.C.: U.S. Department of Health, Education, and Welfare.

Ratnam, S., and R. Prasad (1979) Clinically important factors in safety and health hazards of fertility regulating agents in the developing world. Singapore Journal of Obstetrics and Gynecology 9:17-24.

Reardon, M., S. Deeds, N. Dresner, J. Diksa, and W. Robinson (1974) Real costs of delivering family planning services. American Journal of Public Health 64:860-868.

Reddy, P., and C. Murthy (1977) Social marketing of Nirodh: An interim assessment of an experiment. Population Centre Bangalore Newsletter 3:1-14.

Reinke, W. (1981) Cost-Effectiveness with Equity: A Review of Narangwal Project Experience. Paper prepared for the International Workshop on Cost-Effectiveness Analysis and Cost-Benefit Analysis in Family Planning Programs, The Johns Hopkins University, Baltimore, Md.

Report to USAID (1980) Report to USAID of the Ad Hoc Consultative Panel on Depot Medroxyprogesterone Acetate. Office of Population, U.S. Agency for International Development.

Rioux, J. (1980) Uterine bleeding following tubal occlusion in gynecology. Pp. 267-280 in L. Koth, ed., The Safety of Fertility Control. New York: Springer Publishing.

Robinson, W. (1979) The cost per unit of family planning services. Journal of Biosocial Science 11:93-103.

Rochat, R., H. Ory, and K. Schulz (1978) Methods for measuring safety and health hazards of presently available fertility regulating agents in the developing world. Singapore Journal of Obstetrics and Gynecology 9:1-16.

Rodriguez, G. (1977) Assessing the Availability of Fertility Regulation Methods: Report on a Methodological Study. WFS Scientific Reports No. 1. London: World Fertility Survey.

Rodriguez, G. (1978) Family planning availability and contraceptive practice. International Family Planning Perspectives and Digest 4:100-115.

Rooks, J., H. Ory, K. Ishak, L. Strauss, J. Greenspan, A. P. Hill, and C. W. Tyler (1979a) Epidemiology of hepatocellular ademona: The role of oral contraceptive use. Journal of the American Medical Association 242:644-648.

Rooks, J., H. Ory, K. Ishak, L. Strauss, J. Greenspan, A. P. Hill, and C. W. Tyler (1979b) Pp. 131-146 in Institut National de la Sante et de la Recherche Medicale, Conseil Superior de l'Information Sexuelle. Paris: INSERM.

Rothman, K., and C. Louk (1979) Oral contraceptives and birth defects. New England Journal of Medicine 299:522.

Royal College of General Practitioners (1974) Oral Contraceptives and Health. London: Pitman Medical.

Royal College of General Practitioners (1976) Oral contraception study: The outcome of pregnancy in former oral contraceptive users. British Journal of Obstetrics and Gynecology 83:608-616.

Royal College of General Practitioners (1978) Oral contraception study: Reduction in incidence of rheumatoid arthritis associated with oral contraceptives. Lancet 1:569-571.

Royal College of General Practitioners (1981a) Breast cancer and oral contraceptives: Findings in Royal College of General Practitioners' Study. British Medical Journal 282:2089-2093.

Royal College of General Practitioners (1981b) Oral contraceptive study: Further analysis of mortality in oral contraceptive users. Lancet 1:541-546.

Rudel, H., M. Maqueo, J. Calderone, and J. Manatou (1978) Safety and effectiveness of a new low dose oral contraceptive: A three-year study of 1,000 women. Journal of Reproductive Biology 21:79-88.

Ryden, G., L. Fahraeus, L. Molin, and K. Ahman (1979) Do contraceptives influence the incidence of acute pelvic inflammatory disease in women with gonorrhea? Contraception 20:149-157.

Sanhueza, H., I. Sivin, S. Kumar, M. Kessler, A. Carrasco, and J. Yee (1979) A randomized double blind study of two oral contraceptives. Contraception 20:29-48.

Schearer, S. B. (1977) The status of technology for contraception. Pp. 581-604 in J. Money and Y. Muspah, eds., Handbook of Sexology. New York: Excerpta Medica.

Schearer, S. B., and N. Fincancioglu (1981) Family Planning in the 1980's: Challenges and Opportunities. Basic Background Document for the International Conference on Family Planning in the 1980s. New York: Population Council.

Schmidt, S. (1975) Complication of vas surgery. Pp. 78-88 in J. J. Sciarra, C. Markland, and J. J. Speidel, eds., Control of Male Fertility. New York: Harper and Row.

Senanayake, P., and D. Kramer (1980) Contraception and the Etiology of PID: New Perspectives. Paper presented at the International Symposium on Pelvic Inflammatory Disease, Atlanta, Ga.

Shapiro, S., O. Slone, and C. Rosenberg (1979) Dual contraceptive use in relation to myocardial infarction. Lancet 1:743-747.

Shedlin, M., and P. Hollerbach (1981) Modern and traditional fertility regulation in a Mexican community: The process of decision-making. Studies in Family Planning 12:278-296.

Shepard, M. (1974) Female contraceptive sterilization. Obstetrical and Gynecological Survey 29:739-787.

Simmons, G. (1971) The Indian Investment in Family Planning. New York: Population Council.

Simmons, G. (1973) Public Expenditure Analysis and Family Planning Programs. Population Planning Working Paper No. 2. University of Michigan, Ann Arbor, Mich.

Sivin, I., and J. Stern (1979) Long-acting and more effective copper-T devices. Studies in Family Planning 10:263-281.

Slone, D., S. Shapiro, D. Kaufman, L. Rosenberg, O. Miettinen, and P. Stolley (1981) Risk of myocardial infarction in relation to current and discontinued use of oral contraceptives. New England Journal of Medicine 305:420-424.

Soepari, S. (1978) Some observations on safety and health hazards of contraceptives in Indonesia. Singapore Journal of Obstetrics and Gynecology 9:91-95.

Sollins, A., and R. Belsky, (1970) Commercial production and distribution of contraceptives. Reports on Population/Family Planning 4:1-23.

Sparks, R. (1981) Bacterial colonization of uterine cavity. British Medical Journal 282:1189.

Spellacy, W., N. Zaias, W. Buhi, and S. A. Birk (1971) Vaginal yeast growth and contraceptive practices. Obstetrics and Gynecology 38:343.

Stolley, P. (1977) A review of data from the United States concerning the relationship of thromboembolic disease to oral contraceptives. Pp. 122-126 in J. J. Sciarra, G. Zatuchni, and J. J. Speidel, eds., Risks, Benefits and Controversies in Fertility Control. Hagerstown, Md.: Harper and Row.

Stolley, P., J. Tonascia, M. Tockman, P. Sartwell, A. Rutledge, and M. Jacobs (1975) Thrombosis with low-estrogen oral contraceptives. American Journal of Obstetrics and Gynecology 102:197.

Swan, S. H., and W. L. Brown (1980) Oral contraceptive use, sexual activity and cervical carcinoma. American Journal of Obstetrics and Gynecology 129:52.

Takahashi, M., and D. B. Loveland (1976) Bacteriuria and oral contraceptives: Routine health examinations of 12,076 middle class women. Pp. 95-103 in S. Ramcharan, ed., The Walnut Creek Study, Vol. II. U.S. Department of Health, Education, and Welfare Public No. (NIH) 76-563. Washington, D.C.: U.S. Department of Health, Education, and Welfare.

Talwar, P. (1980) Distribution effectiveness of Nirodh: Free vs. commercial channels. Population Center Luchow Newsletter 5:1-6.

Talwar, P., and G. Berger (1977) The relation of body weight to side effects associated with O.C. British Medical Journal 1:1637-1638.

Talwar, P., J. Dingfelder, and R. Ravenholt (1977) Increased risk of breakthrough bleeding when one O.C. tablet is missed. New England Medical Journal 296:1236-1237.

Targum, S., and N. Wright (1974) Association of the intrauterine device and pelvic inflammatory disease: A retrospective pilot study. American Journal of Epidemiology 262-271.

Thaler, I., E. Paldi, and D. Steiner (1978) Intrauterine device and pelvic inflammatory disease. International Journal of Fertility 23:69.

Tietze, C. (1970) Evaluation of intrauterine devices: Ninth progress report of the cooperative statistical program. Studies in Family Planning 1:1-40.

Tietze, C. (1979) Induced Abortion: 1979, 3rd ed. New York: Population Council.

Tietze, C. (1980) Maternal mortality excluding abortion mortality. World Health Statistics Report 30:312-338.

Tietze, C. (1981) Induced Abortion: A World Review, 1981, 4th ed. New York: Population Council.

Tietze, C., and S. Lewit (1980) Mortality associated with reversible methods of fertility regulation. Pp. 42-48 in L. Koth, ed., The Safety of Fertility Control. New York: Springer Publishing.

Tomkinson, J., A. Turnbull, G. Robson, E. Cloake, A. Adelstein, and J. Weatherall (1979) Report on Confidential Enquiries into Maternal Deaths in England and Wales, 1973-1975. Department of Health and Social Security, Report on Health and Social Subjects 14, Her Majesty's Stationery Office, London.

Toppozada, M. (1979) Safety and hazards of oral contraceptives and prostaglandins with special reference to the developing world. Singapore Journal of Obstetrics and Gynecology 9:37-41.

Toppozada, M., F. Onsy, and E. Fares (1979) The protective influence of progestin-only contraception against moniliasis. Contraception 20:99.

Torres, A., J. Forrest, and S. Eisman (1981) Family planning services in the United States, 1978-1979. Family Planning Perspectives 13:132-141.

Trussell, J. (1974) Cost versus effectiveness of different birth control methods. Population Studies 28:85-106.

Tsu, V. (1980) Underutilization of health centers in rural Mexico: A qualitative approach to evaluation and planning. Studies in Family Planning 11:145-153.

United Nations Fund for Population Activities (1976) Survey of Contraceptive Laws: Country Profiles, Checklists, and Summaries. New York: UNFPA.

U.S. Food and Drug Administration Advisory Committee on Obstetrics and Gynecology (1968) Report on Intrauterine Contraceptive Devices. Washington, D.C.: U.S. Government Printing Office.

Vessey, M. P. (1978) Contraceptive methods: Risks and benefits. British Medical Journal 2:721-722.

Vessey, M. P. (1979) Oral contraception and neoplasia. British Journal of Family Planning 4:69-71.

Vessey, M. P. (1980) Female hormones and vascular disease: An epidemiological overview. British Journal of Family Planning 6(Supplement):1-12.

Vessey, M. P., and J. I. Mann (1978) Female sex hormones and thrombosis. British Medical Bulletin 34:157-162.

Vessey, M. P., R. Doll, R. Peto, B. Johnson, and P. Wiggins (1976) A long-term follow-up study of women using different methods of contraception: An interim report. Journal of Biosocial Science 8:375-427.

Vessey, M. P., K. McPherson, and B. Johnson (1977a) Mortality among women participating in the Oxford-Family Planning Association Contraceptive Study. Lancet 2:731-733.

Vessey, M. P., C. R. Kay, J. A. Baldwin, J. A. Clarke, and J. MacLeod (1977b) Oral contraceptives and benign liver tumors. British Medical Journal 1:1064-1065.

Vessey, M. P., N. H. Wright, K. McPherson, and P. Wiggins (1978) Fertility after stopping different methods of contraception. British Medical Journal 1:265-267.

Vessey, M. P., D. Yeates, and R. Flavel (1979a) Risk of ectopic pregnancy and duration of use of an intrauterine device. Lancet 2:501-502.

Vessey, M. P., L. Meisler, R. Flavel, and D. Yeates (1979b) Outcome of pregnancy in women using different methods of contraception. British Journal of Obstetrics and Gynecology 86:548-556.

Vessey, M. P., K. McPherson, and D. Yeates (1981a) Mortality in oral contraceptive users. Lancet 1:549.

Vessey, M. P., K. McPherson, and R. Doll (1981b) Breast cancer and oral contraceptives: Finding in Oxford-Family Planning Association Study. British Medical Journal 282:2093-2094.

Vessey, M. P., D. Yeates, R. Flavel, and K. McPherson (1981c) Pelvic inflammatory disease and the intrauterine device: Findings in a large cohort study. British Medical Journal 282:855.

Vitoon, O. (1976) Minilaparotomy for interval female sterilization. Pp. 112-119 in J. Sciarra, W. Droegemueller, and J. Speidel, eds., Advances in Female Sterilization Techniques. New York: Harper and Row.

Wang, C. (1974) Voluntary sterilization in Taiwan area. Pp. 447-453 in M. Schima, et al., eds., Advances in Voluntary Sterilization. New York: American Elsevier.

Weiss, N. S., and T. A. Sayvetz (1980) Incidence of endometrial cancer in relation to the use of oral contraceptives. New England Journal of Medicine 302:551-554.

Westinghouse Population Center (1974) Contraceptive Distribution in the Commercial Sector of Selected Developing Countries: Summary Report. Columbia, Md.: Westinghouse Population Center.

Westoff, C. (1981) Unwanted fertility in six developing countries. International Family Planning Perspectives 7:43-52.

Westoff, C., and N. Ryder (1968) Duration of use of oral contraception in the United States, 1960-1965. Public Health Reports 83:277-287.

Westrom, L. (1975) Effect of acute pelvic inflammatory disease on fertility. American Journal of Obstetrics and Gynecology 121:707-713.

Westrom, L., L. Bengstsson, and P. Mardh (1976) The risk of pelvic inflammatory disease in women using intrauterine contraceptive devices as compared to non-users. Lancet 2:221.

Wingrave, S., C. Kay, and M. Vessey (1979) Oral contraceptives and diabetes mellitus. British Medical Journal 1:23.

Wingrave, S., C. Kay, and M. Vessey (1980) Oral contraceptives and pituitary adenomas. British Medical Journal 8:685-686.

World Health Organization (1980) Ninth Annual Report, Special Program of Research Development and Research Training in Human Reproduction. Geneva: WHO.

World Health Organization (1981) Report from the Special Programme for Research, Development and Research Training in Human Reproduction's Task Force on Long-Acting Systemic Agents for the Regulation of Fertility. British Journal of Obstetrics and Gynecology 88:317-321.

World Health Organization, Task Force on Psychosocial Research in Family Planning and Task Force on Service Research in Family Planning (1980b) User preference for contraceptive methods in India, Korea, the Philippines, and Turkey. Studies in Family Planning 11:267-273.

Wortman, J. (1975) Sterilization: Vasectomy--what are the problems? Population Reports, Series D, No. 15.

Wortman, J. (1976a) A review of the complications of laparoscopic sterilization. Pp. 37-47 in J. Sciarra, W. Droegemueller, and J. Speidel, eds., Advances in Female Sterilization Techniques. New York: Harper and Row.

Wortman, J. (1976b) The diaphragm and other intravaginal barriers--A review. Population Reports, Series H:57-76.

Wright, N., and P. Laemmle (1968) Acute pelvic inflammatory disease in an indigent population. American Journal of Obstetrics and Gynecology 101:979.

Wright, N., M. P. Vessey, B. Kenward, K. McPherson, and R. Doll (1978) Neoplasia and dysplasia of the cervix uteri and contraception. British Journal of Cancer 38:273-279.

Chapter 22

NORMATIVE AND PSYCHIC COSTS OF CONTRACEPTION

Donald J. Bogue

CONTRACEPTION AS DISJUNCTION WITH THE INDIVIDUAL'S PAST

Contraception is a goal-oriented, voluntary behavior, each episode of which is the result of conscious volition. It is motivated by one particular need--to have sex without conception and thereby to avoid the potential negative conseque ces of pregnancy.

Explaining contraceptive behavior is a complex theoretical effort. There is a major disjunction, at the level of the individual and the couple, between noncontrol of fertility and the use of fertility-control practices. Learning, motivation, intention formation, and experimentation--all in a cultural and social context--are involved in this disjuncture; a new mode of behavior (adoption of an innovation) must be initiated and reinforced, and become habitual. Because this new behavior is intimately linked to culture, religion, and one's perception of self and one's role in the family, the neighborhood, and the community, this adaptation is of major significance. This may be especially true for people in developing countries, who may have to abandon a former behavior pattern and substitute a new one; in developed societies, in contrast, little more than the initiation of new generations into conventional adult behavior may be involved. Fertility decline has a causal pattern more complex than simply the weakening or relaxing of factors that formerly resulted in high fertility. The determinants of fertility-regulation behavior are not necessarily the obverse of the determinants of noncontrol of fertility; contraception may be a new way of achieving some of the society's oldest and most treasured goals. In fact, what appears at the aggregate level to be a smooth "demographic transition" is actually the increasing prevalence of couples making a distinctive behavior change, based on unique and complex combinations of social and psychological forces. Research on fertility must therefore address contraceptive behavior in its most disaggregated form--the individual and the couple. This in turn requires the study of the adoption of contraception from a social-psychological perspective.

The transition to use of contraception involves a cost/benefit analysis by one or both members of a couple, in which the perceived net benefits of having another child (Fawcett, in these volumes) are

compared with the perceived net costs of practicing contraception (Schearer, in these volumes). The focus of the present discussion is the nonmaterial "normative and psychic" costs of contraceptive behavior: the attitudes and beliefs that imply a negative evaluation of contraceptive use, or the cultural, social, and psychological forces that influence individuals and couples not to begin contraceptive practice or to abandon it after a brief trial. For purposes of this discussion, it is assumed that the individuals or couples involved are at least partially informed about family planning, are motivated to practice it, and are in the process of making the cost/benefit calculation. In Asia, Latin America, and North Africa, a substantial proportion of couples with two living children fall into this category--more than 50 percent in many nations; in sub-Saharan Africa, such couples are a much smaller minority, but their proportion appears to be increasing thanks to a quarter century of worldwide discussion of "the population crisis." Mass awareness that contraception is possible and is practiced widely in the "modernized" nations has been aroused in even the more remote parts of all continents.

This paper first catalogues the various normative and psychic costs of the adoption of contraception, and then provides a brief review of theory and research related to each. Finally, it synthesizes these findings to indicate trends, identify topics for essential further research, and suggest which approaches may be most useful to family planning programs.

A CATALOG OF THE NORMATIVE AND PSYCHIC COSTS OF CONTRACEPTION

There are numerous possible normative and psychic costs of practicing contraception. In the context of the present discussion, all of these are beliefs or attitudes learned or formed by communication and interaction with others or by first-hand experience; they may or may not be "valid" as judged by scientists. These costs can be grouped into six major categories:

- <u>Contraception as a threat to cultural values and norms</u>
  - As nonconformity with religious and moral beliefs
  - As socially illegitimate behavior
- <u>Contraception as a challenge to social institutions and group values and norms</u>
  - As disharmony with the extended family system
  - As requiring communication about sex between spouses
  - As provoking discord between spouses
  - As undermining family security and status
- <u>Contraception as foregoing perceived benefits of childbearing</u>
  - As a threat to self-fulfillment and security in the family role
  - As a loss of enjoyment of children

As making the family vulnerable to infant mortality

- Contraception as behavior inconsistent with personal values and norms
  - As implying "inner control" or "efficacy"
  - As a threat to sex roles and sexual adjustment
  - As violating modesty and privacy in sexual matters
- Anxiety costs of practicing contraception
  - Anxiety about temporary side effects
  - Fears of permanent damage to health
  - Anxiety about contraceptive failure
- Psychologistics: Perceived acessibility of contraceptive services

This classification is only one of several possible. It is organized according to the source and nature of the costs, progressing simultaneously from society to the individual, from the religious to the secular, from the abstract to the specific, and from contemplation to action. This classification places contraception in a context that makes it easy to apply a broad range of social science perspectives, theory, and research. The classification itself has a theoretical infrastructure: it is intended to be applicable to a number of different social development innovations, with contraception being only an unusually important instance; it is also intended to be equally valid for developing and developed nations, since there should be a single coherent theory of fertility decline. Consistent with the principles underlying the classification, some of the values attached to having children (Fawcett, in these volumes) are included in this list. Such values can be seen as primarily affecting the demand for children rather than regulation costs. However, since they are often expressed by survey respondents as reasons for not contracepting, they are also treated briefly here.

It should be noted that, although all of the constraints listed are expressed in psychological or social-psychological terms in keeping with the present focus on individuals and couples, none deals with personality traits. The Whelpton and Kiser studies of Indianapolis (1946 to 1958) and the Westoff et al. Princeton Studies (1961, 1963) showed no relationship between such personality traits as anxiety level, compulsiveness, tolerance of ambiguity, need-achievement, and need for nurturance, and desired family size and the practice of contraception. Although psychologists and psychiatrists continue to speculate about personality traits in Third World countries, this is assumed here to be somewhat of a blind alley in research.

The costs or constraints listed above have been collected from fertility and family planning reports (both research and administrative). They have been formulated by anthropologists; sociologists; educators; psychologists and psychiatrists; physicians, nurses, and paramedical workers; field workers for family planning; social workers; and others. The importance of each in limiting contraception depends upon two factors:

- Prevalence--the proportion of the population of reproductive age that experiences the particular cost
- Impact--how closely the cost (when it occurs) is correlated with use or nonuse of contraception

Both of these parameters can vary from population to population; they can also change over time for a particular population. Unhappily, empirical data about both the prevalence and impact of these costs are more scarce than data about most other aspects of fertility. Most of these variables were not included in the World Fertility Survey or in other demographic or social surveys involving fertility. Although frequently cited in the literature, the evidence provided is often anecdotal, conjectural, circumstantial, or little more than opinionated assertions. The analysis presented below attempts to provide an overview and synthesis of what is known about these costs.

As illustration for some of the costs, data from a recent survey of 2,000 Egyptian households are presented; this survey was jointly conducted in 1980 by the State Information Service (Population I-E-C Unit), of the Arab Republic of Egypt and the Social Development Center. It should be noted that contraceptive prevalence rates in this survey are higher than rates for Egypt from other sources. These data are not meant to represent other Third World countries, but to demonstrate the possibilities for research into psychic and normative costs.

CONTRACEPTION AS A THREAT TO CULTURAL VALUES AND NORMS

This category includes challenges to sacred or deeply held cultural and social values that are widely shared and recognized as principles of "right" or "good" conduct.

Contraception as Nonconformity with Religious and Moral Beliefs

Many couples who wish to practice contraception find that it is condemned as immoral by their religion; as a consequence, those followers who contracept may experience feelings of moral guilt and sinfulness. The Roman Catholic position illustrates this problem. In many Third World nations, leading Christian, Moslem, Buddhist, Hindu, Confucian, and other theologians take a liberal view of contraception, but local religious leaders in the villages often vehemently oppose it. Such opposition appears to be greatest among the more conservative or fundamentalist branches of many religions.

Nevertheless, research has indicated that religious beliefs and moral codes are far less of an obstacle to contraceptive use than might be expected. On the basis of his own studies and those of others Stycos (1968) reported that the position of the Catholic Church does not constitute a major obstacle to family planning in Latin America. No consistent differences were found between Catholic

and non-Catholic women in attitudes, contraceptive practice, or fertility. He concludes, "If Catholicism is having little impact on fertility, it may be partly because the average woman is not very 'Catholic'" (Stycos, 1968:183). In rural Guatemala, Bertrand et al. (1978) found that nearly one-half of those surveyed believed family planning to be against God's will. However, closer analysis traced this attitude not to membership in a specific church but to degree of religiosity: those who considered themselves very religious (whether Catholic or Protestant) were less likely to approve of or use contraception than those who were only "somewhat religious." In Indonesia, Sujono (1974) found that Moslems were more resistant to family planning than Hindus, Buddhists, Protestants, Catholics, or Confucians; however, this greater resistance seems to have been based on more limited information about family planning rather than upon theological considerations. Sinquefield (1974) found that, in rural Alabama, women who disapproved of contraception tended to say that it was against God's will; nevertheless, of those women who had achieved their ideal family size, substantial numbers were practicing family planning anyway.

Table 1 provides some data on this subject for Egypt. The left-hand column shows the prevalence of the normative or psychic cost, while the right-hand column shows its impact through its relationship to contraceptive use. In Egypt, there is an undercurrent of "moral uneasiness" and perhaps some guilt about contraceptive use, but this is definitely a minority view. Among the minority that believe religion to be against family planning, use is significantly lower than among those who see no conflict; however, an impressive proportion of the former group who want no more children are nevertheless users.

Recent major declines in fertility in such developing nations as Indonesia (Muslim), Thailand (Buddhist), Colombia, the Philippines, Chile, Mexico, Brazil (Catholic), India (Hindu, Muslim), China (Confucian), Tunisia (Muslim), Malaysia (Muslim, Confucian, Hindu), South Korea (Confucian), and Turkey (Muslim) provide additional indirect evidence that religion poses less of a psychological barrier to the adoption of contraception than had been previously anticipated. Certainly, the prevalence of replacement-level fertility among the Roman Catholic populations of Europe and North America supports this view.

On the basis of this evidence, it can be tentatively concluded that, although deep conservative religiosity does generate psychological costs to contraception in the Third World as a whole, intense feelings of inconsistency between religion and family planning are felt by a minority in most of these countries. Among that minority (which is likely to consist of rural peasants and an urban proletariat), this cost constrains contraceptive use. Roman Catholicism and Islam undoubtedly generate varying degrees of ambivalence toward use among a majority of their followers; when these followers are sufficiently motivated on other grounds, this ambivalence may impede, but does not prevent, contraceptive use.

Contraception as Socially Illegitimate Behavior

Where high fertility is customary and large families are regarded as a virtue, couples who deliberately restrict births to a number substantially below the norm may suffer popular criticism until the practice of family planning becomes socially acceptable or "legitimate." This can pose a major normative cost to potential users.

A strong theoretical and research formulation for the importance

TABLE 1 Threats to Moral and Religious Beliefs as Normative or Psychic Costs of Contraception: Illustrative Data from Egypt, 1980

Question	Prevalence (Percent distribution)	Impact (Percent using contraception)
How much would it be against your religious beliefs to practice family planning?	100	56
No response, undecided, don't know	15	49
Very much against	16	45
Somewhat against	10	53
No conflict with beliefs	59	60
(Chi square = 21.4 with 3 d.f., sig. at .0001)		
Do you think the local khateeb or priest would approve, disapprove, or not care if he learned you were practicing family planning?	100	56
Would approve	47	60
Would not care either way	17	64
Don't know	25	41
Would disapprove	11	56
(Chi square = 35.1 with 3 d.f., sig. at .0001)		

Note: The left-hand column of this table reports data for all 2,001 cases in the sample to show the prevalence of the belief or attitude. The right-hand column, however, is confined to 1,280 cases who reported that they want to have no more children. This permits an assessment of the impact of psychic and normative costs among couples who are already motivated and hence are in a position to make a cost/benefit analysis of contraception.

Source: State Information Service (Population I-E-C Unit), Arab Republic of Egypt, and the Social Development Center, Chicago.

of social pressures has been advanced by Fishbein and Jaccard (1973). They see a person's intention to behave (which leads to behavior) as a function of two factors: beliefs about family planning, together with a "normative component"--the perception that close friends, spouse, or parents want the person to have additional children, weighted by the person's propensity to comply with these perceived wishes. In empirical testing of this conception by Davidson and Jaccard (1976), the normative component was found to be highly predictive of future intentions to practice or not to practice family planning.

Leibenstein (1974) asserts that each couple is exposed to a particular social influence group (SIG), which tends to set standards for the legitimacy of family planning. He emphasizes that these pressures not only vary according to the socioeconomic and other characteristics of the SIG, but also differ for each birth order: pressures to have a first or second child may be vastly different from pressures to have a fourth. Bertrand et al. (1978:31-32) found that, in Guatemala, "the more disapproval a person perceives from 'significant others' the less will be his/her approval of family planning," and "those people who perceive more disapproval of family planning (by peers) are less likely to be using contraceptives." Sujono (1974:96) concluded from analysis of Indonesian data that "the more an individual who personally approves of family planning perceives that it is socially approved, the higher the probability is that he will adopt it." Shevasunt and Hogan (1979) found in northern Thailand that acceptance of family planning was strongly correlated with the perception that the practice was approved by a majority of one's peers. Of course, social legitimacy can also foster contraceptive use, as shown by Freedman and Takeshita (1969:356) for Taiwan:

> The belief that other people who were trusted--friends, relatives, and neighbors--were accepting birth control in large numbers was important in encouraging acceptance. Legitimation in various ways appeared to be important in a situation of considerable ambivalence where new birth control practices conflicted with traditional family values.

Data on the social legitimacy of family planning in Egypt provided in Table 2 show very little evidence that contraception is perceived as illegitimate. Only about 4 to 6 percent of respondents indicated fear of being ostracized or subjected to social criticism if they were to become contraceptors. Nevertheless, fear of being in a minority does appear to be a strong factor: the right-hand column of Table 2 shows that there is less contraceptive use among those who believe that family planning is disapproved by many than among those who believe it is disapproved by only a few.

Recent data from the World Fertility Survey (Lightbourne et al., 1982) and other samples have shown that a majority of the public in several developing nations either approves of contraception or else reports that no more children are desired. This may be accepted as additional evidence that the social illegitimacy of contraception may

TABLE 2 Social Disapproval as a Normative or Psychic Cost of Contraception: Illustrative Data from Egypt, 1980

Question	Prevalence (Percent distribution)	Impact (Percent using contraception)
Of the women who live in this town (city), how many of them do you think approve of family planning? Would you say:	100	56
Less than 3/4	63	50
About 3/4 or more	37	65
(Chi square = 27.4 with 1 d.f., sig. at .001)		
Of the men who live in this town (city), how many of them do you think approve of family planning? Would you say:	100	56
Less than 3/4	63	50
About 3/4 or more	37	65
(Chi square = 26.4 with 1 d.f., sig. at .001)		
Do you think your best friend would approve, disapprove, or would not care either way if she (he) found you were using family planning?	100	56
Would not disapprove	94	57
Would disapprove	6	34
(Chi square = 11.5 with 1 d.f., sig. at .001)		

Note: See note to Table 1.

Source: State Information Service (Population I-E-C Unit), Arab Republic of Egypt, and the Social Development Center, Chicago.

rapidly be becoming a minority rather than a majority view. Nevertheless, the evidence is quite clear that, among those who perceive that the people nearest to them want them to have more children, the practice of contraception would have major social legitimacy costs that would repress contraceptive behavior.

CONTRACEPTION AS A CHALLENGE TO SOCIAL INSTITUTIONS AND GROUP VALUES AND NORMS

Somewhat less general, abstract, and sacred than culture and religion is the realm of "social organization" and "customary behavior." Because these are rooted in a long-term adjustment to the environment, they exert considerable influence over the behavior of individuals, and to challenge them can involve high costs.

Contraception as Disharmony with the Extended Family System

In developing countries, the behavior of adults is influenced by parents, in-laws, siblings, aunts and uncles, and more distant relatives, even when there is more than one household involved. When the attitudes of these kin are strongly pronatalist, the practice of contraception may threaten the harmony in the extended family (see Beckman, in these volumes). Lee (1974:5) has eloquently expressed the dominance of the extended family over the individual in developing societies, and its pronatalist influence:

> In addition to the very basic functions of reproduction and companionship, the (extended) family is the most essential organization of economic production and consumption, the main educational agent for transmitting technical skills and moral values from generation to generation, the centre for controlling and regulating social behavior, the fundamental unit of worship and religio-ritual observance and the major source of welfare and health care. . . . Rare is any individual who does not depend on the family or the wider kin groups for his social, political, and economic security. A consequence of the high dependence on the family and kinship system is the development of a collective orientation. This collective orientation is conducive to high fertility motivation. . . .

Several years ago, when family planning was a new idea in Third World countries, it is probable that the older members of the extended family had much more negative attitudes toward contraception than did younger couples, who may therefore have hesitated to practice family planning. Although this situation may persist in many cultures today, it is probably declining in most countries. As noted above, general public opinion is becoming more favorable toward family planning, and the majority favor it in many places. The climate of opinion in extended families is shifting accordingly. Consistent with this, Stoeckel (1970) found that joint and nuclear families did not differ significantly in their knowledge and practice of family planning in East Pakistan.

Caldwell (1976) has given a strong description of the pervasive pronatal social pressures imposed by the family system and the extended kin/clan network of traditional, particularly African, villages. He believes this family system may be undergoing an

inexorable change toward the nuclear family form due to "Westernization," quite independently of shifts in family planning from illegitimate to legitimate. He concludes that "fertility decline is more likely to precede industrialization (than to follow it) and to help bring it about" (p. 12).

Table 3 summarizes attitudes of extended family members in Egypt. An overwhelming majority of respondents reported that their relatives either would approve outright or would not care if they practiced family planning. (This was not true for grandparents only because many respondents did not know their grandparents' opinions.) Only 6-18 percent reported that their close relatives would have objections. The lower panel of Table 3 shows how objections by family members correlate with contraceptive use. Only where it is believed that a brother or sister (6 percent of respondents) or father- or mother-in-law would object (18 percent) is there a lower rate of use; for all other relatives, there is no significant difference.

It may thus be hypothesized that the trend in developing countries is toward approval of contraception by members of the extended family, perhaps lagging somewhat below the degree of approval in the general public. In many Third World nations today, having a few disapproving relatives appears to exert little influence on use or nonuse of contraception, and the trend is for this to become more common; sub-Saharan Africa appears to be some decades behind Asia and Latin America in this process.

Contraception as Requiring Communication about Sex between Spouses

For many Third World cultures, it is reported that most couples almost never talk about sex, and that wives are extremely shy about mentioning it to their husbands. Because the effective and sustained use of contraception requires such communication, couples incur the psychic cost of violating these taboos (see Beckman, in these volumes). A few empirical examples will illustrate this point.

In rural Guatemala, Bertrand et al. (1978:40) found that "the less husband-wife communication there is, the less likely one is to approve of family planning," and that "those people who have less communication with their spouses are less likely to be using contraceptives than those with more communication." Sinquefield (1974) also verified this empirically in rural Alabama, with the surprising finding that 60 percent of adopters (and 80 percent of nonadopters) had never discussed family planning with their spouses; apparently, secret use of oral pills and IUDs was common. In a study in Dacca, Figa-Talamanca et al. (1974) found that a much higher proportion of contraceptive users than nonusers had discussed both sexual matters and family planning with their spouses. Keller (1973) found that lack of communication between spouses is related to early discontinuation of contraception. In citing issues on which psychologists can make major contributions to family planning, Palmore (1976) gives first priority to the need to know more about the

TABLE 3 Disharmony in the Extended Family as a Normative or Psychic Cost of Contraception: Illustrative Data from Egypt, 1980

Relative[a]		Prevalence (Percent distribution)			
		Approve	Not care	Dis-approve	Don't know
Would _____ approve, disapprove or not care if they were to learn you were using family planning?					
Father	Mother	55	11	12	22
Uncle (paternal)	Aunt (paternal)	51	19	11	19
Uncle (maternal)	Aunt (maternal)	50	19	11	20
Brother	Sister	67	13	6	14
Father-in-law	Mother-in-law	45	13	19	23
Grandfather	Grandmother	28	12	13	47

Relative		Impact (Percent using contraception)		
		Relative dis-approves	Relative approves	Significance
Father	Mother	58	56	Not sig.
Uncle (father)	Aunt (father)	59	56	Not sig.
Uncle (mother)	Aunt (mother)	59	59	Not sig.
Brother	Sister	37	62	Sig.
Father-in-law	Mother-in-law	53	61	Sig.
Grandfather	Grandmother	60	63	Not sig.

Note: See note to Table 1.

[a]Male respondents were asked about the perceived approval or disapproval only of male relatives. Female respondents were asked only about female relatives.

Source: State Information Service (Population I-E-C Unit), Arab Republic of Egypt, and the Social Development Center, Chicago.

interaction between husband and wife as it relates to reproduction.

Table 4 presents recent data on this subject for Egypt. One-third of the couples of reproductive age reported never having discussed contraception; among this group, the proportion practicing contraception was only 40 percent that of couples that had held such discussions. Despite the high proportion of couples who had not discussed contraception, only 4 percent said that most people cannot have such discussions; among this small group, use of contraception was extremely low.

Overcoming shyness or cultural taboos against discussing contraception with one's spouse are still major psychic costs for significant numbers of couples in Third World countries. It is possible that this is less so in many modernizing countries, however, and that it is continuing to diminish.

Contraception as Provoking Discord Between Spouses

If one spouse wishes to practice contraception and the other wishes to have more children, this represents a major disagreement. It is commonly believed that wives are more likely to favor family planning than their husbands. In male-dominated societies, women are reluctant to challenge their husband's authority; physical as well as verbal abuse may result. Hence, having an uncooperative spouse may result in the surreptitious practice of contraception and in major psychic costs. However, the uncooperative male is a stereotype. Although it is true that women have an earlier and stronger motivation for family planning, the lag in husbands' attitudes is generally very slight. As "breadwinners," men can equally appreciate the benefits of childspacing and limiting family size, a fact that emerged early in the empirical literature. Bogue (1962) discussed it for India; it was verified by CELADE and CFSC (1972:78-79) in a survey of seven Latin American metropolises; and it has been reported regularly since. Nevertheless, the stereotype persists, perhaps because of the periodic appearance of dramatic cases to the contrary. Even where spouses do not talk to each other about family planning, each is independently exposed to the mass media, to discussions with peers, and to contact with family planning programs. By the time the second or third child is born, both spouses tend to arrive at a similar attitude toward contraception, and open disagreement over whether or not contraception should be practiced occurs only in a minor percentage of cases.

Recent data from Egypt about husband-wife agreement over contraception illustrate this point. Respondents were asked whether or not their spouses approved of family planning. This was cross-tabulated against the respondent's own attitude toward family planning, to yield the results shown in Table 5. Only about 6 percent of the couples reported themselves to be fully discordant over the issue of family planning; an additional 5 percent did not know the spouse's attitude. Thus, in about 90 percent of the cases, there was apparently a consensus that family planning is a good thing, or at least tolerance by one spouse of the other's approval. Unwillingness

TABLE 4 Need for Communication Between Spouses as a Normative or Psychic Cost of Contraception: Illustrative Data from Egypt, 1980

Question	Prevalence (Percent distribution)	Impact (Percent using contraception)
Have you and your spouse ever talked about using some method of family planning?	100	56
Yes	67	66
No	33	26
(Chi square = 145.2 with 1 d.f., sig. at .001)		
In general, do you feel that a husband and wife can talk to each other about family planning without feeling embarrassed?	100	57
Most can	91	59
About one-half can	4	40
Most cannot	4	23
Don't know	1	12
(Chi square = 26.0 with 3 d.f., sig. at .001)		

Note: See note to Table 1.

Source: State Information Service (Population I-E-C Unit), Arab Republic of Egypt, and the Social Development Center, Chicago.

of husbands to permit their spouses to use contraception is reported today most frequently for nations of sub-Saharan Africa, and less for Asia and Latin America, where campaigns on "responsible parenthood" have focused attention on the male.

A search of the literature therefore fails to produce data showing major discord between spouses over family planning. Nevertheless, persistent evidence that a significant share of women appear to use oral pills or the IUD surreptitiously does not permit this psychic cost to be wholly dismissed.

Contraception as Undermining Family Security and Status

Where the family is the principal unit of social organization, its continuity and strength may be believed to depend on the number of children born. For a couple that has achieved its desired family

TABLE 5 Husband-Wife Agreement over Contraception: Illustrative Data from Egypt, 1980

	Attitude of Respondent			
Attitude of Spouse	Total	Approves	Neutral	Dis-approves
Approve	86.2	84.4	0.4	1.4
Neutral	2.9	1.7	0.9	0.3
Disapprove	6.4	4.2	0.5	1.7
Don't know	4.6	3.3	0.4	0.9
Total	100.1	93.6	2.2	4.3

Note: Figures do not add up to 100 because of rounding.

Source: State Information Service (Population I-E-C Unit), Arab Republic of Egypt, and the Social Development Center, Chicago.

size, but which lacks a son, the practice of contraception could generate considerable psychic and normative costs. Where status in the clan and the community is enhanced by having many grandchildren of both sexes, curtailment of childbirth represents an opportunity cost. In these ways, contraception can create fears about the weakening or extinction of the lineage (see Fawcett, in these volumes). It is plausible to expect that these feelings of insecurity about family status will tend to diminish as family organization changes from the extended to the nuclear form.

Contraception as Foregoing Perceived Benefits of Childbearing

An obvious major psychic and normative cost of contraception is the foregoing of benefits believed to derive from having children. Even where the net balance of beliefs and attitudes strongly favors a decision to practice family planning (to satisfy economic or other needs), there may be sadness or regret at having to make this choice.

Contraception as a Threat to Self-Fulfillment and Security in the Family Role

In marriage, each partner achieves a sense of self-worth and self-fulfillment by playing a social role perceived as satisfying,

socially acceptable, and reflective of his or her self. For most adults (in all cultures), childbearing and childrearing are integral aspects of this role (see Fawcett, in these volumes).

In high-fertility societies, the cost for a woman of practicing contraception may be fear that her entire role or status will be undermined, and that her husband will abandon her or take another wife. At a deeper level, Lidz (1969) believes that many women undergo psychological and normative suffering when they use modern contraceptives precisely because the risks of childbirth have been removed. They may suffer feelings of frustration or guilt over having sexual intercourse "for no purpose" other than its enjoyment.

A man, on the other hand, may fear that if he fails to continue fathering children, his friends will perceive him as being an inadequate male and family head. The wife's management of fertility (by oral pills, IUD, or sterilization) may also be seen as undermining the husband's authority and possibly leading her to unfaithful or promiscuous behavior (Hollerbach, 1980). Her seeking to enter the labor force may in addition be ego-deflating to the male and a further threat to sexual exclusivity. Thus, contraceptive use can generate psychic tensions within individuals and between couples by affecting their sexual adjustment. Not practicing contraception, using unreliable methods, or "taking chances" with reliable methods may be ways to release or express these tensions.

Contraception as a Loss of Enjoyment of Children

Children can be a great source of joy and satisfaction; contraception, whether for economic or other reasons, may therefore thwart or frustrate these pleasures of parenthood, requiring psychic sacrifices of considerable magnitude (Fawcett, in these volumes). Although the deep-seated need to bear children and the demand to enjoy parenthood are universal, they appear to be largely satisfied by the first two or three children who survive to age 2 (Bulatao, 1981). Beyond that point, the decision to begin contraception or to bear additional children appears to be determined by factors other than child enjoyment. Consequently, adoption of contraception at higher parities should have only small normative and psychic costs of this sort.

Contraception as Making the Family Vulnerable to Infant Mortality

Infant mortality is so common in many developing societies that some observers cite it as a major reason for nonadoption of contraception. In these circumstances, practicing family planning could cause a couple to be anxious that they might end up with fewer children than desired. Infant death rates have been falling in Third World countries for the past two decades (Chen, in these volumes); this is the major factor in the increased life expectancies in these countries. As the public becomes aware of this trend, there should be

less resistance to family planning because of the fear of infant mortality. The limited research that has been done shows that, to date, large segments of the public tend to be only partially informed of these trends or are skeptical of the claims. Fear of infant death as a reason for desiring many children is often cited in fertility surveys. Bulatao (1975), for example, found this to be a leading reason for wanting more children. CELADE/CFSC found moderate support for this factor, although they found other social-psychological variables more powerful.

It may also be noted that contraception is correctly perceived in many Third World countries as promoting infant survival because it permits longer intervals between births. This is used as a major argument for family planning in sub-Saharan Africa.

Table 6 presents data from Egypt on the fear of infant mortality and awareness of changing mortality trends. Only about one-fifth of the respondents had a correct estimate of the level of infant mortality; more than 40 percent had an exaggerated estimate; and more than one-third did not know. There was widespread awareness of the fact that infant mortality is declining; however, about one-fifth of respondents perceived it as remaining unchanged or even rising in comparison with a decade ago. The potency of such misunderstanding is indisputable: the practice of family planning is much lower among those with exaggerated estimates of infant mortality or those who are unaware that it is declining.

CONTRACEPTION AS BEHAVIOR INCONSISTENT WITH PERSONAL VALUES AND NORMS

Even in the absence of any of the psychic and normative constraints discussed above, there may be some conflict between the overt contraceptive behavior required and an individual's long-term commitment to certain values and norms.

Contraception as Implying "Inner Control" or "Efficacy"

Noncontraceptors often tend to believe that family size is determined by God, fate, or chance--and is hence outside their sphere of responsibility. Adoption of contraception requires abandoning this philosophy of "external control" and assuming personal responsibility for family size. This has wide ramifications: once this inner control is assumed, cognitive consistency requires equal self-reliance in other spheres.

Rotter (1960) has explored the ways in which this conflict affects innovation and acceptance of new ideas. Because traditional village people are thought to be highly fatalistic, it was hypothesized early in family planning efforts that overcoming this fatalism would be an important psychic cost for potential users of contraception. A number of research studies in fact show that a fatalistic outlook toward childbearing and family size is a prevalent and powerful impediment to

TABLE 6 Fear of Infant Death as a Normative or Psychic Cost of Contraception: Illustrative Data from Egypt, 1980

Question	Prevalence (Percent distribution)	Impact (Percent using contraception)
Out of every 10 babies born in this (village/neighborhood), how many of them do you think will die before they are 5 years old?	100	56
Zero or one (correct)	22	65
Two (incorrect)	19	53
Three (very wrong)	13	48
Four or more (very wrong)	10	42
Don't know	36	58
(Chi square = 25.8 with 4 d.f., sig. at .0001)		
Do you believe that babies die more often or less often than they did 10 years ago?	100	56
The same or more often today	21	44
Less often today	69	60
Don't know	10	50
(Chi square = 21.0 with 2 d.f., sig. at .0001)		

Note: See note to Table 1.

Source: State Information Service (Population I-E-C Unit), Arab Republic of Egypt, and the Social Development Center, Chicago.

contraception. As early as 1967, Groat and Neal (1967:958) stated, "For those high in powerlessness, fertility seems likely to constitute an occurrent, a chance happening, an unmanaged event." Clifford and Ford (1974) found that fatalism was associated with nonuse of contraception, and with lowered effectiveness of fertility control among those who were contracepting. Sinquefield (1974:31) applied the Rotter scale of internal-external control to a sample of low-income black women in rural Alabama and found "the lower a woman's degree of internal control, the higher the probability is that she will resist family planning." Niehoff and Anderson (1966) saw peasant fatalism as a serious but not insurmountable barrier to adoption of new behaviors, pointing out that much fatalism is based on religious philosophy, which is revered but not practiced for pragmatic reasons. Much of it is based on situational factors; if these change, fatalism

TABLE 7 Inner Versus External Control as a Normative or Psychic Cost of Contraception: Illustrative Data from Egypt, 1980

Question	Prevalence (Percent distribution)	Impact (Percent using contraception)
Do you really believe that a person can limit his family size to any number he chooses or do you think this is something you don't really have any control over?	100	56
A person can control family size	66	65
It is something a person cannot control	38	35
Not sure, don't know	6	0
(Chi square = 89.9 with 1 d.f., sig. at .001)		

Note: See note to Table 1.

Source: State Information Service (Population I-E-C Unit), Arab Republic of Egypt, and the Social Development Center, Chicago.

diminishes. Bulatao's (1975) Value of Children study in the Philippines suggested that the effect of personal efficacy on family planning may be mediated by its effect on values and costs: the more efficacious respondents gave more weight to the costs of children and were more likely to disregard social pressures to have children.

Table 7 reports data from Egypt that support the "efficacy" hypothesis: only about two-thirds of the Egyptians of reproductive age surveyed have a feeling of control over family size; among the one-third who are fatalistic or not sure, the rate of contraceptive use is comparatively low.

Contraception as a Threat to Sex Roles and Sexual Adjustment

Couples often perceive the practice of contraception as a threat to the enjoyment of sex. Contraceptive appliances may be perceived as nuisances that interfere with or reduce pleasure; the pill and sterilization are sometimes mistakenly believed to weaken libido. In such cases, these psychic costs may be a very strong and direct impediment to contraceptive use. In other cases, elimination of the pregnancy risk may remove sexual inhibitions, an observation made about the pill, the IUD, and male and female sterilization.

The little empirical evidence available indicates that good sexual

TABLE 8 Interference of Contraception With Sex Life as a Normative or Psychic Cost of Contraception: Illustrative Data from Egypt, 1980

Question	Prevalence (Percent distribution)	Impact (Percent using contraception)
Some people think that using condoms will interfere with the pleasure and naturalness of sex. Other people say that modern condoms are so good that people are not aware of any difference. What do you think? Do you think that condoms:	100	77
Greatly interfere with sex life	20	78
Interfere to some degree	35	81
Do not interfere with sexual pleasure	10	77
Don't know, no opinion	35	72
(Chi square = 4.5 with 3 d.f., not sig.)		

Note: See note to Table 1.

Source: State Information Service (Population I-E-C Unit), Arab Republic of Egypt, and the Social Development Center, Chicago.

adjustment and the practice of contraception are positively correlated. Sinquefield (1974) found strong support for this hypothesis: women who wished they were married to someone else or did not enjoy sex tended to be nonusers. Keller (1970) found that "defensive masculinity" (covert anxiety over sexual adequacy) was linked to nonuse of contraception.

The Egyptian survey investigated this issue with respect to condoms by asking the question reported in Table 8. A majority of Egyptians said they believe that condoms do interfere with sex, and only 10 percent were willing to declare unilaterally that they do not. Because this belief is so widespread and the use rate of condoms is extremely low, there is no correlation between this attitude and the general practice of contraception.

Contraception as Violating Modesty and Privacy in Sexual Matters

The practice of contraception may require a certain amount of manipulation of the sexual organs and submission to medical examination. For women who are very shy about sex, this may create

TABLE 9 Embarrassment at Pelvic Examination as a Normative or Psychic Cost of Contraception: Illustrative Data from Egypt, 1980 (female respondents only)

Question	Prevalence (Percent distribution)	Impact (Percent using contraception)
How would you feel about getting a physical examination from a female doctor?	100	54
Too embarrassed to permit it	3	43
Very embarrassed but would permit it	17	47
A little embarrassed	8	59
Not embarrassed	72	55
(Chi square = 3.7 with 3 d.f., not sig.)		
How would you feel about getting a physical examination from a male doctor?	100	54
Too embarrassed to permit it	20	49
Very embarrassed but would permit it	49	53
A little embarrassed	8	68
Not embarrassed	23	54
(Chi square = 5.8 with 3 d.f., not sig.)		

Note: See note to Table 1.

Source: State Information Service (Population I-E-C Unit), Arab Republic of Egypt, and the Social Development Center, Chicago.

distress. In many clinics providing contraceptive services, a woman must have a pelvic examination; because of a shortage of female physicians, these examinations are often performed by a male physician. To the extent that women dread this examination, it is a psychic cost of contraception, although this distress has seldom been measured.

In Egypt, women were asked a question about examination by a female and a male physician (Table 9). There was a comparatively low level of embarrassment with female physicians, but a very high level with male physicians. One-fifth declared they could not undergo such an examination, and an additional one-half said they would permit it, but would feel very embarrassed; only about one-fourth of the women would feel it to be an unembarrassing, normal medical procedure. However, the impact of this psychic cost upon the practice of contraception appears to be small. As shown in the right-hand column

of Table 9, the practice of family planning among those who would feel embarrassment is somewhat lower than among those who would not feel embarrassment, but these differences are too small to be statistically significant, either for male or female physicians.

ANXIETY COSTS OF PRACTICING CONTRACEPTION

Another category of constraints on the adoption of contraception is anxieties and fears about effects upon the user.

Anxiety about Temporary Side Effects

Every method of contraception thus far invented has caused at least some temporary physical discomfort or side effect among a significant minority of users (see Schearer, in these volumes). These side effects are perceived as mild and temporary by most users in Europe and North America, who receive medical counsel on their transitory and harmless nature. In sharp contrast, in Third World countries, side effects are often greatly exaggerated and feared: symptoms cited are frequently not verified by clinical trials, and their effects are perceived as debilitating and harmful; moreover, many do not believe that they are temporary. The pill, the IUD, and sterilization (the most effective of the modern methods) tend to have especially strong fears attached to them. These fears are clearly based on misinformation and rumor. Whether they arise from inadequate counseling, medical neglect of unusual cases of strong reaction, sensationalism in newscasts, or deliberate diffusion by opponents of family planning, they should not simply be dismissed as irrational fears; they exact a high toll in psychic costs and in refusal to adopt modern contraception.

Bogue (1962:533) early advised as a basic premise that "in order to avoid backfires, the limitations, weaknesses and disadvantages of using family planning must be admitted and discussed openly." Holmes (1973:24) reported the following for Thailand:

> By far the most important health-related factor causing people to avoid birth control measures was the fear of possible side effects from using various methods. . . . There is considerable evidence that beliefs about negative side effects make up a large proportion of villages' "total knowledge" about family planning. . . . These are circulated in one form or another as rumors. . . . Peer communication or gossip works very rapidly.

Shevasunt and Hogan (1979:105) found in northern Thailand that "medical reasons" (side effects) were given by nearly one-half of all women who had discontinued use of the pill, IUD, or injection. Keller (1973:37) reports that follow-up interviews with dropouts from family planning clinics found "side effects were almost exclusively mentioned as the first reason, and often other reasons followed." The potential psychic cost of these exaggerated fears is great--both to the public

and to population programs.

That exaggerated fears of side effects continued to be a major psychic cost is illustrated in Table 10 by data from Egypt. Most respondents had heard of the side effects of oral pills; however, more than 70 percent were either incorrectly or insufficiently informed about these effects. Those who incorrectly believed that these side effects are not temporary were much less inclined to practice family planning than those who were correctly informed.

TABLE 10 Threats to Physical Well-Being as Normative or Psychic Costs of Contraception: Illustrative Data from Egypt, 1980

Question	Prevalence (Percent distribution)	Impact (Percent using contraception)
A few women feel a little sick when they first start to take the pill. Have you ever heard about this? IF YES: How long do these symptoms last?	100	59
Two months or less	29	67
More than two months	58	58
Don't know	13	36
(Chi square = 35.8 with 2 d.f., sig. at .001)		
Can using birth prevention pills cause any disease if a woman is in good health when she starts using the pills?	100	57
Yes	32	52
Maybe, don't know	18	52
No	50	62
(Chi square = 11.0 with 2 d.f., sig. at .004)		
Index of misinformation about safety of methods	--	56
Low misinformation	--	74
Moderate misinformation	--	59
High misinformation	--	26
(Chi square = 112.0 with 2 d.f., sig. at .0001)		

Note: See note to Table 1.

Source: State Information Service (Population I-E-C Unit), Arab Republic of Egypt, and the Social Development Center, Chicago.

Fears of Permanent Damage to Health

Despite massive research evidence that permanent damage to health is very rare when contraceptives are provided with appropriate medical supervision (see Schearer, in these volumes), there is widespread belief in developing countries that permanent damage to health will almost inevitably result from long-term use. This belief is particularly prevalent for the most effective methods--the pill, the IUD, and sterilization.

Intense fears about the long-term effects of contraception on health, based on rumor and half-truths, are reported from many parts of the world. Keller (1973) found that dropouts from family planning programs in the U.S. were likely to have accepted negative rumors about such harmful effects. Stycos and Marden (1973) found that two-thirds of the women who had heard of oral contraceptives before coming to clinics (in Honduras) had heard that the method was harmful; an even higher percentage had negative views about the IUD. They concluded that "the source of such beliefs is primarily gossip" (p. 81). Mundigo (1973) confirmed that this was a major factor in discontinuation, and blamed clinics for inadequate counseling. In rural Guatemala, Bertrand et al. (1978:55) found that "the greater one's exposure to negative rumors about the pill, the less likely one is to approve of family planning." Numerous studies of reasons for discontinuation of contraception have found large proportions of such responses as "medical reasons--other," which imply that the client (rather than the doctor) prescribed the discontinuation. How to maintain continuation of contraception in the face of these powerful rumors has been a major problem for family planning programs in Third World countries.

Table 10 provides data from Egypt on fear of the long-term health risks of contraception. Women who had such fears had an adoption rate 10 percentage points below that of women who did not. In addition, respondents were asked, "How safe for a person's health is the _____ method?" Results for people who knew the method and had an opinion are in Table 11. The correct answer, in every case, is very nearly 100 percent safe. That fears of the oral pill

TABLE 11 Percentage of Respondents Considering Each Contraceptive Method Safe or Unsafe: Illustrative Data from Egypt, 1980

Method	Safe	Unsafe	Method	Safe	Unsafe
Oral pill	25	75	Creams and jellies	72	28
IUD	40	60	Male sterilization	75	25
Diaphragms	62	38	Female sterilization	78	22
Vaginal Tablets	63	37	Rhythm	95	5
Injections	71	29			

TABLE 12 Perceptions of Contraceptive Unreliability as Normative or Psychic Costs of Contraception: Illustrative Data from Egypt, 1980

Method	Prevalence (Percent distribution)		
	Reliable	Unreliable	Don't know
How reliable (effective in preventing pregnancy) do you think the _____ method is?			
Oral pill	77	13	10
IUD	52	27	21
Injections	40	10	50
Diaphragm	31	22	47
Foaming tablet	23	23	54
Vaginal creams and jellies	24	23	53
Condom	38	37	25
Female sterilization	70	5	25
Male sterilization	44	5	51
Rhythm method	32	48	20

Index of misinformation about reliability	Prevalence (Percent distribution)	Impact (Percent using contraception)
Total	100	56
Low misinformation	12	74
Moderate misinformation	55	65
High misinformation	33	36
(Chi square = 114.0 with 2 d.f., sig. at .0001)		

Note: See note to Table 1.

Source: State Information Service (Population I-E-C Unit), Arab Republic of Egypt, and the Social Development Center, Chicago.

and the IUD (the two leading methods available) are pandemic is clearly evident. These responses to detailed questions about the effects of oral pills, the IUD, and sterilization on health were combined to form an "index of misinformation" about health safety (Table 10). Those with high scores on misinformation were only about one-third as likely to be practicing family planning as those with low scores. This wide disparity, combined with the high prevalence of

misinformation, leads the Egypt report to conclude, "This combination of responses lays bare what appears to be the single greatest obstacle to the progress of family planning in Egypt" (SIS/SDC, Report 2).

Anxiety about Contraceptive Failure

The decision to practice contraception generates a new desire--the desire not to have an unwanted accidental pregnancy. Because of misinformation and rumors, many people greatly underestimate the reliability of modern methods of contraception; those who only a few months before may have been unconcerned about pregnancy may experience considerable anxiety that the method they have chosen will fail. This may be particularly true for couples who greatly increase their sexual activity as a consequence of adopting a modern method. The other psychic and normative costs may not seem to be worth enduring if the probability of success is low.

Data for Egypt illustrate the underestimation of the reliability of modern contraceptive methods (and overestimation of the reliability of traditional or folk methods) in many--if not most--Third World countries. Table 12 reports the perceptions of an Egyptian sample about the reliability of the various methods. The correct answer for all methods is "reliable," which includes all responses from "very reliable" to "moderately reliable." Obviously, there is massive underappreciation of the efficacy of modern contraceptives in avoiding pregnancy. Those who use these methods can only suffer needless anxiety and worry; this anxiety is part of the price faced by potential users who hold these popular views.

An "index of misinformation about reliability," compiled by combining all items of understatement of efficacy (and overstatement of efficacy of spermicides, condoms, and rhythm), is reported in the bottom panel of Table 12. One-third of the population is highly misinformed on this index, and an additional 55 percent moderately so; only one adult in eight can be said to be adequately informed. The impact of this misinformation on the use of contraception is clear: the rate of contraceptive use is only one-half as high among those who are poorly informed as among the very few who are not misinformed.

PSYCHOLOGISTICS: PERCEIVED ACCESSIBILITY OF CONTRACEPTIVE SERIVCES

Some form of family planning service is "available" (at a cost) to a very high percentage of fertile couples in developing countries. Even where there are no organized family planning programs, contraceptives can be obtained in pharmacies and/or from private physicians in nearby cities. Instead of being objective statements of reality, discussions of availability tend to become subjective studies of potential user's knowledge and perceptions; if services are perceived as being nonexistent or too inconvenient and costly, it is as if they did not in fact exist.

Tsui et al. (1981) found that perceived availability was significantly linked to contraceptive use in three developing countries (Bangladesh, Korea, and Mexico). Lightbourne et al. (1982) report World Fertility Survey data indicating that, in most Asian and Latin American countries surveyed, high proportions of the respondents (49 to 92 percent) knew of an outlet where family planning services could be obtained. Brackett and Ravenholt (1980) found that this knowledge is related to travel time to the nearest sources: perceived availability declines with greater distance, and is also linked with actual use. (Lightbourne et al. [1982] confirm this.)

Perceived availability of contraception can involve a number of dimensions. Monetary cost is obviously important: if people believe they cannot afford contraception at current prices, it is inaccessible to them. Family planning programs around the world are subsidizing supplies and services in order to overcome this psychic cost. Another dimension is follow-up medical care. Where clinics have a reputation for not answering questions or not showing concern for women with symptoms of side effects of contraception, it is logical to expect reluctance to adopt. Also significant is the general treatment clients receive when they attend clinics--waiting time, cordiality of staff, willingness to answer questions, privacy, and confidentiality. Finally, some clinics, biased in favor of or against particular methods, may recommend and provide only one kind of contraceptive, giving the client no choice.

Research on these dimensions is extremely limited, despite awareness of their importance on the part of experts in the management of contraceptive services. Some programs have sought to provide the ultimate in accessibility--delivery of the service to individual homes, free of charge. Such "saturation" experiments have usually resulted in increased acceptance and use, at least temporarily.

A special dimension of accessibility is whether to integrate family planning with other health or social development programs, thereby providing wider coverage and greater acceptability, or to maintain specialized family planning programs. Experience in some countries has shown that busy and overworked public health clinics tend to give contraception a lower priority and to show less initiative and consistency in offering it than specialized family planning agencies.

All of the international agencies dealing with contraception are dedicated to the principle that perceived accessibility--in its physical, financial, and human relations dimensions--must be improved. Thus, they are seeking to promote accessibility as part of their technical assistance, training, and advisory services.

SYNTHESIS AND CONCLUSIONS

The normative and psychic costs of contraception reviewed above can be categorized according to level of prevalence and impact:

Level 1: Minor normative and psychic costs
Level 2: Moderate normative and psychic costs
Level 3: Major normative and psychic costs

It should be noted that there is great country-to-country variability, and that only crude data exist for some areas. Because so little is known of the situation in sub-Saharan Africa, it is prudent to limit the classification to the Third World nations in Asia, Latin America, and Northern Africa and the Middle East.

Level 1: Minor Normative and Psychic Costs The empirical evidence indicates that the following four sources of psychic and normative costs are not highly prevalent and do not have a strong impact on contraceptive practice:

Disharmony with the extended family system
Loss of enjoyment of children
Threat to sex roles and sexual adjustment
Violation of modesty and privacy in sexual matters

The wide dissemination of information about population and contraception over the past decade, combined with the increasing availability of a wide variety of reliable modern contraceptives and rising material expectations, appear to have negated the impact of these factors.

Level 2: Moderate Normative and Psychic Costs These normative and psychic costs appear to be moderately prevalent in Third World societies; in most nations, only a minority of the population is affected by each. Within that minority, these factors usually have a moderate or weak impact, so that, overall, they have a strong impact on only a small fraction of the total.

Nonconformity with religious and moral beliefs
Provoking discord between spouses
Undermining family security and status
Making the family vulnerable to infant mortality
Perceived accessibility of contraceptive services

Level 3: Major Normative and Psychic Costs The following costs appear to have a major effect on a very large share of those couples in Third World countries who are not now contracepting. Thus they may be identified as the major barriers to greater adoption of family planning, in the following order of importance:

Fears of permanent damage to health
Anxiety about temporary side effects
Requiring communication about sex between spouses

Implying "inner control" or "efficacy"
Socially illegitimate behavior
A threat to self-fulfillment and security in the family role

Because of the fragmentary and varied nature of the empirical data, this synthesis is necessarily highly informal and approximate. However, it should provide hypotheses for further research efforts; these efforts need to be multivariate, with all of the normative and psychic costs considered simultaneously to measure the independent impact of each.

A few other concluding points might be made. First, in Third World nations, certain fundamental, noneconomic social changes associated with modernization appear to be taking place that have only a low correlation with changes in the per-capita gross national product (the usual indicator of economic development). All have the effect of reducing the psychic and normative costs of contraception. These changes may be identified as follows:

a. Progressive nuclearization of the family, with diminishing power of the extended family
b. Urbanization of the population, with increasing secularization and individualization
c. Decreasing infant mortality rates
d. Increasing democracy in the status of women
e. Extensive mass media exposure to modern ("Western") models of husband-wife interaction and decision making
f. Increasing internal control and decreasing external control in a wide sphere of activity, including health
g. Rapid accumulation of knowledge, accompanied by increased pressures for long-range planning and decision making

With these changes, decreasing prevalence and impact of the contraceptive costs discussed in this paper can be anticipated, even where economic development stagnates.

Second, most of the "major" and "moderate" costs (including family vulnerability to infant mortality, socially illegitimate behavior, anxiety about temporary side effects, fears of permanent damage to health, anxiety about contraceptive failure, perceived physical accessibility, and perceived organizational availability) can be affected by well-planned programs of public information based on scientific fact, without "propaganda" either for or against any particular population policy.

Finally, this discussion has treated each of the psychic and normative costs as if its relationship to contraception were inherently negative. To the extent that these costs are based on norms, once the pronatalist position of a society becomes a minority point of view, the direction of influence of all of the culture-based costs is reversed. For example, the social legitimacy factor can (and does) turn into social disapproval and gossip about people who bear excessive numbers of children. Such a reversal may be expected for disharmony with the extended family system, loss of enjoyment of

children, nonconformity in religious and moral beliefs, threat to self-fulfillment and security in the family role, socially illegitimate behavior, requiring communication about sex between spouses, and implying "inner control" or "efficacy." Survey evidence is showing that already, pronatalist values are a minority view in many Third World countries. Thus, as worldwide discussion of the topic continues, one can expect many costs of contraception to turn into costs of noncontraception.

BIBLIOGRAPHY

Ager, J. W. (1976) Multiple regression and facet techniques in psychological research on population. Pp. 87-103 in S. H. Newman and V. D. Thompson, eds., Population Psychology: Research and Educational Issues. Washington, D.C.: U.S. Department of Health, Education, and Welfare.

American Psychological Association (1972) Task force on psychology, family planning, and population policy report. American Psychologist 27:1000-1005.

Arnold, F., and J. T. Fawcett (1976) The Value of Children: Hawaii, Vol. 3. Honolulu: East-West Population Institute.

Back, K. W., and P. H. Hass (1973) Family structure and fertility control. In J. T. Fawcett, ed., Psychological Perspectives on Population. New York: Basic Books.

Bagozzi, R. P., and F. Van Loo (1978) Toward a general theory of fertility: A causal modeling approach. Demography 15:301-319.

Bakare, C. G. (1974) An appraisal of psychology research in family planning. Professional Psychology 5:346-351.

Bakker, C. B., and C. R. Dightman (1964) Psychological factors in fertility control. Fertility and Sterility 15:559-567.

Beckman, L. J. (1981) The relationship between sex roles, fertility, and family size preferences. Psychological Abstracts 65:18-49.

Bertrand, J. T., M. A. Pineda, and E. Soto (1978) Communicating Family Planning to Rural Guatemala. Chicago: Community and Family Study Center, University of Chicago.

Bogue, D. J. (1962) Some tentative recommendations for a "sociologically correct" family planning communication and motivation program in India. Pp. 503-538 in C. V. Kiser, ed., Research in Family Planning. Princeton, N.J.: Princeton University Press.

Bogue, D. J. (1967) Sociological Contributions to Family Planning Research. Chicago: Community and Family Study Center, University of Chicago.

Bogue, D. J., ed. (1970) Further Sociological Contributions to Family Planning Research. Chicago: Community and Family Study Center, University of Chicago.

Boldt, E., and A. H. Latif (1977) Contraceptive careers: Towards a subjective approach to fertility regulating behavior. Journal of Comparative Family Studies 8:357-367.

Brackett, J. W., and R. T. Ravenholt (1980) The potential demand for voluntary sterilization: Some findings from the World Fertility Survey. In M. E. Schima and I. Lubell, eds., Voluntary Sterilization: A Decade of Achievement. New York: Association for Voluntary Sterilization.

Brody, E. B. (1974) Psychocultural aspects of contraceptive behavior in Jamaica: Individual fertility control in a developing country. Journal of Nervous and Mental Disease 159:108-109.

Brody, E. B., F. Ottey, and J. LaGranada (1974) Couple communication in the contraceptive decision making of Jamacian women. The Journal of Nervous and Mental Disease 159:407-412.

Bulatao, R. A. (1975) The Value of Children: Philippines, Vol. 2. Honolulu: East-West Population Institute.

Bulatao, R. A. (1981) Values and disvalues of children in successive childbearing decisions. Demography 18:1-25.

Buripakdi, C. (1977) The Value of Children: Thailand, Vol. 4. Honolulu: East-West Population Institute.

Caldwell, J. C. (1976) Toward a restatement of demographic transition theory. Population Development Review 2:321-366. (Reprinted in J. C. Caldwell, The Persistance of High Fertility, 1977.)

Cawte, J. (1975) Psychosexual and cultural determinants of fertility choice behavior. American Journal of Psychology 132:750-753.

CELADE and CFSC (1972) Fertility and Family Planning in Metropolitan Latin America. Chicago: Community and Family Study Center, University of Chicago.

Chung, B. M., J. A. Palmore, S. J. Lee, and S. L. Lee (1972) Psychological Perspectives: Family Planning in Korea. Seoul: Korean Institute for Research in the Social Sciences.

Cicourel, A. V. (1967) Fertility, family planning, and social organization: Some methodological issues. Journal of Social Issues 23.

Clifford, W. B., and T. R. Ford (1974) Variations in value orientations and fertility behavior. Social Biology 21:185-195.

Cochrane, S. H., and F. D. Bean (1976) Husband-wife differences in the demand for children. Journal of Marriage and the Family 38:297-307.

Cogswell, B. E., and M. B. Sussman (1974) Changing roles of women, family dynamics, and fertility. Pp. 11-26 in H. Y. Tien and F. D. Bean, eds., Comparative Family and Fertility Research. Leiden: Brill.

Coombs, L., and D. Fernandez (1978) Husband-wife agreement about reproductive goals. Demography 15:57-73.

Crawford, T. J., R. Heredia, and E. Stocker (1970) Family planning attitudes and behavior as a function of the perceived consequences of family planning. In D. J. Bogue, ed., Further Sociological Contributions to Family Planning Research. Chicago: Community and Family Study Center, University of Chicago.

Davidson, A. R., and J. J. Jaccard (1975) Population psychology: A new look at an old problem. Journal of Personality and Social Psychology 31:1073-1082.

Davidson, A. R., and J. J. Jaccard (1976) Social psychological determinants of fertility intentions. In S. H. Newman and V. D. Thompson, eds., Population Psychology: Research and Educational Issues. Washington, D.C.: U.S. Department of Health, Education, and Welfare.

DuBois, C. A. (1963) Socio-cultural aspects of population growth. Pp. 251-265 in R. O. Greep, ed., Human Fertility and Population Problems. Cambridge, Mass.: Shenkman.

Elliott, R. (1973) Advertising family planning. In Readings on Population Information and Education. New York: Ford Foundation.

Fawcett, J. T. (1970) Psychology and Population. New York: Population Council.

Fawcett, J. T., ed. (1973) Psychological Perspectives on Population. New York: Basic Books.

Fawcett, J. T. (1974) Psychological research on family size and family planning in the United States. Professional Psychology 5:334-344.

Figa-Talamanca, I., L. W. Green, and A. Fisher (1974) Social and Psychological Aspects of Family Planning Communication and Attitude Change Strategies. Paper presented at Expert Group Meeting on Social and Psychological Aspects of Fertility Behavior, ESCAP, Bangkok.

Fishbein, M., and J. Jaccard (1973) Theoretical and methodological considerations in the prediction of family planning intentions and behavior. Representative Research in Social Psychology 4:37-51.

Freedman, D. S., R. Freedman, and P. K. Whelpton (1960-61) Size of family and preference for children of each sex. American Journal of Sociology 66:141-159.

Freedman, R. (1962) American studies of family planning and fertility: A review of major trends and issues. Pp. 211-227 in C. V. Kiser, ed., Research in Family Planning. Princeton, N.J.: Princeton University Press.

Freedman, R., and J. Y. Takeshita (1969) The program setting, results, and implications. Pp. 171-200 in Family Planning in Taiwan. Princeton, N.J.: Princeton University Press.

Freedman, R., and P. K. Whelpton (1952) Fertility planning and fertility rates by adherence to traditions. In P. K. Whelpton and C. V. Kiser, eds., Social and Psychological Factors Affecting Fertility, Vol. 3. New York: Milbank Memorial Fund.

Freedman, R., and P. K. Whelpton (1952) The relationship of general planning to fertility planning and fertility rates. Pp. 549-574 in P. K. Whelpton and C. V. Kiser, eds., Social and Psychological Factors Affecting Fertility, Vol. 3. New York: Milbank Memorial Fund.

Friedman, H. L., R. L. Johnson, and H. P. David (1976) Dynamics of fertility choice behavior: A pattern for research. In S. H. Newman and V. D. Thompson, eds., Population Psychology: Research and Educational Issues. Washington, D.C.: U.S. Department of Health, Education, and Welfare.

Groat, N. T., and A. G. Neal (1967) Social psychological correlates of urban fertility. American Sociological Review 32:945-959.

Hass, P. H. (1974) Wanted and unwanted pregnancies: A fertility decision-making model. Journal of Social Issues 30:125-165.

Hill, R., J. M. Stycos, and K. Black (1959) The Family and Population Control. Chapel Hill, N.C.: University of North Carolina Press.

Hoffman, L. W., and F. Wyatt (1960) Social change and motivations for having larger families: Some theoretical considerations. Merrill-Palmer Quarterly 6:235-244.

Hollerbach, P. E. (1980) Power in Families: Communication and Fertility in Decision-Making. Center for Policy Studies Working Papers No. 53. New York: Population Council.

Holmes, H. (1973) Human Factors which Influence Responses to Family Planning among Northeastern Thai Villagers. UNDP/UNICEF Development Support Communication Service.

Insko, C. A., R. R. Blake, R. B. Cialdini, and S. A. Mulaik (1970) Attitude toward birth control and cognitive consistency: Theoretical and practical implications of survey data. Journal of Personality and Social Psychology 16:228-237.

Iritani, T. (1979) The Value of Children: Japan, Vol 6. Honolulu: East-West Population Institute.

Keller, A. B. (1970) Psychological sources of resistance to family planning. In D. J. Bogue, ed., Further Sociological Contributions to Family Planning Research. Chicago: Community and Family Study Center, University of Chicago.

Keller, A. B. (1973) Patient attrition in five Mexico City family planning clinics. In J. M. Stycos, ed., Clinics, Contraception and Communication: Evaluation Studies of Family Planning Programs in Four Latin American Countries. New York: Appleton-Century-Crofts.

Laing, J. E. (1970) The relationship between attitudes and behavior: The case of family planning. In D. J. Bogue, ed., Further Sociological Contribution to Family Planning Research. Chicago: Community and Family Study Center, University of Chicago.

Lee, R. P. L. (1974) Social Change and Changes in Fertility Motivation. Paper presented at Expert Group Meeting on Social and Psychological Aspects of Fertility Behavior, ESCAP, Bangkok.

Lee, S. J., and J. Kim (1979) The Value of Children: Korea, Vol. 7. Honolulu: East-West Population Institute.

Lehfeldt, H. (1971) Psychology of contraceptive failure. Medical Aspects of Human Sexuality 5:68-77.

Leibenstein, H. (1974) An interpretation of the economic theory of fertility: Promising path or blind alley? The Journal of Economic Literature 12:456-487.

Lidz, R. (1969) Emotional factors in the success of contraception. Fertility and Sterility 20:761-771.

Lightbourne, R., S. Singh, and C. Green (1982) The World Fertility Survey: Charting global childbearing. Population Bulletin 37(1). Washington, D.C.: Population Reference Bureau.

MacDonald, A. P., Jr. (1970) Internal-external locus of control and the practice of birth control. Psychology Reports 27:206.

Miller, W. B. (1973) Personality and Ego Factors Relative to Family Planning and Population Control. Unpublished report. Department of Psychiatry, Stanford University, Stanford, Calif.

Miller, W. B., and R. K. Godwin (1977) Psyche and Demos: Individual Psychology and the Issues of Population. New York: Oxford University Press.

Morgan, R. W., J. Kocher, and M. Carvajal (1976) New Perspectives in the Demographic Transition. Occasional Monograph Series No. 4. Washington, D.C.: Interdisciplinary Communications Program, Smithsonian Institution.

Mundigo, A. I. (1973) Honduras revisited: The clinic and its clientele. In J. M. Stycos, ed., Clinics, Contraception, and Communication: Evaluation Studies of Family Planning Programs in Four Latin American Countries. New York: Appleton-Century-Crofts.

Newman, S. H., and V. D. Thompson, eds. (1976) Population Psychology: Research and Educational Issues. Washington, D.C.: U.S. Department of Health, Education, and Welfare.

Niehoff, A. H., and J. C. Anderson (1966) Peasant fatalism and socioeconomic innovation. Human Organization 25:273-282.

Olson-Prather, E. (1976) Family planning and husband-wife relationships in Turkey. Journal of Marriage and the Family 38:379-385.

Palmore, J. A. (1976) Demographic evaluation systems and psychological research designs. In S. H. Newman and V. D. Thompson, eds., Population Psychology: Research and Educational Issues. Washington, D.C.: U.S. Department of Health, Education, and Welfare.

Palmore, J. A., P. M. Hirsch, and A. B. Marzuki (1971) Interpersonal communication and the diffusion of family planning in West Malaysia. Demography 8:411-425.

Piotrow, P. T. (1973) World Population Crisis: The United States Reponse. New York: Praeger.

Poffenberger, T. (1969) Husband-Wife Communication and Motivational Aspects of Population Control in an Indian Village. New Delhi: Central Institute of Family Planning.

Pohlman, E. (1969) The Psychology of Birth Planning. Cambridge, Mass.: Schenkman Publishing Company, Inc.

Polgar, S. (1966) Some socio-cultural aspects of family planning in the United States today. Human Organization 25:321.

Polgar, S. (1975) Cultural development, population, and the family. Pp. 239-251 in Department of Economic and Social Affairs, The Population Debate: Dimensions and Perspectives. Papers of the World Population Conference, Bucharest, 1974. New York: United Nations.

Pratt, L., and P. K. Whelpton (1953) Extra-familial participation of wives in relation to interest in and liking children, fertility planning, and actual and desired family size. In P. K. Whelpton and C. V. Kiser, eds., Social and Psychological Factors Affecting Fertility. New York: Milbank Memorial Fund.

Presser, H. B. (1977) Early motherhood: Ignorance or bliss? Family Planning Perspectives 9.

Presser, H. B. (1977) Guessing and misinformation about pregnancy risks among urban mothers. Family Planning Perspectives 9.

Rainwater, L. (1965) Family Design: Marital Sexuality, Family Size, and Contraception. Chicago: Aldine.

Rogers, E. M. (1971) Incentives in the diffusion of family planning innovations. Studies in Family Planning 2:241-248.

Rogers, E. M. (1973) Communication Strategies for Family Planning. New York: The Free Press.

Rosario, F. Z. (1971) A Survey of Social Psychological Variables Used in Studies of Family Planning. Paper No. 11. Honolulu: East-West Communications Institute.

Ross, J. A., and R. G. Potter (1980) Changes in acceptors' and users' ages: A test of an explanatory mechanism. Population Studies 34:367-380.

Rotter, J. B. (1960) Generalized expectancies for internal versus external control reinforement. Psychological Monographs 80:1-28.

Sandberg, E. C., and R. I. Jacobs (1971) Psychology of the misuse and rejection of contraception. American Journal of Obstetrics and Gynecology 110:227-242.

Shedlin, M. G., and P. E. Hollerbach (1981) Modern and traditional fertility regulation in a Mexican community: The process of decision making. Studies in Family Planning 12:278-296.

Shevasunt, S., and D. P. Hogan (1979) Fertility and Family Planning in Rural Northern Thailand. Chicago: Community and Family Study Center, University of Chicago.

Sinquefield, J. C. (1974) A Social-Psychological Study of Resistance to Family Planning in Rural Alabama. Chicago: Community and Family Study Center, University of Chicago.

Smith, M. B. (1965) Motivation, communications research, and family planning. Pp. 70-92 in M. Sheps and J. C. Ridley, eds., Public Health and Population Change. Pittsburgh, Pa.: University of Pittsburgh Press.

Steinlauf, B. (1979) Problem-solving skills, locus of control, and the contraceptive effectiveness of young women. Child Development 50:268-271.

Stoeckel, J. E. (1970) A socio-demographic analysis of family planning in a rural area of East Pakistan. In D. J. Bogue, ed., Further Sociological Contributions to Family Planning Research. Chicago: Community and Family Study Center, University of Chicago.

Stycos, J. M. (1962) A critique of the traditional Planned Parenthood approach in underdeveloped areas. Pp. 477-501 in C. V. Kiser, ed., Research in Family Planning. Princeton, N.J.: Princeton University Press.

Stycos, J. M. (1968) Contraception and Catholicism in Latin America. In J. M. Stycos, ed., Human Fertility in Latin America. Ithaca, N.Y.: Cornell University Press.

Stycos, J. M. (1971) Opinion, ideology, and population problems: Some sources of domestic and foreign opposition to birth control. Pp. 533-566 in National Academy of Sciences, Rapid Population Growth, Consequences and Implications. Baltimore, Md.: The Johns Hopkins Press.

Stycos, J. M., ed. (1973) Clinics, Contraception, and Communication: Evaluation Studies of Family Planning Programs in Four Latin American Countries. New York: Appleton-Century-Crofts.

Stycos, J. M. (1977) Indexing birth control. Family Planning Perspectives 9:286-292.

Stycos, J. M., and K. W. Back (1964) The Control of Human Fertility in Jamaica. Ithaca, N.Y.: Cornell University Press.

Stycos, J. M., and P. G. Marden (1973) Health and family planning in a Honduran barrio. In J. M. Stycos, ed., Clinics, Contraception, and Communication: Evaluation Studies of Family Planning Programs in Four Latin American Countries. New York: Appleton-Century-Crofts.

Sujono, H. (1974) The Adoption of an Innovation in a Developing Country: The Case of Family Planning in Indonesia. Chicago: Community and Family Study Center, University of Chicago.

Thompson, L., and G. B. Spanier (1978) Influence of parents, peers, and partners on the contraceptive use of college men and women. Journal of Marriage and the Family 40:481-491.

Thompson, V. D., and H. P. David (1977) Population psychology in perspective. International Journal of Psychology 12:135-146.

Tien, H. Y., and F. D. Bean, eds. (1974) Comparative Family and Fertility Research. Leiden: Brill.

Tobin, P. L. (1976) Conjugal role definition, value of children, and contraceptive practice. Social Quarterly 17:314-322.

Townes, B., F. L. Campbell, L. R. Beach, and D. C. Martin (1976) Birth planning values and decisions: Preliminary findings. In S. H. Newman and V. D. Thompson, eds., Population Psychology: Research and Educational Issues. Washington, D.C.: U.S. Department of Health, Education, and Welfare.

Tsui, A. O., D. P. Hogan, J. D. Teachman, and C. Welti-Chanes (1981) Community availability of contraceptives and family limitation. Demography 18:615-625.

Wanty-Pancot, M. C., and G. Rucquoy (1975) Psychological resistance of women to the principal feminine contraceptive methods: Toward a clinical classification. Acta Psychiatrica Belgica 75:49-73.

Westoff, C. F., R. G. Potter, P. C. Sagi, and E. G. Mishler (1961) Family Growth in Metropolitan America. Princeton, N.J.: Princeton University Press.

Westoff, C. F., R. G. Potter, and P. C. Sagi (1963) The Third Child. Princeton, N.J.: Princeton University Press.

Whelpton, P. K., and C. V. Kiser, eds. (1946, 1950, 1954, 1958) Social and Psychological Factors Affecting Fertility. New York: Milbank Memorial Fund.

Williams, P. (1970) Traditionalism and change receptivity: A study of reactions to a fertility reduction campaign. In D. J. Bogue, ed., Further Sociological Contributions to Family Planning Research. Chicago: Community and Family Study Center, University of Chicago.

Wood, R. J., F. L. Campbell, B. D. Townes, and L. R. Beach (1977) Birth Planning Decisions. American Journal of Public Health 67:563-565.

World Health Organization Task Force on Psychosocial Research in Family Planning and Task Force on Service Research in Family Planning (1980) User preferences for contraceptive methods in India, Korea, the Philippines, and Turkey. Studies in Family Planning 11:267-273.

World Health Organization Task Force on Psychosocial Research in Family Planning, Special Programme of Research, Development, and Research Training in Human Reproduction (1981) A cross-cultural study of menstruation: Implications for contraceptive development and use. Studies in Family Planning 12:3-16.

World Health Organization Task Force on Psychosocial Research in Family Planning, Special Programme of Research, Development, and Research Training in Human Reproduction (1981) Women's bleeding patterns: Ability to recall and predict menstrual events. Studies in Family Planning 12:17-27.

Wu, T.-S. (1977) The Value of Children: Taiwan, Vol. 5. Honolulu: East-West Population Institute.

Wyatt, F. (1967) Clinical notes on the motives of reproduction. Journal of Social Issues 23:29-56.

Yaukey, D., W. Griffiths, and B. J. Roberts (1967) Couple concurrence and empathy on birth control motivation in Dacca, East Pakistan. American Sociological Review 32:716-726.

Chapter 23

ABORTION: ITS PREVALENCE, CORRELATES, AND COSTS

Henry P. David*

INTRODUCTION

Induced abortion is one of the oldest forms of fertility regulation;[1] it is also one of the most controversial.[2] No other elective surgical procedure has evoked as much worldwide debate, generated such emotional and moral controversy, or received greater sustained attention from members of the public concerned with women's rights and well-being. Although some developing countries have achieved significant fertility declines in recent years, actual family size continues to exceed total desired family size in most (Harrison, 1980; Westoff, 1981; World Fertility Survey, 1980). In many countries, abortion is a traditional method of fertility regulation, especially where modern contraceptives are only gradually becoming accessible. The World Fertility Survey (WFS) obtained little information on abortion, in part because the host governments decided against using the WFS abortion module; however, evidence strongly suggests that nearly everywhere, women of all backgrounds resort to abortion to some extent, regardless of legal codes, religious sanctions, or personal dangers.[3]

Because of the illegality, social ambivalence, and political sensitivity associated with abortion, empirical data about its role within the total context of fertility regulation still pose numerous questions. It is the purpose of this paper to summarize what is known about prevalence, costs, and correlates of abortion in developing countries. An overview of abortion procedures is followed by a discussion of research data sources and constraints. The legal status and actual practice of abortion in 144 countries are then summarized.

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This is followed by a discussion of the worldwide incidence of abortion and perceptions of its prevalence, as well as its effects on fertility rates, the abortion-contraception relationship, and the role of repeat abortions. Characteristics of clients and service providers are also noted. Next, available data on mortality and morbidity are reviewed within the context of the legal status of abortion. This is followed by a discussion of economic, social, and psychological costs for the woman, her family, and society; the costs of denied abortion are also considered. The paper concludes with a list of propositions summarizing the major points presented and suggesting areas for further research.

Abortion Procedures

As used by the medical profession, the term "abortion" denotes the termination of a pregnancy "after the implantation of the blastocyst in the endometrium but before the fetus has attained viability, that is, before it has become capable of surviving, with appropriate life support, the neonatal period and eventually maintaining an independent extrauterine life" (Tietze, 1981). The two major categories of abortions are the induced and the spontaneous. The former are initiated voluntarily to terminate a pregnancy that is known or believed to exist; all other abortions are deemed spontaneous, even if an external cause is involved, such as an injury or high fever. This paper addresses only induced abortion, whether legal or illegal according to the prevailing legislation in each country.

Three primary abortion methods are currently used by physicians: (1) instrumental evacuation by the vaginal route, (2) uterine surgery, and (3) medical induction of labor. In the first category, surgical curettage has been progressively replaced in recent years by suction curettage, also known as vacuum aspiration, which has been shown to be simpler, quicker, and less traumatic (Tietze, 1981). The average time required for instrumental evacuation is less than five minutes. "Menstrual regulation" is a variant of suction curettage that is generally limited to the first two weeks after a missed menstrual period when pregnancy cannot yet be reliably diagnosed. It has become popular in many developing countries with restrictive abortion legislation whose statutes make proof of pregnancy an essential element of the so-called crime of abortion (Dunshee de Abranches, 1976; Paxman and Barberis, 1980). "Dilatation and evacuation" is the use of instrumental evacuation procedures early in the second trimester, usually at 13 to 15 weeks of gestation. In the second category, the two major uterine surgical procedures for the termination of pregnancy are hysterotomy and hysterectomy. Finally, medical induction of labor is generally used to terminate second-trimester pregnancies, beginning in the 16th week of gestation. Methods range from replacement of amniotic fluid by a hypertonic solution of sodium chloride to intraamniotic injections of prostaglandins. (For a detailed description of these procedures and their relative advantages and disadvantages, see Tietze, 1981).

Of course, persons without medical training also have methods for inducing abortion. These include spells and incantations, a variety of traditional medications that tend to be either ineffective or toxic, and various procedures designed to damage or destroy the conceptus, leaving its expulsion to natural forces. The most widely used method is probably the insertion of a foreign body into the uterus. Twigs, roots, clothes hangers, rubber tubes (catheters), and other objects have been used for this purpose (e.g., Figa-Talamanca, 1977, 1980; Tietze, 1981). In Southeast Asia, abdominal massage is practiced by indigenous midwives to induce bleeding (Narkavonnakit, 1979b; Narkavonnakit and Bennett, 1981; Gallen, 1982; Gallen et al., 1981). Elsewhere, injections of soapy water or readily available household disinfectants may be used (Tietze, 1981).

The differential diagnosis between spontaneous and illegal or self-induced abortion is sometimes impossible: the latter cannot be identified without either evidence of manipulation, such as injury to the cervix or perforation of the uterus, or information from the woman, members of her family, or the person performing the abortion. Most septic abortions are believed to be induced; however, many illegally induced abortions show no signs or symptoms, whereas some spontaneous abortions do (Tietze, 1981). Incomplete abortion is the most common diagnosis when women are admitted to hospitals for aftercare, usually for postabortal bleeding caused by retention of placental tissue.

Data Sources and Constraints

Although abortion is common, it is extremely difficult to assess empirically. Legal, religious, and cultural constraints vary widely, giving the term different meanings from country to country and over time within the same country. Only recently and in a few countries has it been possible to distinguish the costs of abortion (both granted and denied) from other consequences of unwanted pregnancy (Illsley and Hall, 1976; Moore, 1974, 1976; David et al., 1978).

Research is most representative, valid, and reliable in countries where abortion is legal, and where efficient population registration systems include information on fertility and related health services, for example in Cuba, Czechoslovakia, Hungary, Denmark, and the United Kingdom (e.g., Tietze, 1981). However, few developing countries have statistical systems that integrate abortion and other health services data. In countries where abortion is illegal, most information on the health, socioeconomic, and psychological costs of abortion is derived from four sources: hospital records, death certificates, retrospective surveys of women, and interviews with abortion service providers. Terms and measurements used in abortion research are defined in Figure 1.

Hospital records generally report the number of women admitted for treatment of abortion complications and the number of subsequent deaths in a given period of time. Such records can suggest a minimum incidence of mortality, and reflect the public costs of illegal

FIGURE 1 Terms and Measurements Used in Abortion Research

Terms

ABORTION: The termination of a pregnancy before the fetus is capable of extrauterine life (medical definition).

INDUCED ABORTION: Deliberate interference with a pregnancy, with the intention of terminating it, by the pregnant woman herself or by another person.

SPONTANEOUS ABORTION: All abortions not induced are spontaneous even if an external cause such as trauma or disease is involved; also called miscarriage.

SEPTIC ABORTION: Abortion that is followed by infection. The majority of septic abortions are thought to be induced, but infection can occur after spontaneous abortion.

INCOMPLETE ABORTION: The presence of retained products of conception in the uterus after a spontaneous or induced abortion. Incomplete abortion is the most common diagnosis when women are hospitalized for abortion complications.

ABORTIFACIENT: A drug or other substance used to cause a pregnant woman to abort.

Measurements

Abortion is usually measured by RATES, which relate numbers of abortions to population, or by RATIOS, which relate numbers of abortions to numbers of events such as livebirths, deliveries, or pregnancies.

PREVALENCE RATE: The proportion of women who have had one or more abortions in their lifetimes, usually expressed as a percentage. This is the most common measurement reported by surveys.

ABORTION RATE (INCIDENCE RATE): The number of abortions in a given period, usually a year relative to a whole population or to a population of women. This measurement of incidence is usually expressed as a number of abortions per 1,000 women of reproductive age, 15-44 or 15-49. Incidence rates can also be age- or parity-specific.

HOSPITALIZED ABORTION RATE: The number of women hospitalized in a given period, usually one year, for abortion complications relative to the population of all women or of women of fertile age.

FIGURE 1 (continued)

ABORTION RATIO: The number of abortions relative to the number of live births, pregnancies, or deliveries in a given period (usually one year), expressed as the number of abortions per 1,000 events. Sometimes ratios are reported as the number of abortions in women's lifetimes per 1,000 lifetime live births.

ABORTION-MORTALITY RATIO: The number of deaths associated with or attributed to abortion per 100,000 abortions (also known as a death-to-case rate). When complete data are not available, the ratio is often expressed as the number of in-hospital deaths attributed to abortion per 1,000 cases of abortion complications.

ABORTION-MORTALITY RATE: The number of deaths associated with or attributed to abortion per 100,000 women of fertile age.

Sources: Liskin (1980); Tietze (1981).

abortion (Figa-Talamanca, 1979). Among the major disadvantages of this information source are frequent failure to differentiate between spontaneous and induced abortion (WHO, 1979a), inaccuracy of official records (Lopez-Escobar et al., 1978), and the selectivity of women admitted to hospitals, who represent an unknown proportion of the total number of women obtaining abortions. Thus, although hospital records document the considerable expenses involved in caring for women admitted for abortion-associated complications, conclusions based on these data are tenuous because they seldom consider the much larger proportion of women whose abortions do not necessitate hospitalization. With the growing availability of simpler methods for terminating early pregnancies, medical, paramedical, and nonmedical abortionists can be expected to improve their skills. Complications may be further reduced if present clinical trials with prostaglandin analogues lead to a low-cost vaginal suppository for safe, self-administered, first-trimester abortion (e.g., Foster, 1980).

Although death certificates can provide a minimum figure for abortion mortality, their completeness and validity varies greatly among developing countries. For example, deaths may be ascribed to other causes or simply not be registered.

Retrospective surveys of abortion incidence permit selection of representative samples and, if repeated, extrapolation to population subgroups over time. However, even in countries where abortion is legal, such as Hungary, Japan, and Yugoslavia, it has been noted that women either selectively "forget" to mention abortions in their pregnancy histories (e.g., Hungary, 1969b; Hogue, 1975, 1978), or do not include medication taken to bring on a late period (e.g., Newman, 1980). Another difficulty is the lack of comparability due to differences in design, as well as in age and marital status of

respondents, and a lack of specificity in questions asked (e.g., Gaslonde, 1976). Prospective surveys are more valid, but are also much more costly (e.g., Santee, 1975). Another approach is the "randomized response technique," which permits respondents to give information on highly sensitive topics without revealing the actual facts to the interviewer (Warner, 1965). However, although numerous modifications have been explored, results have been mixed. In general, there are no reliable broad-based statistical data on illegal abortion (Tietze, 1981).

Recently published surveys of abortion service providers in Korea (Hong and Tietze, 1979), Thailand (Narkavonnakit, 1979a, 1979b), the Philippines (Gallen, 1982), and Mexico (Tomaro, 1981; Gallen et al., 1981) are more promising sources of abortion data. By developing rapport and guaranteeing anonymity, researchers have obtained reliable data about the abortion experience of selected married and unmarried women, confirmed by local interviews with women seeking abortions.

Finally, abortion-related psychosocial research is constrained by sociocultural ambiguities and political sensitivities. In the United States, for example, more statistics are available on legal abortion than on any other surgical procedure. However, problems in interpretation persist, due partly to the difficulty of obtaining representative population samples from the range of public and private service providers. These problems are compounded by the lack of comparability between local and regional studies, the complexities of obtaining adequate follow-up access to the woman and her partner, and the absence of standardized instruments for assessing psychosocial and economic determinants and costs (David, 1978a). Reported sociodemographic information is usually very limited in the national surveys conducted by the Centers for Disease Control (1980) or the Alan Guttmacher Institute (Forrest et al., 1979; Henshaw et al., 1981, 1982). Similar limitations have been noted in other developed countries where abortion is legal (IUSSP, 1977).

ABORTION POLICIES, LAWS, AND PRACTICES

As of April 1982, the worldwide legal status of abortion ranges from complete prohibition to elective abortion at the request of the woman during the first trimester of pregnancy, usually defined as the first twelve weeks of gestation beginning with the first day of the last menstrual period. Figure 2 summarizes the current legislative situation in 144 countries, both developed and developing, according to four major categories of abortion availability and grounds. In the 25 nations where abortion is entirely illegal, no grounds for pregnancy termination are cited in the legislation. In 39 countries, the availability of legal abortion is specifically restricted to situations threatening the woman's life. Conditional reasons for abortion are stated in the laws of 48 lands; these conditions include risk to the woman's mental or physical health beyond that normally associated with pregnancy, some degree of likely impairment of the fetus or the child, and pregnancy resulting from incest or rape. In

FIGURE 2 Legal Status of Abortion by Grounds April 1982: 144 Countries

ILLEGAL Not allowed regardless of indications N = 25	Belgium Burundi Central African Rep. Colombia Dominican Republic	Gabon Haiti Indonesia Iran Mali Malta Mauritania	Monaco Mongolia Niger Panama Philippines Portugal Rwanda	Somalia Spain Tonga Upper Volta Western Samoa Zaire
RESTRICTIVE Allowed under narrow life-threatening conditions only N = 39	Afghanistan Bahrein Bangladesh Benin Botswana Burma Chad Chile Guatemala Iraq	Ireland Ivory Coast Kenya Laos Lebanon Lesotho Libya Madagascar Malawi Mauritius	Mozambique Nauru Nicaragua Nigeria Pakistan Paraguay Saudi Arabia Senegal Sierra Leone Sri Lanka	Sudan Syria Togo United Arab Emirate Uruguay Vanuatu Venezuela Yemen, North Yemen, South
CONDITIONAL Allowed under broad health, eugenic, and juridical indications N = 48	Albania Algeria Argentina Australia Bahamas Barbados Bolivia Brazil Cameroon Canada Congo Costa Rica Ecuador	Egypt El Salvador Ethiopia Fiji Gambia Ghana Greece Grenada Guinea Guyana Honduras Hong Kong Israel	Jamaica Jordan Korea, Rep. of Kuwait Liberia Malaysia Mexico Morocco Namibia Nepal New Zealand Papau-New Guinea	Peru Seychelles South Africa Swaziland Tanzania Thailand Trinidad and Tobago Turkey Uganda Zimbabwe
ELECTIVE Allowed on request or for social indications in first trimester N = 32	Austria Bulgaria China Cuba Cyprus Czechoslovakia Denmark Finland France	German Dem. Rep. German Fed. Rep. Hungary Iceland India Italy Japan	Korea, Dem. People's Rep. Luxembourg Netherlands Norway Poland Romania Singapore Sweden	Switzerland Tunisia USSR United Kingdom USA Viet Nam Yugoslavia Zambia

Sources: Official Gazettes: International Digest of Health Legislation; Law Files of the International Planned Parenthood Federation; Transnational Family Research Institute; Cook and Dickens (1979); Stepan (1979); Paxman (1980a); and David (1981).

32 lands, abortion is available on request in the first 10 or 12 weeks of gestation, for specific social or socioeconomic indications, or for reasons of failure of a routinely used contraceptive method.

Seen in historical perspective, a social revolution has occurred in abortion legislation in recent decades. In 1954, abortion was illegal in all countries except Iceland, Denmark, Sweden, and Japan.[4] In the subsequent 27 years, more than 30 countries, including such major developing nations as China, India, Singapore, and Tunisia, changed their formerly restrictive laws or policies to permit abortion on a woman's request or for a broad range of social indications. These changes can be traced, in part, to increased recognition of the health dangers of illegal abortion, and to growing support for a woman's right to terminate an unwanted pregnancy early in gestation under safe conditions. During the same period, four Eastern European countries (Bulgaria, Czechoslovakia, Hungary, and Romania) rerestricted their liberal legislation somewhat as part of a well organized pronatalist effort (David and McIntyre, 1981; David, 1982a), while New Zealand and Israel succumbed to conservative pressures in making abortion for social reasons less accessible. In Iran, the Revolutionary Government revoked implementation of the liberal legislation. Only China, Singapore, and Tunisia openly acknowledged legalizing abortion for the purpose of limiting population growth and enhancing social and economic development. Presently, about two-thirds of the world's population live under conditions of liberal legislation, mostly in Europe, North America, and parts of Asia.

In actual practice, abortion remains illegal, restrictive, or difficult to obtain in many of the larger and more populous developing countries of Asia; all of Latin America, except Cuba; all of sub-Saharan Africa; and all the Moslem countries of the Middle East and North Africa, except Tunisia and Kuwait. In a number of countries where abortion is legal, it is also extremely difficult to obtain. Legalization does not require health authorities to meet existing demand or ensure service availability at the earliest stage of pregnancy.[5] The American and European experience of administrators unwilling to comply with existing legislation, or health personnel asking to be excused from providing abortion services, can be duplicated in many developing countries. Abortions continue to be enmeshed in more regulatory requirements than most other medical procedures (Paxman, 1980a). In Brazil, Mexico, and Peru, where the legislation is conditional (covering only rape, incest, or broadly defined health reasons), the process of obtaining a legal abortion is so cumbersome that "conditional" really is equivalent to illegal. Abortion is legally available on request in India; however, it is in fact largely unavailable in most rural areas where the majority of the population lives. In Zambia, bureaucratic requirements and limited available resources complicate legal abortion availability. The Kuwait legislation is too recent to permit a judgment.

Conversely, in some countries, strict anti-abortion laws are unenforced. In Chile, Korea, and Taiwan, abortions are performed by physicians with little legal risk. In Thailand, most identified rural

abortionists were wives of government civil servants (Narkavonnakit, 1979a). In Panama, law enforcement officials are known to look the other way when physicians terminate early pregnancies under the name "menstrual regulation."[6] Elsewhere, definitions of legal grounds for abortion may be so clouded and confusing as to preclude legal action against physicians. Abortion to save a woman's life can be authorized under the general principles of criminal law applicable to a given state of necessity (Stepan, 1979); this probably explains why some abortions on medical grounds are tolerated even in those few countries where prohibitions against illegal abortions are said to be strictly enforced.

In sum, evolving societal trends, coupled with the increasingly well-organized women's movement and its male supporters, gradually moved many legislators toward abortion liberalization. However, because significant segments of the population still oppose both abortion and freer access to contraception, which could reduce the need for abortion, termination of unwanted pregnancies continues to be restricted for many women in developed and developing countries, particularly the young and the economically disadvantaged (Jaffe et al., 1981; David, 1981a).

INCIDENCE AND FERTILITY EFFECTS OF ABORTION

Worldwide Incidence and Perceived Prevalance

The total number of abortions performed each year throughout the world is not known and perhaps never will be. Estimates range from 13.7 million (Rochat et al., 1980) to 55 million (International Planned Parenthood Federation, 1974, 1978), suggesting abortion ratios ranging from 207 to 450 per 1,000 live births. Moreover, these estimates combine information from countries where abortion is legal and reliably reported and those where it is illegal or in which nationwide abortion data are not reported.[7]

No reliable method has yet been devised to estimate the incidence of illegal abortions (Tietze, 1981).[8] However, on the basis of data cited by Tietze (1981), International Planned Parenthood Federation (1974, 1978), and Liskin (1980), as well as information gathered for Abortion Research Notes (1972), it is possible to suggest some broad patterns and trends in developing countries where access to abortion is illegal or legally restricted. Induced abortion is probably more frequent in Asia and Latin America than in Africa and the Middle East. It is also perhaps more common in those countries of Southeast Asia where it is legally restricted but widely available in practice (e.g., South Korea, Thailand) than in those countries where it is legal but actual access is very limited (e.g., India). Rates of illegal abortion are probably increasing in most developing countries as a larger proportion of women decide to terminate unwanted pregnancies regardless of legal technicalities. For example, it has been suggested that every year in rural Thailand, one in seven women of fertile age has an illegal abortion, typically by means of

abdominal massage provided by a traditional practitioner residing in the woman's village (Narkavonnakit, 1979a, 1979b, 1980; Narkavonnakit and Bennett, 1981).

The situation in India is particularly noteworthy because of the comparatively low incidence of legal abortion since the Medical Termination of Pregnancy Act made legal abortion available on request in 1972: the reported number of legal terminations increased from 24,000 in 1972 to 278,100 in 1977, while the number of illegal abortions was estimated at between four and six million (Goyal, 1978). Indian researchers suggest that women continue to resort to illegal abortion because of insufficient information about legal termination services (Chandrasekhar, 1978; Krishna Menon, 1979); limited publicity about the law and the widely held misperception that abortion is illegal (Goyal, 1978); lack of adequate facilities, particularly in rural areas (Padubidri and Kotwani, 1979); impersonal and unattractive abortion services at approved centers, with long waiting periods (P.S. David, 1978; Krishna Menon, 1979); and reluctance of unmarried women to register for abortions at hospitals and clinics (Bhatt, 1980). Since access to legal abortion is limited, illegal abortion remains a major health problem. This is in sharp contrast with South Korea, where abortion is often perceived to be available on request although its legal availability is conditional (Hong and Watson, 1976): a 1975 national abortion survey yielded an abortion ratio of 667 abortions per 1,000 live births (Park et al., 1979); a 1977-78 survey of abortion providers in Seoul suggested an abortion ratio of 2,750 per 1,000 live births in the capital city (Hong and Tietze, 1979).

Most information on the extent of illegal abortion in the Middle East from the 1960s and early 1970s is of limited quality. More recent information from Tunisia (where elective abortion is legal) and from Turkey (where abortion is widely available) indicates that increasing numbers of women have resorted to abortion to terminate unwanted births (Nazer, 1980; Tecsan et al., 1980).

In sub-Saharan Africa, Zambia's legislation is similar to that of Britain. The requirement that requests must be approved by three physicians and that procedures must be performed in hospitals, except under certain specified circumstances, has kept the number of legal abortions low--173 in 1976 (Mhango and Grech, 1979). Surveys have not been particularly successful in eliciting information on illegal abortion, in part because few women are willing to admit flaunting strong tribal sanctions and legal restrictions. Still, in many parts of Africa, abortion is said to be a traditional form of birth control (Ndeti, 1973; Waife, 1978).

Characteristics of Clients and Service Providers

Clients

Major demographic characteristics reported from some of the countries where abortion is legal include the woman's age, number of prior

births, and marital status. Among the women seeking abortions, the proportion of those under 20 years of age ranges between 25 and 30 percent in the United States, Canada, England and Wales, and Norway; in recent years, the United States has reported the highest proportion of teenagers and unmarried women among all women obtaining pregnancy terminations (CDC, 1979; Tietze, 1981). Conversely, the proportion of older, parous, and married women is high in Tunisia, India, Japan, Czechoslovakia, and Hungary. Intermediate positions are represented by Denmark, Finland, the German Federal Republic, and Singapore.

These patterns tend to reflect differences in adolescent sexual activity, societal disapproval of premarital pregnancies and births, and the customary age at first marriage, together with differences in the availability and accessibility of contraceptive and abortion services (Tietze, 1979b, 1981). Determinants of choice behavior in resolving an unwanted pregnancy--whether to terminate or not--also vary widely across and within cultures, influenced in part by considerations related to the present partner situation, postponement of initial childbearing. desire to extend childspacing, or the wish not to exceed the "completed" number of children (e.g., David, 1980; Miller, 1981).

As with all other data on illegal abortion, information on the social and demographic characteristics of women resorting to illegal abortions is fragmentary. Some data are available for Latin America (IFRP, 1980a). These data show that 18 percent of users were single and that 47 percent wanted no additional children. It might also be noted that the women in this study were markedly younger and of lower parity than those reported in Latin American studies published in the 1960s. Data for Asia (Liskin, 1980) showed that the number of abortions tended to increase with the wife's education and the husband's occupational status; 20 percent of users were single. A carefully designed study in a rural province in Thailand (Narkavonnakit, 1980) showed that nearly one-third of the married users had not completed their families and sought abortions for childspacing purposes; more than 50 percent had completed their families; and the remaining 10 percent cited marital or economic problems as their motive in seeking abortion. Finally, some data are available for Africa. Most African women using abortion tend to come from selected population subgroups and to practice abortion early in their reproductive careers (Liskin, 1980). The majority of those hospitalized for abortion complications are less than 25 years old, usually unmarried, and of low parity. Many young African women resort to abortion because pregnancy constitutes grounds for expulsion from most African schools (Siwale, 1977).

Service Providers

Surveys of illegal abortion practitioners have recently been reported from Thailand (Narkavonnakit, 1979a, 1979b; Narkavonnakit and Bennett, 1981) and from the Philippines (Gallen, 1982). These surveys show that most practitioners are women, generally without medical

training. Most do not state their primary motive as making money, but regard or claim to regard what they are doing as a community service.[9] Moreover, most are seldom harrassed by local authorities. Sometimes, the performance of illegal abortions is seen by practitioners as a way to reduce health risks associated with many conditions under which such abortions are sought and as an opportunity to encourage the use of contraception (see Faundes and Hardy, 1978).

On the other hand, the reverse can also be true. In countries where abortion is legal, a woman's request to terminate an unwanted pregnancy presents an ethical and moral dilemma for many physicians and nurses, posing conflicts between the woman's decision and a personal commitment to saving life (e.g., Nathanson and Becker, 1977, 1980). In some respects, the process of obtaining an abortion differs markedly from traditional medical practice. Women wishing to terminate an unwanted pregnancy are usually "healthy"; some physicians are prepared to perform abortions to save a woman's physical health, but not to preserve the economic well-being of her family (Potts, 1979). These conflicts play a significant part in the abortion debate. Moreover, conditions of practice, perceptions of professional roles, and the woman's economic status are often interrelated. Historically, women with greater economic resources have had far fewer difficulties in obtaining abortions from qualified physicians than have economically disadvantaged women, whether the abortion sought was legal or illegal. Inequity is increased when private prejudice is permitted to become public policy because physicians and hospital administrators refuse to perform or permit legal abortions.

Effects on Fertility Rates

It has been suggested that no developed country has achieved a decline in its birth rate without considerable recourse to abortion, whether legal or illegal, and that a similar situation prevails in developing countries (Potts, 1972). This statement is supported by an extensive review of the available research literature (van der Tak, 1974). In examining fertility trends, consideration was given to availability of abortion in practice as well as in law, to the extent of concurrent contraceptive practice, and to the degree to which legal abortions displaced previously illegal abortions. Note was also taken of other factors bearing upon observed fertility trends, such as changes in age at marriage and in sexual behavior; age/sex and rural/urban population structure; and concurrent socioeconomic and infant mortality levels. The most dramatic recorded declines in fertility over relatively short time periods occurred when elective abortion was made available to a population already strongly motivated to control family size, and practicing only traditional or no contraception at the time of abortion legalization.

Extensive surveys conducted over several years in Korea demonstrate that abortion played an important role in that country's national fertility decline and served as a major stimulant for more effective contraceptive practice (Hong and Watson, 1976). Presently,

legal abortion is widely used to supplement contraception, especially by older women at higher parities and by urban women with higher education (KIFP, 1979). In Latin America, Cuba has achieved the lowest birth rate, 14.7 per 1,000 population in 1979. Recent fertility declines have been associated with improved access to legal abortion and contraceptive services within the socialized system of public health care. While the number of induced abortions peaked in 1975, the abortion ratio continued to rise, reaching 745 abortions per 1,000 live births in 1978 (Hollerbach, 1980). Similarly, in the People's Republic of China, abortion ratios in major cities are increasing with declining birth rates (Tien and Shao, 1980; Chen, 1981; Chen and Kols, 1982).

Abortion/Contraception Interrelationships

Studies of abortion are incomplete unless they consider the complementary relationship between abortion and contraception as methods of fertility regulation. Successful contraception requires the coordination of three distinct human forces: the drive to have sexual intercourse, the wish to have or not to have a child, and the will to regulate the consequences of sexual behavior (David et al., 1978). Although these forces may be logically linked, they are not psychologically related. Contraception requires a considerable and ever-vigilant effort, typically with a longer-term reward that appears only as the absence of an event. Although improvements have been and continue to be made in fertility-regulating methods and delivery systems, universal availability and acceptability remain elusive goals.

All known societies use a mixture of contraception and abortion to control their fertility (Potts, 1970). Historically, the notion of preventing conception is relatively recent, requiring adherence to a new level of shared responsibility in sexual behavior, exposure to and acceptance of contraceptive information and education, and conscious precoital planning. In contrast, abortion requires little prior educational effort; moreover, a missed period and anxiety about an unwanted pregnancy usually provide sufficient motivation. Unlike most contraceptives, abortion is a 100 percent effective, one-time, coitus-independent operation, based on certainty rather than probability (Moore, 1971). Abortion also avoids interference with sexual activity and spares the woman the health dangers believed by some to be associated with modern contraceptives. Furthermore, where guilt is associated with abortion, at least some guilt may also be associated with contraceptives, which often require a continual rather than a single violation of a value system.

The relative roles of contraception and abortion vary within and between countries. In some countries, abortion is the primary means of fertility control; in others, increased use of contraception lowers the incidence of abortion; in still others, abortion and contraception increase together. These patterns suggest a possible transitional path from high to lower abortion rates: with the passage of time, contraceptive practice improves, and resort to abortion declines,

although it is never eliminated. Such has been the experience reported for some countries of Western, Northern, and Eastern Europe, Latin America, and Japan (e.g., Requena, 1970; van der Tak, 1974; Potts et al., 1977; David and McIntyre, 1981). Many developing countries are at an earlier phase in the evolution of abortion practice, but may be moving more rapidly to more effective contraceptive practice (David, 1982b).

In those countries where abortion and modern contraceptives are equally available, it is important to learn why some women continue to rely on abortion rather than on contraception. Findings from Yugoslavia indicate a greater degree of personal efficacy or control, future planning, and husband-wife consensus in the group of successful contraceptors. A low sense of efficacy threatens the effective use of contraceptive methods, which require a woman's initiative and consistent discipline (Kapor-Stanulovic and Friedman, 1978; Bogue, in these volumes).

Numerous studies have shown that women who are highly motivated to control family size will use both abortion and contraception (e.g., David et al., 1978; Potts et al., 1977). Women who have practiced contraception are more likely to resort to abortion than those who have not, and vice versa. These relationships have been documented in surveys of women in developed and developing countries where abortion is legal, for example, Hungary (e.g., Klinger and Szabady, 1978; Klinger, 1979), Japan (e.g., Muramatsu and van der Tak, 1978), Singapore (e.g., Tan, 1978), Tunisia (e.g., Nazer, 1980), the United States (Zelnik and Kantner, 1978), and Yugoslavia (e.g., Kapor-Stanulovic and Friedman, 1978). Similar findings have been reported from countries where abortion is technically illegal but easily available, for example, South Korea (e.g., Hong and Watson, 1976), the Philippines (e.g., Flavier and Chen, 1980), and Turkey (e.g., Tecsan et al., 1980). Other studies document the shift to more vigilant contraceptive practice following hospitalization for abortion or abortion complications (e.g., Miller et al., 1976; Liskin, 1980).

Chile provides a particularly instructive example of what can be accomplished when an intensive family planning program is initiated at a time when contraceptive practice is low and resort to illegal abortion high (Onetto, 1980). Between 1964 and 1978, the percentage of women using contraceptives increased seven-fold from 3.2 to 23 percent. During the same period, the number of women admitted to Chilean hospitals for abortion complications declined from over 56,000 to 37,900, and abortion-related maternal mortality decreased from 11.8 to 4.2 per 10,000 live births. These observations, plus steady declines in the total maternal mortality rate, the neonatal and infant death rate, and the birth rate, suggest a gradual increase in the number of women relying on contraception rather than illegal abortion to control their fertility (Liskin, 1980).

Experience in different countries with varied abortion legislation and access to modern contraceptives indicates that the use of abortion or contraception is greatly influenced by the availability of various methods and by such personal characteristics as the woman's age and parity (David et al., 1978). In general, if modern contraceptives are

readily obtainable, more women who previously relied on ineffective methods, backed by legal or illegal abortion, will shift to more efficient contraceptive practice (Liskin, 1980; David and McIntyre, 1981). Part of the problem is that in numerous countries where abortion is highly restrictive, hospitals and service providers are, for diverse reasons, reluctant to offer contraceptives to women hospitalized with complications of illegal abortions (e.g., IFRP, 1980a; Gallen, 1982). Under such circumstances, resort to repeat abortion is almost inevitable.

Although the number of unmarried women included in abortion studies in developing countries is generally small, when meaningful comparison is possible, married women are usually more likely to accept contraception (e.g., Hardy and Herud, 1975; Miller et al., 1976, 1977). This may reflect women's differing perceptions of their immediate need for contraception, as well as cultural attitudes about sexual activity and the acceptability of contraceptive use among unmarried women. However, in a study of women under age 20 discharged from 39 hospitals in nine Latin American countries, the same percentage of married as unmarried women were practicing contraception when interviewed several weeks after treatment for abortion complications (IFRP, 1980a). The data show that, in general, women over age 20 at higher parity accept contraceptives after abortion more frequently than women under age 20 at lower parity (e.g., Hardy and Herud, 1975; IFRP, 1980a; Miller et al., 1976, 1977).[10]

Women interviewed in hospitals after admission for abortion complications at times represent a perplexing group for advocates of family planning. For example, in the Dominican Republic, such women were highly motivated to prevent births of unwanted children and were generally aware of the availability of modern contraceptives, but gave little indication of adopting such methods. Illogical as it seems, women hospitalized with abortion complications were fearful of health hazards believed to be associated with the longer-term use of contraceptives and preferred the risks of illegal abortion (Ramirez et al., 1978). This may be partly explained by the taboo nature of abortion, which impedes the dissemination of information through the media or by word of mouth; as one result, the same misinformation keeps recirculating. The true relationship between the risks of illegal abortion and contraception needs to be more fully communicated.

Abortion-related medical and behavioral research has focused almost entirely on women; men are often the forgotten sexual partner. Very few studies have reported on the couple decision-making process in developed or developing countries, and even fewer on male perceptions of and experiences with abortion (Miller and Godwin, 1977; David, 1980; Shostak, 1979). In numerous developing countries, many men continue to insist on having the sole right to decide whether or when to have a child, deny their wives access to contraception, and oppose changes in women's traditional roles (Stokes, 1980). For example, in the Dominican Republic, a sizable proportion of husbands either did not know or did not want to know their wives' abortion histories, preferring to let them take responsibility for such decisions (Friedman et al., 1975). Secretive abortion where male

disapproval of contraception is perceived has also been reported from Jamaica (Brody et al., 1976; Brody, 1981) and Colombia (Browner, 1976).

Given reasonable availability of contraceptives, there is no evidence of competition between abortion and contraceptive practice. Women experiencing contraceptive failure followed by unintended conception and unwanted pregnancy are often prepared to go to any length to seek an abortion, whether legal or not. Observations from many countries suggest that "abortion is the horse that pulls contraceptive practice into the community" (Potts et al., 1977).

Repeat Abortions

Five factors combine to make women with previous abortion experience more likely candidates for future abortions than other women (Tietze, 1978a; Tietze and Jain, 1978). First is the age factor: among women who have had at least one abortion, as compared to those who have not, more are in the sexually most active prime reproductive age group (20-29 years), and fewer are teenagers and older women. Second, it can be assumed that nearly all women who have had abortions were sexually active and probably resume sexual activity after their abortions. Third, all women with abortion experience have been able to conceive; this compares to the 40 percent of all women aged 15 to 44 without abortion experience who are unable to conceive, have undergone surgical sterilization, are married to vasectomized men, or are not sexually active. Fourth, women who have had one abortion are likely to resort to another to avoid a future birth, whereas women at risk of having a first abortion probably include a substantial number who would not choose to terminate an unintended conception. Finally, there is a very small group of women who consciously prefer to rely on abortion rather than on contraception, plus a larger number who find it difficult to practice contraceptive vigilance consistently and effectively. These women are at high risk for both first and repeated abortions.

The proportion of repeat abortions among all abortions has increased most rapidly in those countries, such as the United States, where restrictive abortion laws and practices have only recently been replaced by relatively easier access to pregnancy termination. For example, in the United States, the proportion of repeat abortions rose from about 15.2 percent of all reported abortions in 1976 to 29.5 percent in 1978 (Tietze, 1981).[11] This phenomenon should not be interpreted as a decrease in the practice of contraception or motivational deficiencies. Indeed, Tietze (1978a) concludes that, after experiencing their first abortion, "a substantial majority" of women "did in fact practice contraception with a high degree of consistency and success." This finding has been substantiated by more recent U.S. studies (e.g., Howe et al., 1979; Shepard and Bracken, 1979).

MORTALITY AND MORBIDITY

Mortality from Illegal Abortion

Illegal abortions are associated with greater mortality, morbidity, and other long-term complications when performed by inexperienced practitioners or under unhygienic conditions than when induced by skilled operators using modern methods. Although, as previously noted, sources of data are inaccurate and unreliable, review of available studies shows that abortion is a major cause of maternal mortality in developing countries (Liskin, 1980). Mortality associated with illegal abortions is probably about 50 to 100 deaths per 100,000 abortions. Even at the lowest estimate, the death-to-case rate is almost 50 times higher than that associated with legal curettage procedures in the United States.

Since recorded hospital admissions often include women with spontaneous abortions, which are less likely to be life-threatening than illegal abortions, and generally exclude women who do not come to the hospital after an illegal abortion, the reported ratios may overestimate mortality from illegally induced pregnancy terminations. This observation is confirmed by studies from hospitals in India and Thailand reporting mortality only among women with admitted or presumed illegal abortions. These ratios range from 8 to 307 deaths per 1,000 admissions for complications of illegal abortion (e.g., Bhatt and Soni, 1973; Chatterjee, 1977; Malhotra and Devi, 1979; Philips and Ghouse, 1976; Koetsawang, 1975, 1976). Registered deaths attributed to complications of induced and spontaneous abortion as a proportion of all registered maternal deaths for the years 1970-78 show an annual average of 20 percent or higher for several developing countries. However, such data are of questionable value because many deaths are not registered; moreover, in some countries, where overall maternal mortality is low, a few deaths attributed to abortion may constitute a large proportion of all maternal deaths (Tietze, 1981).

Finally, it should be noted that medically safe abortions are available in nearly every country, dependent on the ability to pay. It is the large group of economically disadvantaged women most in social need who, unable to pay the price of safety, may pay with their health and sometimes with their lives.

Mortality from Legal Abortion

Data from countries where abortion is legal are usually fairly complete, although they may underestimate the number of abortions performed and associated deaths (Moore, 1974; Potts et al., 1977). In the United States, more epidemiological data have become available for the mortality and morbidity of legal abortion than for any other surgical procedure. The mortality ratio from legal abortion was shown to be lowest of all (Cates and Tietze, 1978; Grimes and Cates, 1979),[12] with the rate increasing as the abortions were performed later in the gestation period (Centers for Disease Control, 1980).

When performed under ideal conditions, first-trimester abortion has a mortality as low as one per 100,000 (IFRP, 1980b). In Cuba, where access to legal abortion was gradually liberalized in the 1960s and there is a good registration system, the mortality ratio was 1.2 deaths per 100,000 legal abortions during 1971-1974. Total abortion deaths per 100,000 women age 15 to 44 years declined from 3.6 in 1968 to 1.6 in 1974, falling further to 0.2 in 1978 as illegal abortions were sharply reduced (David, 1979; Hollerbach, 1980).[13]

The risk-benefit considerations of abortion depend not only on the relative advantages or disadvantages of illegal and legal abortion, but also on the disadvantages of being pregnant, especially in the developing countries. In many of these countries, particularly in rural areas, maternal mortality remains high because of a lack of medical resources (including personnel), the unwillingness or inability of women to seek prenatal care, and the large number of high-parity older women having further pregnancies (IFRP, 1980b). For those countries for which reliable data are available, United Nations estimates indicate that maternal death rates during pregnancy (including abortion), childbirth, and the puerperium are up to ten times higher in developing than in developed countries (United Nations, 1976, 1977). This discrepancy in the risks of pregnancy makes the legality or illegality of abortion a variable of particular importance (IFRP, 1980b).

Morbidity from Illegal Abortion

Complications of abortion are more difficult to measure than mortality; however, the incidence of serious complications appears to be higher with illegal abortions performed by untrained practitioners using unsafe methods, especially in advanced stages of pregnancy. The most frequent major complications of illegal abortion are pelvic infection, hemorrhage, and shock, requiring post-operative care (WHO, 1978). Another frequently reported complication is trauma to the pelvic organs, including cervical lacerations, uterine perforation, and damage to the bladder and intestines. Moreover, although there are no systematic studies of longer-term complications of illegal abortion, published reports often cite adverse effects on subsequent pregnancies (e.g., Liskin, 1980).

Particular complications are frequently associated with the method used to induce abortion. For example, chemical substances inserted into the cervical os can cause burns and bleeding and may lead to the formation of bladder or rectal fistulas (Potts et al., 1977; Schwarz, 1968); abdominal massage, frequently practiced in Southeast Asia and Africa, can cause internal bleeding and organ damage (Gallen, 1979; Mwambia, 1973; Sambhi, 1977); mechanical methods, such as the insertion of a twig or other object into the cervix, may lead to uterine and intestinal perforation and subsequent peritonitis (Lwanga, 1977; Philips and Ghouse, 1976). Other nonmedical methods include eating or drinking quinine, laundry whiteners, or any one or a combination of potions or chemicals that can lead to poisoning, renal

failure, or intense vomiting requiring immediate medical attention. These should not be confused with folk medicines that may bring on a late menstrual period early during gestation when women are less certain about their pregnancy (Browner, 1980). The far less dangerous methods of suction curettage are generally practiced by physicians or by experienced midwives and nurses. However, in developing countries where abortion is illegal, the choice of method is frequently limited by a woman's knowledge of and access to service providers, the means at the provider's disposal, and financial costs. Thus safety considerations may become secondary to the urgent need to terminate an unwanted pregnancy.

Women admitted to hospitals for complications are not typical of all those receiving illegal abortions; they are representative only of those whose complications are sufficient to require medical treatment and who choose to request such care. Moreover, less skilled practitioners are becoming increasingly experienced in the use of modern abortion methods, offer to perform earlier abortions at lower cost, and more often give their clients antibiotics after the procedure to reduce the likelihood of sepsis and associated complications (Potts, 1980).

In view of the paucity of data on rural illegal abortions, the data from Thailand are of particular importance (Narkavonnakit, 1980; Narkavonnakit and Bennett, 1981). First, the total number of indigenous procedures performed during the year (17,228) was estimated. This figure was then compared with the total number of hospital admissions for incomplete abortions during the same period (415) plus the total number of abortion clients who were not hospitalized but were incapacitated for a while (3,970). The total complication rate thus derived was 25.4 percent; only 2.4 percent experienced complications serious enough to require hospitalization. Most dangerous were self-administered traditional medications (orally ingested abortifacients), followed by intramuscular injections. Abdominal massage, the most frequently used method, was also the least debilitating, followed by uterine injections (Narkavonnakit and Bennett, 1981).

Although complication rates for illegal abortions cannot be readily determined because of a lack of reliable data, it is instructive to note changes in hospital admissions for septic or incomplete abortions in areas where legal restrictions have been eased. For example, data from New York City municipal hospitals show that some 6,500 women were admitted in 1969 for treatment of incomplete spontaneous or illegally induced abortions. In 1971, the year following abortion legalization, the figure was 3,600, and by 1975 (the most recent year for which data are available), the number of women admitted had fallen to 2,700, mostly for miscarriages (Alan Guttmacher Institute, 1980). Similar findings have been reported from other U.S. cities (Liskin, 1980), from England (Soskice and Trussell, 1973), and from Yugoslavia (Stampar, 1973-74).

Morbidity from Legal Abortion

In countries where abortion is legal, the use of more reliable abortion methods helps account for generally much lower complication rates. In the United States, for example, curettage during the first trimester appears to be safest, with suction (vacuum aspiration) curettage causing fewer major complications than sharp (D&C) curettage (Grimes and Cates, 1979). Other techniques used later in pregnancy have higher complication rates.

Longer-term complications of legal abortion have been studied extensively in diverse countries, often with conflicting results (Belsey, 1979; Edstrom, 1975; WHO, 1978, 1979b; Cates, 1982). One reason is the multiple variables involved, including different abortion methods (suction versus sharp curettage), different stages of gestational development in women of diverse age and parity, different levels of skill and experience among medical service providers, the possible influence of smoking during pregnancy, and selective "forgetting" among women questioned about prior abortions (Hogue, 1975, 1978; Grimes and Cates, 1979). Moreover, the absence of international standards for recording and evaluating the severity of symptoms makes comparisons between studies difficult (Cates, 1979; Tietze, 1981). Some comparative data are provided by Tietze (1981), who summarized findings of nine major studies on the outcome of the first pregnancy following one or more abortions performed in medical settings. These studies were conducted in 16 locations and involved a total of about 12,000 women with abortion experience and 90,000 women in comparison groups. In general, the data do not show a significantly higher risk of an adverse outcome of pregnancy for those having prior abortion experience. Risks for women with one prior abortion are generally higher than those for women having experienced a previous live birth; however, this can be explained by a shift of the dangers of first pregnancy to the second pregnancy when abortion takes place.

Abortion in the second trimester of gestation requires more skill and is associated with higher mortality, complication rates, and costs (e.g., Tietze, 1978b, 1979a; Cates et al., 1979; Cates and Tietze, 1978; Berger et al., 1981). In recent years, "dilatation and evacuation" procedures have become an increasingly acceptable option for such abortions; these procedures can be done at 13-15 weeks of gestation, whereas medical induction cannot be safely performed until 16 weeks. The advantages and disadvantages of using these procedures in developing countries have been reviewed by Cates et al. (1980). Although perceived as emotionally stressful by operating room staff, they offer many psychological advantages for the patient, who does not experience labor (Rooks and Cates, 1977; Hern and Corrigan, 1978).[14]

Observations in developed countries where second-trimester abortions are legal suggest that the highest proportion of delayed abortion occurs among women under age 20. Partially as a function of age, these women tend to be single, pregnant for the first time, and low in education and socioeconomic status (David, 1981d; Berger et al., 1981). External conflicts likely to delay the abortion decision

include lack of information on the availability or location of services, financial difficulties, bureaucratic and service provider bias, parental/guardian consent requirements, and inaccurate medical diagnosis. Psychological conflicts include ambivalence about the abortion decision, hesitation or fear to confide in partner or parents, a history of irregular menstrual periods, and late recognition or denial of pregnancy (David, 1981d). Fortunately, the proportion of second trimester abortions in the United States declined steadily from 17.9 percent of all abortions in 1972 to 8.6 percent in 1978 (CDC, 1980). The trend observed in all countries for which data are available shows a decline in legally induced second-trimester abortions.[15]

In conclusion, review of available findings from countries where abortion is legal shows that, when performed by competent providers in aseptic conditions, abortion is a comparatively safe procedure involving less risk of mortality and morbidity than carrying a pregnancy to term. However, additional research is needed to identify more precisely the longer-term complications, if any, that may be associated with different abortion techniques and with particular groups of women at risk.

OTHER COSTS: ECONOMIC, SOCIAL, AND PSYCHOLOGICAL

Economic and Social Costs

In developing countries where legal abortions are easily and safely available on request during the first trimester of pregnancy, financial costs to the woman are quite low. For example, no charges are made in Cuba (David, 1979), for married women in China (Wolfson, 1976), or in public hospitals in Tunisia (Nazer, 1980). In India, costs vary with the type of facility and service provider sought (David, 1975). Costs of government-provided legal abortion services are deemed far lower than those of medical services made necessary by illegal abortion complications.[16]

In developing countries with restrictive legislation, the price of an illegal abortion varies widely from no fee to whatever the traffic will bear (Liskin, 1980). Traditional birth attendants and less-skilled practitioners generally charge lower fees and at times accept goods in payment (Flavier and Chen, 1980; Gallen, 1982; Gallen et al., 1981; Sampoerno and Sadli, 1975); gestational age is the determining factor for most practitioners who charge on a per-month-of-pregnancy basis (e.g., Narkavonnakit, 1979a). The highest charges are usually requested by physicians, who use more modern and safer methods. Thus economically disadvantaged women often have no choice but to seek the services of less-skilled practitioners relying on more dangerous procedures (e.g., Viel, 1979).

The financial costs of an illegal abortion can include far more than the service provider's fee. For example, there may be charges for drugs used to alleviate subsequent complications or for transportation to a hospital. When hospitalization is involved, there

may be concomitant loss of pay from missed work and additional costs of services rendered while the woman is incapacitated (e.g., Ramirez et al., 1978; Narkavonnakit and Bennett, 1981). Complications of illegal abortion also burden both governmental and nongovernmental medical facilities. Since it is often impossible to distinguish between spontaneous and illegally induced abortions, costs of treatment can seldom be determined exactly; however, available evidence suggests that most abortions resulting in complications are illegally induced and that complicated cases are more costly than uncomplicated ones (Liskin, 1980). In the Dominican Republic, for example, the cost of treating complications was deemed to be nearly 50 percent of the maternal hospital budget; moreover, hospital treatment of an abortion complication cost more than 12 times as much as a normal hospital delivery (Ramirez and Garcia, 1975). In many developing countries, hospitals are hard-pressed to provide quality care to meet the needs created by the dual impact of high birth rates and high rates of admission for abortion complications. As one consequence, women are often discharged too soon, resuming household and other responsibilities before they have fully recuperated, and placing themselves at greater risk for subsequent problems (e.g., Viel, 1976).

Psychological Costs

Of all the complications of abortion, psychological costs are the most difficult to assess (Potts et al., 1977). Early research on abortion of necessity focused on small groups of women who had been granted therapeutic abortions under restrictive conditions or who had procured illegal abortions (Osofsky et al., 1975). Studies conducted prior to liberalization in the United States yielded inconsistent findings, ranging from frequent or severe psychological sequelae, to occasional direct or indirect problems, to no noticeable difficulties (David, 1978a). There was little research evidence to support the warnings of psychiatrists regarding the alleged frequency of serious depression following illegally induced abortions (Osofsky et al., 1973). Studies conducted following liberalization have been summarized from time to time (e.g., Institute of Medicine, 1975; Illsley and Hall, 1976; David, 1978a). However, many of these studies consist of impressionistic case reports, often without addressing rudimentary methodological concerns. Inconsistencies of interpretation stem from a lack of consensus regarding symptoms, severity, and duration of mental disorder; opinions based on clinical case studies without regard to the vast number of women who do not come to therapeutic attention after abortion; and a lack of adequate follow-up studies (Adler, 1976). Indeed, health professionals' perceptions of the psychological consequences of abortions, what they expect women to experience, are not always matched by the experiences reported by the women themselves (Baluk and O'Neill, 1980). Review of the diverse literature from countries where abortion is legal suggests that, for the vast majority of women, feelings of guilt, regret, and sadness,

when noted, are mild and transitory, usually followed by a sense of relief associated with successful crisis resolution (David, 1981b).

One reason for the sometimes conflicting opinions on the psychological costs of abortion is a lack of epidemiological data in the international research literature on the incidence of either postabortion or postpartum psychotic reactions. By means of computer linkage, it recently became possible to screen all women in Denmark under age 50 terminating a pregnancy or carrying to term in 1975 for admission to psychiatric hospital within three months after abortion or delivery. Data were also obtained on admissions to psychiatric hospital for all Danish women aged 15 to 49 over a similar time period. Admission to psychiatric hospital was deemed a measurable event, reflective of severe stress associated in time with delivery and abortion, and less subject to diverse interpretations than visits to clinical practitioners (David et al., 1981). For never married and currently married women, the postpregnancy-related risk of admission to psychiatric hospital was around 12 per 10,000 abortions or deliveries, compared with an overall admission rate of 7.5 per 10,000 Danish women of similar age. The postabortion rate of admission to psychiatric hospital adds only slightly to the risk for major medical abortion complications (estimated in the United States at 50 per 10,000 abortions) when the procedure is performed by skilled practitioners using modern methods during the first trimester (Tietze, 1981).

In sum, it may well be a truism that there is no psychologically painless way to cope with unintended conceptions and unwanted pregnancies (David, 1972a, 1972b). For some women, abortion elicits doubts and feelings of guilt and remorse that must be considered psychological costs, regardless of their duration or whether they come to the attention of mental health specialists (Lamanna, 1980). The decision to terminate an unwanted pregnancy is seldom easy (David, 1980); however, alternatives such as forced marriage, bearing an out-of-wedlock child, giving a child up for adoption, or adding an unwanted child to an already strained marital relationship are also likely to create psycholcgical problems for the woman, the child, the family, and society (David, 1973, 1981c). In general, more research needs to focus on the conditions that may influence the intensity and duration of postpregnancy-related depression, including desire for pregnancy; stress before or during pregnancy; first- or second-trimester abortion; social support for the abortion decision or coercion by family, friends, or the medical community; religious or moral opposition; previous emotional health, etc. (Hollerbach, 1979).

The scant evidence available from developing countries suggests that religious attitudes, beliefs, or practices do not prevent motivated women from seeking abortions, regardless of legal status. Abortion is an often dramatic, comparatively expensive, and sometimes dangerous event of considerable personal significance, but is largely invisible to society. At a time of need, a woman makes decisions in her private world, sharing sometimes with her male partner, but expecting little help from the community. When deemed necessary, the physical and mental health risks of a more dangerous illegal procedure

are preferred to the alternative of carrying an unwanted pregnancy to term.

Costs of Denied Abortion

Although the dynamics of intended and unintended conceptions and wanted and unwanted pregnancies and childbearing have long been debated (e.g., Pohlman, 1969; Hass, 1974; Miller, 1978), it has seldom been possible to systematically follow women denied abortion or the children they were compelled to bear. The only longitudinal study with matched controls ever reported is still in progress in Prague, Czechoslovakia (Dytrych et al., 1975, 1978; David, 1981c; David and Matejcek, 1981). Unique circumstances combined to make available for detailed medical, psychological, and social assessment 110 boys and 110 girls born in 1961-63 to Prague women twice denied abortion for the same pregnancy, and a matched control group of children whose mothers had not applied for pregnancy termination. The control group was formed on the basis of pair-matching according to age, sex, number of siblings, birth order, and school class; the mothers were matched for age, marital status, and socioeconomic status as determined by the husband's occupation and his presence in the family. The research staff was not involved in the matching process and did not know which child belonged to what subgroup.

The children were about 9 years old at the time of original psychological, educational, and medical assessment, and were subsequently followed up at varied time intervals (Matejcek et al., 1978, 1979, 1980). Initially, aggregate differences between the study and control children were not statistically significant. However, differences observed in school, family, and social life were highly consistent and cumulatively in disfavor of the study children. Group differences have persisted through 16 to 18 years of family life; they have actually widened and become more significant statistically. A review of all the data from this unique and continuing longitudinal study suggests that "unwantedness" during early pregnancy constitutes a not-negligible factor for the subsequent development of the child (David, 1981c).

PROPOSITIONS

The following propositions are based on the previous sections, where references to the literature will be found.

1. In many developing countries, abortion is a traditional method of fertility regulation, especially where modern contraceptives are only gradually becoming available and more widely accessible. Women resort to abortion to terminate unwanted pregnancies regardless of socioeconomic or cultural background, legal codes, religious sanctions, or risks to physical or mental well-being.

2. Influenced by different legal, social, and political ambiguities, abortion has different meanings from country to country

and over time within the same country. Findings should therefore be judged in terms of the constraints under which they were obtained. In countries where abortion is illegal, the advantages and disadvantages of available data sources should be considered, as should the observation that most women obtaining illegal abortions may never come to the attention of the hospital system, or may "forget" their experiences in retrospective interviews. Locally initiated surveys of known service providers offer the best hope for reliable information on illegal abortion.

3. The worldwide legal status of abortion ranges from complete prohibition to elective abortion at the request of the woman during the first trimester of pregnancy. However, restrictive abortion legislation has rarely, if ever, been effective in preventing abortion. In certain countries, strict abortion laws are not enforced; some abortions on medical grounds are tolerated even in those few countries which adhere to strict legal prohibitions. Conversely, liberalization of abortion legislation does not ensure ready access to services or abandonment of humiliating restrictions, especially for economically disadvantaged women.

4. No reliable method has yet been demonstrated for estimating at reasonable cost the incidence of illegal abortion and associated health risks. However, the frequent statement that abortion is the world's leading method of fertility regulation has no basis in verifiable fact and is almost certainly wrong. No developed country has achieved a significant decline in birth rates without considerable recourse to abortion, whether legal or not, and it is likely that the experience of developing countries will be similar.

5. Given reasonable availability of contraceptives, the relationship between abortion and contraception is complementary rather than competitive; therefore, the most efficient approach to achieving voluntary reduction in birth rates is a national program providing ready access to modern contraceptives, backed by widely available legal or quietly condoned abortion. Abortion is rarely preferred to contraception; it is usually sought as the only possible way of avoiding a birth at that time. There is strong evidence that a substantial majority of women are more efficient contraceptors after abortion. However, in countries where abortion is highly restrictive, service providers are often reluctant to offer contraceptives to women hospitalized with complications of illegal abortion, thus setting the stage for continued resort to illegal abortion; moreover, women hospitalized with complications stemming from illegal abortions are also fearful of the alleged health hazards of modern contraceptives.

6. An increasing proportion of repeat abortions among all legal abortions and a repeat rate higher than the first-abortion rate can be expected for several years after abortion has been legalized, as the pool of women at risk for repeat abortion continues to rise to an eventual plateau. Age, sexual activity, ability to conceive, decision to terminate a previous pregnancy, and a conscious preference for abortion as the chosen method of fertility regulation are the major factors influencing the incidence of repeat abortion.

7. Sociodemographic characteristics of abortion-seeking women

differ greatly among countries reporting such data. These diverse findings reflect differences in adolescent sexual activity, societal disapproval of premarital pregnancies and births, and the customary age at first marriage, plus differences in the availability and accessibility of modern contraceptives and abortion services. Determinants of choice behavior resolving an unwanted pregnancy, whether to terminate or carry to term, vary widely within and across cultures.

8. Attitudes of medical and allied health personnel are central to the equitable provision of legal abortion services and to resolution of special problems faced in countries where abortion is illegal. The process of obtaining an abortion differs markedly from traditional medical practice. Women asking to terminate an unwanted pregnancy are usually "healthy," seeking technical assistance to implement their own decision rather than seeking a medical diagnosis or medical treatment for a medically identifiable disease. The resultant role conflict with the more traditional orientations of medical decision makers is a major divisive influence.

9. When performed by untrained practitioners or under unhygienic conditions, illegal abortions are associated with greater mortality and morbidity and longer-term complications than when induced by skilled operators using modern methods. Illegal abortion is a major cause of maternal mortality in many developing countries. Although medically safe abortions are available nearly everywhere, they are not easily accessible to poor women, who, unable to pay the price of safety, may pay with their health and sometimes with their lives.

10. Data from developed and developing countries where abortion is legal indicate that the mortality ratio associated with first-trimester abortion is far lower than that associated with carrying a pregnancy to term; in the United States, for example, abortion is safer than a tonsillectomy. However, the risks of pregnancy vary greatly among developed and developing countries, making the legality or illegality of abortion a variable of particular importance, in relative health risks. In countries where abortion is legal, the methods used by competent service providers also influence the much lower complication rates. Suction curettage appears to be safest in the first trimester; additional research is needed to identify more precisely the longer-term complications, if any, that may be associated with different abortion techniques and with particular groups of women at risk. Abortion in the second trimester of gestation requires more skill and is associated with higher mortality, complication rates, and costs.

11. In developing countries, a woman's choice is frequently limited by her knowledge of and access to service providers, the means at the provider's disposal, and financial costs. Within that context, considerations of safety (and subsequent morbidity) may become secondary to the urgent need to terminate an unwanted pregnancy. However, as illegal service providers become increasingly skilled in the use of modern methods, women admitted to hospital for abortion-associated complications may no longer be typical.

12. In developing countries with restrictive legislation, the

financial cost of an illegal abortion varies widely. Ability to pay and gain access to medical care are closely associated with reduced risks or complications; economically disadvantaged women often have no choice but to seek the services of lesser skilled practitioners relying on more dangerous procedures. If complications occur, additional personal costs are incurred, including the loss of pay for missed work and the expense of providing services to the family. Complications of illegal abortions also burden medical facilities, requiring longer and more expensive care than other obstetrical and gynecological events. As one consequence, women may be discharged too soon, assuming household and other responsibilities before they have fully recuperated, and placing themselves at greater risk for subsequent health problems.

13. There is no psychologically painless way to cope with an unwanted pregnancy. Of all the costs of abortion, legal or illegal, obtained or denied, the psychological ones are the most difficult to assess. For the vast majority of women, feelings of guilt, regret, or sadness, when noted, are mild and transitory, usually followed by a sense of relief associated with successful crisis resolution; few women come to the attention of mental health services and fewer still experience a psychotic reaction. When abortion is deemed personally necessary, the physical and mental health risks of more dangerous illegal procedures are preferred to the alternative of carrying an unwanted pregnancy to term.

14. Denial of an abortion request constitutes a not-negligible risk factor for the subsequent life of a child born to a woman compelled by society to deliver an unwanted pregnancy.

15. Overall, findings suggest that a liberal abortion policy is likely to reduce problems of fertility control confronting women, families, and society, especially the young and the poor. In the final analysis, the legality of induced abortion is a political issue. Although universally practiced, tolerated, or approved by large population groups, and most effective in meeting individual fertility objectives, abortion is often the least politically acceptable means of fertility regulation.

NOTES

1. Perhaps the first published reference to pregnancy termination as a means of fertility regulation appeared in Aristotle's (384-322 BC) Politics. Abortion was recommended as a means of maintaining the ideal size of the city state wherever couples already had sufficient children (Aristotle, 1932; Farr, 1980).
2. No major religion has a unified or unbroken history of support or opposition to induced abortion. It was not until 1869 that Pope Pius IX "made a sharp change in church law by eliminating any distinction between a formed and unformed fetus in meting out the penalty of excommunication for abortion," even to save the life of the woman (Callahan, 1970). A variety of opinions can be found in

each of the major Western and nonWestern religions, most of which altered their views over time (e.g., Moore, 1974; David, 1980, 1981a).

3. Motivation to control fertility is at times so strong that women who are otherwise law-abiding, have little or no money to spare, and are concerned about their health are willing to break the law, borrow money, and risk their physical and psychological well-being to avoid unwanted births (e.g., David et al., 1978; David, 1981b; Liskin, 1980; Gallen et al., 1981).
4. The USSR pioneered in the liberalization of abortion legislation in 1920, restricted abortion again in 1936, and then reliberalized it in 1955, an action eventually followed by all the socialist countries of Central and Eastern Europe except Albania. Despite evidence that the USSR abortion rate may be the highest in the world--well above the birth rate in most cities at least--the liberal law of 1955 has remained in force.
5. None of the countries which liberalized its laws since 1967 authorized trained nonphysicians to perform pregnancy termination (Paxman, 1980b). In China, early abortions are often performed by nurses, "barefoot doctors," or midwives. In Bangladesh, despite the absence of authorizing legislation, "lady health visitors" have received training and are performing menstrual regulation procedures during early gestation when determination of pregnancy is less certain.
6. In some Middle Eastern countries, physicians and midwives benefiting financially from performing illegal abortions are said to be reluctant to support proposals for legislative changes (Nazer, 1970).
7. The numbers of legal abortions, abortion rates per 1,000 women 15 to 44 years of age, and abortion ratios per 1,000 live births six months later are regularly compiled by Tietze (e.g., 1981) for all countries reporting such information. Among developing lands, only Cuba, India, Singapore, and Tunisia provide national data on an annual basis, with Cuba having perhaps the most complete information. Fragmentary data are also coming from China, where abortion is available on request.
8. Although there is little doubt that desperate women will resort to abortion no matter what the legal circumstances or risks to well-being, the frequent statement that induced abortion is the world's leading method of fertility regulation has no basis in verifiable fact and is almost surely wrong (Berelson et al., 1979).
9. Motivations for providing illegal abortion range from "making money" to "helping poor women." Although the former attitude may prevail in major cities and in much of Latin America, the latter seems more prevalent in rural sectors of those Asian countries where abortion is technically illegal and service providers are seldom disturbed by the authorities.
10. The importance of educational level to postabortion contraceptive practice in developing countries appears to vary, with no clear trends emerging from the limited research literature (Liskin, 1980).

11. All such reports must be considered cautiously since women's responses to questions about repeat abortion are notoriously subject to error, selective "forgetting," and deliberate denial, regardless of the legal status of abortion (Hogue, 1975, 1978).
12. The mortality ratio was 1.4 deaths per 100,000 abortions in 1977 (CDC, 1979), compared with 12 maternal deaths from all causes per 100,000 live births in 1972 to 1975 (Cates and Tietze, 1978), and 16 deaths per 100,000 tonsillectomies in 1977 (National Center for Health Statistics, 1979). More recent data have been reviewed by Tietze (1981) and by Cates (1982).
13. Similar patterns have been observed elsewhere. Despite large increases in the annual number of abortions in Singapore after legislative reforms in 1970 and 1974, the total number of abortion deaths decreased from 51 in 1968-70 to 26 in 1974-76 as the incidence of illegal abortions dropped (Lim et al., 1979). By contrast, rerestriction of a very liberal abortion policy in Romania in late 1966 resulted in an increase in the number of deaths attributed to abortion from 64 in 1965 to 170 in 1967 and 432 in 1976 (Tietze, 1979a; WHO, 1965, 1967, 1980). A dramatic contrast is reported from India, giving a mortality rate of 660 per 100,000 for medically induced abortions and 780 per 100,000 among women admitted to the same hospital for incomplete abortions during the same time period (IFRP, 1980b). Overall, illegal abortion mortality probably varies from 100 per 100,000 when performed by qualified medical practitioners to over 1,000 per 100,000 when induced by unskilled persons.
14. The use of prostaglandin analogues in 12,500 late terminations without fatality in London has been reported by Atherton (1980).
15. Although there are no systematic studies from developing countries where abortion is illegal, there is no reason to doubt that mortality and morbidity increases with abortion delay into the second trimester.
16. The cost-effectiveness of alternative service-delivery models by skilled and experienced paramedical personnel is being explored in several countries, including the rural areas of China (PIACT, 1980).

BIBLIOGRAPHY

Abortion Research Notes (1972) Bethesda, Md.: Transnational Family Research Institute.

Adler, N. E. (1976) Sample attrition in studies of psychosocial sequelae of abortion: How great a problem? Journal of Applied Social Psychology 6:240-259.

Adler, N. E. (1979a) Abortion: A social-psychological perspective. Journal of Social Issues 35:100-119.

Adler, N. E. (1979b) Psychosocial issues of therapeutic abortion. Pp. 159-177 in D. Youngs and A. Ehrhardt, eds., Psychosomatic Obstetrics and Gynecology. New York: Appleton-Century-Crofts.

Akingba, J. B. (1977) Abortion, maternity and other health problems in Nigeria. Nigerian Medical Journal 7:465-471.

Alan Guttmacher Institute (1980) Safe and Legal: 10 Years' Experience with Legal Abortion in New York State. New York: Alan Guttmacher Institute.

Ampofo, P. A. (1973) Epidemiology of Abortion in Selected African Countries. Paper presented at the IPPF Conference on the Medical and Social Aspects of Abortion in Africa, Accra, Ghana.

Aristotle (1932) Politics. Cambridge, Mass.: Harvard University Press.

Attherton, R. D. (1980) 12,500 late terminations. Abortion Research Notes 9:8.

Baluk, U., and P. O'Neill (1980) Health professionals' perceptions of the psychological consequences of abortion. American Journal of Community Psychology 8:67-75.

Begum, F., A. R. Khan, and S. Jahan (1978) Experience with Abortion Related Admissions in Dacca Medical College Hospital. Technical Report No. 8. Dacca: Bangladesh Fertility Research Programme.

Belsey, M. A. (1979) Long term sequelae of induced abortion: Considerations in interpretations of research. Pp. 156-162 in G. I. Zatuchni, J. J. Sciarra, and J. J. Speidel, eds., Pregnancy Termination. Hagerstown, Md.: Harper and Row.

Berelson, B., W. P. Mauldin, and S. J. Segal (1979) Population: Current Status and Policy Options. Center for Policy Studies Working Papers No. 44. New York: Population Council.

Berger, G. S., W. E. Brenner, and L. Keith, eds. (1981) Second Trimester Abortion: Perceptions After a Decade of Experience. Boston: Wright/PSG.

Bhatt, R. V. (1980) Personal communication to L. Liskin, 15 March.

Bhatt, R. V., and J. M. Soni (1973) Criminal abortion in Western India. Journal of Obstetrics and Gynecology of India 23:243-246.

Bhuiyan, N., R. Begum, and S. Begum (1979) Characteristics of Abortion Cases Admitted in Chittagong Medical College in 1978. Technical Report No. 33. Dacca: Bangladesh Fertility Research Programme.

Brody, E. B. (1981) Sex, Contraception, and Motherhood in Jamaica. Cambridge, Mass.: Harvard University Press.

Brody, E. B., F. Ottey, and J. LaGrande (1976) Fertility related behavior in Jamaica. ICP Occasional Monographs, No. 6.

Browner, C. (1976) Poor Women's Fertility Decisions: Illegal Abortion in Cali, Colombia. Unpublished Ph.D. dissertation. University of California, Berkeley.

Browner, C. (1980) The management of early pregnancy: Colombian folk concepts of fertility control. Social Science and Medicine 14B:25-32.

Callahan, D. (1970) Abortion: Law, Choice, and Morality. New York: Macmillan.

Cates, W., Jr. (1979) Late effects of induced abortion: Hypothesis or knowledge? Journal of Reproductive Medicine 22:207-212.

Cates, W., Jr. (1982) Legal abortion: The public health record. Science 215:1586-1590.

Cates, W., Jr., and C. Tietze (1978) Standardized mortality rates associated with legal abortion: United States, 1972-1975. Family Planning Perspectives 10:109-112.

Cates, W., Jr., K. F. Schulz, D. A. Grimes, and C. W. Tyler, Jr. (1979) The effect of delay and method choice on the risk of abortion morbidity. Family Planning Perspectives 9:266-272.

Cates, W., Jr., K. F. Schulz, and D. A. Grimes (1980) Dilatation and evacuation for induced abortion in developing countries: Advantages and disadvantages. Studies in Family Planning 11:128-133.

Centers for Disease Control (1979) Abortion Surveillance, 1977. Atlanta, Ga.: Centers for Disease Control.

Centers for Disease Control (1980) Abortion Surveillance, 1978. Atlanta, Ga.: Centers for Disease Control.

Chandrasekhar, S. (1978) Population and Law in India, 2nd ed. Dehli: Macmillan.

Chatterjee, P. (1977) Induced abortion and its hazards. Journal of the Indian Medical Association 69:173-175.

Chen, P. C. (1981) Rural Health and Birth Planning in China. Research Triangle Park, N.C.: International Fertility Research Program.

Chen, P. C., and A. Kols (1982) Population and birth planning in the People's Republic of China. Population Reports, Series J, No. 25.

Cook, R. J., and B. M. Dickens (1979) Abortion laws in commonwealth countries. International Digest of Health Legislation 30:395-502.

David, H. P. (1972a) Unwanted pregnancies: Costs and alternatives. Pp. 439-466 in C. F. Westoff and R. Parke, Jr., eds., Demographic and Social Aspects of Population Growth. Vol. 1 of the Commission on Population Growth and the American Future Research Reports. Washington, D.C.: U.S. Government Printing Office.

David, H. P. (1972b) Abortion in psychological perspective. American Journal of Orthopsychiatry 42:61-68.

David, H. P. (1973) Psychological studies in abortion. Pp. 241-273 in J. T. Fawcett, ed., Psychological Perspectives on Population. New York: Basic Books.

David, H. P. (1978a) Psychosocial studies of abortion in the United States. Pp. 77-115 in H. P. David, H. L. Friedman, J. van der Tak, and M. Sevilla, eds., Abortion in Psychosocial Perspective: Trends in Transnational Research. New York: Springer.

David, H. P. (1978b) Healthy family functioning: A cross-cultural overview. Bulletin of the World Health Organization 55:327-342.

David, H. P. (1979) Notes from Cuba. Abortion Research Notes 8(1-2).

David, H. P. (1980) The abortion decision: National and international perspectives. Pp. 57-98 in J. T. Burtchaell, ed., Abortion Parley. Kansas City, Mo.: Andrews and McMeel.

David, H. P. (1981a) Abortion policies. Pp. 1-40 in J. E. Hodgson, ed., Abortion and Sterilization: Medical and Social Aspects. London: Academic Press.

David, H. P. (1981b) Worldwide abortion trends. Pp. 75-192 in P. Sachdev, ed., Abortion: Readings and Research. Toronto: Butterworths.

David, H. P. (1981c) Unwantedness: Longitudinal studies of Prague children born to women twice denied abortion for the same pregnancy and matched controls. Pp. 81-102 in P. Ahmed, ed., Coping with Medical Issues: Pregnancy, Childbirth and Parenthood. New York: Elsevier.

David, H. P. (1981d) Second trimester: Social issues. Pp. 221-237 in G. S. Berger, W. E. Brenner, and L. Keith, eds., Second Trimester Abortion Perspective After a Decade of Experience. Boston: Wright/PSG Publishing Co.

David, H. P. (1982a) Eastern Europe: Pronatalist policies and private behavior. Population Bulletin 36.

David, H. P. (1982b) Incentives, reproductive behavior, and integrated community development in Asia. Studies in Family Planning 13:159-173.

David, H. P., and Z. Matejcek (1981) Children born to women denied abortion: An update. Family Planning Perspectives 13:32-34.

David, H. P., and R. J. McIntyre (1981) Reproductive Behavior: Central and Eastern European Experience. New York: Springer.

David, H. P., H. L. Friedman, J. van der Tak, and M. J. Sevilla, eds. (1978) Abortion in Psychosocial Perspective: Trends in Transnational Research. New York: Springer.

David, H. P., N. K. Rasmussen, and E. Holst (1981) Postpartum and postabortion psychotic reactions. Family Planning Perspectives 13:88-92.

David, P. S. (1975) India. Pp. 8-20 in H. P. David and B. Shashi, orgs., Psychosocial Aspects of Abortion in Asia. Washington, D.C.: Transnational Family Research Institute.

David, P. S. (1978) Abortion: The Indian experience. People 5:16-17.

Denmark, National Board of Health (1978) Statistics on Legal Abortion, 1977 (and earlier years). Copenhagen: National Board of Health.

Dunshee de Abranches, C. A. (1976) Menstrual regulation in Latin America: The language of the law. Pp. 89-91 in H. H. Holtrop, R. S. Waife, W. Bustamante, and A. Rizo, eds., New Developments in Fertility Regulation. Chestnut Hill, Mass.: Pathfinder Fund.

Dytrych, Z., Z. Matejcek, V. Schuller, H. P. David, and H. L. Friedman (1975) Children born to women denied abortion. Family Planning Perspectives 7:165-171.

Dytrych, Z., Z. Matejcek, and V. Schuller (1978) Children born to women denied abortion in Czechoslovakia. Pp 201-224 in H. P. David, H. L. Friedman, J. van der Tak., M. Sevilla, eds., Abortion in Psychosocial Perspective: Trends in Transnational Research. New York: Springer.

Edstrom, K. G. B. (1975) Early complications and late sequelae of abortion: A review of the literature. Bulletin of the World Health Organization 52:123-139.

Farr, A. D. (1980) The Marquis de Sade and induced abortion. Journal of Medical Ethics 6:7-10.

Faundes, A., and E. Hardy (1978) Contraception and abortion services at Barros Luco Hospital, Santiago, Chile. Pp. 284-297 in H. P. David, H. L. Friedman, J. van der Tak, and M. Sevilla, eds., Abortion in Psychosocial Perspective: Trends in Transnational Research. New York: Springer.

Figa-Talamanca, I. (1977) Social and psychological factors in the practice of induced abortion as a means of fertility control in an Italian population. Genus 27:99-266.

Figa-Talamanca, I. (1979) Health and economic effects of illegal abortion: Preliminary findings from an international study. Pp. 361-369 in G. I. Zatuchni, J. J. Sciarra, and J. J. Speidel, eds., Pregnancy Termination. Hagerstown, Md.: Harper and Row.

Figa-Talamanca, I. (1980) Personal communication, March.

Flavier, J. M., and C. H. C. Chen (1980) Induced abortion in rural villages of Cavite, the Philippines: Knowledge, attitudes, and practice. Studies in Family Planning 11:65-71.

Forrest, J. D., E. Sullivan, and C. Tietze (1979) Abortion in the United States, 1977-1978. Family Planning Perspectives 11:329-341.

Foster, H. W. (1980) Suppository to induce abortion in 1-7 hours undergoing trials. Ob/Gyn News, 15 November.

Friedman, H. L., and R. L. Johnson (1978) Methodological issues in psychosocial abortion research. Pp. 301-305 in H. P. David, H. L. Friedman, J. van der Tak, and M. Sevilla, eds., Abortion in Psychosocial Perspective: Trends in Transnational Research. New York: Springer.

Friedman, H. L., A. Ramirez-Medina, and E. Garcia-Tatis (1975) Attitudes of a sample of male heads of household in the Central, Oriental, Sur, and Cibao regions, Dominican Republic. Pp. 89-99 in Epidemiology of Abortion and Practices of Fertility Regulation in Latin America: Selected Papers. Scientific Publication No. 306. Washington, D.C.: Pan American Health Organization.

Friedman, H. L., R. L. Johnson, and H. P. David (1976) Dynamics of fertility choice behavior: A pattern for research. Pp. 171-198 in S. H. Newman and V. D. Thompson, eds., Population Psychology: Research and Educational Issues. DHEW Publication No. (NIH) 76-574. Washington, D.C.: Center for Population Research.

Gallen, M. (1979) Massage abortion. People 6:2.

Gallen, M. (1982) Abortion in the Philippines: A study of clients and practitioners. Studies in Family Planning 13:35-44.

Gallen, M., T. Narkavonnakit, J. B. Tomaro, and M. Potts (1981) Traditional Abortion Practices: Three Studies of Illegal Abortion in the Developing World. Research Triangle Park, N.C.: International Fertility Research Program.

Gaslonde, S. (1976) Abortion research in Latin America. Studies in Family Planning 7:211-217.

Goyal, R. S. (1978) Legalization of abortion: A social perception. Health and Population: Perspectives and Issues 1:302-308.

Grimes, D. A., and W. Cates, Jr. (1979) Complications from legally induced abortions: A review. Obstetrical and Gynecological Survey 34:177-191.

Hall, M., ed. (1977) Abortion Systems and Patient Needs: A Cross-National Research Design. Paper presented at the World Health Organization Scientific Group on Abortion, Geneva.

Hardy, E., and K. Herud (1975) Effectiveness of a contraceptive education program for postabortion patients in Chile. Studies in Family Planning 6:188-191.

Harrison, P. (1980) Unwanted births: A new perspective. People 7:15-16.

Hass, P. H. (1974) Wanted and unwanted pregnancies: A fertility decision-making model. Journal of Social Issues 30:125-165.

Henshaw, S., J. D. Forrest, E. Sullivan, and C. Tietze (1981) Abortion in the United States, 1978-1979. Family Planning Perspectives 13:6-18.

Henshaw, S. K., J. D. Forrest, E. Sullivan, and C. Tietze (1982) Abortion services in the United States, 1979 and 1980. Family Planning Perspectives 14:5-15.

Hern, W. M., and B. Corrigan (1978) What About Us? Staff Reactions to the D&E Procedure. Paper presented at the 16th Annual Meeting of the Association of Planned Parenthood Physicians, San Diego, Calif.

Hogue, C. J. R. (1975) Low birth weight subsequent to induced abortion: A historical prospective study of 948 women in Skopje, Yugoslavia. American Journal of Obstetrics and Gynecology 123:675-681.

Hogue, C. J. R. (1978) Review of postulated fertility complications subsequent to pregnancy termination. Pp. 356-367 in J. J. Sciarra, G. I. Zatuchni, and J. J. Speidel, eds, Risks, Benefits, and Controversies in Fertility Control. Hagerstown, Md.: Harper and Row.

Hollerbach, P. E. (1977) Parental choice and family planning: The acceptability, use, and sequelae of four methods. Pp. 189-222 in Y. E. Hsia, K. Hirschhorn, R. L. Silverberg, and L. Godmilow, eds., Counseling in Genetics. New York: Liss.

Hollerbach, P. E. (1979) Parental choice and family planning: The acceptability, use, and sequelae of four methods. Pp. 189-222 in Y. E. Hsia, K. Hirschhorn, R. L. Silverberg, and L. Goldman, eds., Counseling in Genetics. New York: Liss.

Hollerbach, P. E. (1980) Recent trends in fertility, abortion, and contraception in Cuba. International Family Planning Perspectives 6:97-106.

Hong, S. B., and C. Tietze (1979) Survey of abortion providers in Seoul, Korea. Studies in Family Planning 10:161-163.

Hong, S. B., and W. B. Watson (1976) The Increasing Utilization of Induced Abortion in Korea. Seoul: Korea University Press.

Howe, B., H. R. Kaplan, and C. English (1979) Repeat abortions: Blaming the victims. American Journal of Public Health 69:1242-1246.

Hungary, Central Statistical Office (1969a) Survey Techniques in Fertility and Family Research: Experience in Hungary. Budapest: Central Statistical Office.

Hungary, Central Statistical Office (1969b) The concealment of induced abortions: An estimate of induced abortions. Pp. 110-118 in Survey Techniques in Fertility and Family Research. Budapest: Central Statistical Office.

Illsley, R., and M. H. Hall (1976) Psychosocial aspects of abortion: A review of issues and needed research. Bulletin of the World Health Organization 53:93-106.

Institute of Medicine (1975) Legalized Abortion and the Public Health. Washington, D.C.: National Academy of Sciences.

International Fertility Research Program (1980a) Abortion in Latin America. Research Report No. DDX 005. Research Triangle Park, N.C.: International Fertility Research Program.

International Fertility Research Program (1980b) Ramos. Research Triangle Park, N.C.: International Fertility Research Program.

International Planned Parenthood Federation (1974) Survey of World Needs in Population. London: International Planned Parenthood Federation.

International Planned Parenthood Federation (1978) Unmet needs. People 5:25-32.

International Union for the Scientific Study of Population (1977) Recommendations for Comparative Abortion Statistics in Countries Where Induced Abortion is Legalized. IUSSP Papers No. 7. Liege: International Union for the Scientific Study of Population.

Jaffe, F. S., B. L. Lindheim, and P. R. Lee (1981) Abortion Politics: Private Morality and Public Policy. New York: McGraw-Hill.

Kapor-Stanulovic, N., and H. L. Friedman (1978) Studies in choice behavior in Yugoslavia. Pp. 119-144 in H. P. David, H. L. Friedman, J. van der Tak, and M. Sevilla, eds., Abortion in Psychosocial Perspective: Trends in Transnational Research. New York: Springer.

Klinger, A. (1979) Birth control and family planning in Hungary in the last two decades. World Health Statistics 32:257-268.

Klinger, A., and E. Szabady (1978) Patterns of abortion and contraceptive practice in Hungary. Pp. 168-200 in H. P. David, H. L. Friedman, J. van der Tak, and M. Sevilla, eds., Abortion in Psychosocial Perspective: Trends in Transnational Research. New York: Springer.

Koetsawang, S. (1975) Annual Statistics 2511-2518/1968-1975: Illegal Abortion. Bangkok: Siriraj Family Planning Research Unit, Mahidol University.

Koetsawang, S. (1976) Annual Statistics 2519/1976: Abortion. Bangkok: Siriraj Family Planning Research Unit, Mahidol University.

Korean Institute for Family Planning (1979) The Korean National Fertility Survey, 1974. First country report, Seoul, 1977. Summarized in International Family Planning Perspectives 5:35-36.

Krishna Menon, M. K. (1979) A recent program of legal abortion in India. Pp. 395-398 in G. I. Zatuchni, J. J. Sciarra, and J. J. Speidel, eds., Pregnancy Termination. Hagerstown, Md.: Harper and Row.

Lamanna, M. A. (1980) Science and its uses: The abortion debate and social science research. Pp. 101-158 in J. T. Burtchaell, ed., Abortion Parley. Kansas City, Mo.: Andrews and MeMeel.

Lim, L. S., M. C. E. Cheng, M. Rauff, and S. S. Ratnam (1979) Abortion deaths in Singapore (1968-1976). Singapore Medical Journal 20: 391-394.

Liskin, L. S. (1980) Complications of abortions in developing countries. Population Reports, Series F., No. 7.

Lopez-Escobar, G., C. Riano-Gamboa, and N. Lenis-Nicholls (1978) Abortion: Questions, Commentaries, and Partial Results of Some Colombian Research (in Spanish). Monograph No. 8. Bogota: Corporacion Centro Regional de Poblacion.

Lozano, C. A., A. M. T. Peralta, M. F. Reyes, P. R. Alvarado, and J. Saravia (1979) Morbidity-Mortality: Classification and Treatment of Septic Abortion (in Spanish). Bogota: Facultad de Medicina, Universidad Nacional de Colombia.

Lwanga, C. (1977) Abortion in Mulago Hospital, Kampala. East African Medical Journal 54:142-148.

Malhotra, S., and P. K. Devi (1979) A comparative study of induced abortions before and after legalization of abortions. Journal of Obstetrics and Gynecology of India 29:598-601.

Matejcek, Z., Z. Dytrych, and V. Schuller (1978) Children from unwanted pregnancies. Acta Psychiatrica Scandinavica 57:67-90.

Matejcek, Z., Z. Dytrych, and V. Schuller (1979) The Prague study of children born from unwanted pregnancies. International Journal of Mental Health 7:63-77.

Matejcek, Z., Z. Dytrych, and V. Schuller (1980) Follow-up study of children born from unwanted pregnancies. International Journal of Behavioral Development 3:243-251.

Mhango, C. G., and E. S. Grech (1979) Family planning programme and abortion laws in Zambia. In N. Mwaniki, M. Marasha, J. K. G. Mati, and M. K. Mwaniki, eds., Surgical Contraception in Sub-Sahara Africa. Chestnut Hill, Mass.: Pathfinder Fund.

Miller, E. R., S. Pachauri, and A. Saha (1976) Patterns of Contraceptive Acceptance after Abortion: A Study in Four Asian Hospitals. Chapel Hill, N.C.: International Fertility Research Program.

Miller, E. R., V. McFarland, M. S. Burnhill, and I. W. Armstead (1977) Impact of abortion experience on contraceptive practice. Advances in Planned Parenthood 12:15-28.

Miller, W. B. (1978) The intendedness and wantedness of the first child. Pp. 209-243 in W. B. Miller and L. F. Newman, eds., The First Child and Family Formation. Chapel Hill, N.C.: Carolina Population Center.

Miller W. B. (1981) The Psychology of Reproduction. Springfield, Va.: National Technical Information Service.

Miller W. B., and R. K. Godwin (1977) Psyche and Demos. New York: Oxford University Press.

MINSAP (Ministry of Public Health) (1980) Annual reports and personal communications from Havana, Cuba.

Mohlake, S. (1980) Personal communication, May.

Moore, E. C. (1971) Induced abortion and contraception: Sociological aspects. Pp. 131-155 in S. H. Newman, M. B. Beck, and S. Lewit, eds., Abortion Obtained and Denied: Research Approaches. New York: Population Council.

Moore, E. C. (1974) International Inventory of Information on Induced Abortion. New York: Columbia University International Institute for the Study of Human Reproduction.

Moore, E. C. (1976) Abortion, Including Review of Current Status. New Delhi: World Health Organization, Regional Office for South-East Asia.

Muramatsu, M., and J. van der Tak (1978) From abortion to contraception: The Japanese experience. Pp. 145-167 in H. P. David, H. L. Friedman, J. van der Tak, and M. Sevilla, eds., Abortion in Psychosocial Perspective: Trends in Transnational Research. New York: Springer.

Mwambia, S. P. K. (1973) The Meru of Central Kenya. In A. Molnos, ed., Cultural Source Materials for Population Planning in East Africa, Vol. 3. Nairobi: East African Publishing House.

Narkavonnakit, T. (1979a) Rural Abortion in Thailand: A National Survey of Practitioners. Bangkok: Research and Evaluation Unit, National Family Planning Program.

Narkavonnakit, T. (1979b) Abortion in rural Thailand: A survey of practitioners. Studies in Family Planning 10:223-229.

Narkavonnakit, T. (1980) A Study of 110 Women who Experienced an Abortion Performed by a Traditional Practitioner in the Province of Chayapoon, Thailand, 1980. Unpublished manuscript. Research and Evaluation Unit, National Family Planning Program, Bangkok.

Narkavonnakit, T., and T. Bennett (1981) Health consequences of induced abortion in rural Northeast Thailand. Studies in Family Planning 12:58-65.

Nathanson, C. A., and M. H. Becker (1977) The influence of physicians' attitudes on abortion performance, patient management and professional fees. Family Planning Perspectives 9:158-163.

Nathanson, C. A., and M. H. Becker (1980) Obstetricians' attitudes and hospital abortion services. Family Planning Perspectives 12:26-32.

National Center for Health Statistics (1979) Detailed Diagnoses and Surgical Procedures for Patients Discharged from Short-Stay Hospitals: United States, 1977. Hyattsville, Md.: U.S. Department of Health, Education, and Welfare.

Nazer, I. R. (1970) Abortion in the Near East. Pp. 267-273 in R. E. Hall, ed., Abortion In A Changing World, Vol. 1. New York: Columbia University Press.

Nazer, I. R. (1980) The Tunisian experience in legal abortion. International Journal of Gynecology and Obstetrics 17:488-492.

Ndeti, K. (1973) Abortion in Traditional Societies: A Sociological Review of Abortion in Six East African Societies. Paper presented at the International Planned Parenthood Federation Conference on the Medical and Social Aspects of Abortion in Africa, Accra, Ghana.

Newman, L. F. (1980) Widespread use of emmenagogues. Cited in Population Reports, Series F., No. 7.

Ng, K. H., and T. A. Sinnathuray (1975) Maternal mortality from septic abortions in University Hospital, Kuala Lumpur from March 1968 to February 1974. Medical Journal of Malaysia 30:52-54.

Ojo, O. A., and V. Y. Savage (1974) A ten year review of maternal mortality rates in the University College Hospital, Ibadan, Nigeria. American Journal of Obstetrics and Gynecology 118:517-522.

Onetto, E. (1980) Abortion in Chile, 1964-1979. Unpublished paper in the files of the Population Information Program.

Osofsky, J. D., J. H. Osofsky, and R. Rajan (1973) Psychological effects of abortion: With emphasis upon immediate reactions and follow up. Pp. 188-205 in H. J. Osofsky and J. D. Osofsky, eds., The Abortion Experience. Hagerstown, Md.: Harper and Row.

Osofsky, J. D., H. J. Osofsky, R. Rajan, and D. Spitz (1975) Psychosocial aspects of abortion in the United States. Mount Sinai Journal of Medicine 42:456-468.

Padubidri, V., and B. G. Kotwani (1979) Septic abortions: 5 years' review. Journal of Obstetrics and Gynecology of India 29:593-597.

Palmer, S. J. (1978) Abortion in Africa: An expert group report. Pp. 23-27 in F. T. Sai, ed., A Strategy for Abortion Management: Report of an IPPF Africa Regional Meeting. London: International Planned Parenthood Federation.

Pan American Health Organization and Transnational Family Research Institute (1975) Epidemiology of Abortion and Practices of Fertility Regulation in Latin America: Selected Reports. Scientific Publication No. 306. Washington, D.C.: Pan American Health Organization.

Park, B. T., B. M. Choi, and H. Y. Kwon (1979) The 1976 National Fertility and Family Planning Evaluation Survey. Seoul: Korean Institute for Family Planning.

Pauls, F. (1973) Abortion Profile in Kinshasa, Zaire. Paper presented at the International Planned Parenthood Conference on Medical and Social Aspects of Abortion in Africa, Accra, Ghana.

Paxman, J. M. (1980a) Law and Planned Parenthood. London: International Planned Parenthood Federation.

Paxman, J. M. (1980b) Roles for non-physicians in fertility regulation: An international overview of legal obstacles and solutions. American Journal of Public Health 70:31-39.

Paxman, J. M., and M. Barberis (1980) Menstrual regulation and the law. International Journal of Gynecology and Obstetrics 17:493-503.

Philips, F. S., and N. Ghouse (1976) Septic abortion: Three year study 1971-1973. Journal of Obstetrics and Gynecology of India 26:652-656.

Pohlman, E. W. (1969) The Psychology of Birth Planning. Cambridge, Mass.: Schenkman.

Potts, M. (1970) Postconceptive control of fertility. International Journal of Gynecology and Obstetrics 8:957.

Potts, M. (1972) Introduction: Problems and strategy. Pp. 1-16 in M. Potts and C. Woods, eds., New Concepts in Contraception. Baltimore, Md.: University Park Press.

Potts, M. (1979) Perspectives on fertility control. International Journal of Gynecology and Obstetrics 16:449-455.

Potts, M. (1980) Personal communication, November.

Potts, M., P. Diggory, and J. Peel (1977) Abortion. Cambridge, Mass.: Cambridge University Press.

Program for the Introduction and Adapatation of Contraceptive Technology (PIACT) (1980) Contraceptive use in China. PIACT Product News 2(1):6.

Ramirez, A., and E. Garcia (1975) Study of Abortion in 200 Women in the Dominican Republic. Santo Domingo: Universidad Nacional Pedro Henriquez Urena.

Ramirez, C. E., A. Russin, and R. L. Johnson, with A. Ramirez, E. Garcia, A. E. Noboa Mejia (1978) The preferred risk of illegal abortion in the Dominican Republic. Pp. 225-240 in H. P. David, H. L. Friedman, J. van der Tak, and M. Sevilla, eds., Abortion in Psychosocial Perspective: Trends in Transnational Research. New York: Springer.

Requena, M. (1970) Abortion in Latin America. Pp. 338-352 in R. E. Hall, ed., Abortion in a Changing World, Vol. 1. New York: Columbia University Press.

Riano-Gamboa, G., J. G. Ferguson, and A. Goldsmith (1975) Clinical Management of Incomplete Abortion in the University Hospitals of Colombia (in Spanish). Conference Paper Series No. 79. Chapel Hill, N.C.: International Fertility Research Program.

Rochat, R. W., D. Kramer, P. Senanayake, and C. Howell (1980) Induced abortion and health problems in developing countries. Lancet 2:484.

Rooks, J. B., and W. Cates, Jr. (1977) Emotional impact of D&E vs. instillation. Family Planning Perspectives 9:276-277.

Rushwan, H. M. E., J. G. Ferguson, Jr., Z. M. El Nayal, E. H. E. El Nahas, and R. P. Bernard (1975) Three Center Study on Incomplete Abortion in Khartoum, Sudan. Unpublished manuscript. International Fertility Research Program, Chapel Hill, N.C..

Sai, F. T. (1974) Sub-Saharan black Africa. Pp. 243-249 in H. P. David, ed., Abortion Research: International Experience. Lexington, Mass.: Heath.

Sambhi, J. S. (1977) Abortion by massage: "Bomoh." IPPF Medical Bulletin 11(1).

Sampoerno, D., and S. Sadli (1975) Indonesia. Pp. 21-28 in H. P. David and B. Shashi, orgs., Psychosocial Aspects of Abortion in Asia. Washington, D.C.: Transnational Family Research Institute.

Santee, B. (1975) A prospective abortion study in Santiago, Chile. Pp. 30-38 in Epidemiology of Abortion and Practices of Fertility Regulation in Latin America: Selected Reports. Scientific Publication No. 306. Washington, D.C.: Pan American Health Organization.

Sauvy, A. (1969) General Theory of Population. London: Weidenfeld and Nicolson.

Schwarz, R. H. (1968) Septic Abortion. Philadelphia: Lippincott.

Shepard, M. J., and M. B. Bracken (1979) Contraceptive practice and repeat induced abortion: An epidemiological investigation. Journal of Biosocial Science 11:289-302.

Shostak, A. B. (1979) Abortion as fatherhood lost: Problems and reforms. The Family Coordinator 28:569-574.

Siwale, S. H. (1977) View from Africa: Zambia. In D. J. Bogue, K. Oettinger, M. Thompson, and P. Moore, eds., Adolescent Fertility. Chicago: University of Chicago Commmunity and Family Study Center.

Soskice, D. W., and J. J. Trussell (1973) Effects of the abortion act. British Journal of Hospital Medicine 299-302.

Stampar, D. (1973-74) An investigation concerning the reliability of data on the frequency of induced abortion (in Serbo-Croation). Stanovnistno 3-4:273-277.

Stepan, J., ed. (1979) Survey of Laws on Fertility Control. New York: United Nations Fund for Population Activities.

Stokes, B. (1980) Men and Family Planning. Paper No. 41. Washington, D.C.: World Watch Institute.

Tan, S. B. (1978) The Psychosocial Aspects of Abortion in Singapore. Ottawa: International Development Research Centre.

Tecsan, S., C. E. Carpenter-Yaman, and N. H. Fisek (1980) Abortion in Turkey. Ankara: Institute of Community Medicine, Haceteppe University.

Tien, H. Y., and X. W. Shao (1980) How China meets its population problem. International Family Planning Perspectives 6:65-73.

Tietze, C. (1978a) Repeat abortions--why more? Family Planning Perspectives 10:286-288.

Tietze, C. (1978b) Safety and health hazards of abortion. Journal of Obstetrics and Gynecology (Singapore) 9:49-56.

Tietze, C. (1979a) Induced Abortion: 1979, 3rd ed. New York: Population Council.

Tietze, C. (1979b) Legal abortion in the world today. Pp. 406-415 in G. I. Zatuchni, J. J. Sciarra, and J. J. Speidel, eds., Pregnancy Termination: Procedures, Safety, and New Developments. Hagerstown, Md.: Harper and Row.

Tietze, C. (1981) Induced Abortion: A World Review, 4th ed. New York: Population Council.

Tietze, C., and A. K. Jain (1978) The mathematics of repeat abortion: Explaining the increase. Studies in Family Planning 9:294-299.

Tomaro, J. B. (1981) Mexico. In M. Gallen, T. Narkavonnakit, J. B. Tomaro, and M. Potts, Traditional Abortion Practices: Three Studies of Illegal Abortion in the Developing World. Research Triangle Park, N. C.: International Fertility Research Program.

United Nations (1976) Demographic Yearbook, 1975, Table 28. New York: United Nations.

United Nations (1977) Demographic Yearbook, 1976, Table 16. New York: United Nations.

van der Tak, J. (1974) Abortion, Fertility, and Changing Legislation: An International Review. Lexington, Mass.: Lexington Books.

Viel, B. (1976) The Demographic Explosion: The Latin American Experience. New York: Irvington.

Viel, B. (1979) The health consequences of illegal abortion in Latin America. Pp. 353-360 in G. I. Zatuchni, J. J. Sciarra, and J. J. Speidel, eds., Pregnancy Termination: Procedures, Safety, and New Developments. Hagerstown, Md.: Harper and Row.

Waife, R. S. (1978) Traditional Methods of Birth Control in Zaire. Chestnut Hill, Mass.: Pathfinder Fund.

Warner, S. L. (1965) Randomized response: A survey technique for eliminating evasive answer bias. Journal of the American Statistical Association 60:63-69.

Westoff, C. (1981) Unwanted fertility in six developing countries. International Family Planning Perspectives 7:43-52.

Wolfson, M. (1976) Planning for people. People 3:18-21.

World Fertility Survey (1980) Summary of major findings presented at the World Fertility Conference, London, July. International Family Planning Perspectives 6:114-116.

World Health Organization (1965) World Health Statistics Annual, Vol. 1. Vital Statistics and Causes of Death. Geneva: World Health Organization.

World Health Organization (1967) World Health Statistics Annual, Vol. 1. Vital Statistics and Causes of Death. Geneva: World Health Organization.

World Health Organization (1978) Induced Abortion. Technical Report Series No. 623. Geneva: World Health Organization.

World Health Organization (1979a) World Health Statistics Annual, Vol. 3. Vital Statistics and Causes of Death. Geneva: World Health Organization.

World Health Organization (1979b) Special Programme of Research, Development, and Research Training in Human Reproduction: Eighth Annual Report. Geneva: World Health Organization.

World Health Organization (1980) Statistics on file in data bank. World Health Organization, Geneva.

Zelnik, M., and J. F. Kantner (1978) Contraceptive patterns and premarital pregnancy among women aged 15-19 in 1976. Family Planning Perspectives 10:135-144.

Zipper, J. (1975) Chilean experience with IUDs: Updating the programme. Pp. 217-324 in F. Hefnawi and J. J. Segal, eds., Analysis of Intrauterine Contraception. Amsterdam: North Holland.

Chapter 24

INFANTICIDE AS DELIBERATE FERTILITY REGULATION

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Infanticide has been practiced by human populations at least since the upper Paleolithic era (Carr-Saunders, 1922). It is recorded in ancient literature, from the Bible (Moses) to the plays of Sophocles (Oedipus); in archeological records (Carr-Saunders, 1922; Valois, 1961); in past and contemporary anthropological accounts (Ellis, 1827; Balikci, 1967; Wagley, 1969); and in historical anthropological and demographic literature (Langer, 1974; Trexler, 1973a; Shorter, 1977). In fact, the practice has been so common that one anthropologist has called infanticide "the most widely used method of population control during much of human history" (Harris, 1977:5).

Despite the many past and present accounts of infanticide, the practice has seldom been quantified. It is difficult enough to obtain accurate fertility data in much of the world; it is more difficult still to get accurate infant mortality data, and nearly impossible to obtain accurate data on the deliberate killing of infants and children. Moreover, the discussion of infanticide in relation to fertility is constrained by the fact that there are many stated reasons for infanticide, ranging from characteristics of the infant at birth (twins, deformities, wrong sex) to explicit familial or societal concerns about overpopulation, large families, or close spacing. Although only these latter concerns are overtly linked to fertility, many of the other reasons may be "excuses" for eliminating an unwanted child or maintaining population growth at specific levels.

With these constraints in mind, this paper will discuss the available evidence on the use of infanticide as a fertility control measure. First, definitions and forms of infanticide will be presented, followed by an examination of its incidence. The discussion will then focus on infanticide in relation to fertility. Under this heading, the relationships between fertility and infant mortality will be explored, particularly as regards behavioral interventions affecting mortality. Infanticide as a form of fertility control at both the societal and individual or familial levels will also be discussed under the same heading. Finally, conclusions and suggestions for needed research will be presented.

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DEFINITIONS AND FORMS OF INFANTICIDE

Definitions of infanticide in the literature range from "the willful destruction of newborn babies through exposure, starvation, strangulation, smothering or . . . lethal weapon" (Langer, 1974:353) to killing of "a child within the first year of life" (Kluge, 1978:33) to "child-killing" without reference to age (Trexler, 1973a:98). Although strictly speaking, infanticide should mean the willful destruction of infants, it has come to refer to both infants and children. Nevertheless, in most societies where overt infanticide is practiced, it occurs very early in the child's life, before it has the status of a real person in the society. Thus the problem of defining infanticide is similar to that of defining the beginning of life in induced abortion. Once a society has the technology to intervene in utero to save a life, the failure to do so could be labeled infanticide, as has induced abortion. As Williamson points out, "the line between abortion and infanticide is not always clear." She mentions that both the Kamchadal of Siberia and the Yanomamo of Venezuela kill the fetus through the wall of the abdomen at some point during the last few months of pregnancy (1978:62). In fact, the definition of when life is taken usually depends on a cultural definition of when life begins. In modern U.S. society, this is often the age at which a fetus can survive outside the mother's uterus, although technological developments are constantly lowering that age. Among the Machigenga, a newborn is not accepted until its mother has nursed it, often a day after birth (Johnson, 1981:63). Among Andean Indian groups, a child may not be acknowledged until it has survived its first year (Whitehead, 1968). In the past in Japan, a child was not named until the seventh day after birth (Bacon, 1891:63). Williamson (1978) says the Peruvian Amhuaca do not consider children fully human until they are three years old. In other societies, the acknowledgement of a newborn as a member of the society with a right to life may take days or even weeks (Ford, 1964:74).

The definition of infanticide is also complicated by the fact that it does not necessarily involve the deliberate or violent killing of a child. In the past, it has also been taken to include both abandonment and "negligence in the care of children" (Carr-Saunders, 1922). One could argue that abandonment does not constitute infanticide. However, while it is certainly not overt killing, it is the discarding of the child under circumstances which may mean its death. The demographic and historical literature contains many examples of infant and child abandonment in Europe during the 17th, 18th, and 19th centuries, with mortality rates as high as 90 percent (Trexler, 1973a; Kellum, 1974; Shorter, 1977; Langer, 1974). Current definitions can also include "passive infanticide" in the form of what has been called benign neglect (Cassidy, 1980) or underinvestment (Scrimshaw, 1978; Ware, 1977, 1981), which leads to child mortality that might otherwise have been avoided. This concept of negligence or underinvestment is itself complicated by the fact that in some situations, it is not the result of a conscious decision. Parents may simply favor some children over others, and because resources are

scarce, the results are sometimes fatal for the neglected child (see Neel, 1970; Chandrasekar, 1959:124-125; Harris, 1977:16; Ware, 1977, 1981; Scrimshaw, 1978). In other instances, parents may decide a child is "not for this world" and refuse to seek medical treatment for or invest resources in that child (Gutierrez de Pineda, 1955:19). In today's world, both developed and developing, such unconscious underinvestment is more prevalent than the deliberate killing of a child (Dickeman, 1975:133).

This unconscious underinvestment or passive infanticide can be more precisely defined as any combination of medical, nutritional, physical, or emotional neglect of an infant or young child in comparison to other children in the family or to children of families in similar socioeconomic and educational circumstances. In many instances, this neglect will lead to death, but there will also be many survivors, who may be physically and/or emotionally compromised because of the neglect they experienced. It is important to note that underinvestment is defined in relative terms: the best an impoverished family can provide would frequently be considered inadequate by modern medical and nutritional standards; neglect in fact occurs only when an infant or child receives less than the family might be able to provide, and less than family members know should be provided.

Infanticide, then, can comprise a number of behaviors. These include the following, which are not necessarily mutually exclusive:

Deliberate killing
Placing the child in a dangerous situation
Abandonment where the child might survive
"Accidents"
Excessive physical punishment
Lowered biological support
Lowered emotional support

In all but perhaps the first of these situations, failure is possible; thus infanticide may be attempted, but unsuccessful. Such attempted infanticide must be discussed along with actual deaths, just as a discussion of contraceptive use would normally include contraceptive failure rates.

INCIDENCE OF INFANTICIDE

The scarcity of accurate data on actual frequencies of infanticide has already been mentioned. There are no such data in the demographic literature reviewed for this paper. The anthropological literature includes analyses of a data set called the Human Relations Area Files (HRAF), which contains data on over 300 societies organized by topic. Because of the nature of anthropological research, these societies tend to be small, although they often include representatives of fairly large populations, such as the Ibo of Nigeria, the Eskimo of Alaska and Canada, and the Aymara of Bolivia and Peru. The data were

collected from the 18th century on, but come primarily from the 20th century.

Divale and Harris (1976) analyzed this data set for populations for which there was information on age-sex structure and presence (or recent presence) of warfare. Their analysis of 112 societies (561 populations) meeting these criteria also included a discussion of infanticide. Although their sample is not random, they feel it is generally representative of preindustrial societies because it is so large, and because the set of HRAF societies is reasonably representative of the world's major geographic regions. Table 1 is based on their listing of societies. Unfortunately, they do not specify what they mean by words such as "common" and "occasional;" however, they still give a rough idea of the incidence of infanticide. All of the Asian societies they list practiced infanticide "commonly," as did 58 percent of the African societies. Oceania had the lowest proportion of societies "commonly" practicing infanticide, although there are no data on infanticide for 58 percent of those societies, and the actual figure may therefore be higher. On a global basis, 36 percent of the preindustrial cultures in the sample practiced infanticide commonly, and 15 percent practiced it occasionally or rarely. It was clearly identified as not practiced in only 9 percent of the 112 cultures. This supports what the historical and archeological literature cited at the beginning of this chapter suggests--that human societies have practiced infanticide for a long time. It does not, however, tell us whether the practice was intended to curb population growth or limit family size, rather than to destroy malformed infants or accomplish other similar purposes. The societies

TABLE 1 Frequency of Infanticide in 112 Societies, by World Area

World Area	Common	Occasional or not common	Not practiced	No information	Total
Asia	6	0	0	0	6
Africa	7	0	0	5	12
North America	11	4	3	5	23
Oceania	12	5	6	32	55
South America	4	7	1	4	16
Total	40	16	10	46	112
Percent	36	15	9	40	100

Source: Based on data in Divale and Harris (1976:533-535) from the Human Relations Area Files. Societies with no information on infanticide are included because of the possibility that the absence of information is related to the absence of infanticide.

where the former reasons have been documented will be listed later in this discussion.

Table 1 relates to overt or admitted infanticide for which, as noted, the data are scarce. Evidence of differential care or passive infanticide is even more difficult to come by. The best evidence emerges from the examination of sex differentials in mortality and morbidity. On a strictly biological basis, slightly more males than females are born. Thus, if there were any sex differential in mortality, males should have the higher rates (Stolnitz, 1956). India provides an example of the opposite. Findings from the Khanna study indicate that boys receive more food and medical care than girls (Singh et al., 1965). Also, in the first five years of life, the female death rate was 74 per 1000 per year while the male death rate was 50 (Wyon and Gordon, 1971). Welch (1974) reports similar data from Bangladesh, where a girl is more likely to survive in a family with more boys than girls than one with the opposite balance. Also reporting on Bangladesh, D'Souza and Chen found "pronounced excess female mortality over male mortality" (1980:258). For example, in 1975 the postneonatal mortality rate for males was 98.4 per 1000 live births, while the female rate was 126.3. Overall, the mortality rates for females were "significantly higher" through age 4, and then were normal through age 14. Ware (1981) adds that in Asia, Jordan, Pakistan, and Sabah, infant mortality is higher for female babies; female mortality is also higher for ages 1 through 4 in nine populations--Bangladesh, Burma, India, Jordan, Pakistan, Sabah, Sarawak, Sri Lanka, and Thailand. Kaku (1975) suggests that, as recently as 1966, there is evidence for "passive" female infanticide in Japan based on a significant rise in the rate of female infant mortality, partly due to accidents. It is noteworthy that this was a temporary, one-year rise; the rates for males remained unchanged for the period from 1961 through 1967 examined by Kaku. Kaku speculates that the rise in female mortality was due to differential care based on the belief that girls born in that year, the year of the Firehorse, were ill-fated and supposedly destined to murder their husbands. A recent report on China (Wren, 1982) states that female babies are still sometimes drowned, and that mothers of daughters (firstborn) are sometimes beaten and ill-treated. For Arab areas, data for Jordan, Lebanon, Syria, and the Palestinian Arabs document poorer nutritional status and higher mortality rates for girls than for boys from ages 1 to 5 (Cook, 1964; Kimmance, 1972). For Africa and Latin America, there is less evidence for higher female infant and young child mortality with the exception of some Latin American Indian groups (Scrimshaw, 1978:389).

In sum, the data on differential infant and young child mortality by sex strongly indicate behavioral differences in the care of male and female children in some cultures under some circumstances. The extent to which this differential care reflects either societal or individual "population policies" will be discussed in the following section.

INFANTICIDE AND FERTILITY

Relationships Between Fertility and Infant Mortality

The current literature on the relationship between fertility and infant mortality includes theories about both behavioral and biological factors. First, the theory of demographic transition states that mortality declines are eventually followed by fertility declines (Notestein, 1945; Davis, 1945). The child replacement hypothesis states that children who die will be replaced as quickly as possible (Omran, 1971), while the child survival hypothesis states that couples must produce enough children to ensure the survival of a given number to adulthood (Taylor et al., 1976). The health approach indicates that couples will not reduce their fertility until they are convinced that infant mortality levels have indeed dropped (Preston, 1978); it also posits that family-size limitation and greater birth spacing will contribute to improvements in the nutritional and health status of mothers and children (Berg, 1970; Zeitlin et al., 1982). However, another potential factor in the fertility-infant mortality equation is seldom mentioned: that in some societies, infant mortality may be an overt or even a completely unconscious way of attaining a given family size (Ware, 1977; Scrimshaw, 1978).

Figure 1 illustrates the relationships between infant mortality and fertility. The solid lines represent relationships that are acknowledged and frequently discussed. Thus, high fertility affects infant mortality through biological mechanisms (maternal depletion, early weaning) and is in turn affected by those same mechanisms (when an infant dies during the lactation period, the mother resumes ovulation and can become pregnant sooner than if she continued nursing). Mortality is assumed to influence fertility behavior through the child survival and replacement effects discussed above. Behavioral links from high fertility to infant mortality (represented in the figure by dotted lines) have been largely omitted from previous discussions. Even though overt infanticide has been in the literature for a long time, differential care and child neglect have rarely been discussed in relation to fertility. As Ware (1977:3) states, "if parents kill or neglect their children as a means of limiting family size, then any relationship between fertility control and involuntary

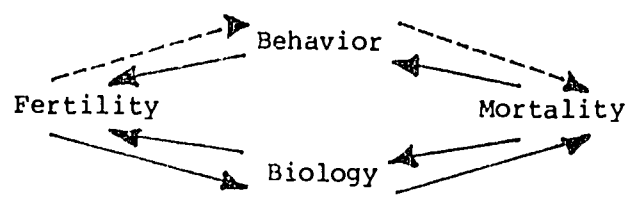

FIGURE 1 Behavioral and Biological Relationships Between Fertility and Infant Mortality

Note: Solid lines indicate relationships often discussed, broken lines behavioral relationships seldom discussed.

child loss will be totally obscured in all available statistics." An important concept behind Ware's statement is that of family size. To a demographer, the number of pregnancies and live births is an important variable; to an individual or family, the bottom line is the number of living children--the current, and eventually the completed family size.

The influence of family size on infant mortality and fertility can be seen in a closer examination of the hypotheses on relationships between infant mortality and fertility. Both the child replacement and the child survival hypotheses are useful for explaining fertility behavior in some societies; however, neither hypothesis alone nor the two taken together are sufficient to describe fertility-mortality relationships in many societies.

Taylor et al. (1976) maintain that there is little direct evidence for the child survival hypothesis, and question a direct causal link between the decline of child mortality and a decline in fertility. They point out that reduced child mortality has not been a precondition for lower fertility in some situations; moreover, it is difficult to prove that parents replace each child. They sugggest that "no single factor can be expected to explain the totality of complex motivations which lead to or inhibit fertility reduction" (p. 263), and that the balance of factors varies with the society and its stage in the process of demographic transition. Thus the child survival hypothesis tends to have some validity at the point in the transition where there has been a drop in mortality. This article is one of the few that acknowledges the possibility of mortality as a family-size control strategy. The authors suggest that the relative degree of unwantedness of children is a factor in infant mortality and fertility. The spectrum of infant mortality may range from lower-parity children who die but were wanted, to children at higher parities whose births exceed family-size desires.

The child replacement hypothesis is closely linked to the child survival hypothesis, and there is frequently little distinction made between them. However, the child survival hypothesis relates to the need to believe that children will survive to adulthood before fertility regulation is accepted, whereas the child replacement hypothesis addresses the more immediate, micro-level attempt of a couple to replace as quickly as possible a child who dies. Preston (1978) defines replacement rates as the average ratio of additional births to additional deaths. He points out that in no population are as many as 50 percent of child deaths replaced by additional births, and suggests a variety of reasons for this: there may not be a target number of surviving children; the targets may be so high that fertility couldn't possibly be any higher; the targets may be for one sex only; the couple may have fecundity problems; the child's death may result in a downward modification of ideal family size; and the child's death may have been anticipated and protected by insurance strategies of "overproduction" (pp. 12-14). Of these explanations, only the one related to targets for one sex allows for the possibility that every effort may not be made to prevent some child deaths. Other studies provide examples of the failure to replace dead children. In

Guatemala, Teller et al. (1975:338-343) conclude that "women do not seem to be overcompensating for an intra-interval death by hastening the coming of the next conception." In Colombia and Mexico, it has been suggested that parity levels may in fact decrease with increased child deaths (Rutstein and Medica, 1978).

One of the most interesting analyses of child survival and replacement is provided by Chowdhury et al. (1976) for Pakistan and Bangladesh. They address complications in assessing the impact of child mortality on fertility arising from the fact that high fertility can contribute to high mortality. Although their data show that women with fewer living children experience shorter birth intervals, it is difficult to sort out whether those shorter intervals are due to conscious efforts to replace dead children, result from shorter lactation amenorrhea following an infant death, or contribute to the deaths through shortening lactation and maternal depletion (see also Heer, in these volumes; Chen, in these volumes). In an attempt to eliminate some of these biases, they analyzed birth intervals according to previous child deaths, excluding those deaths that had occurred just prior to the birth interval examined. They found no statistically significant difference in birth intervals between women who had experienced at least one child death and those who had not. They concluded that "in the context of these two South Asian societies with moderately high levels of fertility and mortality, there is no evidence that child deaths generate a desire to replace children" (Chowdhury:255-258).

The inadequacy of the theory of demographic transition for characterizing a number of populations has been suggested (Preston, 1978; Ware, 1977), and is evident from the preceding discussion. This may be because there is a certain amount of infant mortality in many societies which cannot be assumed to result solely from factors beyond the control of individuals.

Infanticide as Fertility Control

At the Societal Level

Historically, infanticide has been directly linked to fertility regulation. One of the most common reasons given for overt infanticide in the literature is regulation of either societal or familial fertility (Abernethy, 1979:52; Dickeman, 1975; Carr-Saunders, 1922). Specifically, this often involves limiting population to avoid food shortages. For example, Firth (1961:202) writes that the Tikopia practiced infanticide in proportion to the available food; this was done unwillingly, "with limited resources in mind," and only after the family already had at least one child of each sex. Some societies limit population according to the scarcity of other goods that have become associated with prestige: "Competition for essential resources is replaced by competition for socially valued goods" (Wilkenson, 1973:48). Thus, for example, the money that must be set aside for a dowry can make a female child less attractive to her parents.

A number of societies acknowledge explicitly that they practice infanticide to limit population. These include ancient cultures such as the Greeks (Langer, 1974), large societies of the recent past such as Japan and China (Lorimer, 1954; Langer, 1974), and recent and current preindustrial cultures such as the Eskimo (Freeman, 1971), the McKenzie Dene (Helm, 1980), the Australian aborigines (Howitt, 1904; Goodale, 1971), and the Jakun and Sakai of Malaya (Skeet and Blagden, 1906). Others, such as the Yaudapu Enga of New Guinea (Gray, 1981) and the Kung Bushmen (Howell, 1979; Lorimer, 1954), practice infanticide to increase spacing, which has the effect of reducing completed fertility rates.

When infanticide is consciously related to the need to regulate population size in relation to scarce resources, it is easy to see the link between the behavior and biological adaptation to a specific environment (Dickeman, 1975:120-129). Anthropological ecologists theorize that "beliefs and behaviors that affect fertility, death and disease rates are major factors in the adaptations of human societies. Over time, every society develops behavioral strategies which maximize gains and minimize losses in its population size relative to particular environments" (Alland, 1970:203). For any given biocultural adaptation, there is a maximum population level beyond which food energy extraction may damage the environment enough to threaten the survival of the group. When a population approaches this level, called carrying capacity, Malthusian checks on size may begin to operate, and the group may or may not evolve successful stategies for averting environmental degradation (Alland, 1970). Most human groups do not wait until the Malthusian checks begin to operate, but reduce fertility or increase mortality through behaviors designed to improve the quality of life of the existing population. These theories help explain why behavior that is detrimental to individual survival (such as infanticide) may be practiced: the possibility of survival or the quality of life of the entire group may be enhanced if fewer individuals are present (Scrimshaw, 1978:399).

In a discussion of individual and group fertility stategies, Wrigley (1978:135) labels as "unconscious rationality" those "patterns of behavior in animals which bring an apparent benefit to the species of which individual members of the population are unaware. What is true of societies of animals may be true equally of societies of men." He (along with others such as Alland) suggests that particular behaviors may develop as a result of a trial and error process comparable to the economic concept of the "invisible hand of the marketplace." In an example of this sort of reasoning, Freeman (1971:1016) writes of Eskimo infanticide that the practice has ecological advantages, but that it is "doubtful" whether Eskimos are "aware of such ecologic/biologic implications. . . . However, because the implications are adaptive, the trait itself (infanticide) is all the more likely to persist."

Female infanticide, the most common, can be seen either as an intermediate mechanism for population control or as an end to itself. If infant mortality is a means of population control, it is, of course, more efficient to eliminate females given the existence of

polygamy, since a few males could keep a population of females reproducing. In discussing the relationships between social structure, fertility, female infanticide, and warfare, Divale and Harris (1976) suggest that both warfare and female infanticide operate as population-regulating mechanisms, but that warfare and male-dominated social structures provide the motive for female infanticide, which is the real population regulation mechanism. Their analysis can be challenged. Hirshfeld et al. (1978) and Lancaster and Lancaster (1978) have questioned the precision of Divale and Harris' data and their interpretation of the value of women. Divale and Harris (1976) admit that the link with warfare appears weak, and that female infanticide can occur in the absence of warfare. Moreover, it is not clear that either sex ratios or rates of infanticide are precisely reported for many of the 393 societies they examined. Nevertheless, it is unarguable that female infanticide will have a greater impact on population growth than will male infanticide, as long as polygamy is practiced.

It is also clear that in order for preferential female infanticide to exist, the society must place a higher value on male than on female infants. This is the case, for example, in harsh environmental conditions where male strength is important. In a detailed examination of four Eskimo tribes, Riches (1974) showed a relationship between the harshness of the environment and female infanticide, where tribes under the greatest pressure also had the highest sex ratio. In a very few cultures, the tables are turned, and women are perceived as more valuable for their gathering or farming skills. This is true for the Tiwi of Australia (Goodale, 1971) and the Warao of Venezuela (Wilbert, 1982), both of which practice male more commonly than female infanticide.

Other discussions of female infanticide acknowledge that its ultimate function may be the reduction of rates of population growth, but that its proximate utility may be maintenance of the social structure. The most detailed discussion of this is provided by Dickeman (1975, 1979). In some cases, female infanticide served to offset heavy male mortality rates from hunting and warfare; in other instances, however, it could be attributed to "asymetrical marriage alliances." In societies such as India, China, and Europe, the preferential marriage form was hypergamy, with women marrying men of higher castes or classes. To do this, women needed large doweries. This created an excess of women at the top, and encouraged the practice of preferential female infanticide.

Whether infanticide is practiced for population control or for other reasons, it must be recognized that it is a more adaptive mechanism for fertility and population control than induced abortion. Induced abortion often carries with it higher risks of maternal mortality and subsequent infertility due to infections. Although this is not true under modern medical conditions, such conditions did not exist in the past and are not legally available in many societies today. Although infanticide carries a higher risk for the mother than if she had not undergone the risks of pregnancy and birth in the first place, it is still safer than inducing an abortion under poor

conditions (Tietze et al., 1976).

The theories discussed in this section are rather easily applied to small, isolated populations whose relationship to the environment is direct and relatively unchanging, although a precise measure of carrying capacity has proved extremely elusive. Given the current interdependence of human societies as well as rapidly developing technologies for extracting food and energy from the environment, direct relationships between adaptation and environment are much more difficult to observe. Such relationships may persist in some peasant communities, and behaviors that evolved in the past may also persist in the present; however, in the current world, behaviors such as overt or passive infanticide may be better understood at the micro level of individuals or families.

At the Individual or Familial Level

When infanticide is mandated or clearly encouraged at the societal level for purposes of population control, birth spacing, or family-size limitation, individuals will be pressured by other members of the society to follow those norms. When such mandates are not present or explicit, individuals may still choose overtly, covertly, or unconsciously to reduce their family size or influence spacing through behaviorally induced infant mortality.

Infanticide, either active or passive, is extremely difficult to document at the individual level, particularly when the practice is not officially sanctioned or is forbidden. Nevertheless, there is evidence that in addition to occasional cases of overt infanticide, individuals in many societies practice abandonment, neglect, and differential care (Dickeman, 1975; Neel, 1970). There are reports of widespread abandonment in Latin American countries, for instance, though estimates of the number of abandoned children are difficult to credit (Hollsteiner and Tacon, 1982).

In addition to actual abandonment, a major means of passive infanticide is differential care. For example, in a Guatemalan community, a woman who felt she already had too many children tried unsuccessfully to abort a pregnancy. When a perfectly healthy baby was born, she declared that it was weak and sickly and would die soon. It did, probably due to a lack of feeding and nurturing (M. Scrimshaw, 1977). As defined earlier, differential care involves the withholding of scarce resources from the less valued children. These may be children of a less-preferred sex, as discussed above. They may also include children of a higher birth order who are not as well integrated into the family, or members of a closely spaced pair.

Parity above five is associated with higher infant mortality in many studies (Wyon and Gordon, 1971; Radovic, 1966; Roberts and Tanner, 1963), as is being the second in a closely spaced pair of children (Wolfers and Scrimshaw, 1975). In both cases, however, there are many other behavioral and biological factors involved, so that the impact of differential care cannot be established on the basis of current evidence.

Nevertheless, cases of differential care are reported in the literature. Aguirre (1966) cites incidents of infants and young children being "allowed to die" when attacked by disease, calling this "masked infanticide." Chagnon (1968) mentions a Yanomamo mother who did not feed her baby, saying it had stopped eating because of a bad case of diarrhea. He found that the baby would eat, but the mother was starving it. In discussing differences between the mothers of normal and malnourished children in India, Graves (1977) notes that mothers of malnourished children felt significantly more negative about their pregnancies.

In a discussion of differential mortality in India, Simmons et al. (1980:14) state that "other things being equal, a child's survival will be determined by how much it is wanted," in relation to the number of children the parents have and the child's sex. In an analysis of sex differentials for infectious causes of death in Bangladesh, D'Souza and Chen (1980) state that the reason for these differentials is probably neglect, especially in feeding, which then renders an infant more susceptible to infection. In Korea, one study showed that for 100 male children under the age of 5, there were 85 visits to the health center in a year, but only 50 visits a year for 100 female children (Ware, 1981:57).

In sum, methods of passive infanticide include outright abandonment, as well as neglect in the areas of feeding (including breastfeeding and supplementation), sanitation, medical care, supervision, and attention. The undesirability of a particular child may be explicitly voiced by parents as they discuss their ill or deceased children; more often, however, the occurrence of passive infanticide must be estimated by the researcher, either through direct observation or by inference.

CONCLUSIONS AND RECOMMENDED RESEARCH

It is clear that the data on infanticide are scattered and incomplete. Anthropologists have documented its occurrence in many pre-industrial societies, but have not provided quantitative information. Demographers and historians have provided some quantitative information for societies in the past, but little for the present. In fact, the existence of infanticide in the present has been largely ignored or denied. This is regrettable because unless it is acknowledged that some infant mortality is behaviorally induced or influenced, many theories, such as the child replacement hypothesis, fail to offer adequate explanations of fertility and mortality patterns in some societies. Passive infanticide has further implications related to child health since the many survivors of such attempts are often physically, mentally, and emotionally compromised.

Several areas of needed research on the subject of infanticide may be identified.

1. Improved Quantification Anthropologists and others observing or being told of infanticide should strive for both precision and

quantification. How frequently does it occur per 1000 live births and per family? Why is it done? How is it done? Who decides it must be done? How do people feel about it? In the case of passive infanticide, the researcher should try to document differential care and attitudes toward specific infants and children as precisely as possible.

2. Better Analysis of Existing and New Quantitative Data Some of the questions raised in this chapter on such problems as the relationship between maternal age, maternal health, and higher infant mortality can be addressed through multivariate analysis. Studies that include objective data on the mother's health status are rare, but they exist and should be exploited. Even in the absence of such information, more can be done with questions of correlation and causality in the relationship between fertility and infant mortality.

3. Further Examination of the Current Hypotheses on Relationships Between Fertility and Infant Mortality Omran (1971) mentions the scarcity of studies specifically designed to investigate either direct or indirect effects of child survival on fertility. Similarly, Schultz (1976:280) states: "No one, to my knowledge, has yet estimated . . . the separate fertility effects of a child's death attributable to behavioral and biological factors while holding constant the more important socioeconomic determinants of reproductive demands." In sum, questions such as the impact of maternal age, weight, health status, and nutritional status on perinatal, infant, and child mortality must be addressed. Differential mortality must be assessed while controlling for birth order, number of living children in the family, contraception, lactation, and other related variables. On the behavioral side, particular attention needs to be paid to the impact on children of the family's economic situation and the resultant choices that must be made related to food, medical care, and attention or care while the mother works.

4. Quantification and Better Understanding of Infant and Child Abandonment How extensive is it? Under what circumstances do parents abandon children? How does child abandonment relate to birth spacing, parity, attempts at contraception or abortion, and family economic status? Are some children retained while others are abandoned? How do parents perceive the fate of abandoned children?

5. Further Investigation of Passive Infanticide The family context of infants and children who show signs of malnutrition, untreated disease, abuse, and neglect needs to be examined. Attention should be paid to factors such as sex, birth order, number of surviving siblings, parental family-size desires, and spacing when such children appear in health centers or as research subjects. Parents should be observed and interviewed to elicit their attitudes and behaviors towards these children, with every effort made to quantify and analyze the resulting data.

To summarize, some of the data needed to better understand both overt and passive infanticide as they relate to the relationships between fertility and infant mortality already exist, but have not been properly exploited. Other types of information need to be collected. Most important, if this is to be done, researchers and health care providers must change their view of parent/child relationships to admit the possibility that both overt and passive infanticide still exist.

BIBLIOGRAPHY

Abernethy, V. (1979) Population Pressure and Cultural Adjustment. New York: Human Sciences Press.

Aguirre, A. (1966) Colombia: The family in Candelaria. Studies in Family Planning 1(11).

Alland, A. (1970) Adaptation in Cultural Evolution: An Approach to Medical Anthropology. New York: Columbia University Press.

Bacon, A. M. (1891) Japanese Girls and Women. New York: Gordon Press.

Balikci, A. (1967) Female infanticide on the Arctic coast. Man 2:615-625.

Berg, A. (1970) Toward survival: Nutrition and the population dilemma. Interplay 24-27.

Carr-Saunders, A. M. (1922) The Population Problem. A Study in Human Evolution. London: Clarendon Press.

Cassidy, C. M. (1980) Benign neglect and toddler malnutrition. In L. Greene and F. Johnson, eds., Social and Biological Predictors of Nutritional Status, Physical Growth, and Development. New York: Academic Press.

Chagnon, N. (1968) Yanomamo: The Fierce People. New York: Holt, Rinehart, and Winston.

Chandrasekhar, S. (1959) Infant Mortality in India 1901-1955. London: George Allen and Unwin, Ltd.

Chowdhury, A. K. M. A. et al. (1976) The effect of child mortality experience on subsequent fertility: Pakistan and Bangladesh. Population Studies 30:249-261.

Cook, R. (1964) Nutrition and mortality of females under 5 years of age compared with males in the greater Syria region. Journal of Tropical Pediatrics 10:76-81.

Davis, K. (1945) The world demographic transition. Annals of the American Academy of Political and Social Science 237:1-11.

Dickeman, M. (1975) Demographic consequences of infanticide in Man. Annual Review of Ecology and Systematics 6:100-132.

Dickeman, M. (1979) Female infanticide, reproductive strategies and social stratification: A preliminary model. In N. A. Chagnon and W. Irons, eds., Evolutionary Biology and Human Social Behavior: An Anthropological Perspective. North Scituate, Mass.: Duxbury Press.

Divale, W. T., and M. Harris (1976) Population, warfare and the male supremicist complex. American Anthropologist 78:521-538.

D'Souza, S., and L. C. Chen (1980) Sex differentials and mortality in rural Bangladesh. Population and Development Review 6:257-270.

Ellis, W. (1827) Narrative of a Tour Through Hawaii. London.

Firth, R. (1957) We, the Tikopia. London: Allen and Unwin.

Firth, R. (1961) Elements of Social Organization. Boston: Beacon Press.

Ford, C. S. (1945) A Comparative Study of Human Reproduction. Yale University Publications in Anthropology No. 3. New Haven, Conn.: Yale University Press.

Ford, C. S. (1964) A Comparative Study of Human Reproduction. Human Relations Area Files Press No. 32. New Haven, Conn.: Yale University Press.

Freeman, M. (1971) A social and economic analysis of systemic female infanticide. American Anthropologist 73:1011-1018.

Goodale, J. (1971) Tiwi Wives. Seattle, Wash.: University of Washington Press.

Graves, P. L. (1977) Nutrition, infant behavior and maternal characteristics: A pilot study in West Bengal, India. American Journal of Clinical Nutrition 30:242.

Gray, B. (1981) Personal communication.

Gulick, J., and M. E. Gulick (1975) Kinship, contraception and family planning in the Iranian city of Isfahan. Pp. 241-293 in M. Nag, ed., Poulation and Social Organization. The Hague: Mouton.

Gutierrez de Pineda, V. (1955) Causas culturales de la mortalidad infantil. Revista Colombiana de Antropologia 4:11-86.

Harris, M. (1977) Cannibals and Kings: The Origins of Cultures. New York: Random House.

Helm, J. (1980) Female infanticide, European diseases, and population levels among the McKenzie Dene. American Ethnologist 7:259-285.

Hirschfeld, L. A., J. Howe, and B. Levin (1978) Warfare, infanticide and statistical interference: A comment on Divale and Harris. American Anthropologist 80:110-115.

Hollsteiner, M. R., and P. Tacon (1982) Urban Migration in Developing Countries: Consequences for Families and Their Children New York: United Nations.

Howell, N. (1979) Demography of the Dobe/King. New York: Academic Press.

Howitt, A. W. (1904) The Native Tribes of South-East Australia. London.

Johnson, O. (1981) The socioeconomic context of child abuse and neglect in native South America. Pp. 55-70 in J. E. Korbin, ed., Child Abuse and Neglect: Cross-Cultural Perspectives. Berkeley, Calif.: University of California Press.

Kaku, K. (1975) Were girl babies sacrificed to a folk superstition in 1966 in Japan? Annals of Human Biology 2:391-393.

Kellum, B. (1974) Infanticide in England in the later Middle Ages. History of Infanticide Quarterly 1:367-388.

Kimmance, K. J. (1972) Failure to thrive and lactation failure in Jordanian villages in 1970. Environmental Child Health 18:313-316.

Kluge, E.-H. (1978) Infanticide as the murder of persons. In M. Kohl, ed., Infanticide and the Value of Life. Buffalo, N.Y.: Prometheus Books.

Lancaster, C., and J. Lancaster (1978) On the male supremicist complex: A reply to Divale and Harris. American Anthropologist 80:115-117.

Langer, W. (1974) Infanticide: A historical survey. History of Childhood Quarterly 1:353-365.

Lorimer, F. (1954) Culture and Human Fertility. Zurich: UNESCO.

Neel, J. V. (1970) Lessons from a "primitive" people. Science 170:815-822.

Newcombe, H. (1965) Environmental versus genetic interpretations of birth order effects. Eugenics Quarterly 12:90-101.

Notestein, F. W. (1945) Population--The Long View. In T. W. Schultz, ed., Food for the World. Chicago: University of Chicago Press.

Omran, A. R. (1971) The Health Theme in Family Planning. Carolina Population Center Monograph No. 16. Chapel Hill, N.C.: University of North Carolina.

Oxhorn, H. (1955) Hazards of grand multiparity. Obstetrics and Gynecology 5:150-156.

Preston, S. H. (1972) Interrelations between death rates and birth rates. Theoretical Population Biology 3:162-185.

Preston, S. H. (1978) The Effects of Infant and Child Mortality on Fertility. New York: Academic Press.

Radovic, P. (1966) Frequent and high parity as a medical and social problem. American Journal of Obstetrics and Gynecology 94:583-585.

Riches, D. (1974) The Netsilik Eskimo: A special case of selective female infanticide. Ethnology 13:351-362.

Roberts, D. F., and R. E. S. Tanner (1963) Effects of parity on birth weight and other variables in a Tanganyika Bantu Sample. British Journal of Preventive and Social Medicine 17:209-215.

Rutstein, S., and V. Medica (1978) The Latin American experience. In S. Preston, ed., The Effects of Infant and Child Mortality on Fertility. New York: Academic Press.

Schultz, T. P. (1976) Interrelationships between mortality and fertility. In R. G. Ricker, ed., Population and Development: The Search for Selective Interventions. Baltimore, Md.: The Johns Hopkins University Press.

Scrimshaw, M. (1977) Personal communication.

Scrimshaw, S. C. M. (1978) Infant mortality and behavior in the regulation of family size. Population and Development Review 4:383-403.

Shorter, E. (1977) The Making of the Modern Family. New York: Basic Books.

Simmons, G. B., C. Smucker, S. Bernstein, and E. Jenson (1980) Post-Neonatal Mortality in Rural India: Implications of an Economic Model. Paper presented to the annual meeting of the American Public Health Association, Detroit.

Singh, F., J. E. Gordon, and J. B. Wyon (1965) Cause of death at different ages by sex and by season in a rural population of the Punjab 1957-1959: A field study. Indian Journal of Medical Research 53:906-917.

Skeet, W. W., and C. O. Blagden (1906) Pagan Races of the Malay Peninsula, Vol. 2. London.

Stolnitz, G. (1956) A century of international mortality trends: II. Population Studies 10:1742.

Taylor, C. E., J. S. Newman, and N. U. Kelley (1976) The child survival hypothesis. Population Studies 30:263-278.

Teller, C., W. Butts, C. Yarborough, A. Lechtig, J.-P. Habicht, H. Delgado, and R. Martorell (1975) Effects of declines in infant and child mortality on fertility and birthspacing: Preliminary results from retrospective data in four villages. Pp. 338-343 in Seminar on Infant Mortality in Relation to the Level of Fertility. Committee for International Coordination of National Research in Demography. Bangkok: CICRED.

Tietze, C., J. Bongaarts, and S. B. Schearer (1976) Mortality associated with a control of fertility. Family Planning Perspectives 8:6-14.

Trexler, R. (1973a) Infanticide in Florence: New sources and first results. History of Childhood Quarterly 1:98-116.

Trexler, R. (1973b) The foundlings of Florence 1395-1455. History of Childhood Quarterly 1:259-284.

Valois, H. V. (1961) The social life of early Man: The evidence of skeletons. In S. L. Washburn, ed., The Social Life of Early Man. Chicago: Aldine.

Wagley, C. (1969) Cultural influences on population: A comparison of two Tupi tribes. Pp. 268-280 in A. P. Vayda, ed., Environment and Cultural Behavior. New York: The Natural History Press.

Wagley, C. (1977) Welcome of Tears. New York: Oxford University Press.

Ware, H. (1977) The relationship between infant mortality and fertility: Replacement and insurance effects. Proceedings of the International Population Conference, Liege, 1977, Vol. 1. Liege: International Union for the Scientific Study of Population.

Ware, H. (1981) Women, Demography and Development. Development Studies Center Demography Teaching Notes. Canberra: Australian National University.

Welch, F. (1974) Sex of Children, Prior Uncertainty, and Subsequent Fertility Behavior. R-1510-RF. Santa Monica, Calif.: Rand Corporation.

Whitehead, L. (1968) Altitude, fertility and mortality in Andean countries. Population Studies 22:335-346.

Wilbert, J. (1982) Personal communications.

Wilkenson, R. G. (1973) Poverty and Progress. London: Methuen.

Williamson, L. (1978) Infanticide: An anthropological analysis. Pp. 61-75 in M. Cohl, ed., Infanticide and the Value of Life. Buffalo, N.Y.: Prometheus Books.

Wolfers, D., and S. C. M. Scrimshaw (1975) Child survival and intervals between pregnancies in Guayaquil, Ecuador. Population Studies 29:479-496.

Wren, C. S. (1982) Old nemesis haunts China on birth plan. New York Times, July 29.

Wrigley, E. A. (1978) Fertility strategy for the individual and the group. Pp. 135-154 in C. Tilley, ed., Historical Studies of Changing Fertility. Princeton, N.J.: Princeton University Press.

Wyon, J., and J. Gordon (1971) The Khanna Study: Population Problems in Rural Punjab. Cambridge, Mass.: Harvard University Press.

Yeats, W. B. (1928) King Oedipus. New York: MacMillan.

Zeitlin, M. F., J. D. Wray, J. B. Stanbury, N. P. Schlossman, M. H. Meurer, and P. J. Weinthal (1982) Nutrition and Population Growth: The Delicate Balance. Cambridge, Mass.: Oelgeshlager, Gunn and Hain, Inc.

Chapter 25

POPULATION PROGRAMS AND FERTILITY REGULATION

W. Parker Mauldin

MEASURING THE IMPACT OF FAMILY PLANNING PROGRAMS

Over the past two decades, there has been a tremendous increase in official attention to population issues. This is reflected in awareness and concern, in policies and programs, in training of personnel and development of institutions, and in growing research efforts. Antigrowth and profamily planning policies have been established in 35 countries (with nearly 80 percent of the population of the developing world), usually accompanied by some form of program, though these are still weak in many.[1] Training and research programs in demography/social science and biomedicine/contraceptive development have been undertaken in Asia and Latin America, and to a lesser extent in Africa.

A population assistance community has emerged, with the objectives of promoting and supporting population activities. Net funding is now over $500 million per year from international, national, and private sources (see Table 1). Funds are devoted to

> a wide range of population activities, including national censuses, demographic surveys and research; information and education programs; delivery of family planning services; construction of training centers, and maternal and child health and family planning clinics; training of doctors; paramedical personnel and village health workers; supply of contraceptives, equipment and vehicles; programs for marketing non-clinical contraceptives; and staff and institutional development (Kanagaratnam, 1978:11).

A large proportion of such funding, roughly three-quarters, goes to family planning activities.

This increased attention to population issues has in turn generated an interest in evaluating the impact of family planning programs on contraceptive use and on fertility levels (Marshall, 1977).

There is an extensive literature on measuring the impact of family planning programs on fertility using both micro and macro analytical approaches (United Nations, 1978, 1979; Forrest and Ross, 1978; Ross and Forrest, 1978; Chandrasekaran and Hermalin, 1975; Gorosh and

TABLE 1. Assistance for Population Activities by Major Donors, 1971 and 1980 (in thousand U.S. dollars)

Donor	1971	1980
Total Governmental	$133,744	$413,070
United States	109,567	195,000
Norway	3,870	47,260
Sweden	7,446	40,080
Germany	1,657	35,000
Japan	2,090	30,700
Netherlands	1,106	15,109
Canada	2,496	13,521
United Kingdom	2,311	13,000
Denmark	1,918	12,490
Others	1,283	10,910
Total Multilateral	$23,547	$338,029
UNFPA	8,937	157,518
World Bank	1,600	77,800
WHO	2,823	41,878
United Nations	6,995	37,892
UNICEF	2,382	9,331
UNESCO	38	6,652
ILO	165	6,001
FAO	607	3,957
Others		7,000
Total Private Agencies	$60,798	$117,432
IPPF	15,202	50,956
Family Planning International Assistance	276	18,800
Population Council	16,347	14,436
Ford Foundation	21,261	5,400
Rockefeller Foundation	5,981	4,534
Mellon Foundation		3,500
Hewlett Foundation		1,465
Other	1,731	18,341
Aggregate Total	$218,089	$868,531
Net Total (eliminating double counting)	$168,553	$519,895

Source: Adapted from tables compiled by UNFPA.

Wolfers, 1979; Potter, 1969, 1977). Despite this large literature, however, there are substantial problems in performing such measurements. Perhaps the most serious problem is that on a national scale, one cannot know what would have happened without the family planning program. In experimental programs and matching studies, this problem can be largely overcome by comparison of the experimental and control or matched groups. On a national scale, one can construct models taking into account changes in socioeconomic factors, but different models give different results. It is generally acknowledged that institutional, including cultural, factors are important determinants of fertility; however, we do not yet know how to quantify the effects of institutional factors, and in particular we do not know how to identify those factors that "trigger" a fertility decline.

Because of these methodological problems, both the International Union for the Scientific Study of Population and the Population Division of the United Nations are actively seeking to improve techniques for measuring program impact. To this end, Forrest and Ross classify methods of analyzing the impact of family planning programs under seven categories: decomposition, correspondence of timing of program activity and fertility change, matching studies, experimental and control areas, multiple regression and areal units, births averted among acceptors, and simulation methods. The Chandrasekaran and Hermalin volume and the United Nations Manual IX use slightly different but highly similar categories.

The problems addressed and raised by these methodologies are illustrated in the case of decomposition techniques. Basically, changes in age structure affect crude birth rates, but not total fertility rates; changes in marital patterns affect both. One of the first steps in analyzing the determinants of changes in fertility is therefore to standardize rates, or decompose changes in fertility that are attributable to changes in age structure, in marital patterns, and in marital fertility (see Shryock and Siegel, 1971; United Nations, 1979; Kitagawa, 1955; Cho and Retherford, 1973). Because family planning programs are often thought to affect marital fertility, but not age structure or marital patterns, such decomposition is useful to separate out that part of fertility change that is presumed not to be affected by population programs.

There are a number of limitations to this methodology, however. First, although family planning programs do not affect age structure significantly in the short run, if a program has helped reduce fertility over a period of 10 to 15 years, the changing age composition, with fewer people in the younger age groups, is a factor in the increasing proportion of women of reproductive age. Analysts have generally ignored this possible effect of population programs. Similarly, most analysts assume that population programs should not be credited with affecting changes in marital patterns. Increasingly, however, population programs seek to influence attitudes about the appropriate age of first marriage (notably in China), and the age of marriage itself. There have not been attempts to quantify this relationship.

Finally, most developing countries have rather poor statistical

systems, and data are often unavailable that are required for decomposing changes in crude birth rates during recent periods.[2] With these limitations in mind, the present paper reviews the available literature, focusing first on the general relationship between family planning programs and prevalence of contraceptive use, and then on empirical studies both across and within countries of the relationship between family planning programs and fertility decline.

FAMILY PLANNING PROGRAMS AND PREVALENCE OF CONTRACEPTIVE USE

The annual number of family planning acceptors in large-scale programs has increased from a few tens of thousands around 1960 to about 2.5 million in 1965 and approximately 25 million in 1980. Estimates of prevalence of use are now available from the World Fertility Survey, contraceptive prevalence surveys by Westinghouse Health Systems (Lewis and Novak, 1982) and the Centers for Disease Control (Morris and Anderson, 1982), and national surveys in a number of countries. These data demonstrate very rapid increases in contraceptive prevalence

TABLE 2 Percent of Current Contraceptive Users Among Married Couples, Wife Aged 15-44, by Specified Year

Country and Year	Percent	Country and Year	Percent	Country and Year	Percent
Colombia		Mexico		South Korea	
1969	21	1973	13	1964	9
1976	45	1976-77	32	1968	19
1978	49	1978	41	1976	44
Taiwan		Thailand		1979	54
1965	13	1969-70	14		
1970	26	1975	37		
1976	46	1979	48		
1980	70				

Sources:
Colombia--Bureau of the Census (1979); Colombia, Departamento Administrativo Nacional de Estadistica (1977); Larson (1981).
Mexico--Nortman and Hofstatter (1980); Population Information Program (1981).
South Korea--Ross and Smith (1970:225-230); Keeny (1972:102); Cho and Retherford (1982).
Taiwan--Freedman et al. (1982); Taiwan Provincial Institute of Family Planning (1980).
Thailand--Knodel et al. (1982).

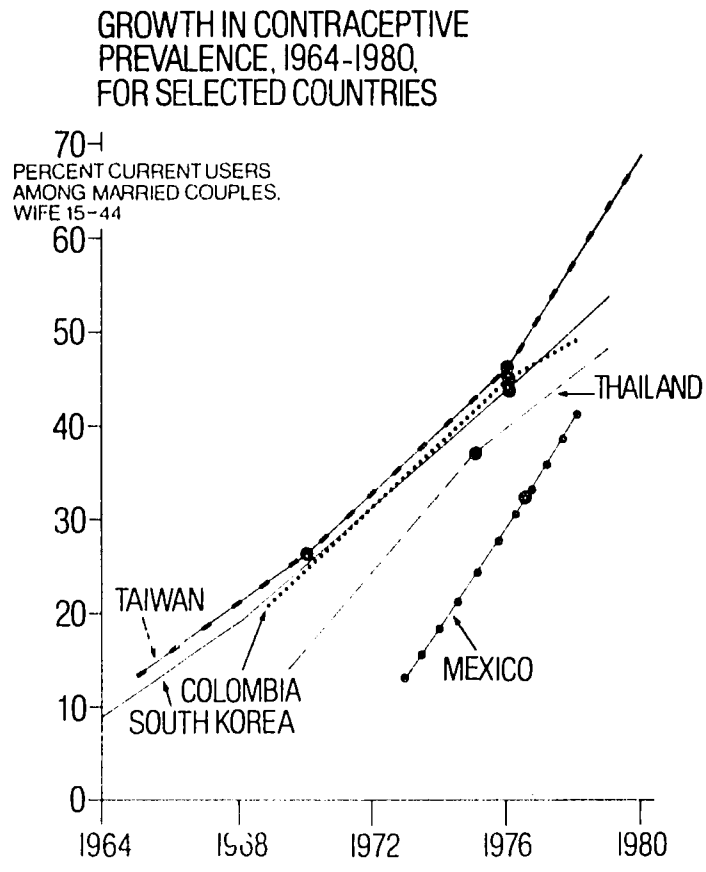

FIGURE 1 Growth in Contraceptive Prevalence: Selected Countries, 1964-1980

rates in some countries with national family planning programs (Table 2 and Figure 1). In some countries, however--Ghana, Kenya, Morocco, Bangladesh, Nepal, and Pakistan, for example--contraceptive prevalence rates remain low after many years of a national family planning program.[3]

Global, regional, and country estimates of prevalence rates have been made using regression equations based on the relationship between crude birth rates and prevalence rates, as reported in surveys; this relationship is strong, as indicated by an R^2 of 0.91 (Nortman and Hofstatter, 1980). However, this approach overestimates prevalence of use in countries with high proportions of sterility caused by venereal disease and in countries with a high incidence of induced abortion. Moreover, prevalence estimates derived from surveys or regression equations include both program and nonprogram sources, and thus do not give direct evidence on the impact of family planning programs.

Although continuation rates vary with the particular method used and characteristics of the user, in practice the average period of use in most developing countries is two years. Accordingly, the estimated number of current users of fertility control methods directly attributable to a national program may be estimated as double the number of reported annual acceptors. This estimation procedure gives a figure of about 50 million couples in developing countries (excluding China) using contraception from program sources in 1978-79;

an estimate based on a regression equation gives a figure of more than 80 million (Larson, 1981; Diaz-Briquets, 1980). These figures suggest that (1) about 60 percent of contraceptive use in developing countries (excluding China) is from program sources; and (2) about 20 percent of couples in the reproductive ages are using a contraceptive method (34 percent including China, where the prevalence rate is thought to be about 68 percent).

The major issue remains, however, of whether and to what extent government programs lead to an increase in prevalence of use. Government programs typically make contraceptives available at a subsidized price or at no monetary cost to the user. One would expect, therefore, that some users who previously purchased supplies in the commercial sector would shift to the public sector when available.[4] Many former users of privately supplied fertility control methods switch to program sources of supply initially; this is sometimes called the substitution effect. Although most evaluation studies collect information on what methods an acceptor used prior to enrollment in the family planning program, providing a correction factor, there may be either under- or over-reporting of former use. Also, many program administrators and evaluators believe, with some evidence, that a larger proportion of those switching from nonprogram to program supplies also switch from an inefficient to a modern and more efficient method of fertility control. Another aspect of the substitution effect is that some former nonusers who first turn to a program source would have gone to a private or commercial source if the program were unavailable.[5]

A related question is how effective commercial avenues of distributing contraceptives would have been without the program. Most private donors and many governments have recognized the potential importance of the commercial sector, encouraging it to expand its activities; in some instances they have subsidized commercial contraceptives to reduce their costs. Although there is no satisfactory empirical evidence relating to this question, most informed observers conclude that government programs have led to availability of supplies much more rapidly and at much lower cost than would otherwise have been the case.

The precise extent of the substitution effect, and of the general effect of family planning programs on levels of contraceptive use, is therefore a complex and difficult question. However, though these effects are difficult to measure with any exactitude, evidence presented in Figure 2 indicates that "the gross contribution of the government to the prevalence rate is substantial at all levels of the rate" (Nortman, 1982:31).

Some empirical studies have been done to explore the relationship between contraceptive availability and levels of use. Of course, this issue is clouded by the factor of motivation. One extreme position is that, without strong motivation to limit family size, availability of methods will have no effect; conversely, with sufficient motivation, couples will control their fertility whether or not methods are readily available. For example, much of the fertility decline in the Western world was accomplished by the use of coitus interruptus, the

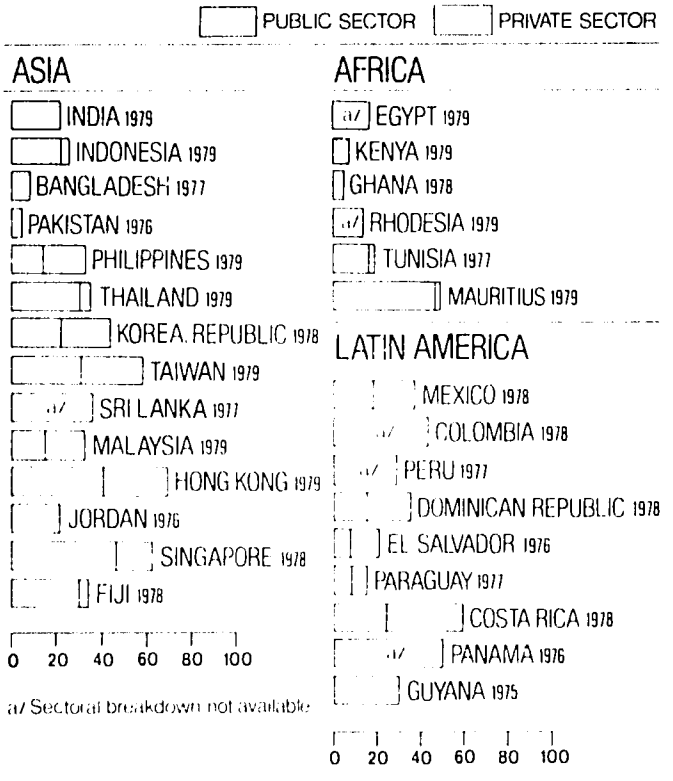

FIGURE 2 Percent of Married Women of Reproductive Age Using Contraception in Specified Year (countries listed in order of population size)

Source: Nortman (1982:29).

condom, and possibly abortion. Another view is that there is a considerable demand, largely unexpressed, for fertility control methods. The availability of supplies and services, accompanied by an informational program, can therefore appreciably accelerate the adoption of fertility control. This view is disputed by authors such as Davis (1967), Driver (1972), and Petersen (1981). Assessment of the relationship between availability and use is further complicated by the argument that data will not answer the question because program administrators would not go to the expense of establishing facilities if there were no demand; thus a high correlation between availability and use does not indicate that use results from availability.

The data that do exist on trends in availability and their relationship to use are limited. Macro data sets show that the number of service points in national family planning programs was about 110,000 in 29 countries in the late 1970s (Nortman and Hofstatter, 1980); although a comparable figure is not available for the early 1960s, far fewer service points and fewer national family planning programs existed at that time. As was noted above, there was a very

large increase in the number of users of contraceptive methods in developing countries during this period. This lends some support to the view that increased availability often leads to increased use. It should also be noted that information programs typically accompany an increase in service outlets, and such programs are thought to legitimize and popularize contraceptive use.

Another approach was to ask knowledgeable persons to estimate the extent to which various types of contraceptive services were available within 33 developing countries, and then to relate availability to fertility decline from 1960 to 1973. The responses indicated a moderately strong relationship between these two factors. However, there were deficiencies in the data used, and it was concluded that "many programs might be much more effective if the entire range of fertility regulation methods were generally available in rural, as well as urban areas, and many service points, at convenient hours, and at low or no cost" (Mauldin, 1975:33).

Along related lines, a study carried out by the World Fertility Survey reported average "time of travel to perceived nearest outlet" for methods of fertility control as shown in Table 3. The data are taken from in-depth pilot studies designed to determine the feasibility of obtaining information on household and community availability of fertility control methods, and should therefore be regarded as illustrative (Rodriguez, 1977). Data on perceived time to the nearest outlet for contraceptive supplies have been collected in a number of World Fertility Surveys and in prevalence surveys carried out under the auspices of the Centers for Disease Control (Morris and Anderson, 1982) and Westinghouse Health Systems (Lewis and Novak, 1982). The analysis of those data reported in Rodriguez (1977) is largely limited to the relationship between knowledge of the location of a source of supply for oral contraceptives and their use or nonuse. Within urban areas, location of residence does not affect the perception of time required to travel to a source of oral

TABLE 3 Average Travel Time (in minutes) to Nearest Known Family Planning Outlet by Country and Urban-Rural Residence

	Median		Mean	
Country	Urban	Rural	Urban	Rural
India	15	30	26	51
Panama	15	30	19	31
Turkey	10	30	13	57

Source: Rodriguez (1977:52, Table 3.9.1).

contraceptives; within rural areas, perceived travel times do vary, and where they are relatively high, use is generally low. Thus, although these data only weakly support the hypothesis that use increases with availability in urban areas, there is some support for the hypothesis in rural areas.

EMPIRICAL STUDIES OF THE RELATIONSHIP BETWEEN FAMILY PLANNING PROGRAMS AND FERTILITY DECLINE

A number of empirical studies have attempted to assess the relationship between family planning programs and fertility decline, especially relative to the effects of socioeconomic variables (see Retherford and Palmore, in these volumes, for a detailed discussion of this issue). Of these studies, evaluations of experimental programs are most important, and will be discussed first. Other single-country studies will be considered next, followed by studies across countries.

Experimental Programs

There have been many experimental and demonstration programs relating to various aspects of family planning; 96 of these are reviewed by Cuca and Pierce (1977), who classified them as follows:

- 46 were concerned with the type and characteristics of personnel suited for certain functions or the type of remuneration that would elicit the most favorable performance.
- 19 were concerned with the contribution of mass media campaigns to the effectiveness of programs.
- 16 related to the effectiveness of integration of health programs and family planning services.
- 10 were attempts to determine whether intensive campaigns increase the acceptance and practice of family planning.
- 14 sought to measure the impact of various schemes for increasing the availability of contraceptives, mostly community-based distribution (CBD) programs.
- 6 tested the impact of incentives.

Most of these experimental and demonstration programs measured changes in the number of acceptors rather than changes in fertility. A substantial number of these programs were successful in increasing acceptance of family planning, and elements of them were incorporated into national programs. There also have been a sizable number of experimental programs in which the results were inconclusive, and of course, some notable failures.

Among the programs that were successful in reducing fertility are the following:

- The Comilla Organizer Study, in which the total fertility rate was reduced from 8.5 to 6.2 or by 27 percent from 1958-59 to

1966-67.

- The San Gregorio experiment, in which fertility was reduced by 20 percent from 1962 to 1966.
- The Greenland experiment, in which the birth rate decreased from about 45 to 20 between 1967 and 1969, a reduction of 50 percent.
- The Koyang/Kimpo experiment, in which the general fertility rate fell by 38 percent in Koyang and 13 percent in Kimpo over a period of about two and a half years from 1962 to 1964.
- The Cerro de Pasco experiment in which the total fertility rate decreased 18 percent from 8.06 to 6.58 from 1966 to 1970.

Experiments designed to reduce fertility but which failed to do so include the well-known Khanna experiment in India, the Lulliani experiment in Pakistan, and probably the Sweden-Ceylon experiment in what is now Sri Lanka. (In the last case, Cuca and Pierce say that, despite some decrease in the birth rate, there was no evidence that this decline was related to the experimental treatment.) The Gandhigram experiment in India is often cited as a successful intervention program, and it is reported that the crude birth rate declined from 43 in 1959 to 31 in 1971. However, the reports containing those figures are so skimpy that one is not comfortable in accepting the results. Jain obtained and analyzed some additional data, but these were not adequate to resolve the questions nor to warrant publication. Therefore, the results of the Gandhigram Experiment are classified here as indeterminate.

In recent years, there has been much interest in community-based distribution programs. One such program in Bangladesh, its eventual successor, and another program in South Korea are discussed below. The Bangladesh studies were conducted among a very poor and uneducated rural population in Matlab Thana from 1975 to 1981 to test the hypothesis that contraceptive services can reduce fertility (Phillips et al., 1982; Chen et al., 1981). The initial study, known as the Contraceptive Distribution Project (CDP), tested a pill and condom household contraceptive distribution approach; the second study, known as the Family Planning Health Services Project (FPHSP), augmented that strategy with better training of workers, a wider selection of methods, more intensive follow-up and referral services, and ancillary health care.

In the CDP project, nonclinical methods of contraception (oral pills and condoms) were distributed in 153 villages with a population of 135,000, while 80 villages were serviced by the regular government programs and designated as the comparison area. Since village-based government services have not yet been fully implemented, the studies represent a de facto test of the effects of services vis-a-vis no services at all. In all, 154 lady village workers (LVWs), mostly illiterate, elderly, and widowed women, were recruited and instructed in the distribution of oral contraceptives. Each worker was responsible for maintaining lists of women eligible for contraception and for conducting household visits to all of these women to offer six months of pill supplies and replenish stocks when needed. The project was launched in October 1975 with minimum worker training in

motivation and follow-up, in accordance with the hypothesis that distribution alone would increase contraceptive use and reduce fertility.

A baseline survey of eligible women showed that about 33 percent of the respondents were either current users of contraception or expressed a desire to cease childbearing and an interest in using contraception in the future. In a survey conducted three months after contraceptive distribution was started, however, only 17 percent of the respondents were using oral pills. Moreover, prevalence of pill use had declined to 9 percent by the end of the first 18 months of the study. Overall prevalence was correspondingly low: 18 percent at 3 months and 13 percent at 18 months. Overall prevalence in comparison area villages remained at 4 percent throughout the study. It is likely that the overall impact of CDP during its first year ranged between 5 and 17 percent. CDP had an effect, though modest, on fertility in Matlab in its first impact year; in the second CDP project year, the program had no effect (Stinson et al., 1982).

The limitations of CDP led to a reformulation of contraceptive research in Matlab and the FPHSP. The overall goal of the FPHSP service system was to shift from the CDP emphasis on contraceptive technology to an emphasis on comprehensive contraceptive care, including frequent and regular visits to all women, whether contracepting or not, providing a wide choice of methods, and ancillary health services. The initial emphasis was on comprehensive family planning services rather than maternal and child health. The most important change was the addition of the injectable depo-provera to the battery of methods available in the village. The principal link established between health and family planning services was a three-tiered referral system for the detection and treatment of side effects, with FVWs treating minor side effects and referring more serious problems to subcenters for treatment or further referral to a physician.[6]

Introduction of this new system was followed by a sharp rise in contraceptive prevalence from 10 percent in October 1977 to 34 percent by the end of 1978, where use prevalence remains to date. The general fertility rates in the treatment and control areas were almost identical at the beginning of these experiments, but differed by 25 percent in 1978. The crude birth rates were 34.7 and 46.9, respectively. This is an impressive result from a relatively simple, apparently easily replicable program that was carried out in a high-fertility, low-income, poorly educated population. However, because high-quality management may have played more of a role in the experiment than is apparent, the replicability of this program cannot be assessed until larger programs similar or identical in design are carried out.

The Korean Population Policy and Program Evaluation Study used local canvassers to register "at risk" women and keep those lists up to date. These women were visited at home and offered either a free three-month supply of oral pills or condoms or a coupon for a free IUD insertion or tubal ligation. The canvasser who made the initial contacts continued to provide information to couples and operated a

resupply depot out of her home. This service only provided contraceptives; no integration with other health or social services was sought.

A baseline survey was taken about a year before the program began; the program lasted forty months, and a year after it ended another survey was taken. Thus there were two surveys five years apart. The study was carried out in the province of Cheju. Its population of 420,000 had appreciably lower rates of contraceptive use than did all of Korea at the beginning of the study--21 percent as compared with 36 percent among women 15 to 44 years of age--and higher fertility--a total fertility rate of 4.6 as compared with 3.9 for all of Korea. Five years later, contraceptive use had more than doubled from 21 to 45 percent, as compared with a substantial but smaller increase from 36 to 54.5 percent for all of Korea. Fertility fell slightly more rapidly in Cheju than in all of Korea--30 percent as compared with 28 percent. The changes in fertility were more rapid in the experimental area than in rural Korea: there was a decrease of 32 percent in the total fertility rate in South County, of 40 percent in North County, and 29 percent in rural Korea as a whole (Park et al., 1982).

Single-Country Studies

Although there are many nonexperimental studies of fertility decline in individual countries, for the most part these analyses do not attempt to quantify how much of the decline is attributable to specific independent variables. Chen and Fawcett (1979), for example, attribute fertility decline in Singapore to employment opportunities for women and constraints on the availability of housing, on the one hand, and family planning and governmental disincentives for childbearing on the other. Their analysis, though convincing, is qualitative rather than quantitative.

Similar conclusions were drawn for Malaysia, where Jones (1982) found that, although family planning played a lesser role than socioeconomic factors in the fertility decline, it was nevertheless an important force. Again, however, its effect cannot be quantified. Parallel findings were made for the Philippines (Concepcion, 1982), and for Thailand, where Knodel et al. (1982:30-31) made the following observation:

> The development of an active program corresponds closely with the timing of the fertility decline in rural areas; the vast majority of Thai women report receiving their contraceptive supplies or services through the program; analysis of services statistics indicates that the number of estimated births averted through the program can account for most of the observed decline in fertility, and the presence of a program outlet in a village, and to a lesser extent, in a subdistrict, is generally associated with higher contraceptive use and lower fertility, after controlling for other factors than is the absence of an outlet.

The authors also note that socioeconomic development, at least as conventionally defined, does not seem to account for much of the decline; rather, they emphasize the rapid expansion of mass communication and transportation systems that has considerably reduced the isolation of village life.[7] Similar studies in Taiwan by Freedman et al. (1982) and in the Republic of Korea by Cho and Retherford (1982) assign more importance to socioeconomic factors than do the Philippine and Thai analyses, but also credit the family planning programs with having important effects. One analysis in the Republic of Korea indicated that the national family planning program accounted for about 37 percent of the decline in the birth rate per thousand women aged 15-44 between 1963 and 1973.

Another illustrative example is provided by contrasting fertility decline in Brazil and China. In the former there has been no national population program, only a private family planning program that was restricted to a few states. Carvalho et al. (1982:24) note that "the occurrence of fertility reduction practically without family planning programs makes Brazil an important case for the discussion of the effects of institutional efforts on fertility." Their analysis is interesting and provocative:

> Beginning in the second half of the 1960s, there appears to have been a very sharp acceleration in the falling trend in fertility levels of the Brazilian population. . . . This acceleration occurred mainly due to increased use of contraception. From an economic point of view, there seem to have been two principal causes for the acceleration in the decline in fertility: one structural--the intensification in the process of proletarianization; and the other cyclical--the fall in the standard of living among large segments of the population.
>
> . . . the process of proletarianization increased the cost of subsistence for the labor force through the substitution of foodstuffs purchased in the market for domestically produced foodstuffs, even though this did not involve a change in the composition of the consumer basket. In addition, other items placed new burdens on the family, such as housing and transportation. These transformations had the effect of discouraging large families (Carvalho et al., 1982:48-50).

In China, just the opposite seems to have occurred. Yuan Fang et al. (1982:50) conclude an analysis of fertility decline in China by saying they had analyzed the demographic and socioeconomic factors affecting the birth rate: "None of these factors is conducive to declines in the birth rate. . . . The determinative factor fostering a decline in the birth rate in new China has been the party and government birth planning policy." According to reports, there has been a decrease in the crude birth rate of China from about 37 to about 18, which suggests that, based on today's population, there are 19 million fewer births per year than there would have been without the fertility decline. Most of this change can probably be attributed to China's determined efforts to decrease rates of growth, including the

structure of incentives and disincentives designed to limit the size of its population in the twenty-first century.

Finally, a good illustrative case is provided by Zachariah (1981) in a study of Kerala. Between 1966 and 1978, the crude birth rate in rural Kerala declined from 37 to 26, and in the three districts of Palghat, Ernakulam, and Alleppey, which were studied intensively, from 42 in 1965 to just under 20 in 1979. The most significant decline for the three districts began after 1976, coinciding with the intensified family planning program. A regression analysis that included socioeconomic variables of caste, household expenditures, land owned, years of schooling, roofing material, source of water, toilet facilities, and family planning explained just over one-half of the variance in fertility measured as parity or children ever born. The main conclusion from this analysis was that the principal variables responsible for the decline were education, caste, and family planning.

Zachariah uses three approaches in his effort to determine the relative influence of Kerala's planning program: comparison of Kerala with Sri Lanka, analysis of the characteristics of family planning users and those among whom fertility has declined, and analysis of the relationship between the official family planning output and fertility decline by district and period. Kerala and Sri Lanka are similar in socioeconomic development, and both had relatively weak family planning programs until the mid 1960s. The two areas have very similar prevalence rates for use of conventional contraceptive methods, but differ sharply in their sterilization rates. From 1975 to 1980, Kerala's total marital fertility rate declined by 1.77, and just over half (52 percent) of this decline is attributed to higher sterilization rates. Support for this conclusion is found in the prevalence rates of sterilization in different socioeconomic groups: prevalence rates were higher among those with 1-4 years of schooling; among Ezawa and scheduled caste communities, not among the Naira; and among women from households with lower monthly per capita expenditures. "We attribute this higher sterilization rate among the lower strata of society to the official Family Planning program, especially with its economic incentives" (Zachariah, 1981:59). A third piece of empirical evidence supporting a substantial contribution by the official family planning program to Kerala's fertility decline is the high correlation in particular districts and periods between official family planning output and fertility levels. Zachariah concludes that "the official family planning program has played a significant role in the fertility reduction in Kerala. About 40 percent of the fertility decline can be attributed directly to the official family planning program" (1981:70).

Intercountry Studies

One of the earliest intercountry studies aimed at determining the relative impact of socioeconomic and family planning variables on fertility decline was done by the World Bank (King, 1974). This study of 19 countries, which also contains a separate analysis of 16 states

of India, examines the association between the output of family planning programs, on the one side, and socioeconomic and program input variables, on the other. Socioeconomic variables included were per capita GNP, female secondary school enrollment, death rate, proportion of population in urban areas, newspaper circulation, and density of population; program input variables included the number of service points, personnel, physicians, and funds expended or allocated for the family planning program.

The study found that socioeconomic variables appeared to have slightly greater explanatory power than program input variables in accounting for variations in total user rates. However, service points alone accounted for 62 percent of the total variance. Although the number of service points was associated with socioeconomic variables, the degree of dependence was not very high. Interaction effects accounted for about a third, or a little more, of the total variation. The study concludes that both social change and family planning programs have a positive role in promoting increased contraceptive practice and a decline in fertility.

Srikantan (1977) analyzed fertility decline in 20 countries, and also in the states of India. He used a variety of socioeconomic indicators; two program input variables--medical personnel per 10,000 population, and family planning program expenditure per acceptor; and five program output variables--percent of married women in the reproductive ages who are acceptors of family planning, who use program contraceptives, and who use any contraceptive, acceptors of contraception and sterilization, and cumulative number of acceptors of contraception and sterilization. He concluded that demographic and socioeconomic variables in the 20-country study were directly responsible for 32 percent of the fertility decline, and with indirect effects counted, were responsible for 52 percent. Program input had a small effect of 9 percent, while the program output effect was 39 percent. He notes that the small program input effect partly reflects the lack of suitable program input indicators on a comparable basis for the different countries, and suggests that the results may be interpreted to mean that the program had an impact on fertility that was at least as large as the direct effect of the socioeconomic indicators. There was also positive interaction between these two sets of factors in their fertility impact: on the one hand, socioeconomic change facilitated program implementation; on the other, program inputs had a net spillover effect beyond the program that more than offset program substitution.

Mauldin and Berelson (1978) carried out an analysis of fertility decline from 1965 to 1975 in a large number of developing countries. Their analysis focuses on how much of the fertility decline is associated with "modernization," including such socioeconomic variables as health, education, economic status, and urbanization, and how much with population policies and programs (primarily family planning programs) designed to reduce rates of growth. The study found that, although modernization has a substantial, and usually a more important effect on fertility decline, "on balance family planning programs have a significant, independent effect over and

above the effect of socioeconomic factors" (Mauldin and Berelson, 1978:124; see Table 4).[8] The authors go on to draw the following conclusions:

> The key finding probably is that the two--social setting and program effort--go together most effectively. The joint analysis appears to "explain" or predict about 83 percent of the total variance in fertility decline. Countries that rank well on socioeconomic variables and also make substantial program effort have on average much more fertility decline than do countries that have one or the other, and far more than those with neither. The policy implications are that, if a country wants to reduce its fertility, it should seek a high degree of modernization (which of course all do, and find costly and difficult) and it should adopt a substantial family planning program; for countries at or near the bottom of the socioeconomic scale, however, the results would probably be slight and the administrative implementation very difficult. In such settings it requires a special kind of determination--as found in India, Indonesia, and China in the early to mid-1970s--to implement a strong program effort in a deprived setting.

Another intercountry study (Faruqee, 1979) uses factor analysis as the principal analytical tool, concentrating on fertility decline from 1970 to 1975 in 62 developing countries. This study uses 12 socioeconomic and 3 family planning variables (number of years a government family planning program has been in operation, family planning personnel per million females aged 15-44, and number of family planning facilities per million females 15-44). The factors in this type of analysis represent different variables: factor 1 represents the level of development, including such variables as percent of population living in urban areas, per capita GNP, percentage of gross national product from the primary sector, population per doctor, life expectancy, and the crude death rate; factor 2 is an index of government expenditures (total, for health, education, and government consumption); factor 3 is called the family planning input dimension, and includes the three variables listed above; and factor 4 represents the actual and potential rate of growth of an economy. In the results of this analysis, factor 1 is associated with 30 percent of the variance in the crude birth rate decline, factor 2 with an additional 17 percent, factor 3 with an additional 17 percent, and factor 4 with an additional 11 percent. The four factors together are associated with or "explain" 75 percent of fertility decline.

"Factor analysis does not treat any variable as a dependent variable. Thus, the relationship of a particular variable with the emerging factors is somewhat affected by inclusion of that variable in the same rotated matrices," Faruqee (1979:30) argues. Therefore, he also used multiple regression in his analysis, with the four factors being treated as independent variables. A much smaller proportion of the variance in the crude birth rate decline is explained in this

TABLE 4 Crude Birth Rate Declines (in percents), by Social Setting and Program Effort: 94 Developing Countries, 1965-75

	Program Effort								
	Strong (20+)		Moderate (10-19)		Weak (0-9)		No Program		
Social Setting	Country	Decline	Country	Decline	Country	Decline	Country	Decline	Total
High	Singapore	40	Cuba	40	Venezuela	11	Korea, North	5	
	Hong Kong	36	Chile	29	Brazil	10	Kuwait	5	
	Korea, South	32	Trinidad and Tobago	29	Mexico	9	Peru	2	
	Barbados	31	Colombia	25	Paraguay	6	Lebanon	2	
	Taiwan	30	Panama	22			Jordan	1	
	Mauritius	29					Libya	-1	
	Costa Rica	29							
	Fiji	22							
	Jamaica	21							
	Mean	30	Mean	29	Mean	9	Mean	3	19
	Median	30	Median	29	Median	9.5	Median	2	22
Upper Middle	China	24	Malaysia	26	Egypt	17	Mongolia	9	
			Tunisia	24	Turkey	16	Syria	4	
			Thailand	23	Honduras	7	Zambia	-2	
			Dominican Republic	21	Nicaragua	7	Congo	-2	
			Philippines	19	Zaire	6			
			Sri Lanka	18	Algeria	4			
			El Salvador	13	Guatemala	4			
			Iran	2	Morocco	2			
					Ghana	2			
					Ecuador	0			
					Iraq	0			
	Mean	24	Mean	18	Mean	6	Mean	2	10
	Median	24	Median	20	Median	4	Median	1	7

Lower Middle	Vietnam, North	23	India	16	Papua-New Guinea	5	Angola	4		
			Indonesia	13	Pakistan	1	Cameroon	3		
					Bolivia	1	Burma	3		
					Nigeria	1	Yemen, P.D.R.	3		
					Kenya	0	Mozambique	2		
					Liberia	0	Kampuchea	2		
					Haiti	0	Ivory Coast	1		
					Uganda	-4	Senegal	0		
							Saudi Arabia	0		
							Vietnam, South	0		
							Madagascar	0		
							Lesotho	-4		
	Mean	23	Mean	14	Mean	1	Mean	1		3
	Median	23	Median	14.5	Median	0.5	Median	1.5		1
Low					Tanzania	5	Laos	5		
					Dahomey	3	Central African Rep.	5		
					Bangladesh	2	Malawi	5		
					Sudan	0	Bhutan	3		
					Nepal	-1	Ethiopia	2		
					Mali	-1	Guinea	2		
					Afghanistan	-2	Chad	2		
							Togo	2		
							Upper Volta	1		
							Yemen	1		
							Niger	1		
							Burundi	1		
							Sierra Leone	0		
							Mauritania	0		
							Rwanda	0		
							Somalia	0		
					Mean	1	Mean	2		2
					Median	0	Median	1.5		1
Mean		29		21		4		2		
Median		29		22		2		2		3

Source: Mauldin and Berelson (1978:110). Program effort scores run from 0 to 30 on their scale.

manner--an R^2 of only .28 using all four factors plus the crude birth rate in 1970. The R^2 with factor 1 only is .14, and with factor 3 (family planning input) .21. Thus, economic development "explains" more of the variance in crude birth rate decline than does any other factor, and family planning inputs explain about half as much. The author concludes that his analysis "confirms the significant role of family planning, but development clearly emerges as the more important of the two in influencing fertility decline" (Faruqee, 1979:38). It should also be noted that, if socioeconomic variables such as literacy, school enrollment, infant mortality, and composition of the labor force (e.g., percent in agriculture or nonagriculture) had been included in Faruqee's analysis, the variance in crude birth rate decline that is associated with socioeconomic variables probably would have been increased significantly.

CONCLUSION

Family planning programs vary in coverage, intensity, and quality, and there have been few systematic efforts to measure program inputs. This is an area of research offering significant potential rewards. Many of the problems and issues raised in this paper are not likely to be resolved to the satisfaction of all analysts; however, efforts of the United Nations, of the International Union for the Scientific Study of Population, and of individual scholars are promising. The consensus of most analysts appears to be that, though precise quantitative credit cannot be allocated among socioeconomic factors, institutional factors, and policies and programs, there is considerable empirical evidence that large-scale family planning programs, when well managed, have a substantial effect on fertility independent of the influence of socioeconomic factors.

NOTES

1. At the same time, an upsurge of serious pronatalist policies in Eastern Europe and continued pronatalist policies of lesser intensity characterize some developed countries.
2. Data are available for 13 countries (Mauldin, 1981); although there is considerable variation among these countries, changes in marriage patterns account for one-third or more of changes in crude birth rates for 7 of the 13, and for 20 percent or more in 4 other countries.
3. Although trend data are not available for most countries with national programs, prevalence rates are available for a relatively recent year, e.g., 1975 or later (Larson, 1981).
4. Two general patterns have been observed. In such countries as Korea, Taiwan, Hong Kong, Costa Rica, and Mexico, the public sector grew quickly in relation to the private sector at first, and then more slowly once prevalence rates became relatively high. In India, Indonesia, Thailand, Fiji, and Mauritius, the

public sector has remained predominant even with increased prevalence rates.

5. The reverse also happens, namely, a program user decides to use a private or commercial source because of convenience or anonymity, to avoid travel or waiting time, etc.
6. In mid-1979, development of maternal and child health services lapsed because of the departure of the principal investigator, a physician, from the project. For this reason, the FPHSP is now more a family planning project than an integrated health services scheme.
7. They also believe the pace of fertility decline has been facilitated by certain aspects of the Thai cultural context, in particular the Buddhist outlook on life and the position of women in Thai society.
8. Hernandez (1981) argues that the effect of family planning programs is considerably less than Mauldin and Berelson estimate, based on his regression analyses. His analysis was restricted, however, to multiple regression, and did not deal with exploratory data analysis, cross classification analysis, etc., as did that of Mauldin and Berelson.

BIBLIOGRAPHY

Bureau of the Census (1979) Colombia. Country Demographic Profiles.. ISP-DP-20. Washington, D.C.: U.S. Department of Commerce.

Carvalho, J. A. M., P. T. A. Paiva, and D. Sawyer (1982) The recent sharp drop in fertility in Brazil: Economic boom, social inequality and baby bust. In W. P. Mauldin, ed., Fertility Decline in Developing Countries: Case Studies, forthcoming.

Chandrasekaran, C., and A. I. Hermalin (1975) Measuring the Effect of Family Planning Programs on Fertility. Liege: Ordina Editions.

Chen, L. C., J. Chakraborty, A. M. Sardar, and M. D. Yunus (1981) Estimating and partitioning the mortality impact of several modern medical technologies in basic health services. Pp. 113-140 in International Population Conference, Manila, 1981, Vol. 2. Leige: International Union for the Scientific Study of Population.

Chen, P. S. J., and J. T. Fawcett (1979) Public Policy and Population Change in Singapore. New York: Population Council.

Cho, L. J., and R. D. Retherford (1973) Comparative analysis of recent fertility trends in East Asia. International Population Conference, Liege, Vol. 2. Liege: International Union for the Scientific Study of Population.

Cho, L. J., and R. D. Retherford (1982) Fertility transition in the Republic of Korea. In W. P. Mauldin, ed., Fertility Decline in Developing Countries: Case Studies, forthcoming.

Colombia, Departamento Administrativo Nacional de Estadistica (1977) Encuesta Nacional de Fecundidad, Colombia, 1976, Resultados Generales. Bogota.

Concepcion, M. B. (1982) Changing fertility in the Philippines: When, how, why. In W. P. Mauldin, ed., Fertility Decline in Developing Countries: Case Studies, forthcoming.

Cuca, R., and C. S. Pierce (1977) Experiments in Family Planning: Lessons from the Developing World. Baltimore, Md.: The Johns Hopkins University Press.

Davis, K. (1967) Population policy: Will current programs succeed? Science 158.

Diaz-Briquets, S. (1980) Memo of 19 November, 1980 from Diaz-Briquets of Population Reference Bureau, Washington, D.C. to John Chao of USAID.

Driver, E. (1972) Social ideology, social organization, and family planning: A world view. In E. Driver, ed., Essays on Population Policy. Lexington, Mass.: Heath.

Fang, Y., C. Fenghuan, and Z. Lizhong (1982) A preliminary analysis of birth planning and birth rate reduction in new China. In W. P. Mauldin, ed., Fertility Decline in Developing Countries: Case Studies, forthcoming.

Faruqee, R. (1979) Sources of Fertility Decline: Factor Analysis of Inter-Country Data. World Bank Staff Working Paper No. 318. Washington, D.C.: World Bank.

Forrest, J. D., and J. A. Ross (1978) Fertility effects of family planning programs: A methodological review. Social Biology, 25:145-163.

Freedman, R., A. Hermalin, K. K. C. Liu, and T. H. Sun (1982) The role of socioeconomic development and the family planning program in Taiwan's fertility decline. In W. P. Mauldin, ed., Fertility Decline in Developing Countries: Case Studies, forthcoming.

Gorosh, M. and D. Wolfers (1979) Standard couple-years of protection. Pp. 34-47 in The Methodology of Measuring the Impact of Family Planning Programmes on Fertility, Manual IX. ST/ESA/SER. A/66. New York: United Nations.

Hernandez, D. J. (1981) A note on measuring the independent impact of family planning programs on fertility declines. Demography 18:627-634.

Jones, G. W. (1982) Fertility decline in peninsula Malaysia. In W. P. Mauldin, ed., Fertility Decline in Developing Countries: Case Studies, forthcoming.

Kanagaratnam, D. (1978) Approaches to the Population Problem and Accomplishments of Population Activity: An Overview. Presentation to the Population and Development Course of the Economic Development Institute, World Bank, Washington, D.C.

Keeny, S. M. (1972) East Asia review, 1971. Studies in Family Planning 3:102.

King, T., coordinating author (1974) Population Policies and Economic Development. Baltimore, Md.: The Johns Hopkins University Press.

Kitagawa, E. M. (1955) Components of a difference between two rates. Journal of the American Statistical Association 50:1168-1194.

Knodel, J. (1979) From natural fertility to family limitation: The onset of fertility transition in a sample of German villages. Demography 6:493-521.

Knodel, J., N. Debavalya, and K. Peerasit (1982) Thailand's continuing fertility decline. In W. P. Mauldin, ed., Fertility Decline in Developing Countries: Case Studies, forthcoming.

Larson, A. (1981) Patterns of Contraceptive Use Around the World. Washington, D.C.: Population Reference Bureau.

Lewis, G. L., and J. A. Novak (1982) An approach to the measurement of availability of family planning services. Pp. 241-278 in A. I. Hermalin and B. Entwisle eds., The Role of Surveys in the Analysis of Family Planning Programs. Liege: Ordina Editions.

Marshall, J. F. (1977) Acceptability of fertility regulating methods: Designing technology to fit people. Preventive Medicine 6:65.

Mauldin, W. P. (1975) Assessment of national family planning programs in developing countries. Studies in Family Planning 6:30-36.

Mauldin, W. P. (1981) The determinants of fertility decline in LDCs: An overview of the available empirical evidence. In International Population Conference, Manila, 1981. Liege: International Union for the Scientific Study of Population.

Mauldin, W. P., and B. Berelson (1978) Conditions of fertility decline in developing countries, 1965-75. Studies in Family Planning 89-148.

Morris, L., and J. E. Anderson (1982) The use of contraceptive prevalence survey data to evaluate family planning program service statistics. Pp. 149-170 in A. I. Hermalin and B. Entwisle, eds., The Role of Surveys in the Analysis of Family Planning Programs. Liege: Ordina Editions.

Nortman, D. L. (1982) Empirical patterns of contraceptive use: A review of the nature and sources of data and recent findings. Pp. 25-49 in A. I. Hermalin and B. Entwisle, eds., The Role of Surveys in the Analysis of Family Planning Programs. Liege: Ordina Editions.

Nortman, D. L., and E. Hofstatter (1980) Population and Family Planning Programs: A Compendium of Data through 1978, 10th ed. New York: Population Council.

Park, C. B., J. A. Palmore, L.-J. Cho, and J.-Y. Park (1982) The Korean Experience. Paper prepared for the annual meeting of the Population Association of America, San Diego, Calif.

Petersen, W. (1981) American efforts to reduce the fertility of less developed countries. In N. Eberstadt, ed., Fertility Decline in the Less Developed Countries. New York: Praeger Publishers.

Phillips, J. F., W. S. Stinson, S. Bhatia, M. Rahman, and J. Chakraborty (1982) The demographic impact of the family planning-health services project in Matlab, Bangladesh. Studies in Family Planning 13:131-140.

Population Information Program (1981) Contraceptive prevalence surveys: A new source of family planning data. Population Reports, Series M, Number 5. Baltimore, Md.: The Johns Hopkins University.

Potter, R. G. (1969) Estimating births averted in a family planning program. Pp. 413-434 in S. J. Behrman et al., eds., Fertility and Family Planning: A World View. Ann Arbor, Mich.: University of Michigan.

Potter, R. G. (1977) Use of models in evaluating changing effects of contraceptive behavior. Pp. 273-284 in International Population Conference, Mexico City, Vol. 1. Liege: International Union for the Scientific Study of Population.

Potter, R. G. (1979) Analysis of reproductive process. Pp. 76-96 in The Methodology of Measuring the Impact of Family Planning Programmes on Fertility, Manual IX. ST/ESA/SER/. A/66. New York: United Nations.

Rodriguez, G. (1977) Assessing the Availability of Fertility Regulation Methods: Report on a Methodological Study. WFS Scientific Reports No. 1. London: World Fertility Survey.

Ross, J. A., and J. D. Forrest (1978) The demographic assessment of family planning programs: A bibliographic essay. Population Index 44(1).

Ross, J. A., and D. Smith (1970) Korea: Trends in Four National KAP Surveys, 1964-1967. Population and Family Planning in the Republic of Korea 1:225-230. Seoul: Ministry of Health and Social Affairs, Republic of Korea.

Shryock, H. S., and J. S. Siegel (1971) The Methods and Materials of Demography, Vol. 2. Bureau of the Census. Washington, D.C.: U.S. Department of Commerce.

Srikantan, K. S. (1977) The Family Planning Program in the Socio-Economic Context. New York: Population Council.

Stinson, W. S., J. F. Phillips, M. Rahman, and J. Chakraborty (1982) The demographic impact of the contraceptive distribution project in Matlab, Bangladesh. Studies in Family Planning 13:141-158.

Taiwan Provincial Institute of Family Planning (1980) Annual Report, July 1979-June 1980. Taipei.

United Nations (1978) The Methodology of Measuring the Impact of Family Planning Programmes on Fertility: Problems and Issues. ST/ESA/Ser. A./61. New York: United Nations.

United Nations (1979) The Methodology of Measuring the Impact of Family Planning Programmes on Fertility, Manual IX. ST/ESA/Ser/. A/66. New York: United Nations.

Zachariah, K. C. (1981) Anomaly of the Fertility Decline in Kerala: Social Change, Agrarian Reform, or the Family Planning Programs? Population and Human Resources Division, Discussion Paper No. 81-17. Washington, D.C: World Bank.

Chapter 26

DIFFUSION PROCESSES AFFECTING FERTILITY REGULATION

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The timing and speed of fertility transition depend primarily on two factors: economic and social development (including mortality decline), which, through a variety of mechanisms, reduces the number of births that couples want; and diffusion of birth control, which to some extent proceeds independently of development. Development is more fundamental than diffusion in explaining fertility transition, in the following sense: an advanced state of development is a sufficient condition for fertility decline, whereas the spread of birth control knowledge and services is not (as, for example, when desired fertility exceeds natural fertility). Nevertheless, evidence presented in this paper suggests that the independent effects of diffusion can be significant. Assessing the magnitude of these effects is of considerable policy interest, since programs aimed at diffusion of birth control have been and continue to be the principal instrument of population policy in countries wishing to limit population growth.

This paper first explores the general concept of diffusion. It then suggests how models of diffusion and fertility transition can be integrated to provide a theoretical framework for discussions of the diffusion process. Next, it examines the relationship between diffusion and social integration, as well as the various networks of communication through which diffusion takes place. This is followed by a discussion of the magnitude and significance of the effects of diffusion on fertility transition. Finally, some research issues are raised, along with some policy implications of the discussion.

THE CONCEPT OF DIFFUSION

Diffusion models have been used to analyze the spread of a wide range of innovations, from new farming methods to new consumer products to family planning programs. The principal features of such models have been reviewed by Rogers (1962, 1973), Rogers and Shoemaker (1971), and Brown (1981). The following discussion draws especially on Brown's review.

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Diffusion is the process by which innovations spread from one locale, social group, or individual to another. In diffusion models, the term innovation is used broadly to refer to a product, technique, practice, or idea that is intrinsically new (an invention), or new only to a particular setting, as is the case with some forms of birth control whose practice dates back to ancient times (Himes, 1936). Innovations may be classified as discontinuous, involving the introduction of something dramatically new, or continuous, involving modification of something that already exists. At the start of marital fertility transition, birth control is best viewed as a discontinuous innovation for the vast majority of the population; subsequently, as contraceptive methods and services improve, it may be viewed as a continuous innovation. As a further distinction, consumer innovations are those adopted by individuals or households; technological or producer innovations are those adopted by entrepreneurs or firms; and institutional innovations are those adopted by governments or other nonprofit organizations or agencies. Although birth control innovations encompass all three types, in recent decades some of the most important have been institutional innovations related to the establishment of family planning programs.

Many diffusion studies distinguish factors related to the effective flow of information, employing such concepts as interpersonal networks, two-step flows (opinion leaders and followers), and multi-step flows. In the case of birth control diffusion, it is helpful to conceptualize such flows hierarchically: one level, for example, consists of local interpersonal networks; a second level is the network of family planning and related services within each country; a third level consists of international agencies, private organizations operating at the international level, and counterpart agencies and officials in national governments. Not only information, but also influence and resources flow through these networks.

Also relevant to information flow is resistance or barriers to diffusion. Analysis of these barriers addresses variations in individual propensity to adopt innovations (or innovativeness) and congruence between a particular innovation and the social, economic, and psychological characteristics of the potential adopter. Also emphasized in this connection have been population factors (e.g., density of emitters and potential receptors), distance factors (both geographic and social),[1] and the role of social norms.[2] The demographic literature, discussed in more detail below, has emphasized barriers associated with such cultural factors as language, ethnicity, and religion.

Diffusion is sometimes studied according to certain key attributes of the innovation itself that influence its rate of adoption. In Rogers and Shoemaker's (1971:138ff.) paradigm, the first of these is relative advantage, the degree to which the innovation is perceived to be better, or perhaps less costly, than its alternatives or predecessors, if any. This factor helps explain why, in contemporary less developed countries, modern contraceptive methods such as the pill have been adopted much more quickly than coitus interruptus,

which historically was very important in Europe, but has the considerable relative disadvantage of high psychic costs. A second attribute is compatibility with existing values, norms, technology, and practices, mentioned above for values and norms in connection with barriers to diffusion. A third is complexity. Some complex birth control methods, such as sophisticated forms of the rhythm method requiring careful date keeping, temperature recording, and observation of cervical mucous, have been slow to spread. A fourth attribute is trialability, the degree to which an innovation may be tried on a limited basis. This factor helps explain why sterilization, for example, usually does not become popular until after simple reversible methods such as the pill have become widely accepted. A fifth attribute is the observability of the innovation and its results. One of the major effects of contemporary family planning programs is to increase greatly the observability of birth control innovations, thereby speeding up the diffusion process. Without such programs, birth control has very low observability, partly because it is practiced in the privacy of the home, and partly because it is usually a somewhat taboo subject of conversation, especially when normative barriers to adoption are present.

Characteristics specifically affecting the diffusion of contraceptive innovations have been listed by Freedman and Berelson (1976:14). These include medical safety, clinical effectiveness, reversibility, simplicity and ease of use, absence of side effects, one-time administration for long-lasting effect, protection of privacy, no effect on libido and sexual pleasure, cultural (especially religious) acceptability, simplicity of supply lines, ease of access to supplies, and low cost. Freedman (1979:74) has argued further that attractive methods help legitimize the idea of family limitation.

Analyses of lags in adoption usually distinguish several major stages of diffusion. These vary in number, depending on the particular study, but they usually include an awareness stage; a knowledge-gathering and evaluation stage, leading to a decision whether to try the innovation; a trial stage, involving experimentation with the innovation to determine its utility; and a confirmation stage, involving either continuation or discontinuation, depending on whether the utility of the innovation is confirmed (see, e.g., Rogers, 1962, 1973; Rogers and Shoemaker, 1971). Some innovations, such as sterilization, have zero trialability, in which case the last two stages are combined.

The rate of adoption is usually conceptualized and measured as the number or percentage who adopt within a given time span. Measures of adoption are usually based on either new adopters or contraceptive prevalence (see, for example, Mauldin, 1975); a less frequently used alternative when more direct data are not available is Coale and Trussell's (1974, 1978) demographic index of marital fertility control (used, for example, by van de Walle and Knodel, 1980). Any of several measures of marital fertility, or, more properly, departures of marital fertility from the natural level, may also be used. These are indirect indicators of contraception; on the other hand, fertility is the ultimate variable of interest. In the case of adoption stages,

one may also examine changes in the percentage who know about, or have ever used, a particular method within a given time span.

Adoption (or awareness, or trial) curves, with the percentage who have adopted (or know about, or have ever tried) graphed against time, usually resemble a logistic, or an elongated S-shaped curve. Initially, only a small proportion use the innovation. The rate of use gradually accelerates, then slows down again as saturation is approached. Many individuals are cautious and wait for the innovation to be perfected or demonstrated as effective before trying it, preferring to let others take the initial risks. As van de Walle and Knodel (1980:29) have noted, once some couples in a community adopt family limitation, it is increasingly easy for other couples to follow suit.

Diffusion situations may also be classified according to whether propagators with an interest in diffusion are present or absent. Today's propagators of birth control, as mentioned earlier, include a broad mix of international agencies, government family planning programs, private foundations, private family planning associations, and commercial enterprises that market birth control products. Evidence presented below suggests that diffusion of birth control information and services usually begins sooner and proceeds more rapidly when propagators are present than when they are not. Purposive, organized programs for diffusing birth control include not only family planning programs but also legislation (e.g., China's one-child family law) and incentive programs for limiting family size.

Purposive diffusion has been conceptualized as involving two essential steps: first, the establishment of diffusion agencies (e.g., family planning clinics), the location of which influences the spatial pattern of adoption; and second, the formulation and implementation of a strategy to induce adoption in the service area. Diffusion strategies include such aspects as infrastructure, price, promotional communications, and market selection and segmentation (see, e.g., Roberto, 1975). Diffusion agencies can change norms as well as work around them, or, in some cases, use them as positive incentives or reinforcements. This is especially true for government family planning programs: government endorsement of family planning can have a legitimizing effect that often seems to substantially reduce normative barriers against birth control, resulting in an earlier onset and a faster rate of adoption.

Analysis of lags between invention and adoption has emphasized not only stages of adoption, but also the notion of complementarities, the idea that an innovation may not be practical until complementary products, technologies, practices, or ideas appear or are perfected. If the innovation in question is a marketable product or service, then analysis of profitability, which is closely related to the Rogers and Shoemaker concept of relative advantage, mentioned above, is important because it provides a summary indicator of whether an innovation will be adopted. However, profitability is not so relevant in the case of family planning (except in private-sector marketing of contraceptives) because such programs are not interested in commercial profit, though they are usually established and located with some concern for the

balance of costs and potential benefits.[3]

Implicit in the notions of complementarities, profitability, and cost-benefit analysis is the idea that certain preconditions related to level of economic and social development must exist if there is to be a demand for the innovation. Thus, although level of development alone does not determine the timing and rate of diffusion (this would be an unwarranted reductionist view that simply does not fit the facts), it does place important constraints on that process.

THE INTEGRATION OF DIFFUSION AND FERTILITY TRANSITION MODELS

Given the substantial literature on diffusion, including numerous applications to the spread of birth control,[4] it is astonishing that fertility transition models have slighted the role of diffusion processes. Developments in the two areas have proceeded rather independently, perhaps because of disciplinary isolation: diffusion models have been the province mainly of geographers, communication specialists, and rural sociologists, whereas fertility transition models have been the province mainly of demographers, nonrural sociologists, and economists. There is therefore a clear need to integrate these two traditions.

The time seems ripe for such an integration. As economists have become more interested in fertility transition models, these models have relied increasingly on demand concepts involving the utilities and costs of alternative family sizes. This emphasis is reflected in the framework for these volumes (see Easterlin, 1975). Diffusion models have similarly relied increasingly on profitability, cost-benefit, and utility-cost concepts to explain rates of adoption. Another pertinent development is that economic models increasingly consider information costs, a factor that is, of course, essential to any realistic modeling of diffusion processes.

It would seem, then, that transition and diffusion models can be integrated through the basic utility-cost concepts common to both. A start in this direction is provided by a highly simplified model of sudden and rapid fertility decline that emphasizes both developmental and diffusion processes, proposed recently by Retherford (1979, 1980). The basic idea, following Easterlin (1975, 1978), is that demanded family size is a function of the costs and utilities of achieving each alternative size.[5] These are specified by family-size utility and cost functions, with demanded family size being the number of children that maximizes net utility, computed as the difference between these two functions. The cost of achieving a given family size includes the cost of birth control, which is itself a significant determinant of demand and acts to increase it, especially in pretransition situations where birth control costs are high. Retherford's model defines demanded family size in conformance with general economics usage to include consideration of birth control costs; therefore, demanded family size is not the same as desired or wanted family size.

For simplicity and convenience, the model conceptualizes all

utilities and costs in psychic equivalents so that all costs of birth control, whether monetary or psychic, can be considered together as a single variable. Economists usually restrict the concept of cost to what is objectively measurable, such as money and time costs, and denote psychic costs as disutility; however, psychic costs are central to birth control diffusion processes, and a more flexible concept of costs is therefore useful in studying this area of human behavior. Moreover, whether psychic costs are conceptualized as costs or disutility is irrelevant to the problem of how to measure them.

In the model, two fundamental changes cause populations to approach the threshold of marital fertility control. One of these is mortality decline, which increases the number of surviving children (the number that would occur in the absence of deliberate birth control).[6] The other is decline in the production utility of children (Leibenstein, 1957), which reduces desired family size; this decline is in turn tied to a number of facets of economic and social development, especially the rise of mass education (see Caldwell, in these volumes).[7]

For a period of time, as the threshold of marital fertility control is approached, desired family size (which does not take birth control costs fully into account and hence is less than demanded family size) is lower than natural family size, yet no birth control is practiced. This condition of latent receptivity to birth control seems to be observed in many contemporary developing countries just before fertility transition begins, when desired family size is commonly about four and natural family size between five and six. In this situation, which may persist for some time, the high cost of birth control raises effective demand to the natural family size.

Under the most common circumstances, the model's threshold condition for adoption of birth control is that the birth control cost of preventing the last naturally occurring child must fall below the net cost (without birth control costs taken into account) of acquiring that child. If the cost of prevention exceeds the net cost of acquisition, birth control is not practiced. In the model, as development proceeds, the cost of prevention falls and the net cost of acquisition rises.

The costs of birth control for the typical individual or couple are conceptualized as having a fixed and a variable component. The former consists mainly of normative costs (the psychic costs of violating social norms against the use of birth control) and initial resistance costs (psychic costs associated with ignorance and fear of birth control). The variable component consists mainly of the money, time, inconvenience, and health risk costs of birth control that accumulate the more one restricts family size. If withdrawal or abstinence is used, both the fixed and variable components consist mainly of psychic costs, which are by no means inconsequential if these methods are to be used effectively. Thus the graph of birth control costs by family size declines comparatively gradually between zero and the natural family size; it then drops suddenly and steeply to zero at the natural family size by an amount equal to the fixed cost of birth control, since no birth control at all is necessary to

achieve the natural family size. Before marital fertility transition begins, the fixed cost of birth control is very high. (The variable cost of birth control can also be quite high, as discussed in Schearer's article in these volumes.)

A shift is precipitated when the higher social strata of the population attain the threshold condition and adopt birth control. If a high degree of social integration prevails, the model posits that the pace-setting behavior of the higher social strata quickly stimulates collapse of the normative and initial resistance costs of birth control throughout the population.[8] The more socially integrated the population is, the more quickly this process occurs. By social integration is meant good communication and shared values, norms, and institutions, usually associated with such characteristics as geographic compactness; common political authority; and cultural homogeneity in such areas as language, ethnicity, and religion (Retherford, 1979, 1980; see also Rogers and Shoemaker, 1971, who distinguish between homophilous and heterophilous populations).

When the normative and initial resistance costs of birth control collapse, the fixed cost of birth control, which is initially very high, falls suddenly and dramatically. As a result, a large proportion of the remaining population attains the threshold condition shortly after the dominant stratum does, despite considerable variability in couple perceptions of the various costs and utilities of children. Thus the stage is set for rapid diffusion of birth control innovation, and all the diffusion mechanisms mentioned above come into play. In a well-integrated society, the result is sudden and rapid fertility decline; in less-integrated populations, fertility decline may be more gradual.

The speed of birth control diffusion is also generally faster the later in history that fertility transition begins (Kirk, 1971). There are several reasons for this. First, the later the start, the earlier mortality falls relative to the general level of development, due largely to the importation of advanced health technology, itself a diffusion process of great demographic significance (Davis, 1956; Preston, 1975). Hence increases in natural family size play an increasingly important role, compared with other aspects of economic and social development, in attainment of the threshold condition for adoption of birth control. Natural family size at the start of transition tends to be higher the later in history transition begins, thus raising the potential distance that family size can fall in a short time.

A second reason why diffusion is faster the later in history it begins is that some aspects of economic and social development appear to proceed faster the later they get underway, again because of the increased potential for rapid importation of technology and know-how from more industrialized nations. This works in two ways. First, and rather obviously, all the development-related determinants of fertility decline evolve more rapidly. Second, and less obviously, the normative and initial resistance costs of birth control have less time to attenuate as the threshold of fertility transition is approached ever more rapidly; the less attenuated the fixed cost of

birth control is when the threshold is reached, the larger it is, and the farther it can potentially fall when it finally collapses.

The attenuation of normative birth control costs is an important aspect of cultural lag. Although norms tend to be rooted in the conditions of everyday life, to some extent they have a life of their own, especially if they become institutionalized in, for example, church doctrine or civil law. Pronatalist and anti-birth control norms are rooted in such conditions as high mortality and the high production and security utility of children. When these underlying conditions change, it takes time for the norms to adjust (Roman Catholic doctrine on birth control and the family is a case in point). Knowledge, too, tends to be rooted in the conditions of everyday life. When birth control is not needed, knowledge of methods is not widespread, and erroneous ideas abound. Again, when underlying conditions change, it takes time for knowledge and ideas to catch up. Thus attenuation of initial resistance costs associated with ignorance of birth control is also an aspect of cultural lag. Generally speaking, the later in history transition begins, the faster underlying conditions change, the greater cultural lag becomes, and the larger and more rapid the "catch-up" is once diffusion of knowledge and practice of birth control finally start.

A third reason why diffusion proceeds more rapidly the later in history fertility transition begins relates to the appearance of cheaper and more effective contraceptives and medically safe sterilization and abortion, increasingly propagated through government family planning programs. The later transition begins, the more likely a government is to quickly implement or greatly expand a family planning program to meet the surge in demand for cheap and effective birth control services; thus the money, time, inconvenience, and health risk costs of birth control are driven down at the same time that the normative and initial resistance costs fall. (The discussion below of international population assistance is relevant in this connection.) The overall drop in birth control costs is then especially great, and diffusion especially rapid. Moreover, if government and private agencies inaugurate family planning programs before fertility transition begins in the mass of the population, the consequent reduction in birth control costs (particularly in normative and initial resistance costs because of government endorsement and legitimation) may precipitate adoption of birth control and fertility decline much sooner than would otherwise be the case. Thus diffusion processes may advance the timing of fertility transition as well as speed it up once it starts.

Finally, the later in history that transition begins, the more advanced the means of communication, implying that a high degree of social integration characterizes larger population aggregates than before. Therefore, rapid diffusion of birth control innovation and the related phenomenon of sudden and rapid fertility decline can be expected in these larger aggregates.

Once transition begins and birth control starts to spread rapidly, norms favoring large families weaken; couples are more likely than before to perceive advantanges of fewer children (another aspect of

cultural lag), and thus to reduce family-size desires. Thus, rapid diffusion of birth control and rapid fertility decline often precede rather than follow declines in desired family size (as, for example, in Taiwan and Thailand; see Freedman and Berelson, 1976; Sun et al., 1978; Knodel and Debavalya, 1978; and Freedman, 1978:381). Actual and wanted family size fall almost concurrently, so that the proportion of fertility reported as unwanted does not necessarily change much, at least for a while (Westoff, 1978).

The starting or threshold date of marital fertility transition is usually fairly well defined. However, it is clear from the model just described (which should be viewed as a set of plausible hypotheses, not a proven set of propositions) that the threshold of marital fertility decline may not be so easily defined according to associated levels of economic and social indicators. The model suggests that the threshold date of marital fertility decline is a complex function of such variables as mortality level; economic and social development factors relating to utility of children to parents; and economic, social, cultural, geographic, and political factors influencing the rate of diffusion of birth control. Nothing in the model suggests that there is a unique combination of these factors that determines the onset of marital fertility transition; thus the onset of transition is compatible with a wide range of levels of development, which is in fact what is observed, as discussed later in this paper.

Given this theoretical model, the discussion below examines several aspects of the diffusion process: how it is facilitated by social integration; the networks through which it operates at the local or personal, national or family planning, and international levels; and the extent of its effects on both the timing and pace of the fertility transition.

THE IMPORTANCE OF SOCIAL INTEGRATION AS A FACILITATOR OF DIFFUSION

As mentioned earlier, a high degree of social integration, associated with geographic compactness, common political authority, and cultural homogeneity in such areas as language, ethnicity, and religion, speeds the diffusion process. The province-level Princeton study of historical demographic transition in Europe found sudden onset of rapid fertility decline most noticeable in populations with precisely these features (see, e.g., Coale, 1973; Lesthaeghe, 1977; Livi-Bacci, 1971, 1977; Coale et al., 1979).[9] From the point of view of resistance to adoption, the Princeton study also shows that linguistic, ethnic, and religious boundaries often pose formidable barriers to diffusion: maps of these boundaries coincide remarkably well with ones that distinguish provinces according to date of onset of rapid marital decline (Lesthaeghe's study of Beligum, cited above, provides an especially dramatic example).

In contemporary less developed countries, the most spectacular instances of rapid diffusion of birth control and sudden and rapid fertility decline have also occurred in comparatively small geographic

areas,[10] in populations with a high degree of cultural homogeneity. Well-known examples are Taiwan, South Korea, Hong Kong, Singapore, Thailand, and a number of Caribbean islands, such as Barbados, Jamaica, and Trinidad and Tobago (Mauldin, 1978); Japan, at the time its fertility fell decisively, is a less recent but still notable example. A common political authority, especially as manifested in an aggressive national family planning program, is also evident in most of these examples. As in Europe historically, rapid diffusion of birth control and sudden and rapid fertility decline are even more pronounced in subgroups within countries, where social integration is greater than at the national level. In Northern Thailand, for example, the total fertility rate in Chiang Mai province fell from approximately 5.2 in 1960 to 2.7 in 1975, much more rapidly than the rate for Thailand as a whole (Pardthaisong, 1978); in Singapore, the crude birth rate for Malays fell from 45 per thousand in 1964 to 17 in 1975, again much more rapidly than for Singapore as a whole (Chang, 1978).

A salient aspect of highly integrated populations is the absence of organized institutional resistance representing minority interests. Such resistance, even by a small minority, can be very effective in slowing diffusion of birth control. The role of the Catholic Church in many Western countries is an example. In developing countries, this influence has been weaker than it was historically in Europe, but it can still be observed; for example, during the 1970s an elaborate social marketing scheme for condoms in the Philippines was halted by the Catholic Women's League before it even got off the ground (Repetto, 1977). The inclusion of sympathetic religious leaders on national family planning coordinating boards has helped to counter such opposition; this was done, for example, in Korea (Keeney, 1975). International agencies have frequently pursued a similar approach. For example, in some South Pacific countries, such as Tonga, the United Nations Fund for Population Activities (UNFPA) has provided financial aid to the Catholic Church for promoting the rhythm method; this has had the effect, intended or not, of promoting Church tolerance of other approaches also supported by UNFPA.

The importance of social integration to diffusion is also illustrated by the tendency, seldom studied but well-known among family planning programs, for villages not only to adopt contraception as units, but also to discontinue as units. This may occur, for example, because of rapidly spreading rumors about side effects. Although marital fertility decline at the national level appears to be irreversible once it begins (Knodel and van de Walle, 1979), small localities may sometimes be integrated enough to show reversibility, just as individuals do.

Another relevant dimension of social integration is political integration and power, particularly the degree to which government is centralized. Highly centralized systems, such as those found in China and Indonesia, are conducive to rapid diffusion of family planning through government-sponsored programs. Central government authority reaches down to the production brigade level in China and to the

village headman in Indonesia, both of which have been utilized with great effectiveness by their respective central governments to promote family planning (Freedman, 1978; Keeney, 1975:12, 105). Such political influences can sometimes overcome lack of integration in other areas, such as ethnicity, language, and religion.

DIFFUSION NETWORKS

As noted above, diffusion operates through a hierarchy of networks at several levels: the local or personal, the national or family planning, and the international. These networks are examined in the subsections below.

Local or Personal Networks

Small, local populations, such as villages, are generally characterized by a high degree of social integration. As noted earlier, when normative birth control costs collapse in a highly integrated population, the threshold condition for adoption of birth control is achieved almost simultaneously by a large proportion of the population despite wide variation in couples' perceptions of the utilities and costs of children, and thus in socioeconomic status. In this situation, couple differences in fertility behavior depend a great deal on their location in social networks, and network variables such as information access and relationship to opinion leaders may account for a great deal of the variance in fertility behavior. Later in transition, when the birth control diffusion process is essentially complete, network variables may be less important.

Although the study of local network diffusion relates to several areas of fertility research, both economic (e.g., Easterlin, 1975, 1978; Retherford, 1979, 1980) and psychosocial (e.g., Miller and Godwin, 1977; Miller and Hollerbach, 1979; Burch, 1980), its principal distinctive emphasis is on social influences. In this connection, three topics should be discussed: opinion leadership, social networks, and social press or climate.

Communications researchers have long been concerned with the first two of these topics, studying extensively the relationships between message sources and message receivers (e.g., Shannon and Weaver, 1949). In the early 1960s, when many national family planning program were beginning, communication efforts were modeled after the findings from studies of other innovations. Only in the middle and late 1960s did research focus specifically on opinion leadership and social networks in the area of family planning (e.g., Palmore 1967). Even now, studies in this area are scarce and involve few researchers (e.g., Palmore, 1967; Palmore et al., 1971; Palmore et al., 1977; Fisher, 1978; Placek, 1974-75). Recent family planning program emphasis on "accessibility" and "community-based distribution systems" (Foreit et al., 1978) is consistent with the findings of the opinion leadership and network research that has been done. This research has shown

that, although the mass media facilitate awareness and basic information about contraception, adoption itself is more likely to be encouraged or discouraged by opinion leaders "closer to home" who share many of the same characteristics as the couples who have not yet adopted a method.

Several generalizations summarize the currently prevalent views on family planning opinion leadership. First, opinion leadership in family planning is a multi-step flow, with opinion leaders likely to appear at any step. Second, there is a range of opinion leadership from those who merely inform others about fertility regulation, to legitimizers who not only inform but also recommend, to implementers who are active in promoting use (Palmore, 1967; Palmore et al., 1976). Third, opinion leaders tend to have several characteristics as communicators: they generally participate in social situations, are sensitive to various information sources, are well informed about family planning, are innovators in family planning, and give advice. In particular, they have generally tried and discussed methods themselves, and are well informed about side effects, so that they may discourage use of a particular method or advocate an alternative method.

Analysis of local social networks involves construction of measures from sociometric data, usually obtained from sample surveys with the proviso that whole villages (or other small areas) are included in the sample (for a recent review of network research, see Rogers and Kincaid, 1981). The question on which the sociometry is based varies widely from study to study. In some studies, respondents are asked with whom they have discussed family planning; in others, more general sociometric questions are asked, such as who are the five persons with whom the respondent has closest contact. Of these, the latter approach is probably preferable (Kim and Palmore, 1978). Using answers to these questions, the analyst proceeds to establish the patterns of links among individuals in the area under study. Typically, respondents are represented as circles on a sociometric map of the study area, with lines joining those who say they have close contact with each other. One-headed arrows represent nonreciprocal links, and two-headed arrows represent reciprocal links (i.e., each of the respondents named the other as a close contact). An example of a sociometric map from a study in Korea is shown in Figure 1.

Many types of measures are possible based on such data. For example, the data may be used to define groups that can be used instead of individuals as the focus of analysis. Although such defining of groups can be done in several ways, some standard definitions seem to be emerging in the literature. Richards (1975), principal originator of the popular NEGOPY computer package for network analysis, defines a group as a set of individuals that satisfies five criteria: (1) there must be three or more members; (2) each member must have more than 50 percent of his or her links with other members of the group; (3) there must be at least one way to reach each member from each other member by tracing links between the members; (4) there can be no single person who, when removed from the group, causes the rest of the group to fail to meet any of the first

three criteria; and (5) there must be no single link which, if omitted, causes the group to fail to meet any of the above criteria.

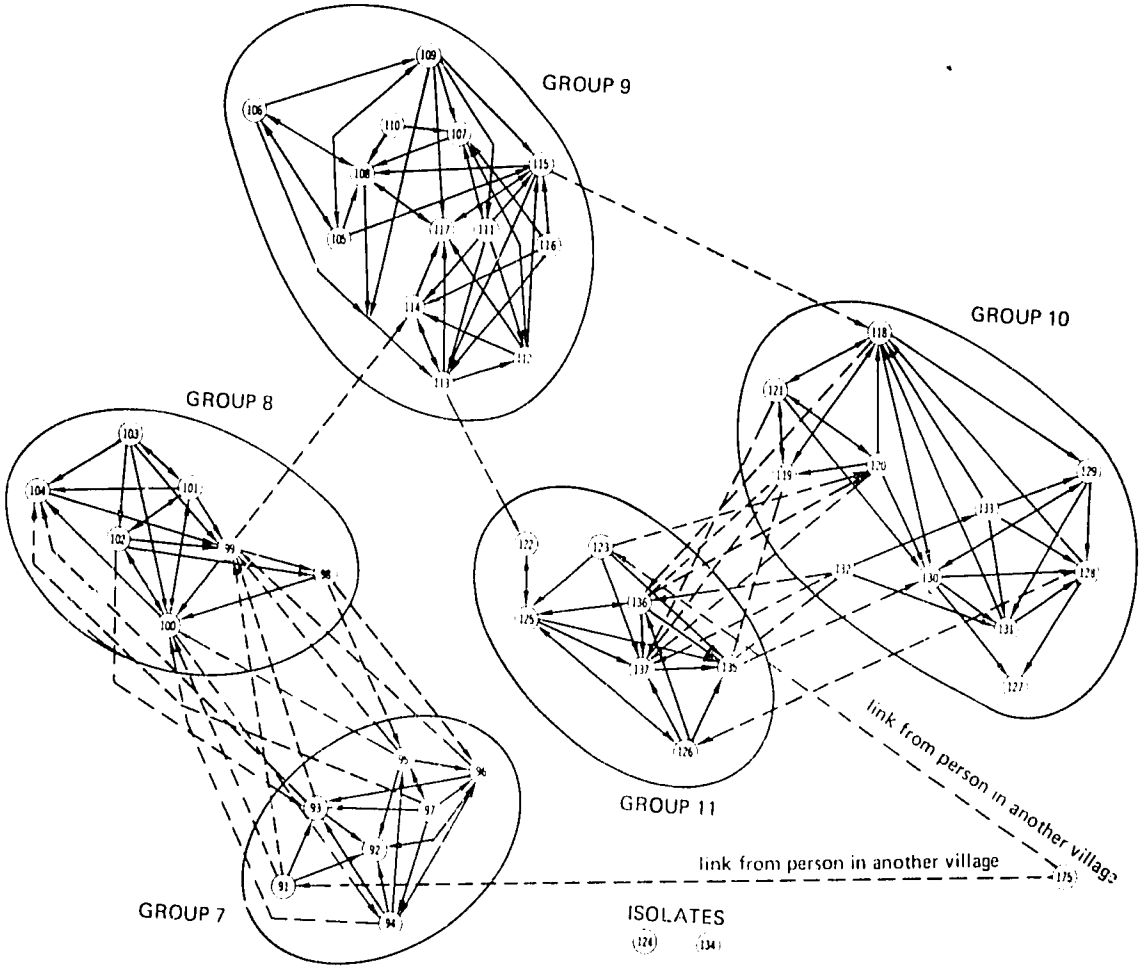

FIGURE 1 An Illustration of Personal Networks: Sangchon Village, Kyeongsangnam Province, Korea, 1975

(Figure 1 shows five groups so defined.)

Many measures can be devised at the group level, such as connectiveness (the number of directed links in a group divided by the maximum possible number of directed links for a group of that size), openness (the number of links group members have with persons outside that group divided by the number of people in the group), and one-step zone size (the number of other groups directly linked to the group of reference). More complex measures, such as zone integration and zone connectiveness, can also be constructed (see, for example, Richards, 1975; Rogers et al., 1976; Rogers and Kincaid, 1981; Danowski, 1976; Kim and Palmore, 1978). It is also possible to construct measures solely from the links themselves. For each respondent, one can count the number of incoming links (those with many are operationally defined as opinion leaders), the number of outgoing links, links to persons who use contraception, links to highly educated persons, and

so on. Both the group and individual link measures can then be related to suitable dependent variables, such as knowledge or use of contraception.

Using measures of the type just discussed, Lee (1977), Kim and Palmore (1978), Rogers and Kincaid (1981), and others have found strong relationships between these measures and contraceptive use. Kim and Palmore, for example, included thirteen network measures in an analysis that also included blocks of indicators of sociodemographic status, family planning program measures, and indices of social climate. They found that network variables explained 38 to 100 percent as much variance as did sociodemographic variables; relative to program variables, the comparable range was 29 percent to 80 percent, while relative to social climate variables, the range was 54 percent to 114 percent.

Closely related to the social network perspective are the notions of social climate and social press, based on the idea that the relevant part of a person's social environment is not only the objective reality, but also the perception of that reality. Social climate or "press" refers to the individual's perception of social pressure to use contraception. Measures of this perception generally rely on a series of questions of the form, "How many of your friends, relatives, and neighbors favor family planning?" Although the idea of climate or press dates back at least to W. I. Thomas and his "definition of the situation" (Thomas and Thomas, 1928), its application to population research is more recent. Palmore and Freedman (1969) and Kinderman (1969) found perceptions of others' contraceptive use levels important in determining individual adoption in Taiwan. Chung et al. (1972), using a scale of ten items, found that birth control press was among the two best psychological variables correlating with family planning use.

The three research topics of opinion leadership, social networks, and social climate are complementary rather than distinct. Social climate measures are related to the social network approach since they simply reflect individual perceptions of what those in the network think. As noted above, there are also social network measures for opinion leadership, so that studies showing the importance of opinion leadership variables to family planning behavior are also related to the social network approach. To date, however, few studies have integrated these approaches.

National or Family Planning Networks

Beyond the local or interpersonal level, national-level diffusion, particularly in the form of family planning programs, is central to the spread of birth control information and adoption. The effectiveness of such programs in promoting the use of birth control varies widely, as do their modes of operation. Although no one type of program or organization is uniformly superior, given the divergence in institutional settings involved,[11] some generalizations about more effective approaches can be made.

TABLE 1 Appropriateness of Contraceptive Methods by Delivery System

Contraceptive Method	Delivery System: Private Family Planning Clinic	Private Physician	Health System	Subsidized Commercial Distribution	Community-Based Distribution
Condom	*		*	***	***
Vaginal Methods	*		*	***	***
Oral Contraceptive	**	**	*	***	***
IUD	***	***	***		
Injectable	***	**	***	**	**
Sterilization	***	***	***		
Abortion or Menstrual Regulation	***	***	**		

*Less appropriate
**Appropriate
***Most appropriate

Source: Perkin and Saunders (1979:1).

First, integration of services is often helpful in overcoming normative and modesty barriers at the start of a program. Such integration may be with health services (e.g., block extension educators in India), or community development services (e.g., the semaul, or community development, movement in Korea), or even broader. A good example of how integration can help is in most South Pacific countries, where there is a highly developed public health nurse network well suited to assuming family planning functions. Women can get contraceptives through the nurse without their neighbors' knowledge, which would be difficult if contraceptives were distributed by a separate group of family planning workers. This advantage is especially great for injectables, which make family planning even less observable (there is no evidence of use in the home after the nurse leaves), and which are very popular in Tonga and Western Samoa, for example. There are also obvious cost advantages to integrated programs, as long as medical control is not too tight. (For example, if medical prescriptions for drug store purchases are rigidly required, and if nurses and paramedical personnel are prohibited from dispensing most kinds of contraceptives, diffusion of family planning may be greatly impeded.) The degree of integration

TABLE 2 Appropriateness of Contraceptive Methods by Stage in Life Cycle

Contraceptive Method	Reproductive Life Stage: Post Menarche	Pre First Birth (delay)	Post First Birth (spacing)	Termination
Condom	**	*		
Vaginal Methods	*	*		
Oral Contraceptive	*	**	*	
IUD		*	**	
Injectable			**	*
Sterilization				**
Abortion or Menstrual Regulation	- - - - - - - Back-up Throughout - - - - - -			

*Appropriate
**Most appropriate

Source: Perkin and Saunders (1979:9).

with health services that is desirable depends a great deal on the local situation.

There is abundant evidence that reliance on a variety of methods and delivery systems has also contributed to higher family planning performance rates in many countries (for a review of evidence relating mainly to community-based distribution, see Gardner et al., 1976, and Foreit et al., 1978). For example, numerous studies of barriers to adoption posed by time and distance have confirmed the importance of outreach workers and community-based distribution (see, e.g., Fawcett et al., 1966; Fawcett et al., 1967; Fuller 1972; Laing, 1979). Tables 1 and 2 summarize the prevailing wisdom regarding the proper mix of methods and delivery systems and the relation of method mix to life-cycle stage of clients.[12]

In contrast, little is known about the most effective ways to use

the mass media to promote family planning. Programs have employed such varied approaches as spot announcements on radio or television; short dramas and discussions on radio and, less often, television; slides and short film strips shown in public movie theaters; slides, film strips, and movies shown by mobil vans; stories and advertisments in newspapers and magazines, especially women's magazines; comic books; match book covers; family planning fans; billboards and posters; flip charts; pamphlets; books; drug store displays; and introduction of family planning messages into the acts of touring magicians, play companies, and the like. Media use has varied widely from country to country. In some countries, media have been used sparingly to keep a low profile for the program and avoid attracting opposition; in others, virtually all of the approaches have been used. Unfortunately, the effectiveness of these various approaches and campaign intensities has not been well researched. This is partly because such research is difficult to carry out when extensive interpersonal communication is likely to contaminate the assessment of media impact.

Because of this lack of research, only a few generalizations can be advanced on the role of the media in the diffusion process. One such generalization is that information, education, and communication (IEC) campaigns can be effective in the early stages of a family planning program: they can increase awareness and knowledge of methods and services, and reduce resistance to birth control by helping to legitimize the idea of family-size limitation (Schramm, 1971).[13] Once knowledge is widespread and birth control begins to be accepted, the impact of such campaigns diminishes, since they do not seem to be very effective in motivating couples to reduce preferred family size.[14]

IEC campaigns can also help to combat rumors. A number of rumors about birth control are common (see Rogers [1973:303ff.] for a partial list): that the IUD moves inside the body; that the IUD or pill or injection causes cancer; that any given method decreases sexual satisfaction or leads to a loss of sexual desire; that the pill leads to weight gain, discoloration of the skin, or nausea; that any chemical method may have long-range genetic effects; that vasectomy leads to impotence; that a method which, in reality, is reversible is not; that all government methods are designed to eliminate certain minority groups or that foreign-supplied drugs are designed to have a negative effect on Third World users; and that government-supplied contraceptives are inferior to those available in the private sector. Some of these fears have some basis in fact, but are frequently exaggerated through rumors (see Schearer, in these volumes; Bogue, in these volumes).

Semantics has also played an important role in IEC campaigns. What used to be called birth control came to be called family planning in the 1950s. Contraceptives were portrayed as medical instrumentalities, reflecting a conscious attempt to associate birth control with family welfare and health, which are virtually universally valued (Davis, 1971). More recently, one notes the choice of the term "menstrual regulation" in place of "early abortion."

International Networks

At the international level, the catalytic role of international population assistance, which grew from about U.S. $2 million in 1960 to more than U.S. $644 million in 1978 (UNFPA, 1979:17, 20; see also Mauldin, in these volumes), has assumed major significance. Such assistance currently covers about half of the actual costs of population activities in developing countries (see Schearer, in these volumes). It often has provided the critical spark to get things moving and helped overcome bottlenecks to keep things moving (Gille, 1977:88). Its effect on the starting times of fertility transition has already been discussed.

Despite this significance, international population assistance has received remarkably little attention from academic researchers, perhaps because analysis in this area requires an institutional approach that emphasizes case studies of particular donor agencies. Such a particularistic approach is somewhat alien to demography, sociology, and economics, the disciplines that have dominated population research. Practitioners in these fields are trained to base explanation on more generalized variables, such as education, per capita income, family planning inputs, and the like, and to emphasize statistical evidence and statistical models. This mode of analysis has been extremely fruitful in analyzing individual and areal data, but it becomes less fruitful as one progresses to more complex units of analysis such as family planning programs and international donor agencies. The analysis of the latter is in many ways not amenable to quantitative methods (although these are still useful), but requires instead a more qualitative approach. For the most part, research of this nature has been carried out not by academics, but by persons associated with donor agencies or action programs themselves.

One excellent study of this kind chronicles the first 25 years of Population Council activities, between 1952 and 1977 (Population Council, 1978). During this period, the Council devoted considerable resources to building indigenous leadership in the population field, promoting demographic data collection and analysis in developing countries, conducting a large biomedical research program, providing technical and organizational assistance to emerging national family planning programs, and promoting the international exchange of information through a major publications program. Although there is little doubt that the Population Council has been very effective as a family planning diffusion agency, its overall impact on fertility is difficult to assess quantitatively because most of its activities have long-term multiplier effects and are several steps removed from individual decisions to limit family size.

Under the aegis of the Population Council, Kim et al. (1972) have provided a valuable history of the early stages of the Korean family planning program, in which Population Council support played an important role. Particularly interesting is the discussion of how private groups, including the International Planned Parenthood Federation and the Planned Parenthood Federation of Korea, laid the foundation for the national program, and then how they worked closely

with the government in addressing those aspects of the program that were either politically sensitive (such as the early IEC campaigns) or required a degree of flexibility difficult to attain in large government bureaucracies (e.g., pilot projects, evaluation activities, and channeling of external assistance funds). More case studies of this kind are needed, since strategies have varied from country to country.

A few other studies are available. A history of the UNFPA has been prepared (Salas, 1979). The World Bank (1972) has described the major thrusts of its program in what was originally prepared as an in-house working paper. Only scant information is available on the evolution of the United States Agency for International Development's (USAID) international population assistance program; this is unfortunate since AID provides close to one-third of all international population assistance (Gille, 1977:81). Historical information on the population programs of the many private foundations involved in the population field, such as the Ford Foundation, is similarly fragmentary. A comprehensive history of the entire international population assistance effort, emphasizing an analysis of its impact, would certainly be extremely useful.

Several aspects of international population assistance worthy of further investigation emerge from the literature that is available. One is international demonstration effects, which practitioners in the field seem to agree are quite important. For example, both Korea and Taiwan have international training programs in family planning (headquartered at the Korean Institute for Family Planning in Seoul--recently reorganized and renamed the Korean Institute of Population and Health--and at the Chinese Center for International Training in Family Planning in Taichung). A great number of government officials from other countries have attended these programs, which have apparently been effective in stimulating the founding and improvement of family planning programs in other countries. In addition to supporting these formalized international training programs, donor agencies have also funded many individual tours enabling high government officials to observe successful programs in other countries. These training programs and tours have been important not only in providing technical and organizational information, but also in generating enthusiasm and making the idea of a family planning program more tangible to those who have never observed one. International conferences have played a complementary role by keeping family planning officials up to date with new developments in other countries, and by encouraging a sense of professionalism and commitment. Again, little research has been done on such demonstration effects; both the case study approach and quantitative analysis would be appropriate.

Similarly, little attention has been paid to the mechanisms by which donor agencies cooperate with one another to minimize duplication and maximize effectiveness of aid funds. One mechanism of cooperation has been international conferences designed explicitly for this purpose, most notably the Bellagio conferences sponsored by the Rockefeller Foundation (see, e.g., Rockefeller Foundation, 1977).

Another mechanism has been needs-assessment missions, which have been pioneered mainly by UNFPA and the World Bank. Because of their broad membership, which typically includes members from a cross-section of public and private agencies and a variety of professional backgrounds, these missions have provided a way to coordinate and integrate population planning with other agencies and other aspects of development planning (UNFPA, 1979:21); these missions also perform important evaluative functions. World Bank missions, reflecting World Bank management views, have sometimes generated pressure by requiring sound family planning programs as a condition of development loans (Keeney, 1975:24), and it seems likely that this has contributed to speeding the diffusion of family planning through government programs. The needs-assessment strategy itself should be more systematically evaluated as a mechanism for family planning diffusion.

The role of international agencies in the development of particular aspects of national programs is also worth investigating. For example, the close relationship of the Population Council to the programs in South Korea and Taiwan helps explain the early reliance of those programs on the IUD, which the Council was instrumental in developing. Similarly, the emphasis on oral contraceptives in the early stages of the Malaysian program can be traced to the population assistance of the Swedish International Development Agency (SIDA), which provided the contraceptives.

Research and evaluation activities have been very important in accelerating and maintaining the momentum of international population assistance. Such work done in the early stages of the Taiwan program has served to a considerable extent as a model; results from the Taiwan studies were extremely important in persuading donor agencies that family planning programs were effective and worth supporting (Cernada, 1970; Cernada and Sun, 1974). Agencies such as the Population Council, UNFPA, and USAID have contributed heavily to basic demographic data collection and demographic research around the world (Gille, 1977) for precisely this reason. Thus research and evaluation have played a very important role in the diffusion of family planning at the international level (and, to a lesser extent, within countries), although again the impact is difficult to assess quantitatively.

Ultimately, diffusion of family planning at the international level reduces the cost of birth control and feeds into the simplified individual-level utility-cost models mentioned earlier. However, the process by which this occurs is complex and frequently indirect. The institutional mechanisms involved, though important, are several steps removed from individual birth control decisions and difficult to capture by quantitative statistical methods.

EFFECTS OF DIFFUSION ON THE TIMING AND PACE OF FERTILITY TRANSITION

The process of diffusion occurs through the hierarchy of networks described above. Its speed and extent will vary according to the

degree of social integration in a given culture, the effectiveness of the various networks, and the presence or absence of barriers to the process, many of which are related to levels of social and economic development. Given these variations, a central question becomes the relative significance of the effects of diffusion and development on fertility decline. The subsections below address this question first for the timing or onset of fertility decline, and then for its pace.

Effects on Timing

A good deal of debate continues to focus on the relative effects of diffusion and development on the timing of fertility transition, and the evidence is not conclusive. Some dismiss diffusion, and family planning programs in particular, as having rather insignificant effects (e.g., Davis, 1963, 1967; Demeny, 1975, 1979a, 1979b), while others assign them major importance (e.g., Freedman, 1978; Mauldin and Berelson, 1978; Bogue and Tsui, 1979a, 1979b).

In an early article bearing directly on this question, Carlsson (1966) argued that fertility decline is basically a process of adjustment to economic and social change, rather than a process of innovation and diffusion of radically new birth control behavior. Carlsson interpreted the existence of substantial urban-rural and regional variations in pretransition marital fertility in Sweden as evidence that birth control was practiced widely before marital fertility transition began.

Knodel (1977) subsequently disputed this conclusion and presented evidence that innovation-diffusion processes, as well as adjustment processes, are important in explaining the timing of marital fertility decline. In making his argument, he distinguished between parity-independent birth control, which affects only birth spacing and is consistent with a natural-fertility regime, and parity-dependent birth control, or family limitation, which involves conscious stopping behavior and departures from natural fertility. According to Knodel's interpretation, urban-rural and regional differences in pretransition marital fertility stemmed mainly from regional variations in parity-independent birth control, mostly through mechanisms involving no conscious effort to reduce fertility. Among these mechanisms, regional variations in the customary length of breastfeeding, which affects birth intervals through its inhibitory effects on ovulation, appear to have been especially important. The association of pretransition marital fertility fluctuations with economic fluctuations (e.g., in the harvest) stemmed mainly from temporary abstinence aimed at postponing births during hard times, and from reduced libido, fecundity, and coital frequency associated with famine, malnutrition, and epidemic diseases. All these parity-independent mechanisms involve spacing but not stopping behavior, and have little or no effect on the age pattern of natural fertility. Some parity-dependent control may have been practiced by small elites or subgroups prior to marital fertility transition, but not by the mass of the population.

Knodel's evidence in support of this interpretation hinges mainly on use of Coale and Trussell's (1974) demographic index of marital fertility control, m, mentioned earlier. This index measures departures from the typical age pattern of natural fertility, and requires as input only a set of age-specific marital birth rates. Thus m is an indirect measure of parity-dependent birth control that is unaffected by parity-independent birth control. In Sweden, m was constant, with minor fluctuations, for 150 years prior to 1880, when marital fertility began its secular decline. In 1880, m began to increase and continued to do so steadily until a much lower level of marital fertility was attained. If parity-dependent birth control were purely an adjustment process, then m should have gradually increased over the entire period for which data are available, since Sweden was developing economically and socially over this entire period. Instead, m followed an elongated S-shaped trajectory over time, which is typical of an innovation-diffusion process.

Carlsson's interpretation has also been questioned by Mosk (1978), who examined Swedish urban-rural fertility differences with a more extensive data set, by province. Mosk found that, in 1880, the earliest date for which he had data, the rural index of marital fertility was lower than the urban index in about half the cases. The index of overall fertility was lower in urban than in rural areas, but mainly because of later age at marriage. Thus the urban-rural and regional variations in marital fertility in 1880 were not closely associated with level of development, and offer no support for a purely adjustment hypothesis.

Other evidence cited by Knodel in support of his interpretation comes from individual-level data from historical family reconstitution studies; these data show that, prior to marital fertility transition, mother's age at the birth of her last child is unaffected by the survivorship of previous children. If parity-dependent birth control were widespread, as Carlsson concludes, then one should observe some stopping behavior at earlier ages among those whose previous births all survived. Knodel also cites the fact that in European countries for which data are available, legitimate and illegitimate fertility started to decline at the same time. Since illegitimate births are unwanted regardless of level of economic development, adjustment processes cannot explain either the decline in illegitimate fertility or its coincidence with the decline in legitimate fertility. Innovation and diffusion of birth control knowledge, skills, and means, however, do provide a plausible explanation. Knodel also observes that in contemporary developing countries, desired family size often does not decline rapidly until after marital fertility begins to fall. This phenomenon is difficult to reconcile with a purely adjustment perspective, but it does make sense if one views parity-dependent birth control as an innovation. In the innovation-diffusion perspective, when parity-dependent control, or family limitation, becomes viewed as acceptable behavior and marital fertility starts to fall, people are more likely to perceive the advantages of smaller families; thus the innovation of family limitation triggers a decline in desired family size. Finally, Knodel

notes that the incredible rapidity of marital fertility decline in many contemporary developing countries cannot be explained purely by adjustment processes, because the pace of development does not at all match the pace of marital fertility decline. In sum, the evidence cited by Knodel suggests that both innovation and adjustment processes are involved in marital fertility transition. Pretransition fluctuations and differentials in marital fertility appear to stem from fluctuations and differentials in natural fertility, relating to the potential supply of children.

Findings from the Princeton study of European fertility transition, mentioned earlier and covering many more countries than those mentioned by Knodel (1977), also suggest that diffusion can have a great effect on advancing the timing of transition. As noted, this study revealed that some two-thirds of European province-sized administrative areas started marital fertility transition within a 30-year period between 1880 and 1910, despite widely different levels of mortality and development (Knodel and van de Walle, 1979). Judging from the results of the Princeton study, diffusion processes may have advanced the timing of fertility transition in the less developed areas of Europe by as much as 50 years, and perhaps more in some cases. Systematic examination of the Princeton data is needed to evaluate more precisely the magnitude of these effects.

Knodel's (1979) study of German villages also sheds light on the possible effect of diffusion on the timing of transition. Although most of his villages were rather similar in economic and social characteristics, fertility transition began almost 100 years sooner in some villages than in others. Barriers to diffusion may well account for much of this difference in timing.

Further evidence is available from contemporary less developed countries, where there seems to be a good deal of diffusion of birth control knowledge and methods from urban to rural areas, especially since organized family planning programs almost invariably begin in urban areas. In Thailand, for example, McCormick Hospital established a high-quality private family planning program in the Chiang Mai area of Northern Thailand; apparently as a result, fertility fell in this area about ten years sooner than in the rest of Thailand (Pardthaisong, 1978). The time gap probably would have been even longer had not the government established a national family planning program about ten years after the McCormick program began. Given Thailand's high rate of population growth, this ten-year difference is not inconsequential, even though it may seem rather insignificant from a long-term historical perspective. The South Korean family planning program, which started out stronger in rural than in urban areas, is a notable exception that actually proves the point, because South Korea is one of the few countries where rural fertility decline has not lagged behind urban decline (Keeney, 1975:35).

A striking characteristic of the contemporary situation in developing countries, compared with the historical situation in Europe, is the presence of an enormous international family planning diffusion effort, discussed earlier, financed in large part by the developed countries (for monetary figures, see Mauldin, in this

volume). Partly as a consequence of this effort, there is today in the developing countries a striking parallel to what Knodel and van de Walle observed in Europe historically, but on a world-wide scale. In slightly less than 30 years, between 1950 and 1979, the proportion of the developing world's population covered by family planning programs has increased from zero to over 90 percent (Nortman and Hofstatter, 1980:17). During the 1960s and 1970s, many of these countries began marital fertility transition, and it appears very likely that, for the 30-year period between 1960 and 1990, at least three-quarters of the developing world's population will have begun the transition. In both cases, historical and contemporary, there is tremendous variability in culture and level of development at the start of transition; in both cases, diffusion offers a plausible explanation of the compression in time of starting dates for the diffusion of birth control and marital fertility transition.

From the point of view of causality, it is important to note that the international population assistance effort is itself basically a consequence of rapid mortality decline after World War II, which, as noted above, occurred largely because of the diffusion of inexpensive but very effective modern public health technology from developed countries (Davis, 1956; Preston, 1975). This astonishing mortality decline caused rapid increases in population that impeded development efforts, causing alarm at both national and international levels. Thus, at the global level, the diffusion effort itself is largely a consequence of mortality decline and population pressure on economic and organizational resources, stemming ultimately from historical economic and social development in the developed countries. Thus we return to the point made at the beginning of this paper, that development is more fundamental than diffusion in explaining fertility transition. Nevertheless, it is still true that the international family planning diffusion effort has gained considerable momentum of its own, and that it has had major effects in particular settings that have been quite independent of local levels of economic and social development.

The above discussion suggests that many of the disagreements about the relative importance of development and diffusion may be more apparent than real. Proponents on both sides of this argument can probably agree that diffusion processes can advance the timing of fertility transition by at least 10 to 20 years and perhaps as much as 50 or more years in some circumstances. The disagreement seems to be not so much about these magnitudes as about their significance. Certainly over the long sweep of history, development is the basic explanation of fertility transition, and a 10- to 20-year advance in the timing of transition is perhaps not very significant. In the short run, however, especially if population is pressing against resources and growing at close to 3 percent a year (implying a doubling time of 23 years), advancing the timing of transition by 10 to 20 years or more by means of an organized diffusion program is of major significance.

As noted above, diffusion processes help explain why threshold levels of mortality and socioeconomic indices at the beginning of

fertility transition vary so much from one country to the next. Besides the Knodel and van de Walle (1979) study of such variations in historic Europe, there are several similar studies in contemporary developing countries. Studies prior to 1978 have been reviewed by Mauldin and Berelson (1978:92). More recently, it has become apparent that Thailand and especially Indonesia have begun marital fertility transition at levels of development (except for mortality) substantially lower than those observed in earlier studies of other less developed countries. Freedman has noted that objective development changes much smaller than those that characterized the West can provide motivation for lower fertility today.[15]

Effects on Pace

How much can diffusion compress the transitional section of the S-shaped adoption curve in time? The answer is complicated by the fact that the rate of diffusion depends also on the speed of decline of desired family size, which is strongly influenced by the speed of economic and social development. Kirk (1971) has shown that fertility declines in contemporary developing countries, where they have begun, are proceeding much more rapidly than they did historically in the developed countries (about three times faster, if one compares transitions starting in 1875-99 with those starting after 1950); however, whether diffusion of birth control has contributed substantially to this acceleration is not evident from his results. Subsequent studies have more clearly demonstrated that family planning programs can greatly accelerate fertility decline. Mauldin and Berelson (1978), for example, regressed fertility change between 1965 and 1975 in a number of developing countries (anywhere between 38 and 94 countries, depending on which of several statistical models was used) against a number of economic and social indicators. They consistently found that family planning input and effort variables greatly increased the proportion of variance explained (usually by at least 15 percentage points), over and above the usual economic and social variables. In the basic regression, seven socioeconomic factors (including mortality level) explained 66 percent of the variance, rising to 83 percent when family planning program effort variables were added.

One can find many instances where program implementation or program improvements have clearly speeded up fertility decline, although it is usually difficult to ascertain by precisely how much because of a lack of control groups. In Korea, for example, the percentage of eligible women (married women of reproductive age) who knew of some contraceptive method increased from 51 percent in 1964, just as the national family planning program was getting into full swing, to 87 percent in 1968; knowledge of the IUD rose from 11 to 84 percent during the same period (Mauldin, 1975:31). Between 1965 and 1973, the percentage who had ever practiced contraception among eligible women with no education increased from 16 to 53 percent and among rural residents from 19 to 58 percent (Freedman and Berelson,

1976:22). As noted above, Korea is one of the few countries where rural fertility decline has not lagged behind urban fertility decline, evidently because in its initial stages, the national family planning program effort was stronger in rural than in urban areas (Keeney, 1975:35; Chung et al., 1972); this pattern also suggests that the program had substantial effects. Between 1965 and 1973, the proportion practicing contraception among those wanting no more children increased from 31 to 54 percent. Between 1972 and 1977, female sterilizations increased from near zero to 22 percent of all new acceptors, due to the introduction of laparoscopy (a simplified outpatient procedure) and a tripling of government subsidies that had the effect of making sterilization virtually free (Westoff et al., 1980:130-137; Korean Institute for Family Planning, 1978:291; Cho and Retherford, 1982). Many other examples could be cited, but are more properly covered in other papers in these volumes having to do with the assessment of family planning program impact (Mauldin, in these volumes).

RESEARCH ISSUES

This paper has raised a number of questions about the diffusion of birth control--the channels through which it occurs, the magnitude and significance of its effects--that cannot be adequately answered without further research. This section addresses several issues related to that needed research.

First, the study of diffusion of birth control in contemporary less developed countries would benefit from more longitudinal and time series data with small areas as the units of analysis. Presently, fertility studies in less developed countries are overwhelmingly based on cross-sectional analyses of single surveys, an approach not suited to the study of diffusion, which is preeminently a time-dependent process. Greater use of comparable cross-sectional surveys large enough to have areal detail would be much more useful. The Princeton study of historical fertility transition in Europe, based on time series of areal data, has proven extremely valuable for the study of diffusion processes even though the data were only of the most elementary kind (Coale, 1973). Today's time series data are, potentially at least, immensely richer.

A related problem concerns the interpretation of statistical findings relating to the effects of development variables and family planning programs on fertility. Statistical findings based on cross-sectional data depend a great deal on the stage of transition from which the data come. Because of diffusion, fertility differentials by, say, education can change dramatically within just a few years. This implies that the coefficient of the educational variable in a cross-sectional multiple regression analysis of fertility can change just as dramatically and quickly. However, this does not mean that the causal relation of education to fertility has changed in any fundamental way during the interim. A similar point can be made regarding apparent changes in the effects of other

socioeconomic and family planning program variables. Time-series data and related analysis techniques, because of the insight they provide into diffusion processes, can aid in the interpretation of such findings.

Better measures of the potential for birth control diffusion also need to be developed. One measure frequently used is the difference between the natural and the desired number of surviving children (see for example, Easterlin, 1975). However, this is not a very good measure because the relative intensity of preference for the desired number over the natural number is highly variable: in today's developing countries that have not yet begun fertility transition, it is common, as mentioned above, for the desired number of children to be about four and the natural number between five and six; Pakistan and Thailand, for example, were both in this situation in the late 1960s (Shah and Palmore, 1979; Knodel and Debavalya, 1978). It is plausible in retrospect, however, that the relative intensity of preference for four over six was much stronger in Thailand than in Pakistan, since rapid adoption of birth control and rapid fertility decline began shortly afterward in Thailand but not in Pakistan, despite a massive contraceptive campaign in the latter. Better measurement of the potential for birth control diffusion might be accomplished by supplementing survey questions on desired family size with at least one additional question designed to assess intensity of preference for the desired number over either the natural number, or one or two more than the desired number (Retherford, 1980). If N is the desired number, the basic question might be of the form: "How much do you prefer N children over N+1 children? Just barely, a little, some, very much, or extremely much?" If responses were scored from 1 to 5, an average score near 5 would indicate that diffusion of birth control and fertility decline were imminent, whereas an average score near 1 would indicate that even very low birth control costs would probably be enough to discourage use. Although this approach has the virtue of being very simple to apply and easy to interpret, it is as yet untested. Other, more established approaches to psychometric measurement of preference intensities, though considerably more complex and difficult to interpret, might also be useful for better measurement of the potential for diffusion of birth control (see, for example, Coombs et al., 1975; Terhune and Kaufman, 1973; Myers and Roberts, 1968; Bulatao, 1981).

In some circumstances, family planning programs initially emphasize contraception as a means of improving maternal and child health through longer birth intervals. To date, research has paid little attention to diffusion of birth control for such purposes. Such research is less important than that on diffusion for family limitation, but it deserves more attention than it has so far received.

POLICY IMPLICATIONS

A high level of development appears to be a sufficient but not a necessary condition of fertility transition. Diffusion processes that

reduce the costs and facilitate the use of fertility regulation also can have a significant impact on the timing and pace of fertility transition. This is even more true in today's less developed countries than in the industrial countries historically because of the innovation in recent decades of organized family planning programs as purposive diffusion agencies. The policy relevance of diffusion research is obvious since purposive diffusion, mainly through family planning programs, is the principal avenue by which governments and other agencies attempt to reduce fertility. Considerable debate continues to focus on the relative significance of the effects of diffusion and economic and social development. The evidence is not conclusive, and more research is needed in this area.

NOTES

1. Physical distance is less important now than it was historically because of improvements in transportation and communication; moreover, existing health networks are sometimes used to provide large areas, if not the entire country, with new birth control information and services within a relatively short period. Nevertheless, birth control costs associated with distance factors have by no means become insignificant (Schearer, in these volumes).
2. Of course, some norms facilitate, rather than impede, diffusion.
3. The weighing of costs and benefits can be a very complex process, especially in government-sponsored programs where service location decisions must take into account such factors as regional political interests and the organization and location of pre-existing health facilities. Such cost-benefit considerations replace profitability considerations in the public and private nonprofit sectors (see Schearer, in these volumes).
4. See, e.g., Rogers, 1973, for an extensive review of the family planning communication and diffusion literature prior to the early 1970s.
5. Family size is defined as the number of children surviving to some criterion age.
6. Note, however, that insofar as infant neglect is a response to unwanted children, infant mortality rates may remain high until contraception becomes acceptable (see Scrimshaw, 1978; in these volumes; van de Walle and Knodel, 1980).
7. The old age security utility of children also falls as a consequence of development (see Potter, in these volumes; Lee and Bulatao, in these volumes), but usually not significantly until well after marital fertility transition first gets underway. Another factor of interest is diffusion of the Western nuclear family ideal, which Caldwell (1976, 1978) has argued plays an important role in stimulating marital fertility control. However, Caldwell's hypothesis, while perhaps valid in some African countries, is highly controversial if held valid for all developing countries. For example, Freedman (1979:69) has noted in rebuttal that, in Taiwan, major fertility decline has occurred

in the presence of traditional family values that are changing slowly but are still very different from Western family values.

8. Van de Walle and Knodel (1980) refer to this process somewhat more generally as "diffusion of the idea of family limitation."
9. To some extent, Europe itself constitutes a common cultural area. Indeed, a precipitous and rapidly diffusing decline in the normative and initial resistance costs of birth control, associated mainly with the adoption of coitus interruptus, offers a plausible explanation of why fully two-thirds of European province-sized administrative areas experienced a sudden onset of rapid marital fertility decline within a 30-year period beginning around 1880, despite a tremendous variety of fertility levels (due to variations in spacing behavior, not stopping behavior), mortality levels, and economic and social conditions just prior to the decline (Knodel and van de Walle, 1979; van de Walle and Knodel, 1980).
10. This is not to say that rapid fertility decline cannot occur also in large populations (e.g., China).
11. Perkin and Saunders (1979:7) observe that the evolution of family planning delivery systems has been from single-purpose to multi-purpose outlets, from private to government to both private and government operations, and from health agencies to commercial and community organizations. The self-contained, single-purpose clinic of the 1960s, often operated by a private family planning association, was supplemented first by the addition of "change agents," usually known as family planning workers; later in the late 1960s and early 1970s by integrated health, postpartum, maternity-centered, and high-risk clinical approaches; and more recently by subsidized marketing and community-based and household distribution. In some countries, additional delivery channels operate through government social security facilities, labor unions and factories, local organizations such as mothers' clubs, and religious communities.
12. The literature on organizational aspects of family planning programs is large, and more extensive treatment of it is beyond the scope of this paper. For further discussion, see United Nations, 1972, 1976, 1977; Inter Governmental Coordinating Committee, 1974.
13. Radio is a useful and inexpensive medium for IEC, since cheap transistor radios are now common throughout most of the developing world and can reach illiterate as well as literate persons (Keeney, 1975).
14. Somewhat on the margin of the IEC effort has been population education in the schools. The impact of such programs on the diffusion of family planning is long-term and therefore difficult to measure (see Kee, 1981, for a recent review of the population socialization literature, including population education).
15. One important reason for exceptions such as Pakistan, Bangladesh, or Afghanistan is that the governments have been unable to set up administrative, communication, and transportation systems capable of reaching the village masses, either with the ideas of the

outside world that would revolutionize expectations, or with the minimal services and goods that make the new ideas and aspirations credible (Freedman, 1978:380). Another reason is that these are Muslim countries where the extremely subordinate position of women is a barrier to the adoption of family limitation; because of the seclusion of women, family planners often find themselves in the position of offering their messages and methods, which are usually female methods, to a largely inaccessible and unreceptive audience (van de Walle and Knodel, 1980:39-40).

BIBLIOGRAPHY

Bogue, D. J., and A. O. Tsui (1979a) A reply to Paul Demeny's "On the end of the population explosion." Population and Development Review 5:479-494.

Bogue, D. J., and A. O. Tsui (1979b) Zero world population growth? The Public Interest 55:99-113.

Brown, L. A. (1981) Innovation Diffusion: A New Perspective. New York: Methuen, Inc.

Bulatao, R. A. (1981) Values and disvalues of children in successive childbearing decisions. Demography 18:1-26.

Burch, T. K., ed. (1980) Demographic Behavior: Interdisciplinary Perspectives on Decision-Making. Boulder, Colo.: Westview Press.

Caldwell, J. C. (1976) Toward a restatement of demographic transition theory. Population and Development Review 2:321-366.

Caldwell, J. C. (1978) A theory of fertility: From high plateau to destablization. Population and Development Review 4:553-578.

Carlsson, G. (1966) The decline of fertility: Innovation or adjustment process. Population Studies 20:149-174.

Cernada, G. P., ed. (1970) Taiwan Family Planning Reader: How a Program Works. Taichung, Taiwan: Chinese Center for International Training in Family Planning.

Cernada, G. P., and T. H. Sun (1974) Knowledge into Action: The Use of Research in Taiwan's Family Planning Program. Paper No. 10. Honolulu: East-West Communication Institute.

Chang, C. T. (1978) Fertility Transition, Nuptiality Changes, and Family Planning in Singapore. Paper presented at the Conference on Comparative Fertility Transition in Asia, Nihon University, Tokyo.

Cho, L.-J., and R. D. Retherford (1982) Fertility transition in the Republic of Korea. In W. P. Mauldin, ed., Fertility Decline in Developing Countries: Case Studies. Forthcoming.

Chung, B. M., J. A. Palmore, S. J. Lee, and S. J. Lee (1972) Psychological Perspectives: Family Planning in Korea. Seoul: Hollym Publishers.

Coale, A. J. (1973) The demographic transition. Pp. 53-72 in International Population Conference, Liege 1973, Vol. 1. Liege, Belgium: International Union for the Scientific Study of Population.

Coale, A. J., and T. J. Trussell (1974) Model fertility schedules: Variations in the age structure of childbearing in human populations. Population Index 41:185-258. (See also Erratum, Population Index 41:572.)

Coale, A. J., and T. J. Trussell (1978) A new procedure for fitting optimal values of the parameters of a model schedule of marital fertility rates. Population Index 44:203-211.

Coale, A. J., B. A. Anderson, and E. Harm (1979) Human Fertility in Russia since the Nineteenth Century. Princeton, N.J.: Princeton University Press.

Coombs, C. H., L. C. Coombs, and G. H. McClelland (1975) Preference scales for number and sex of children. Population Studies 29: 273-298.

Danowski, J. A. (1976) Communication network analysis and social change. Pp. 277-306 in G. C. Chu, S. A. Rahim, and D. L. Kincaid, eds., Communication for Group Transformation in Development. Honolulu: East-West Communication Institute.

Davis, K. (1956) The amazing decline of mortality in underdeveloped areas. Journal of the American Economic Association 46:305-318.

Davis, K. (1963) The theory of change and response in modern demographic history. Population Index 29:345-366.

Davis, K. (1967) Population policy: Will current programs succeed? Science 158:730-739.

Davis, K. (1971) The nature and purpose of population policy. Pp. 3-29 in K. Davis and F. G. Styles, eds., California's Twenty Million: Research Contributions to Population Policy. Berkeley: Institute of International Studies, University of California.

Demeny, P. (1975) Observation on population policy and population program in Bangladesh. Population and Development Review 1:307-321.

Demeny, P. (1979a) On the end of the population explosion. Population and Development Review 5:141-162.

Demeny, P. (1979b) On the end of the population explosion. A rejoinder. Population and Development Review 5:495-504.

Easterlin, R. A. (1975) An economic framework for fertility analysis. Studies in Family Planning 6:54-63.

Easterlin, R. A. (1978) The economics and sociology of fertility: A synthesis. In C. Tilly, ed., Historical Studies of Changing Fertility. Princeton, N.J.: Princeton University Press.

Fawcett, J. T., A. Somboonsuk, and S. Khaisang (1966) Diffusion of Family Planning Information by Word of Mouth Communication. Bangkok: Family Planning Research Unit, Chulalongkorn University.

Fawcett, J. T., A. Somboonsuk, and S. Khaisang (1967) Thailand: An analysis of time and distance factors at an IUD clinic in Bangkok. Studies in Family Planning 1:8-12.

Fisher, A. A. (1978) Family planning opinion leadership in the United States. International Journal of Health Education 21:98-106.

Foreit, J. R., M. E. Gorosh, D. G. Gillespie, and C. G. Merritt (1978) Community-based and commercial contraceptive distribution: An inventory and appraisal. Population Reports, Series J:1-39.

Freedman, R. (1974) Community Level Data in Fertility Surveys. WFS Occasional Papers No. 8. London: World Fertility Survey.

Freedman, R. (1978) Summarized findings on Asian population programs. Population Reports. Series J:380-381.

Freedman, R. (1979) Theories of fertility decline: A reappraisal. In P. M. Hauser, ed., World Population and Development: Challenges and Prospects. Syracuse, N.Y.: Syracuse University Press.

Freedman, R., and B. Berelson (1976) The record of family planning programs. Studies in Family Planning 7:1-40.

Fuller, G. (1972) The Spatial Diffusion of Birth Control in Chile. Unpublished Ph.D. dissertation. Department of Geography, Pennsylvania State University, University Park.

Gardner, J. S., R. J. Wolff, D. Gillespie, and G. W. Duncan, eds. (1976) Village and Household Availability of Contraceptives: Southeast Asia. Seattle, Wash.: Battelle Memorial Institute.

Gille, H. (1977) Recent trends in international population assistance. In Rockefeller Foundation, ed., Bellagio IV Population Conference. New York: Rockefeller Foundation.

Himes, N. E. (1936) Medical History of Contraception. Baltimore, Md.: Williams and Wilkins.

Hong, S. (1976) Fertility and Fertility Limitation in Korean Villages: Community and Individual Level Effects. Unpublished Ph.D. dissertation. Department of Sociology, University of Hawaii, Honolulu.

Inter Governmental Coordinating Committee (1974) Family Planning Administrators and Commercial Marketing Executives. Kuala Lumpur: IGCC Secretariat.

Kee, P.-K. (1981) Population Socialization Research: A Review. Working Paper No. 9. Honolulu: East-West Population Institute.

Keeney, S. M. (1975) East Asia Shares Experience in Family Planning. Taichung, Taiwan: The Chinese Center for International Training in Family Planning.

Kim, J. I., and J. A. Palmore (1978) Personal Networks and the Adoption of Family Planning in Rural Korea. Paper presented at the Fourth Annual Social Networks Colloquium, University of Hawaii, Honolulu.

Kim, T. I., J. A. Ross, and G. C. Worth (1972) The Korean National Family Planning Program. New York: Population Council.

Kinderman, C. R. (1969) Perception and Source of Information: Their Effect on Contraceptive Use in Taiwan. Ph.D. dissertation, Department of Sociology, University of Michigan, Ann Arbor, Mich.

Kirk, D. (1971) A new demographic transition? Pp. 123-147 in National Academy of Sciences, eds., Rapid Population Growth. Baltimore, Md.: The Johns Hopkins University Press.

Knodel, J. (1977) Family limitation and the fertility transition: Evidence from the age patterns of fertility in Europe and Asia. Population Reports 31:219-249.

Knodel, J. (1979) From natural fertility to family limitation: The onset of fertility transition in a sample of German villages. Demography 16:493-521.

Knodel, J., and N. Debavalya (1978) Thailand's reproductive revolution. International Family Planning Perspectives and Digest 4:34-50.

Knodel, J., and E. van de Walle (1979) Lessons from the past: Policy implications of historical fertility studies. Population and Development Review 5:217-245.

Korean Institute for Family Planning (1978) Statistics on Population and Family Planning in Korea, Vol. 1. Seoul: Korean Institute for Family Planning.

Laing, J. E. (1979) Coordination of Outreach and Clinic Activities. 1978 Community Outreach Survey, Preliminary Report No. 2. University of the Philippines Population Institute, Manila.

Lee, S.-B. (1977) System Effects on Family Planning Innovativeness in Korean Villages. Unpublished Ph.D. dissertation. Department of Population Planning, University of Michigan, Ann Arbor, Mich.

Leibenstein, H. (1957) Economic Backwardness and Economic Growth. New Haven, Conn.: Yale University Press.

Lesthaeghe, R. (1977) The Decline of Belgian Fertility, 1800-1970. Princeton, N.J.: Princeton University Press.

Livi-Bacci, M. (1971) A Century of Portuguese Fertility. Princeton, N.J.: Princeton University Press.

Livi-Bacci, M. (1977) A History of Italian Fertility during the Last Two Centuries. Princeton, N.J.: Princeton University Press.

Mauldin, W. P. (1975) Assessment of national family planning programs in developing countries. Studies in Family Planning 6:30-31.

Mauldin, W. P. (1978) Patterns of fertility decline in developing countries, 1950-75. Studies in Family Planning 9:75-84.

Mauldin, W. P., and B. Berelson (1978) Conditions of fertility decline in developing countries, 1965-75. Studies in Family Planning 9:90-147.

Miller, W. B., and R. K. Godwin (1977) Psyche and Demos: Individual Psychology and the Issues of Population. New York: Oxford University Press.

Miller, W. B., and P. E. Hollerbach (1979) A Model for the Cross-Cultural Study for Marital Fertility Regulation. Paper presented at the annual meeting of the Population Association of America, Philadelphia, Pa.

Mosk, C. (1978) Rural-Urban Differentials in Swedish Fertility, 1880-1960. Working Papers in Economics, No. 123. Department of Economics, University of California, Berkeley.

Myers, G. D., and J. M. Roberts (1968) A technique for measuring preference for family size and composition. Eugenics Quarterly 15:164-172.

Nortman, D., and E. Hofstatter (1980) Population and Family Planning Programs: A Compendium of Data through 1978, 10th ed. New York: Population Council.

Palmore, J. A. (1967) The Chicago snowball: A study of the flow of influence and diffusion of family planning information. Pp. 272-363 in D. J. Bogue, eds., Sociological Contributions to Family Planning Research. Chicago: Community and Family Study Center, University of Chicago.

Palmore, J. A. (1968) Awareness sources and stages in the adoption of specific contraceptives. Demography 5:960-972.

Palmore, J. A. (1976) The target that talks back: Personal communication and population research. Pp. 51-55 in S. H. Newman and V. D. Thompson, eds., Population Psychology: Research and Education Issues. Washington, D.C.: U.S. Government Printing Office.

Palmore, J. A., and R. Freedman (1969) Perceptions of contraceptive practice by others: Effects on acceptance. Pp. 224-240 in R. Freedman and J. Y. Takeshita, eds., Family Planning in Taiwan: An Experiment in Social Change. Princeton, N.J.: Princeton University Press.

Palmore, J. A., P. M. Hirsch, and A. B. Marzuki (1971) Interpersonal communication and the diffusion of family planning in West Malaysia. Demography 8:411-425.

Palmore, J. A., M. J. Furlong, F. X. Buchmeier, I. H. Park, and L. M. Souder (1976) Family planning opinion leadership in Korea: 1971. Studies in Family Planning 7:349-356.

Palmore, J. A., C. K. Cheong, K. C. Ahn, S. K. Park, and H. Y. Kwon (1977) Interpersonal family planning communication in Korea 1976: Opinion leadership, home visits by family planning workers, and population problem groups. Pp. 79-105 in D. W. Han, C. K. Cheong, and K. C. Ahn, eds., Reducing Problem Groups in Family Planning IE&C Program. Seoul: Korean Institute for Family Planning.

Pardthaisong, T. (1978) The Recent Fertility Decline in the Chiang Mai Area in Thailand. Paper No. 47. Honolulu: East-West Population Institute.

Perkin, G., and L. Saunders (1979) Extending Contraceptive Use. PIACT Papers No. 5. Seattle, Wash.: Program for the Introduction and Adapation of Contraceptive Technology.

Placek, P. J. (1974-75) Direct mail and information diffusion: Family planning. Public Opinion Quarterly 38:548-561.

Population Council (1978) A Chronicle of the First Twenty-Five Years 1952-1977. New York: Population Council.

Preston, S. H. (1975) The changing relation between mortality and level of development. Population Studies 29:231-248.

Repetto, R. (1977) Correlates of field-worker performance in the Indonesian family planning program: A test of the homophily-heterophily hypothesis. Studies in Family Planning 8:19-21.

Retherford, R. D. (1979) A theory of rapid fertility decline in homogeneous populations. Studies in Family Planning 10:61-67.

Retherford, R. D. (1980) Modeling Sudden and Rapid Fertility Decline. Working Paper No. 1. Honolulu: East-West Population Institute.

Richards, W. D., Jr. (1975) A Manual for Network Analysis (Using the NEGOPY Network Analysis Program). Mimeo. Institute for Communication Research, Stanford University, Stanford, Calif.

Roberto, E. L. (1975) Strategic Decision-Making in a Social Program: The Case of a Family Planning Diffusion. Lexington, Mass.: Lexington Books.

Rockefeller Foundation (1977) Bellagio IV Population Conference. New York: Rockefeller Foundation.

Rogers, E. M. (1962) Diffusion of Innovations. New York: The Free Press.

Rogers, E. M. (1973) Communication Strategies for Family Planning. New York: The Free Press.

Rogers, E. M., and D. L. Kincaid (1981) Communication Networks: Toward a New Paradigm for Research. New York: The Free Press.

Rogers, E. M., and F. F. Shoemaker (1971) Communication of Innovations: A Cross-Cultural Approach. New York: The Free Press.

Rogers, E. M., H. J. Park, K. K. Chung, S.-B. Lee, W. S. Puppa, and B. A. Doe (1976) Network analysis of the diffusion of family planning innovations over time in Korean villages: The role of Mothers' Clubs. Pp. 253-276 in G. C. Chu, S. A. Rahim, and D. L. Kincaid, eds., Communication for Group Transformation in Development. Honolulu: East-West Communication Institute, East-West Center.

Salas, R. M. (1979) International Population Assistance: The First Decade, A Look at the Concepts and Policies Which Have Guided the UNFPA in its First Ten Years. New York: Pergamon Press.

Schramm, W. (1971) Communication in Family Planning. Reports on Population/Family Planning, No. 7. New York: Population Council.

Schrimshaw, S. C. M. (1978) Infant mortality and behavior in the regulation of family size. Population and Development Review 4:383-403.

Shah, N. M., and J. A. Palmore (1979) Desired family size and contraceptive use in Pakistan. International Family Planning Perspectives 5:143-149.

Shannon, C. E., and W. Weaver (1949) The Mathematical Theory of Communication. Urbana, Ill.: University of Illinois Press.

Sun, T. H., H. S. Lin, and R. Freedman (1978) Trends in fertility, family size preferences, and family planning practice: Taiwan, 1961-76. Studies in Family Planning 9:54-70.

Terhune, K. W., and S. Kaufman (1973) The family size utility function. Demography 10:399-418.

Thomas, W. I., and D. S. Thomas (1928) The Child in America: Behavior Problems and Programs. New York: Alfred A. Knopf.

United Nations (1972) The Role of Voluntary Organizations in National Family Planning Programmes. Asian Population Studies Series No. 13. Bangkok: Economic Commission for Asia and the Far East.

United Nations (1976) Role of Surveys and Studies in Family Planning Programme Management and Development. Asian Population Studies Series No. 24. Bangkok: Economic Commission for Asia and the Far East.

United Nations (1977) Report on a Comparative Study on the Administration of Family Planning Programmes in the ESCAP Region: Organizational Determinants of Performance in Family Planning Services. Asian Population Studies Series No. 29. Bangkok: Economic and Social Commission for Asia and the Pacific.

United Nations Fund for Population Activities (UNFPA) (1979) Consultation on Population Assistance Co-ordination, Geneva. New York: United Nations Fund for Population Activities.

van de Walle, E., and J. Knodel (1980) Europe's fertility transition: New evidence and lessons for today's developing world. Population Bulletin 34(6).

Westoff, C. F. (1978) The unmet need for birth control in five Asian countries. Family Planning Perspectives 10:173-181.

Westoff, C. F., N. Goldman, S.-E. Khoo, and M. K. Choe (1980) The recent demographic history of sterilization in Korea. International Family Planning Perspectives 6:136-145.

World Bank (1972) Population Planning: Sector Working Paper. Washington, D.C.: World Bank.

Chapter 27

FERTILITY DECISION-MAKING PROCESSES: A CRITICAL ESSAY

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Previous chapters have examined the elements involved in fertility decisions--the demand for children, the supply of children, and the costs of fertility regulation. The assumption has been that these elements affect fertility because individuals somehow take all of them into account; however, the manner in which this actually transpires is a relatively new focus of inquiry. Individual perceptions, motivations, and decision processes have been increasingly investigated because they are assumed to have predictive power in explaining fertility behavior. In developing nations, greater use of effective fertility regulation promotes a closer association between fertility preferences and actual behavior; within various developed nations, a narrowing of demographic differentials in fertility also means that personal preferences have become more important.

This essay reviews insights on this issue provided in other chapters, and examines how these insights complement one another. In addition, aspects of the fertility decision-making process not directly addressed elsewhere will be examined. The outline of the essay is as follows. Models of fertility decision making require that the individual, couple, or household first forms perceptions of the major elements in the decision. These perceptions of supply (fecundity, child survival), demand (the value of children, sex preferences), and fertility regulation costs (characteristics of contraceptive methods, consequences of use) may differ from objective assessments. The first section of the essay reviews information on these perceptions, providing more detail about supply and alternatives to fertility to complement the discussions of perceptions of demand and perceptions of regulation costs in other chapters. The second section identifies various decision types such as nonrational decisions, ambivalent decisions, and passive and active decisions. In the third section, various decision rules and decision-making models that represent the way individuals combine and weigh factors in decisions are examined. In connection with this discussion, limitations on rational models are covered. The fourth section discusses the more elaborate sequential model for fertility decisions. The fifth section discusses how the perspectives of the two spouses as well as those of other family and nonfamily members are weighed in a decision. The sixth section, finally, considers

differences in the decision process between pretransition and posttransition societies.

PERCEPTIONS OF SUPPLY, DEMAND, AND FERTILITY REGULATION COSTS

Perceptions of Supply

The perceived supply of children depends on a woman's assessment of her fecundity and of the chances of infant and child survival. With regard to perceived fecundity, individuals may deny susceptibility to pregnancy, recognize it as a statistical possibility but not a personal probability, or perceive direct susceptibility. Women appear more likely to err on the side of perceiving higher rather than lower fecundity: in comparison with studies of sterility in natural fertility populations at various ages, self-reports in survey data appear to considerably understate the true proportions sterile (Nortman, 1982). For instance, in a recent analysis of nine Contraceptive Prevalence Surveys conducted by Westinghouse Health Systems in Bangladesh, Colombia, Costa Rica, the Republic of Korea, rural and urban sectors of Mexico, and Thailand, reported infecundity among married women of reproductive age ranged from 6 percent in Costa Rica to 9 percent in South Korea (Nortman, 1982). Summary reports from selected World Fertility Survey (WFS) countries indicate that the proportion of women in union reporting that they think themselves and their husbands physically incapable of having a child ranges from 5 percent to 15 percent and of course varies by the age composition of the sample. In a reinterview following the Indonesian WFS, the reliability of this measure was assessed. Given the total proportion of women who provided similar responses in both surveys, the question appears to be reliable. However, the relatively high proportions of women for whom no answer was available (17-22 percent), or who could not respond to the question (11 percent), indicate problems of validity or reluctance to acknowledge subfecundity (MacDonald et al., 1978).

Fecundity is difficult to measure; it is influenced by heredity, health, age, and regularity of the menstrual cycle, and assessments must also take account of the complicating effects of frequency and regularity of intercourse, duration of postpartum breastfeeding, spontaneous intrauterine mortality, induced abortion, postpartum infecundability, and sterilization. Women appear to base their judgments of fecundity on various criteria. In developed countries, the most significant criterion appears to be the time required to achieve conception. Other criteria include the pattern of the menstrual cycle and flow; the occurrence of a conception while using contraception, or the failure to conceive while not using contraception; maternal childbearing history; and current health conditions or medical tests (Miller, 1981b). In developing countries, there is very little research on the topic; one rural Mexican study suggests that two significant criteria are the time required to achieve conception and number of live births. In addition, variation

in beliefs on the interrelationship between exposure to intercourse and the probability of pregnancy were also reported for this sample (Shedlin and Hollerbach, 1981). The pattern of the menstrual cycle also appears to be significant, since it offers regular reassurance of nonpregnancy and indicates that the body is eliminating "impure" blood, a condition perceived as necessary for the maintenance of health; the latter belief is more widespread among older, less-educated, and rural women in the ten-country investigation conducted by the World Health Organization (WHO Task Force, 1981).

The second component of perceived supply is perceived infant and child survival. If mortality is viewed as high, couples must have more births in order to have the expectation of attaining any desired family size; on the other hand, higher perceived mortality may reduce the demand for surviving children, e.g., through increasing the costs of attaining a particular surviving family size. Perceptions are typically measured by asking respondents to assess the number surviving to a specific age (such as 15) among a hypothetical number of births, sometimes the average for women in the area. Analyses relating perceptions to actual fertility behavior are scant and difficult to interpret. As Bongaarts and Menken note (in these volumes), it may also make sense to assess the number of surviving adult children (or sons specifically) when parents reach age 45 (indicating the supply of children as insurance against economic risks) and the number of surviving adult children when parents reach age 65 (indicating the supply of children for old age security). Respondents have not been asked such questions, however.

Perceptions of lower child survival have some positive effect on fertility preferences and behavior in Taiwanese townships (Heer and Wu, 1975, 1978), although research conducted in Guatemala, where mortality is higher, shows no association between perception of child survival and fertility desires (Pebley et al., 1979). It is difficult to separate the influence of this factor from that of many other influences on fertility desires and behavior, such as mother's age, parity, education, residence, and access to health services (see Heer, in these volumes). Moreover, assessments of general probabilities of survival may differ from personal assessments of risk.

It might be expected that perceptions of general survival levels would be greatly affected by the experience of losing a child. However, those who had and had not lost children showed no sharp differences in the perceived value of children or family-size preferences in a study conducted among Javanese and Sundanese parents in Indonesia (Darroch et al., 1981). Part of the reason may have been that relatively large numbers of couples had experienced child loss. Differentials in perceptions that may affect fertility may occur only as child loss becomes rarer within the society. That expectations of high mortality can be especially persistent despite change in actual probabilities is suggested by a study of Australian, Greek, and Italian parents in Sydney, Australia (Callan, 1980). Greek parents were the most concerned about the possible death of an only child and the concomitant loss of parental status; their fears about child loss were related to the high incidence of child mortality they had

witnessed during their youth in rural Greece, rather than to their experiences in Australia.

Perceptions of Demand

Perceptions are also important with regard to demand for children. Various approaches have been undertaken to measure perceptions of demand, including direct measures of fertility desires and preferences; unfolding theory, especially for assessment of family-size ranges and sex preferences; research on the value of children; and attitude scaling to measure the subjective utility or expected value of children.

Survey responses on these measures are available for a wide variety of less developed country settings, and the evidence available suggests that these measures of perceptions are related to fertility behavior. Fertility desires are related to actual fertility (see McClelland, in these volumes; Pullum, in these volumes); value-of-children indices predict fertility to some extent and vary according to the level of economic development and modernization within a country (Arnold et al., 1975; Fawcett, in these volumes). Perceptions of the value of children also differ by social class and parity, as do the weights parents attach to these costs and benefits in the process of decision making (Bulatao, 1979a, 1979b, 1981). Perceptions regarding the importance of sons and daughters also affect demand. Attitude scaling measures of the subjective utility or the expected value of children satisfactorily predict actual fertility behavior or intentions, although most of the research, to be reviewed in a later section of this chapter, has been conducted within developed-nation contexts. Finally, research has focused on a more difficult topic, estimation of the actual economic costs and benefits of children, primarily the labor contribution of children to parents within rural households.

Despite the varied research already undertaken on perceptions of demand, a few areas related to the perceived and objective utility of children require further clarification and evaluation. Investigation of perceptions of economic benefits and costs, especially educational costs, as well as socioemotional costs and benefits within economically homogeneous and heterogeneous settings, would be a useful complement to research on the actual economic contributions of children. Variation in perceptions among husbands and wives, and by parity and socioeconomic status, should be examined. Although couples in the least developed nations show strong awareness of the economic values of children and couples in developed-country settings stress socioemotional values, noneconomic benefits no doubt exist at all stages of development, and are associated with alternative sources of status for women (see Oppong, in these volumes).

Similarly, parental expectations of old age support from surviving children in less developed nations have been substantiated. However, data are scant on the salience of such concerns among couples during their childbearing years, and on the actual contributions of children

to old age support, such as financial aid, social exchange, and intergenerational coresidence. The possible associations between perceptions of old age support and perceptions of spouse and child survival to various ages should be investigated. Institutional social security systems, cooperatives, unions, and credit and savings institutions, if implemented on a large scale, provide couples with alternative investment strategies, and may help to reduce but will not eliminate the economic value of children as sources of old age security. The impact of such programs on changing perceptions of the economic value of children needs to be examined (see Lindert, in these volumes). Finally, there is limited evidence on actual parental reliance on children as a source of income when usual earnings are reduced because of environmental events, widowhood, or loss of land or employment, and the extent to which perceptions of such risks influence fertility behavior (Cain, 1981; Potter, in these volumes). The opposite situation--perceptions of improved living conditions and of the probability of social mobility, and their impact on fertility--also requires investigation.

Perceptions of Fertility Regulation Costs

The motivation to space births or terminate childbearing depends not only on perceptions of supply and demand but also on the perceived characteristics and costs of fertility regulation methods. Research on the costs of fertility regulation includes both subjective costs (normative and psychic costs, fears of serious and minor side effects) and objective costs (time, distance, and monetary costs involved in acquiring knowledge and access to fertility regulation and actual side effects associated with methods). Perceived costs of fertility regulation are more salient within less developed nations in decisions to initiate and continue contraception, but are amenable to change.

Monetary, time, and health costs of contraception in both developing and developed nations are examined by Schearer (in these volumes). Although monetary costs can have a significant effect on levels of use in developing nations, these should be offset by active public family planning programs, which considerably reduce the level of cost. Unfortunately however, data assessing this impact are extremely limited, inconclusive, and sometimes contradictory. Data on the impact of perceptions of costs are even more limited, but demonstrate that, in some societies, couples would prefer to pay moderate charges for contraceptives than receive them free (see Schearer, in these volumes).

Travel time, means of transport, and distance costs involved in the acquisition of supplies have recently been investigated through World Fertility Survey data measuring perceptions of these costs. Whereas assessments of time of travel can be obtained from most respondents, only a minority can estimate distance (Rodriguez, 1977). There is substantial evidence that limited availability of contraceptive supplies results in high fertility. Rodriguez (1978), analyzing the effect of perceived availability and accessibility of

family planning services (i.e., knowledge of a nearby outlet), reported that current use of effective contraception among exposed women who desired no more children increased as perceived accessibility of services increased in Colombia, Korea, and Malaysia, but not in Costa Rica, where unmet need was uniformly low. However, for Colombia, Korea, and Malaysia, the effect of perceived accessibility was greatly reduced after controlling for various sociodemographic variables, especially place of residence.

With regard to health costs and benefits of contraception, all methods provide at least partial protection against pregnancy, thereby reducing the incidence of potential adverse effects of pregnancy and childbirth, especially in developing nations. However, these potential benefits must be weighed against the major and minor side effects associated with the methods available for use. In developing nations, objective information on serious side effects or health hazards appears very limited; however, fears and misconceptions regarding serious and especially minor side effects strongly affect contraceptive use, selection of particular methods, and therefore fertility. Approximately one-third of women in these countries who discontinue methods report minor side effects as the underlying reason, and drop-out rates far exceed those in developed nations. Attributes of contraceptives which are most significant in method selection are effectiveness, absence of side effects, desired duration of action, and length of time until return of fertility; convenience of use and route of administration are of far less importance (Marsella et al., 1979; WHO Task Force, 1980). Among a variety of contraceptive side effects, alterations in menstrual bleeding patterns are particularly significant, since they are associated with many different types of contraceptives. The impact of misinformation and fears associated with minor side effects is likely to decline with the diffusion of information and services, a topic which should be empirically investigated. However, the significance of serious objective health hazards is likely to increase as levels of information and education increase (see Schearer, in these volumes).

Frameworks relating to the various factors determining acceptability of fertility regulation methods have been formulated (Freedman and Berelson, 1976). Despite these categorizations, systematic integrative models of normative and psychic costs have not been devised and tested in cross-cultural investigations. In standard classifications, these factors are merely grouped together as personal reasons for method discontinuation, a category including personal, social, or cultural factors, as well as discontinuation for a desired pregnancy. The categorization does not provide sufficient data on the sociocultural and psychological reasons for termination.

Based on a variety of studies, Bogue (in these volumes) attempts to estimate the prevalence of a cost (proportion of the population of reproductive age that experiences a particular cost) and the impact of a cost (the degree of association between the cost and contraceptive use). He concludes that major normative and psychic costs of contraception include fears of major and minor side effects of methods, anxiety over contraceptive failure, and the need to discuss

contraception with the spouse. Still other costs less well documented in the literature, such as the threat to moral and religious beliefs, questions about the legitimacy of contraceptive use, insecurity regarding family status, and fear of infant deaths are moderately important. Still other costs less well documented in the literature, such as the threat to harmony in the extended family, discord between spouses, interference with sexual relationships, shyness at a gynecological examination, and the perceived risks of contraceptive failure are comparatively minor, neither very prevalent nor very significant in affecting contraceptive practice.

However, in the absence of systematic data on psychic and normative costs associated with contraceptive nonuse and discontinuation, these conclusions must be considered tentative. The prevalence and impact of normative and psychic costs will differ widely among different sociodemographic groups and have important programmatic implications for service delivery. The impact of these costs should be assessed not only by comparing users and nonusers but also, separately, among those who desire to space or terminate fertility, but are not using or do not intend to use a method; those who have previously used but have discontinued methods, especially after a short period of time; and those who are potential acceptors of contraception but are not currently exposed due to pregnancy or breastfeeding. The impact of normative and psychic costs of contraception should be higher within these subgroups.

Data on the perceived costs of abortion are much more limited and pertain to women who report previous use, or small samples of abortion patients, rather than to all women of reproductive age (David, in these volumes). Although psychic costs are difficult to assess, U.S. data demonstrate that, for the vast majority of women receiving abortions, feelings of guilt and depression, when noted, are mild and transitory. In developing nations, where abortion is typically illegal, use is seriously underreported, but appears related to women's exaggerated fears of contraceptive side effects, their knowledge of service providers, the accessibility of these providers, the methods they utilize in abortion procedures, and the financial costs (David, in these volumes). Thus, accessibility, monetary, and health factors seem to be associated with abortion use in developing countries. Data on normative and psychic costs of abortion in developing nations are too scant to warrant even tentative conclusions, although the high level of underreporting is indicative of the normative costs where abortion is not legalized.

Alternatives to Fertility

Fertility decisions, like all other decisions, involve choices among alternative behaviors. Some psychosocial models have incorporated perceptions of trade-offs between perceived costs and benefits of children and perceived costs and benefits of contraception and abortion, as well as perceived fecundity (Hass, 1974; Luker, 1975; Steinhoff et al., 1971). But relatively few psychosocial models have

examined perceptions of alternatives to fertility for the attainment of these values, especially in developing nations, in part due to the relative scarcity of such avenues. Psychosocial models which have included this dimension have been tested exclusively within the U.S.

One theoretical schema does incorporate alternatives: motivations for and against childbearing are seen as determined by the value of children, alternatives to children which fulfill the same values, the costs incurred (what must be lost or sacrificed) in order to obtain these values, and barriers and facilitators (Hoffman and Hoffman, 1973). Costs include factors like consumption expenditures (education, food, clothing, and medical care), the reduction in family savings and alternative investments, and foregone opportunities for female labor force participation. Barriers and facilitators include such factors as socioeconomic status, community norms, and work and time demands.

As noted by Oppong (in these volumes), high fertility is associated with the economic values provided by children for women. These benefits include child labor, household assistance, old age security, a guarantee of the husband's continued economic support, and strengthened ties with kin who contribute to labor-intensive production. Children also provide political status within the community: they ensure kinship ties, and may increase women's familial influence and power, including their control over their own labor, marital alliances, and future fertility. Children can provide social status because of the approval, prestige, and deference accorded to marriage and motherhood, leading to greater seniority within the domestic group and extended family. Finally, psychic satisfaction can be obtained through the companionship and love of children.

All of these maternal role rewards are hypothesized to be associated with pronatalist role expectations and behaviors. The expansion of alternative role rewards, or other opportunities for women, as well as men, to obtain economic, political, and social status and psychic satisfaction and pleasure, depend upon the level of economic development and the social constraints imposed by sex roles. These constraints in turn involve required allocations of time and material resources to different roles, imposing opportunity costs in time and money on childcare.

The shift of women's activities from domestic to public spheres can be attained through the provision of a variety of alternative sources of status. Employment opportunities, in particular, can provide alternative sources of economic and political status previously provided by children and increase motivation for fertility regulation. The perceived opportunity costs of children at later stages of development can also be raised by an increase in female wage rates concomitant with rising educational attainment; reduction in the labor substitutability of children; and greater childcare constraints (due to reduced reliance on the extended family and siblings for childcare, the higher cost of childcare substitutes, and greater equality in the division of domestic labor) (see Standing, in these volumes).

Aside from occupational opportunities, Oppong (in these volumes) suggests that greater political and social status and psychic satisfaction can be provided through greater leisure time to pursue education, training, and personal pleasure, possibilities for community and civic participation, and opportunities for individual recreation outside the home. When childcare is incompatible with them, these alternative sources of status will raise the perceived opportunity costs of childcare and increase motivation to regulate fertility. Finally, within the home, relative freedom from the constraints of kin, relatives, and spouse; shifts in the division of labor between husband and wife, with greater sharing of domestic labor; and development of companionate marital relationships can also reduce constraints on the selection of alternative sources of status, and provide psychic satisfaction and pleasure as well.

The key concern is the alternatives couples perceive for obtaining the rewards that children provide, or aspects of modernization that make such alternatives more attractive by stimulating perceptions of higher time and money costs of children and childcare. The absence of such alternatives within developing nations is both the primary cause and an effect of high fertility. The impact of such forces within communities can be assessed through psychosocial studies which gather data on the perceived costs and benefits of children, actual role behavior (best gathered through time-budget studies), preferred sex-role behavior, and perceived constraints to alternative sex roles.

Psychosocial research on the topic is limited and inferential, offering partial support for the relationship between alternative sources of status, the value of children, and fertility regulation. Using data from Mexico City and Ankara, Turkey, Bagozzi and Van Loo (1978) have tested with some success the proposition that socioeconomic variables (normative social structure and stratification) and economic constraints (income and price) influence fertility through their impact on social-psychological processes within the family. These processes include the nature of husband-wife interaction (power, conflict, decision making, and marital satisfaction), which in turn determines family size. Research by Scanzoni (1975) in the urban United States also supports the proposition that more modern egalitarian family attitudes and interaction are related to lower demand for children. Another study using national survey data of the value of children to American couples in the childbearing years (Hoffman et al., 1978) tested the hypothesis that the presence of few alternative means for satisfying a particular need would increase the value of children for satisfying this need. This hypothesis did receive some limited empirical support from an examination of subgroup differences, although intensity of need was not considered in the analysis. For instance, low socioeconomic groups with less access to economic resources attached more importance to economic utility values than did others. Women with traditional sex-role definitions valued adult status more than others, and unemployed women gave more importance to fun and stimulation as a perceived value of children.

The complexity of perceptions of supply, demand, and regulation costs, and the degree to which they often differ from objective assessments and are influenced by alternatives to fertility, suggest the importance of considering the decision process as both psychological and social, rather than simply a balancing of economic utilities. Perceptions partly determine the types of decisions that are made, a topic that is considered next.

TYPES OF FERTILITY DECISIONS

One approach to studying fertility decisions is to create typologies of decisions. The more important distinctions are discussed here. Nondecisions may be said to occur when a couple does not foresee that pregnancy results from particular actions, misperceives their fecundity, or lacks knowledge of fertility regulation. Passive decisions take place when restricted perceptions and particular habits or customs, institutionalized within the culture, reinforce the childbearing behavior functional for group survival or growth and leave individuals with little perceived choice (Hull, in these volumes). An alternative characterization of both situations is to say such couples are in a preawareness stage of decision making (Miller and Godwin, 1977); though they make decisions relating to marriage, breastfeeding, sexual relations, and infant and childcare that indirectly affect fertility, decisions directly relating to fertility goals are precluded by lack of knowledge. Another interpretation of passive decision making posits a situation in which individuals or couples act according to internalized social norms regarding appropriate minimum family size or act on the basis of their assumptions about partners' fertility desires. In such situations, the benefits of childbearing are socially reinforced, internalized and recognized, but the relative costs and benefits of childbearing and alternatives to childbearing are not actively discussed and weighed until some later stage (Hollerbach, 1980).

For more active decision making to take place, a couple must be aware of a number of things: the probability of pregnancy, the possibility of regulating fertility, and the fact that costs and benefits are attached to the fertility outcome. Fertility may then be said to be salient to the couple (Hass, 1974; Shedlin and Hollerbach, 1981). Alternatively, the key factor in active decision making may be seen as the weakness of external incentives or internalized motivations to bear children. Individual perceptions of child costs and benefits may then be considered and weighed against one another and against alternatives to childbearing (Fawcett et al., 1972). Active consideration of the consequences of fertility behavior may result in a decision to regulate fertility or to have additional children; however, it may also result in an implicit decision to do nothing. In this case, through the process called behavioral drift, a series of small decisions may lead by default to an unintended major decision. For instance, a series of decisions to have unprotected intercourse may eventually produce an unintended pregnancy (Neal and

Grote, 1980). Such decisions are sometimes characterized as ambivalent. Ambivalence is most noted among the high proportions of women who state that they do not want additional children but are not practicing contraception. High ambivalence about the probability or desirability of pregnancy, about a sexual partner and couple communication, and about the medical, social, and psychological implications of contraceptive use have been found in studies of unwanted pregnancy among adolescents and abortion patients in the U.S. (Kantner and Zelnik, 1973; Kellerhals and Wirth, 1972; Kerenyi et al., 1973); similar observations have been made for multiparous Mexican women considering contraception (Shedlin and Hollerbach, 1981) and for Colombian women considering abortion (Browner, 1979). Women feeling such ambivalence are also more likely to experience failure when they do practice contraception (Jones et al., 1980).

Decisions may also be nonrational if individuals act against their better interests; regret over previous decisions may be seen as indicating irrationality. When one individual has the power to enforce a decision on another, decision making may be termed coercive, although even this behavior involves elements of choice. Also, decisions can be categorized as joint if reached by two or more individuals on the basis of accommodation, compromise, compliance, or mutual agreement, or unilateral if made by one or more individuals in conflict with the desires of another, either openly or surreptitiously (Hollerbach, 1980).

RULES AND MODELS FOR FERTILITY DECISIONS

Research on how individuals choose among alternative fertility behaviors and how they weigh the different perceptions involved has led some to propose simple rules and more complex psychosocial models. Leibenstein (1981) has proposed a hierarchy of rules for fertility decisions: choice may be based on some ethic, or on some definition of conventional behavior, or on partial calculation, or on full calculation. The first two of these alternatives will be considered together briefly, and then the second two. More complex decision models generally assume some degree of calculation. Among these, the most frequently applied to fertility behavior--though mainly in the United States--are subjective expected utility, expectancy x value, and judgment-value-integration-choice models.

Choice by Ethic or Conventional Behavior

In Leibenstein's (1981) hierarchy of decision rules, the first two strategies of choice--on the basis of some ethic and on the basis of some definition of conventional behavior--are influenced by cultural or normative factors. Recourse to either of these rules involves following precedent, and allows the individual to avoid the effort of continual decision making and monitoring of consequences. Fertility decisions that arise repeatedly, such as those related to coital

frequency or contraceptive use, are likely to follow one of these rules (Hull, in these volumes); those that are unique (such as age at first coitus), infrequent (marriage), or regarded as serious (abortion or infanticide) are more likely to involve one of the other rules to be discussed next.

Maximization of Utility and Satisficing

These two strategies have received the greatest attention in the theoretical literature. Maximization of utility, or full calculation in Leibenstein's terms, involves comparing alternative strategies and selecting the best. Satisficing, or partial calculation, involves selecting some satisfactory alternative that meets minimum expectations or demands, though it may not be the best among all possible options (Demeny, 1970; Leibenstein, 1981; Simon, 1979). The focus in satisficing is not on absolute rationality, but on rationality given constraints on information, time, and perceptions. The range of options considered in satisficing may be limited for various reasons. The individual may not consider options that violate his or her image of family life, may exclude the consideration of alternatives because of social pressure, or may perceive certain limitations to the possibility of upward mobility (McNicoll, 1980).

Although theories abound, only limited research exists on the degree to which these two strategies are used, and none of this research pertains to fertility behavior. In a small-scale study involving comparative ratings of films, Mills et al. (1977) found a tendency to use a maximizing strategy in situations offering few alternative choices; satisficing was more prevalent in situations offering a larger number of options, when the task of comparing those options was thought to be arduous or possibly to exceed the limits of information processing, and when choices were presented in sequential order.

The Subjective Expected Utility Model

More complex decision models all assume calculation by individuals of the costs and benefits associated with childbearing and fertility regulation. In the subjective expected utility (SEU) model, consequences of behavior are assumed to vary according to their desirability or utility (or the degree to which they are expected to be liked or disliked) and their subjective probability (the perceived probability that they will actually result from the particular behavior). The SEU of a particular behavior is the sum across all relevant consequences of the products of desirability and subjective probability. SEU and behavior are reciprocally related: SEU determines when behavior occurs, and the behavior itself produces modifications in SEU through the incorporation of new consequences that were not originally expected, or through changes, based on actual experience, in the subjective probability and desirability associated

with particular consequences; a modified SEU would then influence subsequent behavior (Edwards, 1954; Lee, 1971).

The theory has not been applied in developing countries. It has been applied in assessing American husbands' and wives' positive and negative birth planning values at different parities and the ability of this hierarchy of values to predict actual fertility within limited time periods (Beach et al., 1976; Townes et al., 1977). In the small sample studied, there were few pregnancies or attempts to become pregnant within a year among couples for whom no pregnancy was predicted by the SEU measure; among those for whom maximum SEU would be derived from having a child, approximately half reported a pregnancy attempt. Another investigation of sexual behavior among American adolescents (Bauman and Udry, 1981) also generally confirmed the SEU model. SEU scores were related to sexual behavior among both men and women; however, SEU scores did not completely explain racial differences in sexual intercourse among males.

The Expectancy x Value Model

The expectancy x value model was originally developed by Fishbein (1972; also see Fishbein and Jaccard, 1973). It posits that behavioral intentions are determined by both attitudinal and normative variables; in the equation $BI = (\sum B_i A_i) w_1 + (\sum NB_i MC_i) w_2$, an individual's intention to perform some behavior (BI) is a function of that individual's beliefs about the consequences of performing the behavior (B_i) and the evaluation of these consequences (A_i), as well as his beliefs about what others think he should do (NB_i) and his motivation to comply with those others (MC_i). Empirically determined weights w_1 and w_2 reflect the relative importance of each component in the determination of BI.

In empirical studies, behavioral intentions may be represented by intentions to use contraception in general, to use a particular method, or to have a child. Rating-scale measures of beliefs (B_i and NB_i) and values (A_i and MC_i) are generally obtained, combined, and correlated with measures of intentions to test the model. The first sum of products corresponds to individual utilities, whereas the second corresponds to social norms (Jaccard and Davidson, 1976).

The Fishbein model has important limitations. The consequences to be evaluated are not specified by the model (Adler, 1979). Moreover, since multiplication is required, the model assumes that ratings are on ratio scales, which is seldom in fact the case (Schmidt, 1973). Furthermore, the model assumes rational decision making and maximization of utility, thus imposing a decisional framework that may not be accurate. One advantage of the approach, nevertheless, is its incorporation of a normative component to constrain individual choices.

The model has been used repeatedly in U.S. studies to explain various family planning practices as well as the demand for children (Cohen et al., 1978; Davidson et al., 1976; Fishbein and Jaccard, 1973; Fisher et al., 1976; Jaccard and Davidson, 1975; Werner et al.,

1975). Behaviors or intentions predicted with some success by the model over fairly limited time spans (two or three years) include having another child or a two-child family, using birth control pills, contraceptive purchases, types of contraceptives chosen, and the acceptability of actual and hypothetical male contraceptives.

Cross-cultural research based on the Fishbein model is extremely limited. Davidson et al. (1976) compared an American sample with two Mexican samples: college students and low-status women in Mexico City. Intentions to have a two-child family, to use birth control pills, and to have a child in the next two years (among the married women) were predicted as well in the Mexican samples as in the U.S. sample, the multiple correlation coefficients ranging from 0.66 to 0.87. Interestingly, the attitudinal component was the better predictor of intentions for the U.S. and Mexican college samples, whereas the normative component was the better predictor of intentions among the low-status Mexican women. Thus, the appropriate weights of the components of the model vary from sample to sample.

Finally, some research indicates that this model is less effective in predicting a behavior when the individual has no prior experience with that behavior; when the behavior is not directly within the individual's control; when the measure of intention is more abstract; and when the interval between measurement of intention and behavior is longer (Jaccard and Davidson, 1975; Davidson and Jaccard, 1979).

The Judgment-Valuation-Integration-Choice Model

The final model of the fertility decision-making process consists of four major stages: judgment, during which the decision maker identifies the possible consequences of a behavior; valuation, in which each perceived consequence is assigned some subjective value according to its desirability; integration, in which the values of the consequences are combined to form an overall evaluation of the behavior; and choice, in which the individual compares the overall evaluations of a number of behaviors and selects the optimal behavior. Many decisions will be suboptimal because of errors in judgment. Moreover, since individual differences can exist at each stage of the decision sequence, the same choice can result from different sets of beliefs, values, and integration rules (McClelland, 1980).

In particular, integration rules are allowed to vary across individuals. Three main types of rules are posited: additive, in which the overall evaluation of each alternative is the sum of the values attached to each of its consequences; conjunctive/additive, in which an individual eliminates all alternatives with some unacceptable consequence and then evaluates the remaining alternatives according to an additive model; and one-consequence, in which the comparisons across behaviors are based on only one consequence and respondents are indifferent to all other consequences.

In a first test of the model, the framework has been applied to

clients of a U.S. family planning clinic (Nickerson et al., 1981), who were asked about their judgments of three characteristics of contraceptive methods; their preference orderings of alternative behaviors (to provide integration rules), from which their evaluations of the consequences were inferred; and their actual choices, represented in rankings of birth control methods from most to least preferred. The framework accurately described the contraceptive decision-making process of 56 percent of the respondents able to complete all required tasks. The largest group used the additive integration rule, fewer used the conjunctive/additive rule, and a few used the one-consequence rule. Errors in response were attributed to factors such as the restricted set of consequences being considered, lack of prior thought or low salience of the issue to respondents, and difficulty in understanding the task.

Limitations to Rationality

Except for decisions by ethic or conventional behavior, all the rules and models described involve some degree of rationality. It is important to note various impediments to rational decision making that may make particular models less applicable.

First, the consequences or outcomes of actions are not always known and sometimes cannot be taken into account. For instance, under environments of high mortality, a decision to terminate childbearing must be weighed against the unknown possibilities of future widowhood or child mortality. Possible loss of income due to environmental factors may also produce a situation of unknown future risks, and fertility regulation may therefore seem inappropriate (Cain, 1981); the use of fertility regulation itself may have unknown associated health risks. Fertility decisions which cannot take all consequences into account may in retrospect appear irrational.

Second, individuals differ in their ability to acquire accurate information on probabilities (Pitz, 1980; Pitz et al., 1980) and may inaccurately judge the likelihood of different consequences (Tversky and Kahneman, 1974). For instance, cultural differences have been noted in the probability parents attach to having a son or a daughter; these perceived probabilities can systematically deviate from the true ones. When gender preference affects fertility, these cultural variations in perceptions can have some effect (McClelland and Hackenberg, 1978). Similarly, individuals differ in their assessments of the probability and severity of side effects of fertility regulation methods and the efficacy of methods in preventing pregnancy (Bardwick, 1973; Miller, 1975). For instance, contraceptive use in Egypt is comparatively low among respondents who are unsure of or fatalistic about their ability to control family size (see Bogue, in these volumes). Actual experience and knowledge of recent occurrences among acquaintances have the greatest effects on these perceptions (Tversky and Kahneman, 1974). When the probability of contraceptive failure or side effects is assessed from acquaintances' experiences or by analogy to other types of health risks, predictable biases can

result.

Third, collecting information on consequences and probabilities is time-consuming, and the value of the information may be outweighed by the costs of its collection, especially in developing nations (Meeker, 1980). Better-educated individuals or those with greater exposure to the mass media can more easily obtain accurate information on the costs of contraception. The less-educated may bear higher information costs. Information costs have important effects: the kind of information available prior to use affects satisfaction with and later perceptions of contraceptive methods and therefore continuation of use (WHO, 1977). Balanced information on the advantages and disadvantages of contraceptive methods and free choice among them also lead to different choices than when decisions are influenced by the preferences of clinic personnel (WHO Task Force, 1980).

Fourth, the decision-making process itself has other associated normative and psychic costs, such as the acknowledgment it requires of sexual activity, shyness associated with medical examination, the need to discuss family planning with the partner or with others, and fear of disclosure. These costs, discussed by Bogue (in these volumes), may also lead to suboptimal decisions, and are assumed to be a major psychic costs of fertility regulation in developing nations.

Fifth, fertility decisions may involve a mix of consequences, costs, and benefits that produces a situation of ambivalence. For instance, decisions to regulate fertility may be weighed against fears of abandonment, community censure, or familial discord (Shedlin and Hollerbach, 1981). Even when such consequences do not determine the decision, they can increase the individual's insecurity about it. Ambivalence and the absence of clear-cut decisions may mean a failure to maximize utility or may lead to the surreptitious practice of contraception, which also involves psychic costs associated with risk taking.

Finally, the degree of rationality may depend on whose perspective is being considered. Meeker (1980) contends that marital fertility decisions generally attempt to maximize the total reward to all members of the household. Caldwell (in these volumes) cautions, however, that it may be the living standard of the older generation or the satisfaction of one member of the nuclear family, such as the husband, that dominates decision making. The consequences of having several people involved in a decision will be discussed further after consideration of another complication in the application of the preceding rules and models--the possibility that decisions on ultimate fertility are made sequentially and are subject to revision.

SEQUENTIAL FERTILITY DECISIONS

Fertility decisions are linked to the life course. Each birth may be influenced by a different set of motivational, cultural, and family conditions, and fertility decision making therefore involves a complex series of decisions over the life cycle. The sequential or successive

decisions approach investigates this premise and attempts to determine whether and how influences on fertility decisions change (Namboodiri, in these volumes). In principle, the rules and models just described could be applied sequentially to a series of fertility decisions, but the focus in that research has been on confirming the models rather than on using them to understand changing decision patterns.

One critical way in which decision patterns may change in the life course is in the impact of norms. Empirical evidence indicates that there is widespread agreement within and across societies on norms prescribing minimum family size, but far less agreement on maximum norms (Mason, in these volumes). Fertility plans and behavior before a couple attains the norm may be determined primarily by normative pressures; for those above the floor, however, the absence of a maximum norm may mean much greater individual discretion and more recourse to specific cost-benefit calculations. For instance, middle-class couples in a longitudinal U.S. study reported feeling under pressure from family and friends in decisions to remain childless or to have only one child, but not in decisions about a second child (Miller, 1981b). There is conflicting evidence about this proposition, however (Bulatao and Fawcett, 1981), possibly because normative pressures are subtle and may not be recognized as such by those being influenced, or such pressures may simply be internalized and expressed as personal motivations; the institutional contexts of such pressures are complex and difficult to measure through survey interviews; and subgroups within a society may differ in their normative family-size thresholds (Namboodiri, in these volumes).

Changes in the influence of socioeconomic characteristics on fertility decisions across parities have been studied mainly with cross-sectional data from the United States. A number of these studies have consistently shown that permanent income has a positive effect on the propensity to have additional children at lower parities, but a negative effect at higher parities (Bulatao and Fawcett, 1981). The changing influence of other characteristics has also been investigated, with somewhat less consistent results (Namboodiri, in these volumes).

The revision of fertility plans is also of concern in the sequential approach. Namboodiri (in these volumes) suggests that implementation failures are the main cause, and attributes these largely to fecundity impairment, marital disruption, child loss, and differences between sex preferences and actual family composition. In addition, he suggests, plan revision may be due to changes in the extrafamilial and familial contexts of reproduction. The former pertains to social and geographic mobility, and the latter to family living arrangements, the wife's extrafamilial involvements, and the marital power structure. With few exceptions (Bulatao, 1981; Bulatao and Arnold, 1977), the research on sequential decision making has been undertaken in developed nations, and has not used longitudinal data.

COMMUNICATION AND POWER IN DECISIONS

Having children requires two people, but they are not always equally involved in the fertility decision. This section examines how communication and the relative power of the spouses affect decisions. The most frequently investigated question in this area is how these factors affect decisions on family size; also considered in the literature are the effects of communication and power on contraception and abortion decisions (Beckman, in these volumes). This section considers, finally, the roles other people besides the couple play in fertility decisions.

Couple Communication and Fertility

The research on couple communication and fertility has been handicapped by two problems: the measurement of communication and the treatment of communication as static (Beckman, in these volumes). First, within the typical fertility survey, complex concepts such as marital communication, communication on fertility-related issues, and social power generally receive only cursory attention. Research on communication has relied on responses, usually the wife's, about general communication, previous discussion of family-size preferences or fertility regulation, the frequency of discussion, or the initiation of discussion. Spouse agreement on family-size and family planning preferences, as reported in various studies, may be based on discussion, simple coincidence, or projection of individual preferences. Research comparing husbands' and wives' responses is limited, but studies using this approach indicate that discussion is not used that extensively and that joint fertility decisions do not predominate (Coombs and Chang, 1981; Coombs and Fernandez, 1978; Gadalla, 1978; Hill et al., 1959; Yaukey et al., 1967).

On the second problem, the examination of the relationship between communication and fertility at one point in time presents communication as static, rather than as a dynamic process subject to change. Communication has different meanings depending on its timing: in certain situations, casual discussion may indicate the expectation of a large family or a lack of knowledge or inaccurate knowledge about fertility regulation and the monetary and health costs of contraception. Communication may be difficult because of the sensitivity of the topic, feelings of shyness or modesty, and fear of infidelity or of challenging the husband's authority; unilateral fertility regulation may then be more likely. Unilateral use of fertility regulation is dependent in part upon the relative autonomy of partners (number and stability of relationships), the degree of economic dependency in the relationship, and the availability of such methods.

Communication may be absent for several reasons, but even in its absence there may still be agreement on fertility behavior. This may be the case, for instance, where unquestioned power is vested in one person and issues are therefore not discussed (Caldwell, in these

volumes). Apparent agreement may actually mean that few family members are in a position to challenge the decision maker. If the decision is made not to control fertility, it may be very difficult to identify the decision maker in pretransition settings or in the early childbearing stage in transitional settings.

Where communication is present, on the other hand, the evidence supports the conclusion that it is positively related to contraceptive use and duration and effectiveness of use, and negatively related to the demand for children and fertility preferences (Beckman, in these volumes; Bogue, in these volumes). A few studies do suggest, however, that discussion follows rather than leads to contraceptive use, which may initially result from a unilateral decision making. Communication is assumed to lead to greater empathy and increase a couple's ability to act together to achieve goals. Thus it is not the mere occurrence of the communication, but the quantity, quality, content, and timing that are significant. The two most important determinants of the frequency of fertility discussions, in a U.S. study, are the length of time since the birth of the last child and how soon the next child is expected (Miller 1981b).

Marital Power, Dominance, and Fertility

Studies of power and dominance are similarly handicapped by the superficiality of the measures employed; these typically rely on the wife's assessment of final decision-making power over aspects of family life, including finances, childrearing, and leisure time pursuits. The research on this topic may be reviewed from two perspectives: the effects of egalitarian decision making on fertility and the resolution of disgreement or conflict.

Egalitarianism

One general hypothesis has been that egalitarian decision making, which allows the costs women bear to be weighed more heavily, influences fertility negatively through lowered demand for children and earlier and more effective use of contraception. As Hull notes (in these volumes), younger couples in developing nations tend to have more egalitarian decision styles than their elders (Coombs and Chang, 1981; Fox, 1975; Gupta, 1979). However, studying this relationship is complicated by possible reverse effects: having many children, particularly sons, may increase the wife's or the husband's authority (Beckman, in these volumes; Oppong, in these volumes). Another complication is that changes in power may occur over the life cycle that do not relate to fertility. Thus as age and marital duration may affect power distribution in ways that cloud the relationship between power and fertility.

Weak or nonsignificant relationships between decision-making power and contraceptive use are generally reported (Beckman, in these volumes). Even those studies reporting some relationship between male

dominance and cumulative fertility, such as Hill et al. (1959), show only small correlations. However, much of the research to date (Hass, 1971; Hill et al., 1959; Liu and Hutchinson, 1974; Weller, 1968) refers to developing countries in which, at the time of the survey, coitus-dependent methods, requiring greater motivation and cooperation for use, were still comparatively common. Furthermore, the questions used to measure decision-making power are not highly correlated with one another (Hass, 1971), suggesting that negative findings may be due to inappropriate measures.

Another approach in this area is to determine the relative contributions of husbands' and wives' attributes in predicting specific reproductive behaviors; this has typically been done with cross-sectional U.S. data. Neal and Grote (1977) report that using both husbands' and wives' alienation scores predicted fertility better than using scores for each spouse alone, and that husbands' scores often predicted as well as wives'. Two-sex models are usually better predictors than one-sex models, but the differences are not great. Thus the majority of studies, although few, do not support the conclusion that adding data from husbands is worthwhile for investigations of fertility in the United States. It is typically reported that female-only models are better predictors than male-only models, especially for white U.S. couples (Fried and Udry, 1979; Fried et al., 1980). Townes et al. (1977), comparing the ability of wives', husbands', and both spouses' SEU scores to predict the occurrence of a pregnancy among well-educated white couples, reported that a model using an average of wives' and husbands' scores predicted about as well as wives' scores alone, and that husbands' scores alone did not predict as well. The influence and dominance of husbands and wives in fertility decisions may also differ within subgroups of a population, and be masked in aggregate comparisons (Fried and Udry, 1979).

Namboodiri (in these volumes) also notes that there is disagreement on whether marriages begin on an egalitarian footing and evolve until each spouse is dominant in selected domains, or whether most marriages begin as wife-dominant but become egalitarian or husband-dominant later in the life cycle. If either speculation is correct in a given society, it is plausible to expect fertility decisions to be monopolized by the husband or the wife at different stages in the life cycle. Fried and Udry (1979) report that, among a sample of U.S. couples, wives' preferences better predicted fertility outcomes than husbands' preferences at parity one. At parities two and over, wives' and husbands' preferences were about equally important in predicting attempts to become pregnant. Although this particular study indicates that parity-specific models are somewhat better than all-parity models, other research shows conflicting results (Fried et al., 1980; Miller, 1981b).

Resolution of Disagreement and Conflict

Research in developing countries generally supports the view that contraceptive use is more prevalent and continuous when the husband

approves, particularly within lower-class or less-educated subgroups (Beckman, in these volumes). Husbands' approval is also related to communication between spouses about family planning and accounts for discrepancies between wives' motivation for fertility control and couples' contraceptive behavior (Card, 1978). In the absence of disagreement or conflict, however, it is difficult to tell whether approval by either spouse is the determining factor in fertility decisions. Some research therefore focuses specifically on conflict situations.

The evidence reviewed by Beckman (in these volumes) regarding whether husbands' or wives' views prevail in situations of disagreement is contradictory. Beckman attempts to reconcile the contradictions by hypothesizing that profertility decisions are controlled by the husband in high-fertility societies, and antinatal decisions are dominated by the wife, who controls most methods of contraception, in lower-fertility settings.

By contrast, other research in transition and posttransition societies supports the influence of wives in both pronatal and antinatal decisions. For instance, Coombs and Chang (1981), analyzing follow-up data on fertility over a four-year period, concluded that, in cases of disagreement, the wife's attitude prevails, especially if she holds stronger beliefs about the future security and status to be derived from a large family and from sons. A small-scale study of U.S. couples (Miller, 1981a) noted that, in situations of strong disagreement, decisions were commonly postponed until the dissenting spouse was ready for childbearing or a decision was made against childbearing. Women were more influential than men, tending to take a strong position with regard to childbearing, either for it or against it; men tended to be more analytic, more inclined to consider the costs and benefits of children and the general effect that childbearing would have on their lives, thereby tending toward greater neutrality or ambivalence. Men were also less affected emotionally by failure to achieve conception. A larger longitudinal U.S. study of reproductive decision making, which showed that initial disagreement on decisions to have a first or second child was relatively common, also found the majority of wives reporting that they had been more influential than their husbands in the decision to have children (Miller, 1981b).

Substantial disagreement about childbearing may be settled in several ways. Using a recent theoretical paradigm on bases of power (Hollerbach, 1980), Miller (1981a) suggests that acquiescence by one spouse may be justified as an attempt to avoid major marital problems or avert divorce, or as an exercise in altruism, or as acceptance of the legitimacy of the spouse's reasons, it may also be rooted in emotional dependency on the partner. Less frequently, Miller (1981a) notes, neither spouse acquiesces, and one spouse may take unilateral action (such as having a vasectomy or an abortion) or deliberately take risks while contracepting in order to have a child.

Which spouse wins a disagreement may depend partly on status differentials between the spouses. Differences in age, education, and actual or potential earning power may affect the influence the husband

and the wife have over fertility decisions. The research on the effects of education, income, and female employment on fertility is discussed in other chapters (Cochrane, in these volumes; Mueller and Short, in these volumes; Standing, in these volumes). However, there is little developing-country research on the implications of status differentials between spouses for relative power and for fertility decisions.

The Influence of Kin and Nonkin

Fertility decision making in pretransition societies need not be the monopoly of the biological parents. Caldwell (in these volumes) argues, in fact, that in such societies the biological parents have little say; the older generation, who control patterns of production, the consumption of food, medical care, and other items, and exchanges of goods within the household, also control fertility. If fertility is advantageous to these people, the interests of the biological parents may be overridden, according to Caldwell. However, little research exists to confirm the applicability of Caldwell's view to different societies.

The influence of the elderly on fertility decisions depends, obviously, on whether they survive. In pretransition societies, female survival is lower at all ages, and elderly males are more likely to have influence. In transitional societies, female survival is more likely than male survival among the elderly, and the wife's mother or mother-in-law may be more likely to exert influence. The influence of the elderly, which may be assumed to be pronatalist, should be greater in rural areas, among the landless or land poor, where patrilocal rather than neolocal residence and patrilineality prevail, and when the surviving children are few.

Decisions may also be influenced by other relatives or by extrafamilial sources, including neighbors, peers, community leaders, health professionals, and state authorities. Hull (in these volumes) notes three ways in which such sources influence decisional style: by social consensus transmitted to the individual through socialization; by shared value judgments on the propriety of fertility-related behavior and the imposition of sanctions; and by advice and counsel.

The influence of other individuals in fertility decision making is difficult to corroborate through survey research. As previously noted, social pressures may simply become internalized and expressed as personal motivations or preferences for minimum family sizes. In addition, individuals may be reluctant to admit social influence, especially pronatalist pressure or opposition to fertility regulation; such admissions may reveal familial conflict. Some urban studies indicate cases in which kin as well as nonkin appear to exert minimal influence; however, complementary data from rural areas are unavailable. For instance, in a large-scale study of urban Mexican men and women, nine out of ten men and three out of four women who had discussed family planning with their spouses reported no outside influence on the decision to use contraception (PROFAM-PIACT de

Mexico, 1979). The Value of Children study also reported that the majority of respondents in each country considered social pressure and the influence of moral and religious prescriptions as unimportant in relation to their fertility preferences (Arnold et al., 1975; Bulatao, 1979a).

THE FERTILITY TRANSITION AND DECISION MAKING

Much of the foregoing discussion has been based on research in developed countries; comparable research on fertility decision making in developing countries is often lacking. Not surprisingly, there is little evidence on which to base a discussion of changes in fertility decision making in the course of the demographic transition.

Hull (in these volumes) argues that the nature of the decision process is related to the individual's interactions within his or her social setting. Societies undergoing cultural change, particularly in family relations, necessarily change in the way fertility decisions are made. The resultant changes in fertility behavior may be far greater than those expected as a specific consequence of economic change. Conversely, it is possible that fertility decision-making processes and behavior remain relatively stable despite substantial economic change.

Despite the lack of hard evidence, alternative views of pretransition and posttransition fertility decisions may be reviewed. These perspectives are contrasting and highly generalized; their application to any specific case requires much more elaboration than can be provided here.

The first view is that there is no basic change in decision making: in both settings, couples are conscious of the economic consequences of childbearing and respond essentially to these. Family-size preferences reflect calculations of the potential exchanges between parents and children, including costs and benefits that are not strictly economic. Some degree of economic rationality is applicable both before and after the transition. Caldwell (in these volumes) adopts this view in essence, in his argument that the direction of the net transfers between parents and children is primary, both before and after the transition, in determining fertility. There are further complications to Caldwell's view, however, which will be discussed below. Also consistent in principle with the view that the basic features of decisions do not change is Lindert's (in these volumes) review of the empirical evidence on the economic value of children. Lindert focuses on the shift from time-supplying to time-intensive children, and on the effects of rising prices of staples and declining prices of luxury goods in producing an initial increase and a subsequent decline in the demand for children.

A second view is that there is some threshold before which attitudinal inertia prevents any conscious individual control of family size and after which calculation comes to underlie most fertility decisions. Until this threshold has been passed, couples

only regulate their fertility in conformance with traditional rules of marriage, sexual relations, and breastfeeding, and do not perceive the costs and benefits of children. In this situation, fertility is affected by supply factors rather than by explicit decisions. The threshold might be a supply-demand crossroads (Easterlin, 1975), at which the determinants of fertility change from the supply of children to the demand for children. This threshold is reached when the desired number of children declines below the attainable number. Alternatively, the threshold might be seen as the point at which fertility regulation becomes salient (Hass, 1974; Shedlin and Hollerbach, 1981). Once couples are aware of the possibilities for controlling fertility, fertility decisions may change in character. Decisions before the threshold might be characterized as nondecisions or passive decisions, or, following Liebenstein (1981), as decisions governed by ethic or conventional behavior. After the threshold, more calculation may be involved.

Empirical research on this view is limited. For traditional societies, some literature supports the hypothesis that norms regarding family-size preferences are less significant in regulating fertility than those regarding the proximate fertility variables, such as age at marriage and postpartum sexual taboos (Mason, in these volumes; Lee, 1977; Lesthaeghe, 1980). However, even in the least developed societies, couples show strong awareness of the economic and noneconomic benefits and costs of children (Fawcett, in these volumes), calling into question the assumption that decisions are entirely passive.

Part of Caldwell's argument (in these volumes) deserves elaboration as a third alternative view. Although Caldwell sees the basic nature of fertility calculations, rooted as they are in net transfers, as essentially unchanging, he also argues for other changes in the decision process. He sees change as taking place in the social relations underlying the economic transfers: family relations change in the direction of reduced age and sex differentiation, lowering the economic value of children and encouraging fertility regulation. In developing nations, he sees such changes in family relations as occurring through the direct influence of Western missionaries and Westernized administrators, new elites, media, and education systems. He argues further that the identity of the decision makers changes, from the older generation to the couple themselves.

None of these views of the linkage between the transition and decision processes has much empirical support so far.

CONCLUSION

Empirical research on fertility decision-making processes offers alternative perspectives on how the supply of children, demand for children, and costs of fertility regulation are perceived and weighed by individuals. However, few studies have examined these perceptions simultaneously or included perceptions of alternative sources of the economic, political, status, and psychic satisfactions provided by

large families. Research on the supply of children (perceived fecundity and child survival) is extremely limited, especially in developing nations. Similarly, systematic data collection on the prevalence and impact of normative and psychic costs of contraception and abortion has not been undertaken. In contrast, there is much more research on the costs and benefits of children and the monetary, time, and health costs of fertility regulation.

Analysis of the rules of decision making, or the way individuals combine and weigh the consequences of alternative behaviors, has relied quite heavily on theoretical schemas of nondecisions, passive or irrational decisions, ambivalent decisions, and decision making guided by conventional behavior or ethic. More careful consideration of consequences by the individual may promote selection of that action which maximizes overall utility or satisfices. Empirical application of statistical models of decision making to fertility or fertility regulation behavior has also been attempted. A recent model, the judgment-integration-valuation-choice model, which specifies a variety of rules by which individuals integrate the perceived probability and desirability of the consequences of alternative actions, is an improvement over previous models that do not allow variation across individuals in decision rules. Nevertheless, the utility and applicability of this more recent model is reduced by its complexity. Moreover, with the exception of expectancy x value theory, there is little recognition in the various models of the influence of extrafamilial or normative factors, which are more significant in pretransition and transitional societies. Finally, all the models assume that decision making is a rational process in which individuals select the action with the highest expected value. Various impediments to rationality that have been discussed call this assumption into question. Thus, the greatest utility of all of these models may be that, when they are applied empirically, they lead to identification of those consequences which are perceived as probable and evaluated as strongly desirable or undesirable by individuals considering alternative fertility choices.

Research on sequential decision making focuses primarily on changes in the decision-making process below and above the normative family-size floor and changes in the determinants of fertility at different parities. Differences in normative family-size thresholds within subgroups, variation in maximum family-size norms, and plan revisions and plan-implementation failures complicate the study of factors influencing decisions at each birth order.

Research on communication and power has been handicapped by measurement problems and the lack of longitudinal data, although recent formulations of the concept of relative power or dominance should advance this area of study. The relationship between egalitarian decision making and fertility is complicated by the likelihood that these variables have reciprocal effects: greater egalitarianism may influence fertility negatively, whereas having many children, particularly sons, may increase the wife's or husband's authority in the family. In transitional societies, attempts to measure the influence of relative power on fertility are more useful

if they focus on the point at which a couple first considers fertility regulation or on situations of disagreement about fertility goals and regulation. Research has consistently shown that contraceptive use is more prevalent and continuous when the husband approves of it, particularly among the lower class or the less educated; husband's approval is also related to communication about family planning between spouses. Within posttransition societies, the dominance of wives in both pronatal and antinatal decisions has been noted. However, differences in relative power and influence may exist within different subgroups. Within-couple status differentials in age, educational attainment, and income may also affect marital power patterns in situations of disagreement over fertility goals and regulation in both transitional and posttransition societies.

Various views exist on changes in fertility decision making in connection with the demographic transition from high to low fertility. The decision process may not change in essentials, or may change radically from passive to active decisions when a threshold of economic consciousness is reached, or may change in a number of other ways, such as in the identity of the primary decision makers.

Research on fertility decision making requires data, ideally longitudinal, to trace shifts in content and process within different cohorts, as well as across the life cycle. However, cross-sectional studies can still be useful in focusing on decisions with apparently irrational outcomes, such as unwanted births or unregulated fertility when regulation seems called for. Emphasizing the perceived rather than the objective consequences of behavior, the subjective rather than the actual probabilities of their occurrence, and the way competing preferences among family and nonfamily members constrain decision making or must be reconciled may help explain fertility behavior that is nonrational from the community perspective, but may well be rational for the individual. Investigation of changing decisional styles within communities can provide insight into the institutional and situational factors which stimulate a shift from passivity or ambivalence to active decision making on the basis of personally defined goals.

BIBLIOGRAPHY

Adler, N. (1979) Decision models in population research. Journal of Population 2:187-202.

Arnold, F., R. A. Bulatao, C. Buripakdi, B. J. Chung, J. T. Fawcett, T. Iritani, S. J. Lee, and T.-S. Wu (1975) The Value of Children: Introduction and Comparative Analysis, Vol. 1. Honolulu: East-West Population Institute.

Bagozzi, R. P., and M. F. Van Loo (1978) Toward a general theory of fertility: A causal modelling approach. Demography 15:301-320.

Bardwick, J. M. (1973) Psychological factors in the acceptance and use of oral contraceptives. In J. T. Fawcett, ed., Psychological Perspectives on Population. New York: Basic Books.

Bauman, K. E., and J. R. Udry (1981) Subjective expected utility and adolescent sexual behavior. Adolescence 16:527-535.

Beach, L. R., B. D. Townes, F. L. Campbell, and G. W. Keating (1976) Developing and testing a decision aid for birth planning decisions. Organizational Behavior and Human Performance 15:99-116.

Browner, C. (1979) Abortion decision-making: Some findings from Colombia. Studies in Family Planning 10:96-106.

Bulatao, R. A. (1979a) On the Nature of the Transition in the Value of Children. Paper No. 60-A. Honolulu: East-West Population Institute.

Bulatao, R. A. (1979b) Further Evidence of the Transition in the Value of Children. Paper No. 60-B. Honolulu: East-West Population Institute.

Bulatao, R. A. (1981) Values and disvalues of children in successive childbearing decisions. Demography 18:1-25.

Bulatao, R. A., and F. S. Arnold (1977) Relationships between the value and cost of children and fertility: Cross-cultural evidence. In International Population Conference, Mexico, 1977, Vol. 1. Liege: International Union for the Scientific Study of Population.

Bulatao, R. A., and J. T. Fawcett (1981) Dynamic perspectives in the study of fertility decision-making: Successive decisions within a fertility career. Pp. 433-499 in International Population Conference, Manila, 1981, Vol. 1. Liege: International Union for the Scientific Study of Population.

Cain, M. (1981) Risk and insurance: Perspectives on fertility and agrarian change in India and Bangladesh. Population and Development Review 7:435-474.

Callan, V. J. (1980) The Value of Children to Australian, Greek, and Italian Parents in Sydney. Paper No. 60-C. Honolulu: East-West Population Institute.

Card, J. J. (1978) The correspondence of data gathered from husband and wife: Implications for family planning studies. Social Biology 25:196-204.

Cohen, J. B., L. Severy, and O. T. Ahtola (1978) An extended expectancy-value approach to contraceptive alternatives. Journal of Population 1:22-41.

Coombs, L. C., and M. C. Chang (1981) Do husbands and wives agree? Fertility attitudes and later behavior. Population and Environment 4:109-127.

Coombs, L. C., and D. Fernandez (1978) Husband-wife agreement about reproductive goals. Demography 15:57-73.

Darroch, R. K., P. A. Meyer, and M. Singarimbun (1981) Two Are Not Enough: The Value of Children to Javanese and Sundanese Parents. Paper No. 60-D. Honolulu: East-West Population Institute.

Davidson, A. R., and J. J. Jaccard (1979) Variables that moderate the attitude-behavior relation: Results of a longitudinal survey. Journal of Personality and Social Psychology 37:1364-1376.

Davidson, A. R., J. J. Jaccard, H. C. Triandis, M. Morales, and R. Diaz-Guererro (1976) Cross-cultural model-making. Towards a solution of the emic-etic dilemma. International Journal of Psychology 11:1-13.

Demeny, P. (1970) Causes and consequences of excess fertility. A Report on a Family Planning Conference. Monograph No. 7, Carolina Population Center. Chapel Hill, N.C.: University of North Carolina.

Easterlin, R. A. (1975) An economic framework for fertility analysis. Studies in Family Planning 6:54-63.

Edwards, W. (1954) The theory of decision making. Psychological Bulletin 51:380-417.

Fawcett, J. T., S. Albores, and F. Arnold (1972) The value of children among ethnic groups in Hawaii: Exploratory measurements. In J. T. Fawcett, ed., The Satisfactions and Costs of Children: Theories, Concepts, Methods. Honolulu: East West Population Institute.

Fishbein, M. (1972) Toward an understanding of family planning behavior. Journal of Applied Social Psychology 2:214-227.

Fishbein, M., and J. J. Jaccard (1973) Theoretical and methodological considerations in the prediction of family planning intentions and behaviour. Representative Research in Social Psychology 4:37-51.

Fisher, W. A., J. D. Fisher, and D. Byrne (1976) Situational and Personality Determinants of Reactions to Contraceptive Purchasing. Paper presented at the meeting of the American Psychological Association, Washington, D.C.

Fox, G. L. (1975) Love match and arranged marriage in a modernizing nation: Mate selection in Ankara, Turkey. Journal of Marriage and the Family 37:180-193.

Freedman, R., and B. Berelson (1976) The record of family planning programs. Studies in Family Planning 7:1-40.

Fried, E. S., and J. R. Udry (1979) Wives' and husbands' expected costs and benefits of childbearing as predictors of pregnancy. Social Biology 26:265-274.

Fried, E. S., S. L. Hofferth, and J. R. Udry (1980) Parity-specific and two-sex utility models of reproductive intentions. Demography 17:1-12.

Gadalla, S. M. (1978) Is There Hope? Fertility and Family Planning in a Rural Egyptian Community. Cairo, Egypt: American University in Cairo Press.

Gupta, G. R. (1979) Love, arranged marriage and the Indian social structure. In G. Kurian, ed., Cross-Cultural Perspectives of Mate-Selection and Marriage. Westport, Conn.: Greenwood Press.

Hass, P. H. (1971) Maternal Employment and Fertility in Metropolitan Latin America. Unpublished Ph.D. dissertation. Duke University, Durham, N. C.

Hass, P. H. (1974) Wanted and unwanted pregnancies: A fertility decision-making model. Journal of Social Issues 30:125-165.

Heer, D. M., and H.-Y. Wu (1975) The effect of infant and child mortality and preference for sons upon fertility and family planning behavior and attitudes in Taiwan. In J. F. Kantner and L. McCaffrey, eds., Population and Development in Southeast Asia. Lexington, Mass.: Lexington Books.

Heer, D. M., and H.-Y. Wu (1978) Effects in rural Taiwan and urban Morocco: Combining individual and aggregate data. In S. H. Preston, ed., The Effects of Infant and Child Mortality on Fertility. New York: Academic Press.

Hill, R., J. M. Stycos, and K. W. Back (1959) The Family and Population Control: A Puerto Rican Experiment in Social Change. Chapel Hill, N.C.: University of North Carolina Press.

Hoffman, L. W., and M. L. Hoffman (1973) The value of children to parents. Pp. 19-76 in J. T. Fawcett, ed., Psychological Perspectives on Population. New York: Basic Books.

Hoffman, L. W., A. Thornton, and J. D. Manis (1978) The value of children to parents in the United States. Journal of Population 1:91-131.

Hollerbach, P. E. (1980) Power in families, communication, and fertility decision making. Population and Environment 3:146-173.

Jaccard, J. J., and A. R. Davidson (1975) A comparison of two models of social behavior: Results of a survey sample. Sociometry 34:497-517.

Jaccard, J. J., and A. R. Davidson (1976) The relation of psychological, social, and economic variables to fertility-related decisions. Demography 13:329-338.

Jones, E. F., L. Paul, and C. F. Westoff (1980) Contraceptive efficacy: The significance of method and motivation. Studies in Family Planning 11:39-50.

Kantner, J. F., and M. Zelnick (1973) Contraception and pregnancy: Experience of young unmarried women in the United States. Family Planning Perspectives 5:21-35.

Kellerhals, J., and G. Wirth (1972) Social dynamics of abortion requests: Some considerations and preliminary results. International Mental Health Research Newsletter 14:1.

Kerenyi, T. D., E. L. Glascock, and M. L. Horowitz (1973) Reasons for delayed abortion: Results of 400 interviews. American Journal of Obstetrics and Gynecology 117:299-311.

Lee, R. D., ed. (1977) Population Patterns in the Past. New York: Academic Press.

Lee, W. (1971) Decision Theory and Human Behavior. New York: John Wiley and Sons, Inc.

Leibenstein, H. (1981) Economic decision theory and human fertility behavior. Population and Development Review 7:381-400.

Lesthaeghe, R. (1980) On the control of human reproduction. Population and Development Review 6:527-548.

Liu, W. T., and I. W. Hutchinson (1974) Conjugal interaction and fertility behavior: Some conceptual problems in research. In H. Y. Tien and F. D. Bean, eds., Comparative Family and Fertility Research. Leiden: E. J. Brill.

Luker, K. (1975) Taking Chances: Abortion and the Decision Not To Contracept. Berkeley, Calif.: University of California Press.

MacDonald, A. L., P. M. Simpson, and A. M. Whitfield (1978) An Assessment of the Reliability of the Indonesian Fertility Survey Data. WFS Scientific Reports No. 3. London: World Fertility Survey.

Marsella, A. J., C. S. Chin, R. Haditono, and C. E. Santiago (1979) The Acceptability of Alternative Routes of Administration of Fertility Regulating Methods among Rural Indonesian, Korean and Filipino Women. Unpublished manuscript. Human Reproduction Unit, World Health Organization, Geneva.

McClelland, G. H. (1980) A psychological and measurement theory approach to fertility decision-making. In T. K. Burch, ed., Demographic Behavior: Interdisciplinary Perspectives on Decision-Making. Boulder, Colo.: Westview Press.

McClelland, G. H., and B. H. Hackenberg (1978) Subjective probabilities for sex of next child: U.S. college students and Philippine villagers. Journal of Population 1:132-147.

McNicoll, G. (1980) Institutional determinants of fertility change. Population and Development Review 6:441-462.

Meeker, B. (1980) Rational decision-making models in interpersonal behavior. In T. K. Burch, ed., Demographic Behavior: Interdisciplinary Perspectives on Decision-Making. Boulder, Colo.: Westview Press.

Miller, W. B. (1975) Psychiatry and physician illness: The psychosomatic interface. In C. P. Rosenbaum and J. E. Beebe, eds., Psychiatric Treatment: Crisis, Clinic, and Consultation. New York: McGraw-Hill.

Miller, W. B. (1981a) The Personal Meanings of Voluntary and Involuntary Childlessness. Center for Population Research Contract N01-HD-82853. National Institute of Child Health and Human Development, Bethesda, Md.

Miller, W. B. (1981b) The Psychology of Reproduction. Washington, D.C.: National Technical Information Service.

Miller, W. B., and R. K. Godwin (1977) Psyche and Demos: Individual Psychology and the Issues of Population. New York: Oxford University Press.

Mills, J., R. Meltzer, and M. Clark (1977) Effect on number of options on recall of information supporting different decision strategies. Personality and Social Psychology Bulletin 3:213-218.

Neal, A. G., and H. T. Grote (1977) Alienation and fertility in the marital dyad. Societal Forces 56:77-85.

Neal, A. G., and H. T. Grote (1980) Fertility decision making, unintended births and the social drift hypothesis: A longitudinal study. Population and Environment 3:221-236.

Nickerson, C. A., G. H. McClelland, and S. M. Kegeles (1981) A Decision-Making Approach to Contraceptive Choice. Center for Research on Judgment and Policy Report No. 234. Institute of Behavioral Science, University of Colorado, Boulder, Colo.

Nortman, D. (1982) Estimating Potential Contraceptive Demand: An Improved Method of Measurement. Center for Policy Studies Working Paper No. 82. Population Council, New York.

Pebley, A. R., H. Delgado, and E. Brinemann (1979) Fertility desires and child mortality experience among Guatemalan women. Studies in Family Planning 10:129-136.

Pitz, G. F. (1980) Sensitivity of direct and derived judgments to probabilistic information. Journal of Applied Psychology 65:531-540.

Pitz, G. F., N. J. Sachs, and J. Heerboth (1980) Assessing the utility of multiattribute utility assessments. Organizational Behavior and Human Performance 26:65-80.

PROFAM-PIACT de Mexico (1979) Family Planning in Mexico--PROFAM-PIACT de Mexico 1979. Mexico, D.F.: PROFAM-PIACT de Mexico.

Rodriguez, G. (1977) Assessing the Availability of Fertility Regulation Methods: Report on a Methodological Study. WFS Scientific Reports No. 1. London: World Fertility Survey.

Rodriguez, G. (1978) Family planning availability and contraceptive practice. International Family Planning Perspectives 4:100-115.

Scanzoni, J. H. (1975) Sex Roles, Life Styles, and Childbearing: Changing Patterns in Marriage and the Family. New York: The Free Press.

Schmidt, F. L. (1973) Implications of a measurement problem for expectancy theory research. Organizational Behavior and Human Performance 10:243-251.

Shedlin, M. G., and P. E. Hollerbach (1981) Modern and traditional fertility regulation in a Mexican community: Factors in the process of decision-making. Studies in Family Planning 12:278-296.

Simon, H. A. (1979) Models of Thought. New Haven, Conn.: Yale University Press.

Steinhoff, P. G., R. G. Smith, and M. Diamond (1971) The Hawaii pregnancy, birth control and abortion study: Social-psychological aspects. In Proceedings of a Conference on Psychological Measurement in the Study of Population Problems. Berkeley, Calif.: Institute of Personality Assessment and Research, University of California.

Townes, B. D., L. R. Beach, F. L. Campbell, and D. C. Martin (1977) Birth planning values and decisions: The prediction of fertility. Journal of Applied Social Psychology 7:73-88.

Tversky, A., and D. Kahneman (1974) Judgement under uncertainty: Heuristics and biases. Science 185:1124-1131.

Weller, R. H. (1968) The employment of wives, dominance and fertility. Journal of Marriage and the Family 30:437-442.

Werner, P. D., S. E. Middlestadt-Carter, and T. J. Crawford (1975) Having a third child: Predicting behavioral intentions. Journal of Marriage and the Family 37:348-358.

World Health Organization (1977) Special Programme of Research, Development and Research Training in Human Reproduction Sixth Annual Report. Geneva: WHO.

World Health Organization Task Force on Psychosocial Research in Family Planning and the Task Force on Service Research in Family Planning (1980) A study of user preferences of fertility regulating methods in India, Korea, the Philippines, and Turkey. Studies in Family Planning 11:267-273.

World Health Organization Task Force on Psychosocial Research in Family Planning (1981) A cross-cultural study of menstruation. Implications for contraceptive development and use. Studies in Family Planning 12:3-16.

Yaukey, D., W. Griffiths, and B. J. Roberts (1967) Couple concurrence and empathy on birth control motivation in Dacca, East Pakistan. American Sociological Review 32:716-726.

Chapter 28

CULTURAL INFLUENCES ON FERTILITY DECISION STYLES

Terence H. Hull*

In the framework for these volumes, fertility is seen as determined by a number of proximate variables that control, for example, the exposure to coitus, the likelihood of conception, and the process of parturition. Within this framework, ideational cultural variables--norms, beliefs, values, and so on--can only affect fertility to the extent that they influence behavior associated with these proximate variables. Such effects can be direct, as when nuptiality patterns are molded by norms concerning the proper timing of marriage; they can also be indirect, as when behaviors such as schooling or migration that in turn influence the proximate determinants are affected.

Although this framework can be used to analyze fertility at either the individual or social level, it is not as useful for dynamic analysis of the complex interactions between the individual life cycle and the process of social change. In particular, it does not lend itself well to analysis of fertility decision making by people confronted with a variety of constraints and opportunities, a subject on which there is relatively little in the literature generally. Thus, although the framework provides a comprehensive--if not exhaustive--categorization of how socioeconomic variables may affect fertility decision making, it falls short of specifying how and by whom such decisions are made. To address this issue, it is necessary to ask a number of key questions. First, do individuals make conscious decisions about fertility, or is fertility behavior externally determined? Second, if they do make such decisions, to what extent can these be considered "rational"? To what extent do decisions about the proximate variables affect fertility indirectly? How much conscious control over their own fertility do individuals feel they have, and how much fatalism is involved in their perceptions? To what extent and under what circumstances are fertility decisions based on precedent or habit? How does the decision-making process change with changes in the life cycle and in the sociocultural environment? How do couples make fertility decisions? To what extent do those outside the conjugal relationship influence such decisions? The sections below address these questions.

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DO INDIVIDUALS MAKE FERTILITY DECISIONS?

The theoretical and empirical literature contains many assumptions about the nature of fertility decision making. In some cases, the notion of individual decision making is ignored, and the focus is on societal "decisions" in the form of codes of conduct, norms, and values formulated to achieve behavior that is "functional" for the survival or growth of a group. Alternatively, the emphasis is on the individual as decision maker carefully weighing costs and benefits, and making choices to satisfy personally defined objectives.

An examination of classic fertility theories offers interesting insights into this issue of decisional "style." Carr-Saunders (1922:222-223) argued that primitive societies regulate fertility levels by prescribing customs and actions designed to achieve an "optimum" population for the environment. He noted that, because the self-sufficient compact nature of tribal life made pressure on resources or expansion opportunities "obvious," there could be "some semi-conscious adjustment of numbers" by resort to abstinence, abortion, or infanticide. However, exactly how this fine-tuning of numbers might work in practice was not explained. Notestein (1945:39-40) offered an alternative view of primitive societies. Rather than adjusting their numbers to changing fortunes, they were chronically faced with the burden of high, though variable, mortality. As a result, these societies were "ingeniously arranged [with] . . . religious doctrines, moral codes, laws, education, community customs, [etc.] . . . focused toward maintaining high fertility." Thus, whereas Carr-Saunders saw the possibility of selective invocation of cultural variables, Notestein argued that the weight of culture pressed individuals to reproduce at high rates, and that antinatalist ideas and behavior were exceptions to the general rule. This conceptualization fitted well with his theory of demographic transition, which posited certain socioeconomic determinants of the shift from high to low rates of fertility and mortality.

Neither of these writers offered an account of individual perceptions or motivations; in describing the process of population control, they attributed to society such anthropomorphic qualities as "semi-conscious deliberations" and "ingenious" designs. In contrast, Ford (1945:86-87), summarizing a review of hundreds of ethnographies, saw fertility as resulting from a balance of pressures acting on individuals: "Promises of security, approval, and prestige accorded to parents are weighed up against perceptions of pain and possibly death in childbearing, and the impositions of child care." This description (though not the case studies offered by Ford) sounds like a model economizer: a person consciously collecting information and comparing costs and benefits before taking action. However, even this notion of balance of pressures does little to describe whether individuals think much about their fertility, or even whether they consider behavior associated with the proximate determinants as it affects fertility. Instead, this and other classic depictions of fertility control emphasize culture and ecology as interacting

determinants of fertility decisions.

This emphasis on social and economic factors in discussions of primitive population control also underlies many analyses of high and low fertility regimes. High fertility, it is sometimes argued, occurs where the pronatalist factors identified by Notestein predominate (see Benedict, 1972:82, for a concise presentation of this argument). Individual decision making is irrelevant in such circumstances because the full weight of custom reinforces behavior conducive to childbearing. Variations in fertility, then, are the result of external factors, such as the environment or biology, or actions of individuals that have only an indirect, and presumably unintended, impact on fertility. In fact, many early anthropological studies of culture and fertility made no specific mention of individual decision making (e.g., Marshall et al., 1972). The contrasting argument is that low fertility developed when individuals began to make decisions. Economic models (Becker, 1960) and early fertility surveys (Hill et al., 1959) reflected this perspective on individual decision making.

ARE FERTILITY DECISIONS RATIONAL?

Much of the debate about the applicability of economic models to fertility analysis has swung between the extreme views that individuals make no real fertility decisions, or that all fertility behavior implies important decisions (Duesenberry, 1960). Often the issue of whether decisions are made is couched in terms of whether people are behaving rationally (see, e.g., Lorimer, 1954). However, the term "rational" can be interpreted in different ways. Instead of simplistically dividing fertility behavior into rational and nonrational depending on whether or not conscious deliberation takes place, recent writers have suggested that it may be more useful to consider decision making ubiquitous. The way that behavior is shaped through interaction between the individual and the social setting can then be examined (see especially Leibenstein, 1981). Demeny (1970:35) contends that "the word 'rationality' should not be interpreted as suggesting some explicit and careful confrontation of pluses and minuses associated with pregnancy, childbirth, and having a child." Rather, it is "simply behavior that represents a best accommodation of individual desires to the impositions of the environment." The focus is therefore not on absolute rationality, such as the maximization principle, but on different types of rationality that take account of informational, political, time, and perceptual constraints. Cultures are seen as representing a wide range of such constraints or "impositions," since they constitute the cognitive apparatus through which people perceive, reflect upon, and understand their social and physical environment.[1]

An example from anthropology may clarify this point. Malinowski (1929) presented evidence showing that the Trobrianders did not believe that the male had any necessary role in reproduction, but that conception occurred when a spirit entered the womb. Clearly, such a

belief would have important implications for decision making related to a wide range of proximate variables. However, later ethnographers showed that, although this belief was an important part of the Trobrianders' explanation of the nature of life, it did not constitute their full understanding of reproduction; rather, they understood but did not attach much symbolic importance to the biological facts (Leach, 1969). Thus overlapping spiritual, social, and physical realities together define the position of the individual within the culture and the context within which decisions are made.

However, this conception of rationality can become a tautology. If decision making is ubiquitous and always surrounded by a complex web of cultural knowledge and symbolism, and if the efficiency of decisions is defined according to the individual's own perceptions, then all behavior is "rational" by definition unless individuals choose to act against their own interests. Even then the sophist might argue that such a choice reveals higher interests, and hence the behavior is still rational. There are two ways to avoid this tautology. First, the criteria for judging the efficiency of decisions can be seen as external to the individual's immediate perceptions. This lies at the heart of Demeny's (1970) depiction of the externalities involved in fertility behavior, in which high fertility may be rational for the individual but against the interests of the community as a whole, and hence from one perspective irrational. Also, when decisions are seen within a time dimension, an action may be observed to contravene an individual's own a priori and a posteriori perceptions of his or her interests; in this sense, regret is the acknowledgement of a form of irrationality. Second, Herbert Simon and others have introduced the concept of bounded rationality, whereby decision making is depicted not as an exhaustive process of sifting data, but as making the best choice under the circumstances (Simon, 1957; Adler, 1979). It is argued that people limit the number of alternatives they consider, and also avoid the effort of constant decision making by recourse to precedents.

This restriction of perceptions and the development of habits (or customs) also constitute elements of culture which can be institutionalized. One function of culture is to structure the decision-making framework. People think (or do not think) about fertility options in accordance with the language, concepts, and symbols of their cultures. Beliefs about the natural and supernatural worlds condition perceptions about the wisdom of alternative actions. Interactions with and observation of other people provide examples of the opportunities and constraints prevailing in the society. Repetitive, or at least understandable, experiences suggest a basis for habitual behavior, and belief in the predictability of the consequences of actions makes planning possible.

It should be noted, however, that expressing the issue in this form does damage to the concept of culture. For many anthropologists (Keesing, 1974:73-97) and institutional economists (Samuels, 1966:237-288), the argument that culture--or the economy--provides a framework for decision making misses the point that cultures and economies themselves exist as complex patterns of decisions (or

choices, or ideas). Thus the framework both influences and is shaped by decision making.

LEVELS OF FERTILITY DECISION MAKING

Once the basic questions have been addresssed of whether decisions are made and, if so, whether they are rational, it becomes important to ask at what levels decision making takes place. What is the nature of individual decision making? How do couples make fertility decisions? And what role do other people have in the decision making of a married couple? In decision making related to marital fertility, decisions are not informed by the principle of "might makes right," or by the simple rule of "optimization," or even by more sophisticated models of interpersonal behavior such as that described by Meeker (1980). Rather, the levels of decision making vary widely according to specific situations and differ across cultures. The subsections below examine this complex issue at three levels: the individual, the couple, and extraconjugal groups.

Individual-Level Decision Making

A number of issues need to be examined at the level of individual decision making. First, individual decisions may affect fertility indirectly through their effects on the proximate variables. Second, it can be asked to what extent an individual's decisions are conscious, and to what extent determined by either external constaints or habit and precedent. Finally, it is important to address the question of individual decision making over the life cycle.

Decisions Affecting the Proximate Variables

An important, but often overlooked, distinction is that between decisions about fertility per se and those about the proximate variables that determine fertility. The decisional styles involved in each are likely to be different both within and between cultures.

An example is provided by the argument that the demographic transition involves the development of "rational," conscious decision making by individuals who were previously unaware of fertility control issues or methods. It is possible to provide empirical support for the contention that some people do not explicitly plan their family sizes; however, it is still clear that they make carefully considered decisions about marriage, sexual relations, and infant care that have the indirect effect of determining family size, and that these decisions are made within the constraints of a complex set of norms, values, and social rules. (Such cultural influences on behavior related to each of the proximate variables were reviewed systematically by Freedman [1961-62], Nag [1968], and Hawthorn [1970].)

Failure to recognize the importance of decisions like these that

are not consciously concerned with fertility has led to an unfortunate tendency to see the problem of fertility decision making simply as a balancing between the demand for and the supply of children. It is sometimes argued, for instance, that, as long as an individual wants as many children as possible, it is irrelevant to study fertility decision making; the supply constraint alone determines the fertility level. This argument ignores the fact that the supply constraint is itself a product of decision-making processes. Thus it is inadequate to depict fertility decline as the attainment of rationality in family-size decision making; a more complete explanation is needed that includes a description of these more indirect decisional procedures.

Conscious Decisions, External Constraints, and Habit

A central question that needs to be addressed is how conscious individual fertility decisions are, and to what degree they are determined by external constraints or habit. It is difficult to find satisfying answers to these questions in the literature; it is more difficult still to find them in the field. Even where language, social status, race, and relative income are not barriers between researcher and informant, explanations of specific decisions are often vague, contradictory, confused, or, at times, withheld.

One of the most detailed examinations of this problem has been done by Cicourel (1967, 1974), who advocates the use of in-depth interviewing to uncover the specifics of decision making. Such research, he contends, must aim at understanding the contexts in which decisions are made; decision-making processes are truly complex behaviors and retrospective reports of fertility behavior are difficult to interpret without knowledge of their context. In a related effort, Rainwater (1960:177-178) records the fatalism of lower-class Americans who saw no alternative to continued childbearing because of the constraints of their religion and a general lack of knowledge and awareness of alternatives. Also, Shedlin and Hollerbach (1981:294) find that Mexican culture creates a climate in which many "couples proceed through the lifecycle . . . accepting pregnancies with ambivalence or regret and feeling powerless to remedy the situation in an acceptable, understandable manner." Neal and Groat (1980:221) refer to such a situation as "social drift," Day (1979:284) as "behavioral drift"; they stress the social and psychological factors constraining ranges of individual choice and leading to acceptance of fate rather than the assertive consideration of alternatives. "If couples perceive no alternatives to pregnancy and childbearing, they cannot consciously <u>decide</u> to influence the probability of pregnancy and childbearing" since this is determined by biology alone, say Shedlin and Hollerbach (1981:282).

This view of the decision maker as victim does not square well with the concept of culture and decision making presented above. Fatalism, in particular, implies that the external culture or society determines individual behavior. If culture itself consists of

patterns of individual decisions and perceptions of the meaning of those decisions, then cultural influences on the individual are not one-way, but are interactive. Two recent studies of women's roles in Africa illustrate this distinction. Joseph (1979:191-201) challenges the formalist model of Berber social structure, which implies strict boundaries to female decision making. Seen from an interactive perspective, "the experiential life of Berbers . . . allows for a considerable amount of individualistic manipulation and a resulting fluidity of social relations." Women have a "set of means [to] pursue their own interests," even though these are neither codified nor formally acknowledged. Little (1979) develops a similar theme with regard to West African women, who, he says, "have their own goals" and a substantial scope of potential actions for achieving them, despite the formal structure of implied male dominance.

This interaction between individuals and external constraints is complicated by the fact that people must make multiple decisions about different types of behavior often involving contradictory consequences. Unhappiness over one result must be weighed against benefits gained from other results. If the background is one of poverty, then the challenge for the decision maker is to do the best under bad conditions. The statement "I had no other choice" is thus not a denial of decision making, but a confirmation that alternatives were unacceptable, or that the contradictions inherent in the decision problem could not be overcome. In these circumstances, acceptance may be the best decision. "Aberrant" behaviors, such as abortion, suicide, homicide, abstinence, celibacy, and flight, are available alternatives in most societies; when such behaviors are rejected, decisions are being made.

Like external constraints, habit is sometimes seen as the basis for rejecting notions of individual decision making and straightforward utility models of behavior. Leibenstein has recently explored this topic in detail, suggesting that repetitious behavior "may account for most of the fertility behavior that takes place" (1981:396-397). He is concerned with what he calls "passive" decision making, which arises when individuals "choose" to repeat previous behavior rather than invest time and energy in continually calculating the costs and benefits involved in particular decisions.

Repetitive decision making involves two considerations. First, if the decision problem arises routinely, an individual is likely to behave according to habit in making decisions related to both the proximate determinants and fertility itself. For example, frequency of coitus is more likely to involve personal habits than is divorce or abortion; abstinence may perhaps become a habit, but infanticide is too rare and abhorrent to become routine for most mothers. Thus habitual behavior depends very much on the particular fertility decision problem. Second, habitual behaviors can occur not only at the individual but also at the social level. Individuals who refer to and follow precedents may be behaving routinely at the social level even though they have never experienced the particular decision problem before. In this sense it is meaningful to speak of a group of people routinely marrying in early adolescence even though no

individual repeats this behavior. The literature on norms, customs, and traditions is relevant here (Freedman, 1961-62): the culture provides a guide for analyzing the decision problem and suggests solutions to the decision maker, in lieu of personal trial and error.

Another factor is involved in habitual responses to decision problems. For those living in environments of capricious productivity, high mortality, and widespread poverty, fertility decisions can lead directly or indirectly to economic difficulty. Moreover, it is usually impossible to predict accurately the consequences of such decisions (Namboodiri, 1980:87-88). These problems of risk and uncertainty dominate the decision-making process, inhibiting innovation while encouraging social conformity and repetitive individual behavior (Hull, 1975:377; Neher, 1971; Cain, 1981).

Decision Sequences Over the Life Cycle

Routine or habitual behavior can be observed not only in simple individual decisions but also in patterns of decision making over the life cycle (see Bulatao and Fawcett, 1981; Namboodiri, 1973:87-92; Namboodiri, 1980:76-80). Many of these decision patterns related to fertility and the proximate variables are logically consistent and common, although others are inconsistent and rare (see also Kyriazis, 1979; Miller and Godwin, 1977:86-89, 119-131).

The various routine choices that are made over time help to define the individual's decisional style. Ethnographers commonly record observations on rites of passage and family cycles in this way. An implication of this conceptualization is that systematic patterns of decision-making behavior contain an inner logic whose meaning transcends the functional relations between specific decisions. Caldwell (1981) and Lesthaeghe (1980:543) make a similar point by arguing that fertility decline in Africa depends on more than a shift in economic parameters. The decision-making process is changing, as seen in greater individual choice and concern for personal welfare; this change is likely to proceed systematically and sequentially as young people use new strategies to address classic decision problems. The working out of these overlapping sequences of decisional styles varies widely across cultures, according to the socioeconomic processes involved. "Development" is a radically different thing in China and Brazil, in Saudi Arabia and Singapore. Consequently, even if fertility does fall as incomes rise--and this is by no means vouchsafed--it will do so through different decision-making processes and patterns that vary from those that prevailed in the past (see Hull Hull, 1977; Hull, 1977).

As has been noted, many fertility decision sequences are routine, and many decisional styles can therefore be characterized as culture-specific. Examples have been cited in which women seem to "drift" semiconsciously through a series of decisions that produce large families. However, some individuals break out of such cycles, and it is interesting to ask why.

One obvious hypothesis is that economic changes eventually challenge the reasonableness of following established patterns, causing women to abandon the security of culturally supported decisions in favor of innovative behavior (Hull, 1977). This is basically an argument describing the gradual evolution of cultural styles. It is the argument used, for example, to explain the development of abstinence, divorce, and traditional birth control in poor, densely settled Java.

Another hypothesis is that the decision problems themselves change. New methods of fertility control, new ideas about marital relations, or alternative infant feeding practices competing with breastfeeding offer women a range of choices, making innovation possible. Two aspects of this hypothesis are important. First, it can help to explain stability. The overall decision sequence can act to counterbalance change resulting from the introduction of new alternatives. The changing patterns of abstinence and breastfeeding in Africa have been found by Lesthaeghe et al. (1981) to have balanced each other, so that fertility remains relatively stable. This may be interpreted as reflecting a general stability in the logic of the overall decision sequence. Second, the impact of innovation on an established sequence may also be used to explain radical change. As economic or social pressures against a particular set of decisions grows, tension develops in the decision-making pattern. Women may continue to behave in accordance with the common pattern in spite of this tension, because of the strength of the overall logic of the sequence. When a major new factor like safe, efficient contraception is introduced, this tension is stressed, and the whole structure of decision making can change rapidly. This kind of explanation has been advanced to explain Bali's rapid fertility decline (Hull, 1980).

Finally, decision sequences can be altered as relationships change between individuals and others involved in the decision problems. Such changes can take place in three basic ways. First, the decision sequence can be altered by events in the middle of a woman's reproductive years: a life crisis, such as desertion; a social change affecting male-female relations or employment patterns; or an ideological change such as the reassertion of some form of religious fundamentalism. Such changes can alter the locus of fertility decision making. Second, young women may be raised very differently from older women, perhaps enough so to challenge the whole logic of traditional relations and shift the locus of decision making (for a case study see Pool, 1972). Third, women may be either liberated or subjugated as a result of an overt social movement; such changes, even if located primarily in the political or economic sphere, again may have important effects on the locus of fertility decision making. The issue here centers specifically on whose decision is to prevail. This issue is discussed in the subsections below.

Couples as Decision-Making Units

Fertility decisions can be analyzed from the viewpoint of an individual woman, treating the influence of all other people (including the husband) as a set of psychic "costs and benefits"; however, it is more realistic to think of a couple--usually a married couple--as forming the decision-making unit (Miller and Godwin, 1977:76ff.). Conjugal relationships are largely defined in cultural terms; the relative power of spouses in the making of fertility decisions involves both their socialization to specific roles and their interaction over the reproductive life span.[2]

The nature of conjugal relations varies widely. Firth (1936, 1957:434) reports that, for Tikopian women, marriage implies "emancipation because it enables [her] to exercise authority in a sphere of her own. Since there is mutual deference between husband and wife, marriage by explicit social custom means freedom not servitude for her." Halfway round the world, in Tepoztlan, Mexico, Lewis (1949:603) found a different situation:

> Pregnancy and childbearing are viewed without enthusiasm by women. These attitudes are . . . in sharp contrast to those of men. The general reaction of women to pressure to conform is one of a sense of frustration and deprivation. . . . The question of authority in husband-wife relations is very much in the minds of men and women in Tepoztlan. There is an awareness on the part of both of the growing assertiveness of wives and the continual struggle of husbands to keep them under control.

Harmony and partnership or distrust and conflict are the two poles of conjugal style. Which is more characteristic of contemporary cultures? According to Michaelson and Goldschmidt (1971:330), the male dominance of Tepoztlan is at least overtly the norm in most peasant societies. However, this is a complex issue. Although men have strong authority in economic matters, including such areas as the marriage of children that affect the household economy, their personal ties with other family members tend to be weak. In this sphere, the woman exerts strong influence. Furthermore, the authors attribute the widespread occurrence of this pattern among otherwise disparate cultures to "recurrent structural responses to the common organizational problems of peasant family life [and] also recurrent structuring of social sentiments."

This theme of separate conjugal roles with constant problems of authority is widespread in the literature. In Sri Lanka, "although women can exert influence in many situations, decisions are ultimately those of the husband-father. Rarely a rigid disciplinarian, the father is still <u>master</u> in a society where that concept has a living feudal memory" (Ryan, 1952:366). In Botswana, among the Kgatla, "a woman is explicitly instructed at marriage to submit to her husband's attentions . . . quarrels owing to a husband's failure to consider his wife's wishes are commonplace . . ." (Schapera, 1940, 1971:161-162). Evans-Pritchard (1951:133) noted the latent hostility between Nuer

spouses: "When a man has begotten several children by his wife he wants her to die. . . ." This feeling has its roots in the inheritance system, but the tension is not manifest in daily relations because the "authority of the husband in the home" is unchallenged. Nor is role conflict between spouses limited to the tropics. In Shoreditch, near London, in the nineteenth century, a similar though more overtly violent and cruel situation prevailed. As described by Young and Willmott (1957:18), husbands were "mean with money," "callous in sex," and "violent when drunk," as well as harsh and secretive. This situation, they report, had been moderated but not eliminated by the time of their study in the mid-1950s.

Seen across cultures, then, a common pattern of male dominance and segregated conjugal roles is associated with many different cultural settings (Whyte, 1980:341-343). Of course, the quality of the relationship depends on the local moral code, the religion, and the general pattern of social roles. The Sri Lankan "master" exercises authority very differently from a Nuer "chief" or a Tepoztlan "patron." Nonetheless, the important point is that inequality of relationships is widespread, and usually characterized by male dominance (see also Whyte, 1980; Davis, 1955; Back and Hass, 1963; for exceptions to this generalization see Kunstadter, 1963.)

How do fertility-related decisions take place in such contexts? To Blood and Wolfe (1960), the nub of the issue is the concept of relative conjugal power (see also Beckman, 1978:68-75). They note that each type of decision problem presents a couple with the need to establish a balance of interests, and that cultural and personal factors interact to determine the outcome. Hollerbach (1980) has applied this perspective to fertility research and suggests a categorization of typical conjugal power relationships according to the following qualities or characteristics:

a. coercive--threat of punishment;
b. reward--promise of reward;
c. legitimate--appeal to normative bases;
d. referent--identification with role model;
e. expert-oriented--claim of greater knowledge; and
f. informational--manipulation of knowledge.

These relationships are further related to different types of decision making--whether active or passive, joint or unilateral--and to particular cultural circumstances. In another characterization, patterns of power relationships have been classified according to their relative equality, concurrence, segregation, and openness (see Piepmeier and Adkins, 1973:513-514; Rosario, 1970; Hull, 1975; Pohlman, 1969:348-350).

These elements of decisional style are obviously related in subtle ways to the cultural setting. Westoff et al. (1963:243) contend that "effective family planning is based on accommodation, compromise or agreement" in the American setting, and they relate these qualities to social status and education. Back and Hass (1963:86) have summarized a number of Latin American studies in defining the relationship

between "machismo" and fertility (see also Beckman, these volumes); and Hull (1975) analyzed the class differences in conjugal relations in Java in an attempt to interpret fertility differentials (see also Chamie, 1981:204-207). There is clearly room for a great deal more of such work, which could build usefully on the concepts and categorizations proposed by Hollerbach (1980). Although a major purpose would be to define differences between cultures, more innovative work might focus on differences within cultures, comparing couples in different classes, castes, educational groups, generations, and occupations. As Berardo (1980:725) notes, although the issue of marital power has received growing attention in the sixties and seventies, "conceptual refinement remains a task for the eighties," and this will only be achieved through more detailed and diverse empirical studies (Hill, 1965:126-128; Blood and Wolfe, 1960; Rodman, 1979:164-166; Goldberg, 1975:101-102; Bagozzi and van Loo, 1980).

Although the dynamics of power relationships obviously have a direct bearing on decision-making sequences, communication and empathy are also dimensions of the conjugal bond that influence fertility behavior. Husbands and wives frequently do not communicate very freely about fertility-related behavior, and empathy tends to be low where interests and activities are segregated. Mukherjee (1975) found "a marked absence of husband-wife communication" in India (see also Bhatia and Neumann, 1980; Rosario, 1970). Similar results are found in Bangladesh (Yaukey et al., 1967:716). In Egypt, most people studied by Gadalla (1978:88) had not discussed family-size desires, largely because three-quarters of respondents had never thought about the issue. In Java, communication is strongly related to social class and generation. One third of poor older women in a village survey had discussed family planning with their spouses, compared to two-thirds of poor young women and 84 percent of well-to-do young women. Culture, class, and generation are important considerations in studies of conjugal relations.

If communication does take place, it is often assumed that this will cause spouses to empathize with each other's position and therefore act more efficiently to achieve jointly defined goals. Studies addressing this issue in developing countries are rare (Hill et al., 1959; Stycos and Back, 1964; Yaukey et al., 1967). However, in developed countries, empathy does appear to be related to successful use of fertility control and efficient limitation of family size. Even in cases of conflict, the result may be similar. Townes et al. (1980:219), Coombs and Chang (1979:21-22), and Fried and Udry (1979:265) have shown that, in cases of disagreement, the woman's views on fertility behavior can predominate because the issue may be considered part of her "domain." Although this clearly defines a power relationship, it may also suggest a form of empathy deserving more detailed consideration.

If male dominance, lack of communication, and segregated roles are common in contemporary cultures, can these patterns of conjugal behavior be expected to continue in the future? The answer is probably no. In much of the developing world, arranged marriages are on the wane. Young people are being more innovative in their

fertility decision making (Hull and Hull, 1977; Gupta, 1979; Coombs and Chang, 1979; Fox, 1975). Moreover, changes toward more egalitarian decisional styles can generate fertility effects quickly. As Young and Willmott (1957:26-27) found, even where the "old segregation of man and woman has not ended yet," a change in decisional style can result in lower fertility.

The Influence of Other People on Decisional Style

As individuals or couples consider alternatives concerning marriage, sexual relations, contraception, gestation, and parturition, they are strongly influenced by others around them (Miller and Godwin, 1977:171-178; Beckman, in these volumes). Hollerbach's (1980) categories of power relationships apply easily to the way women interact with kin, neighbors, peers, community leaders, health professionals, and state authorities. These extraconjugal influences are important in shaping decisional style in a number of ways:

a. The meaning and nature of decision problems are largely defined by social consensus and passed on to each member of the culture in the process of socialization, as well as in daily interaction and discussion.

b. Value judgments about the propriety of fertility-related behavior are shared; these can be expressed as religious teaching, secular laws, or personal opinions.

c. Advice is sought from people who are regarded as generally wise, even though they may not have information directly related to the decision problem.

Consideration of extraconjugal influences thus returns analysis of fertility decision making back to basic questions about cultural and social influences (see Freedman, 1961-62; Burch and Gendell, 1970; Hill, 1962; Smith, 1963). On a practical level, these influences are thought to be undergoing substantial change in most areas of the world. Shorter (1975:15) sees this as a shift in the "boundary line between the family and the surrounding community" (see also Goode, 1963; Liu, 1977:54-57). The circle of people influential in decision-making sequences is changing (for a contrasting view see Laslett, 1972:1-23). Whereas the traditional family is a productive and reproductive unit sharing strong economic interests among members of an extended kin group, innovative conjugal relations based on emotion modify this family structure. In her love for her husband, a wife may grow to resent his family's claim on his time, property, and loyalty. On the other hand, the extended family may be strengthened (as in Java) in an economy that encourages the growth of corporate units in industrial and commercial enterprise (Berardo, 1980; Hull and Hull, 1977). At issue is how kin relationships influence an individual's approach to particular fertility-related decisions. As Shah (1974:80) points out, "Every person in a household is involved in a complex pattern of behavior with every other member," and the meaning of these relationships may extend far beyond the economic or social activities that define them functionally. In appreciation of

this, Cicourel (1974:21-26), Geertz (1960), and Jay (1969) counsel analysts to look for the "layers" of meaning in interactions.

Answers to questions about social change are not always simple. For example, although many writers see the trend toward individually arranged marriage as an aspect of personal liberation, Young and Willmott (1957:194) cite a different implication. "Affection, for its part, helps to make duty not so much the nicely balanced correlative of rights as a more or less unlimited liability beyond the bounds of self-interest and rational calculation." More public marriage arrangements tend to legitimize the involvement of extensive networks of people in the couple's affairs; although this can involve "meddling," it also offers possibilities of support and protection for individuals facing difficult decision problems. Because of such complexities, Berardo (1980) concluded that "studies which attempt to explain individual associations with kin and how kin ties affect individuals and families might very well predominate in the coming decade." To be useful, these will have to go beyond the rather narrow analysis of "extended family and fertility" to probe deeply the contexts of kin interactions.

Although the literature offers many examples of how kin, neighbors, and peers can influence decisional style, two relationships have so far received little attention in the context of changing cultural settings: the relationship of the decision-making couple to their children and to the State. Looking at developing countries over the past 40 years, particularly in Asia and Africa, the single most important force for change in society has been nationalism. With this have come strong demands for mass education and medical and other services. Governments, as personified by administrators, professionals, fieldworkers, and local leaders, have usurped many functions formerly left to families and small communities. This has radically changed the nature of decision-making environments, and is an important factor in the innovative fertility decision making described above. Schools are in the vanguard of these changes. They clearly alter parent-child relationships in the economic sphere: they command the child's time, impose costs of attendance, and change the child's perceptions of family roles and life expectations. Gaps grow between the parent and the child. In this context, the parent at midpoint in a fertility decision sequence is faced with not only a changing balance of costs and benefits but often also a different view of what behavior associated with the proximate determinants is possible and proper. The child, in Aries' terms (1980), has a role in the family's plan and an "affective" role in the family. While the role of other kin in fertility decisions is decreasing, the role and influence of first-born children may be increasing.

PROPOSITIONS

As this paper has suggested, fertility decision making is far more complex than is suggested by the assumptions of simple utility models. An analysis of fertility decisions must consider whether or

not such decisions are conscious, and, if so, whether they are rational; the extent to which they involve external constraints or habitual responses; how couples interact in the decision-making process; and the extent of involvement of people other than the couple. The propositions below summarize the major conclusions of this paper on these topics. However, one major conclusion that can be drawn is that further research is needed. Tables 1 to 4 suggest a frame for such research. These tables present some limited data gathered in a series of studies in Java in the 1970s, and are followed by a number of more specific propositions drawn from these data that might be investigated by future research.

Summary Propositions

1. The decision-making environment is cultural, including language, belief systems, technology, social institutions, and individual environment. Decision making is both a product and a determinant of this framework. Societies undergoing cultural change are likely to be changing with regard to the way fertility decisions are made.

2. Irrationality is a relative concept that must be defined as a conflict between behavior and objectives in specific situations. Irrationality in decision making can take four forms:

a. lack of adequate deliberation--although the outcome may be reasonable, the process of decision making may be regarded as "irrational" because the decision maker did not use reason in achieving the result;

b. conflict of an individual's decision with objectives set by another individual or group;

c. conflict of an individual's decision with objectives professed by that individual at a different time or level of consideration; and

d. conflict of an individual's decision with objectives attached to a particular decision problem, as opposed to objectives implied in the logic of a decision sequence.

3. Whether habitual or considered, most fertility decision-making behavior involves purposes, benefits, costs, and consequences that are unrelated to childbearing. Marriage serves a variety of social functions, and sexual activity provides personal pleasures that are often considered irrelevant to the number and spacing of births.

4.1. Habitual decision making is most frequent with decision problems that arise frequently and uniformly (especially with the proximate variables of coitus, abstinence, and contraceptive use), and often develops into unconscious reactions to regular stimuli.

4.2. Nonhabitual decision making is most prominent with decision problems that are unique (age at first coitus), infrequent (marriage, periodic abstinence), or regarded as involving serious consequences (abortion, divorce).

4.3. Decision making is likely to follow social precedent under conditions of general uncertainty and risk.

5. Fertility decision making involves a complex sequence of

TABLE 1 Is the Decision Problem Normally a Matter of Conscious Choice?

Decision Problem	Is Individual Aware of Choices: Ever?	Usually?	Does Individual Usually See Choice as Related to: Birth Spacing	Family Size
Fertility Decisions				
Number of children	Yes	Yes	Yes	Yes
Gender of children	Yes	No	No	Sometimes
Spacing of births	Yes	Yes	Yes	Yes
Termination norm	Yes	?	No	Yes
Proximate Behavior Decisions				
Celibacy	--	--	--	--
Initiation of sexual activity	Yes	Yes	No	No
Legitimation of sexual union	Yes	Yes	No	No
Establishment of coresidence	Yes	Yes	No	No
Temporary separation	Yes	Yes	No	No
Dissolution of sexual union				
Permanent separation	Yes	Yes	No	No
Divorce (legal)	Yes	Yes	No	Sometimes
Widowhood/death	Yes	No	No	No
Sexual activity within union				
Average frequency	Yes	Yes	No?	No?
Periodic abstinence	Yes	Yes	No	Yes?
Postpartum abstinence	Yes	Yes	Yes	No
Other voluntary abstinence	Yes	Yes	No	No
Physical incapacity	Yes	No	No	No
Other involuntary abstinence	--	--	--	--
Fecundity of union				
Natural fecundity	--	--	--	--
Sterilization	Yes	No	--	--
Use of contraceptives				
Barrier methods	Yes	Yes	Yes	Yes
Chemical methods	Yes	Yes	Yes	Yes
Pill, injection	Yes	Yes	Yes	Yes
IUD	Yes	Yes	Yes	Yes
Parturition behavior				
Involuntary abortion	--	--	--	--
Voluntary abortion	Yes	Yes	No	No
Postpartum behavior				
Breastfeeding behavior	Yes	Yes	Yes	No
Infant care	Yes	Yes	No?	No?

Note: The answers in each cell are speculations based on field research and survey results. Dash indicates rare, inapplicable, or indeterminate situations.

Source: Maguwoharjo (Indonesia) survey, 1972-73, reported in various publications by Hull and Hull.

TABLE 2 Habit and Precedent in Fertility Decision Making

Decision Problem	Arises Frequently from the Viewpoint of: Individuals	Society	Routine Because of: Habit	Custom
Fertility Decisions				
Number of children	At high parities	Yes	No	Yes
Gender of children	No	No	--	--
Spacing of births	3-6 times	Yes	Yes	Yes
Termination norm	No	Yes	No	Yes
Proximate Behavior Decisions				
Celibacy	Rarely	Rarely	Rarely	No
Initiation of sexual activity	In adolescence	Yes	No	Yes
Legitimation of sexual union[a]	No	No	No	Yes
Establishment of coresidence	Upon marriage	Yes	No	Yes
Temporary separation	Possibly	Yes	Possibly	Possibly
Dissolution of sexual union				
Permanent separation	Rarely	Rarely	--	--
Divorce (legal)	Commonly	Commonly	No	Yes
Widowhood/death	--	--	--	--
Sexual activity within union				
Average frequency	Yes	Yes	Yes	No?
Periodic abstinence	Possibly	No	Yes	Sometimes
Postpartum abstinence	3-4 times	Yes	Yes	Yes
Other voluntary abstinence	Possibly	No	No	Yes
Physical incapacity	--	--	--	--
Other involuntary abstinence	--	--	--	--
Fecundity of union				
Natural fecundity	--	--	--	--
Sterilization	No	No	--	--
Use of contraceptives				
Barrier methods	Rarely	Rarely	Yes	No
Chemical methods	Rarely	Rarely	Yes	No
Pill, injection	Yes	Yes	Yes	No
IUD	No	Yes	No	No
Parturition behavior				
Involuntary abortion	--	--	--	--
Voluntary abortion	Rarely	Yes	No	Yes
Postpartum behavior				
Breastfeeding behavior	Yes	Yes	Yes	Yes
Infant care	Yes	Yes	Yes	Yes

Note: Dash indicates inapplicable or indeterminate situations.

[a]Involves question of marriage, legal, religious, and customary.

Source: Maguwoharjo survey, 1972-73.

TABLE 3 Conjugal Interaction in Decision Making

Decision Problem	Unilateral Decisions by Either Partner: Possible	Common	Requires Both Partners': Knowledge	Approval	Cooperation
Fertility Decisions					
Number of children	Yes	No	No	No	Yes
Gender of children	--	--	?	?	?
Spacing of births	Yes	No	Yes	?	Yes
Termination norm	Yes	No	Yes	?	Yes
Proximate Behavior Decisions					
Celibacy	--	--	--	--	--
Initiation of sexual activity	Yes	No	Yes	Yes	Yes
Legitimation of sexual union	No	No	Yes	Yes	Yes
Establishment of coresidence	No	No	Yes	Yes	Yes
Temporary separation	Yes	No	Yes	?	--
Dissolution of sexual union					
Permanent separation	Yes	Yes	Yes	No	--
Divorce (legal)	Yes	Yes	Yes	No	Yes
Widowhood/death[a]	--	--	--	--	--
Sexual activity within union					
Average frequency	Yes	No	Yes	No	Yes
Periodic abstinence	Yes	No	Yes	No	Yes
Postpartum abstinence	Yes	No	Yes	No	Yes
Other voluntary abstinence	Yes	No	Yes	No	Yes
Physical incapacity	--	--	--	--	--
Other involuntary abstinence	--	--	--	--	--
Fecundity of union					
Natural fecundity	--	--	--	--	--
Sterilization	Yes	No	Yes	Yes	Yes
Use of contraceptives					
Barrier methods	Yes	No	Yes	Yes	No
Chemical methods	Yes	No	Yes	Yes	No
Pill, injection	Yes	No	No	No	No
IUD	Yes	No	Yes	Yes	No
Parturition behavior					
Involuntary abortion	--	--	--	--	--
Voluntary abortion	Yes	No	No	No	No
Postpartum behavior					
Breastfeeding behavior	Yes	Yes	No	No	No
Infant care	Yes	No	No	No	No

Note: Dash indicates inapplicable or indeterminate situations.

[a]Applicable only to murder, suicide.

Source: Maguwoharjo survey, 1972-73.

TABLE 4 Influence of Kin and Community in Fertility Decision Making

Decision Problem	Morally Sensitive	Requires Someone Else's: Knowledge	Approval	Cooperation
Fertility Decisions				
Number of children	No	No	No	No
Gender of children	No	No	No	No
Spacing of births	No	No	No	No
Termination norm	No	No	No	No
Proximate Behavior Decisions				
Celibacy	No	No	No	No
Initiation of sexual activity	Yes	No	No	No
Legitimation of sexual union	Yes	Yes	Yes	Yes
Establishment of coresidence	No	Yes	Yes	Yes
Temporary separation	No	Yes	No	No
Dissolution of sexual union				
Permanent separation	Yes	Yes	No	No
Divorce (legal)	Yes	Yes	Yes	Yes
Widowhood/death	--	--	--	--
Sexual activity within union				
Average frequency	No	No	No	No
Periodic abstinence	No	No	No	No
Postpartum abstinence	No	No	No	No
Other voluntary abstinence	No	No	No	No
Physical incapacity	--	--	--	--
Other involuntary abstinence	--	--	--	--
Fecundity of union				
Natural fecundity	--	--	--	--
Sterilization	Sometimes	Yes	Yes	Yes
Use of contraceptives				
Barrier methods	No	Yes	Yes	Yes
Chemical methods	No	Yes	Yes	Yes
Pill, injection	No	Yes	Yes	Yes
IUD	Sometimes	Yes	Yes	Yes
Parturition behavior				
Involuntary abortion	--	--	--	--
Voluntary abortion	Yes	Yes	Yes	Yes
Postpartum behavior				
Breastfeeding behavior	No	No	No	No
Infant care	No	No	No	No

Note: Dash indicates not applicable or indeterminate.

Source: Maguwoharjo survey, 1972-73.

decision problems over the lifetime of individuals. Fertility is best seen as determined by the combined effects of numerous decisions, rather than as the product of a single decision.

5.1. Decision sequences consist of individual decisions and the logical links that bind them together.

5.2. Given the strength of the logic of decision sequences and established habits and patterns of relationships, the way to induce change is not to provide information about alternative behaviors, but to promote systematic challenges to the power structures involved in the decision-making process.

6. Generally, decision making related to fertility involves the conjugal pair. The nature of the relationship between spouses depends on their relative power to communicate, negotiate, and enforce their desires. Commonly, males dominate in this process, although females can often exert their will informally, or within specific domains.

7.1. Kin influence on decisional style is reciprocal rather than directive. An understanding of this reciprocal relationship is important in distinguishing apparently coerced from more complex, mutually determined behavior.

7.2. The power of individuals other than the couple to influence decisional style is defined by social institutions such as the family, the community, and the state. The nature of the extended family is changing in many areas, with the result that its influence is being modified. Of particular interest is the growing role of the state and children in defining decisional styles.

8. Whatever the aspirations of those attempting to induce fertility change, evidence from most of the developing world indicates that autonomous social changes are currently transforming the style of fertility decision making. Fertility may be modified by shifts in family relations resulting from these changes much more than by changes in economic conditions. Conversely, in the case of some decision-making frameworks, it is possible that fertility behavior may remain relatively stable despite substantial economic changes.

Specific Propositions

As noted above, specific data on the issues raised in this paper are generally lacking. Further research is needed to provide such data, and thereby to permit a more thorough investigation of the general propositions offered above. The data in Tables 1-4 were collected in Java in the 1970s, and are presented here as a frame for the further work needed. The propositions that follow are based on these tables and should be worth further empirical testing.

1. Decision making concerned directly with issues of fertility (number, gender, spacing, and termination) varies in style, both across and within cultures.

2. There may be a lack of congruence between fertility objectives and behaviors related to the proximate variables. Thus, for example, high proportions of women saying they "want no more children" may not indicate a practical desire for birth control.

3. Decisions about celibacy are usually related primarily to personal (often physical) characteristics of individuals, and to social roles developed within specific religious or economic institutions.

4. The formation of sexual unions varies across cultures, being based on the timing of initiation of sexual activity, the practices related to the legitimizing of liaisons, and residence patterns.

5. Decisions about sexual behavior, including regularity and style of coitus, patterns of abstinence, and suspension of normal sexual relations, involve complex and often contradictory motivations on the parts of husbands and wives. In settings where conjugal roles are distinct, communication on these matters will be limited, and behavior is likely to be determined by coercion or reward power, rather than by appeals to information, norms, or expert opinion.

6. Power relationships among families reflect those of the broader society.

7. Involuntary behaviors (or conditions, such as infecundity) form part of decision-making sequences. Even an involuntary condition is frequently surrounded by decisions that directly condition or flow from it.

8. Decision making relating to gestation and the postpartum period focuses on the welfare of the infant rather than on that of older or future children.

9. Innovative contraceptive behavior can be evaluated according to its degree of adaptation to the prevailing decision-making sequence; both the method and the delivery system must be seen in the context of how individuals, couples, and others currently view reproductive decisions. However, adaptation does not always demand accomodation. Such innovations may require--and promote--changes in the way decisions are made. Therefore, whereas current research is directed at modifying methods or educating individuals, a more crucial question in some cases is how particular styles of family relationships can be altered to facilitate acceptance of contraception.

NOTES

1. A very good review of the concept of rationality as used by social scientists is Benn and Mortimore (1976). See especially Chapters 3, 6, 8, and 14.
2. Conjugal relationships take many forms. Although this discussion focuses on marriage, other mating patterns are also important (see Burch, in these volumes). The literature on the Caribbean family offers many insights into decision-making sequences in the context of relatively fluid relationships (see Slater, 1977:154-189).

BIBLIOGRAPHY

Adler, N. E. (1979) Decision models in population research. Journal of Population 2:187-202.

Aries, P. (1980) Two successive motivations for the declining birth rate in the West. Population and Development Review 6:645-650.

Back, K. W., and P. H. Hass (1963) Family structure and fertility control. In J. T. Fawcett, ed., Psychological Perspectives on Population. New York: Basic Books.

Bagozzi, R. P., and M. F. Van Loo (1980) Decision-making and fertility: A theory of exchange in the family. Pp. 91-134 in J. K. Burch, ed., Demographic Behavior: Interdisciplinary Perspectives on Decision-Making. Boulder, Colo.: Westview Press.

Becker, G. (1960) An economic analysis of fertility. Pp. 209-231 in National Bureau of Economic Research, Demographic and Economic Change in Developed Countries. Princeton, N.J.: Princeton University Press.

Beckman, L. J. (1978) Couples' decision-making processes regarding fertility. Pp. 57-81 in K. E. Taeuber, L. L. Bumpass, and J. A. Sweet, eds., Social Demography. New York: Academic Press.

Benedict, B. (1972) Social regulation of fertility. Pp. 73-89 in G. A. Harrison and A. J. Boyce, eds., The Structure of Human Populations. Oxford: Clarendon Press.

Benn, S. I., and G. W. Mortimore, eds. (1976) Rationality and the Social Sciences. London: Routledge and Kegan Paul.

Benn, S. I., and G. W. Mortimore (1976) Rationality and the Social Sciences: Contributions to the Philosophy and Methodology of the Social Sciences. London: Routledge and Kegan Paul.

Berardo, F. M. (1980) Decade preview: Some trends and directions for family research and theory in the 1980s. Journal of Marriage and the Family 42:723-728.

Bhatia, J. C., and A. K. Neumann (1980) Inter-sponsal communication and practice of contraception in India. Journal of Family Welfare 26(4):18-30.

Blood, R. O., and D. M. Wolfe (1960) Husbands and Wives: The Dynamics of Married Living. New York: The Free Press.

Bongaarts, J. (1978) A framework for analyzing the proximate determinants of fertility. Population and Development Review 4:105-132.

Bulatao, R. A., and J. T. Fawcett (1981) Dynamic perspectives in the study of fertility decision-making: Successive decisions within a fertility career. Pp. 433-449 in International Population Conference, Manila, 1981, Vol 1. Liege: International Union for the Scientific Study of Population.

Burch, T. K. (1980) Decision-making theories in demography: An introduction. Pp. 1-22 in T. K. Burch, ed., Demographic Behavior: Interdisciplinary Perspectives on Decision-Making. Boulder, Colo.: Westview Press.

Burch, T. K., and M. Gendell (1970) Extended family structure and fertility: Some conceptual and methodological issues. Journal of Marriage and the Family 32:227-236.

Cain, M. (1981) Risk and insurance: Perspectives on fertility and agrarian change in India and Bangladesh. Population and Development Review 7:435-474.

Caldwell, J. C. (1981) The mechanisms of demographic change in historical perspective. Population Studies 35:5-27.

Carr-Saunders, A. M. (1922) The Population Problem: A Study in Human Evolution. Oxford: Clarendon Press.

Chamie, M. (1981) Marital relations and fertility control decisions among Lebanese couples. Population and Environment 4:189-208.

Cicourel, A. V. (1967) Fertility, family planning and the social organization of family life: Some methodological issues. Journal of Social Issues 23(4):57-81.

Cicourel, A. V. (1974) Theory and Method in a Study of Argentine Fertility. New York: John Wiley and Sons.

Coombs, L. C., and M.-C. Chang (1979) Consistency of Fertility Attitudes Between Marital Partners and its Role in Subsequent Fertility. Taiwan Population Studies, Working Paper No. 43. University of Michigan Population Studies Center and Taiwan Provincial Institute of Family Planning.

Davis, K. (1955) Institutional patterns favoring high fertility in underdeveloped areas. Eugenics Quarterly 2(1):33-9.

Davis, K., and J. Blake (1956) Social structure and fertility: An analytic framework. Economic Development and Cultural Change 4:211-235.

Day, L. H. (1979) Demographic concerns of the 1980s and the applicability of economic and sociological frames of reference to their analysis. Pp. 277-287 in Proceedings of the Conference on Economic and Demographic Change: Issues for the 1980s. Liege: International Union for the Scientific Study of Population.

Demeny, P. (1970) Causes and consequences of excess fertility. Pp. 33-44 in A Report on a Family Planning Conference. Monograph 7, Carolina Population Center. Chapel Hill, N.C.: University of North Carolina.

De Tray, D. (1979) The demand for children in a "natural fertility" population. Pakistan Development Review 18:55-65.

Duesenberry, J. S. (1960) Comment. Pp. 231-234 in National Bureau of Economic Research, Demographic and Economic Change in Developed Countries. Princeton, N.J.: Princeton University Press.

Evans-Pritchard, E. E. (1951) Kinship and Marriage among the Nuer. Oxford, Eng.: Clarendon Press.

Firth, R. (1936, 1957) We, the Tikopia. Boston: Beacon Press.

Ford, C. S. (1945) A Comparative Study of Human Reproduction. New Haven, Conn.: Yale University Press.

Fox, G. L. (1975) Love match and arranged marriage in a modernizing nation: Mate selection in Ankara, Turkey. Journal of Marriage and the Family 37:180-193.

Freedman, R. (1961-62) The sociology of human fertility: A trend report and bibliography. Current Sociology 10/11:35-121.

Freedman, R. (1967) Applications of the behavioral sciences to family planning programs. Studies in Family Planning 23:5-9.

Fried, E. S., and J. R. Udry (1979) Wives' and husbands' expected costs and benefits of childbearing as predictors of pregnancy. Social Biology 26:265-274.

Gadalla, S. M. (1978) Is There Hope? Fertility and Family Planning in a Rural Egyptian Community. Cairo, Egypt: American University in Cairo Press.

Geertz, C. (1960) The Religion of Java. Glencoe, Ill.: The Free Press.

Goldberg, D. (1975) Socioeconomic theory and differential fertility: The case of the LDC's. Social Forces 54:84-106.

Goode, W. J. (1963) World Revolution and Family Patterns. New York: The Free Press.

Gupta, G. R. (1979) Love, arranged marriage and the Indian social structure. Pp. 169-179 in G. Kurian, ed., Cross-Cultural Perspectives of Mate-Selection and Marriage. Westport, Conn.: Greenwood Press

Hawthorn, G. (1970) The Sociology of Fertility. London: Collier-MacMillian.

Hill, R. (1962) Cross-national family research: Attempts and prospects. International Social Science Journal 4:425-451.

Hill, R. (1965) Decision-making and the family life cycle. Pp. 113-139 in E. Shanas and G. F. Streib, eds., Social Structure and the Family: Generational Relations. Englewood Cliffs, N.J.: Prentice-Hall.

Hill, R., Stycos, J. M., and Back, K. W. (1959) The Family and Population Control. Chapel Hill, N.C.: University of North Carolina Press.

Hollerbach, P. E. (1980) Power in families, communication and fertility decision-making. Journal of Population 3(2).

Hull, T. H. (1975) Each Child Brings Its Own Fortune: An Enquiry into the Value of Children in a Javanese Village. Unpublished Ph.D. dissertation. Australian National University, Canberra.

Hull, T. H. (1977) A Review of Research on the Price, Cost, and Value of Children in Indonesia. Paper prepared for the Workshop on the Costs of Children, Pattaya, Thailand. Working Paper No. 12, Population Institute, Gadjah Mada University, Yogyakarta.

Hull, T. H. (1980) Fertility decline in Indonesia: A review of recent evidence. Bulletin of Indonesian Economic Studies 16:104-112.

Hull, T. H., and V. J. Hull (1977) Indonesia. Pp. 827-894 in J. C. Caldwell, ed., The Persistence of High Fertility: Population Prospects in the Third World. Monograph 1, Family and Fertility Change Series. Canberra: Department of Demography, Australian National University.

Jay, R. R. (1969) Javanese Villagers: Social Relations in Rural Modjokuto. Cambridge, Mass.: MIT Press.

Joseph, R. (1979) Sexual dialectics and strategy in Berber marriage. Pp. 191-201 in G. Kurian, ed., Cross-Cultural Perspectives of Mate-Selection and Marriage. Westport, Conn.: Greenwood Press.

Keesing, R. M. (1974) Theories of culture. Annual Review of Anthropology 3:73-97.

Kunstadter, P. (1963) A survey of the consanguine or matrifocal family. American Anthropologist 65:56-66.

Kyriazis, N. (1979) Sequential fertility decision making: Catholics and Protestants in Canada. Canadian Review of Sociology and Anthropology 16:275-286.

Laslett, P., ed. (1972) Household and Family in Past Time. Cambridge, Eng.: Cambridge University Press.

Leach, E. (1969) Genesis as Myth and Other Essays. London: Jonathan Cape.

Leibenstein, H. (1981) Economic decision theory and human fertility behavior: A speculative essay. Population and Development Review 7:381-400.

Lesthaeghe, R. (1980) On the social control of human reproduction. Population and Development Review 6:527-548.

Lesthaeghe, R., I. H. Shah, and H. Page (1981) Compensating changes in intermediate fertility variables and the onset of marital fertility transition. Pp. 71-94 in International Population Conference, Manila, 1981, Vol 1. Liege: International Union for the Scientific Study of Population.

Lewis, O. (1949) Husbands and wives in a Mexican village: A study of role conflict. American Anthropologist 51:602-610.

Little, K. (1969) Women's strategies in modern marriage in Anglophone West Africa: An ideological and sociological appraisal. Pp. 202-217 in G. Kurian, ed., Cross-Cultural Perspectives of Mate-Selection and Marriage. Westport, Conn.: Greenwood Press.

Liu, W. T. (1977) The myths of the nuclear family and fertility in Central Philippines. Pp. 35-62 in L. Lenero-Otero, ed., Beyond the Nuclear Family Model: Cross-Cultural Perspectives. London: Sage Publications Ltd.

Lorimer, F. (1954) Notes on human fertility in Central Africa. Pp. 130-135 in The Interrelations of Demographic, Economic and Social Problems in Selected Underdeveloped Areas. New York: Milbank Memorial Fund.

Malinowski, B. (1929) The Sexual Life of Savages. London: Routledge and Kegan Paul.

Marshall, J. F., S. Morris, and S. Polgar (1972) Culture and natality: A preliminary classified bibliography. Current Anthropology 13:268-278.

Meeker, B. F. (1980) Rational decision-making models in interpersonal behavior. Pp. 23-42 in T. K. Burch, ed., Demographic Behavior: Interdisciplinary Perspectives on Decision-Making. Boulder, Colo.: Westview Press.

Michaelson, E. J., and W. Goldschmidt (1971) Female roles and male dominance among peasants. Southwestern Journal of Anthropology 27:330-352.

Miller, W. B., and R. K. Godwin (1977) Psyche and Demos. New York: Oxford University Press.

Mukherjee, B. N. (1975) The role of husband-wife communication in family planning. Journal of Marriage and the Family 37:655-667.

Nag, M. (1962, 1968) Factors Affecting Human Fertility in Nonindustrial Societies: A Cross-Cultural Study. Yale University Publications in Anthropology No. 66. Reprinted by Human Relations Area Files Press.

Namboodiri, N. K. (1973) Some observations on the economic analysis of human fertility. Pp. 78-95 in I. Z. Husain, ed., Population Analysis and Studies. Kent: Abacus Press.

Namboodiri, N. K. (1980) A look at fertility model-building from different perspectives. Pp. 71-90 in T. K. Burch, ed., Demographic Behavior: Interdisciplinary Perspectives on Decision-Making. Boulder, Colo.: Westview Press.

Neal, A. G., and H. T. Groat (1980) Fertility decision-making, unintended births, and the social drift hypothesis: A longitudinal study. Population and Environment 3:221-236.

Neher, P. A. (1971) Peasants, procreation, and pensions. American Economic Review 61(3,1):380-189.

Notestein, F. W. (1945) Population--The long view. In T. W. Schultz, ed., Food for the World. Chicago: University of Chicago Press.

Piepmeier, K. B., and T. S. Adkins (1973) The status of women and fertility. Journal of Biosocial Science 5:507-520.

Pohlman, E. H. (1969) The Psychology of Birth Planning. Cambridge, Mass.: Schenkman Publishing Co.

Pool, J. E. (1972) A cross-comparative study of aspects of conjugal behavior among women of three West African countries. Canadian Journal of African Studies 6:233-259.

Rainwater, L. (1960) And the Poor Get Children: Sex, Contraception and Family Planning in the Working Class. Chicago: Quadrangle Books.

Repetto, R. (1977) Correlates of field-worker performance in the Indonesian family planning program: A test of the homophily-hererophily hypothesis. Studies in Family Planning 8:19-21.

Rodman, H. (1979) Marital power and the theory of resources in cultural context. Pp. 149-168 in G. Kurian, ed., Cross-Cultural Perspectives of Mate-Selection and Marriage. Westport, Conn.: Greenwood Press.

Rogers, E. M. (1973) Communication Strategies for Family Planning. New York: The Free Press.

Rosario, F. Z. (1970) Husband-Wife Interaction and Family Planning Acceptance: A Survey of the Literature. Working Paper No. 3. Honolulu: East-West Population Institute.

Ryan, B. (1952) Institutional factors in Sinhalese fertility. Milbank Memorial Fund Quarterly 30:359-381.

Samuels, W. J. (1966) The Classical Theory of Economic Policy. New York: World Publishing Company.

Schapera, I. (1940) Married Life in an African Tribe. Middlesex, Eng.: Pelican Books.

Shah, A. M. (1974) The Household Dimension of the Family in India: A Field Study in a Gujarat Village and a Review of Other Studies. Berkeley, Calif.: University of California Press.

Shedlin, M. G., and P. E. Hollerbach (1981) Modern and traditional fertility regulation in a Mexican community: The process of decision making. Studies in Family Planning 12(6/7).

Shorter, E. (1975) The Making of the Modern Family. Glasgow: William Collins and Sons.

Simon, H. A. (1957) Models of Man. New York: John Wiley.

Slater, M. K. (1977) The Caribbean Family. New York: St. Martin's Press.

Smith, R. T. (1963) Culture and social structure in the Caribbean: Some recent work on family and kinship studies. Comparative Studies in Society and History 6:24-46.

Stycos, J. M., and K. W. Back (1964) The Control of Human Fertility in Jamaica. New York: Cornell University Press.

Tien, H. Y. (1968) The intermediate variables, social structure and fertility change: A critique. Demography 5:138-157.

Townes, B. D., L. R. Beach, F. L. Campbell, and R. L. Wood (1980) Family building: A social psychological study of fertility decisions. Population and Environment 3:210-220.

Trussell, T. J., R. Faden, and R. A. Hatcher (1976) Efficacy information in contraceptive counselling: Those little white lies. American Journal of Public Health 66:761-767.

Valentine, C. H., and J. E. Revson (1979) Cultural traditions, social change, and fertility in sub-Saharan Africa. Journal of Modern African Studies 17:453-472.

Westoff, C. F., R. G. Potter, and P. C. Sagi (1963) The Third Child: A Study in the Prediction of Fertility. Princeton, N.J.: Princeton University Press.

Whyte, M. K. (1980) Cross-cultural codes dealing with the relative status of women. Pp. 335-361 in H. Barry and A. Schlegel, eds., Cross-Cultural Samples and Codes. Pittsburgh, Pa.: University of Pittsburgh Press.

Yaukey, D. (1979) On theorizing about fertility. American Sociologist 4:100-104

Yaukey, D., W. Griffiths, and B. Roberts (1967) Couple concurrence and empathy on birth control motivation in Dacca, East Pakistan. American Sociological Review 32(5):716-726.

Young, M., and P. Willmott (1957) Family and Kinship in East London. Harmondsworth: Penguin Books Ltd.

Chapter 29

COMMUNICATION, POWER, AND THE INFLUENCE OF SOCIAL NETWORKS IN COUPLE DECISIONS ON FERTILITY

Linda J. Beckman

Fertility decisions are highly complex. First, they are dyadic or group decisions, usually involving at least one man and one woman, and, where family and social ties are strong, a number of other persons as well. Moreover, these decisions do not represent a simple averaging of the participants' intentions; rather, "the decision is made in the total context of the particular dyadic relationship and is influenced by all aspects of that relationship [especially] communication and dominance" (Miller and Godwin, 1977:77). Additionally, fertility decisions involve a wide range of psychological and interpersonal influences, causing variations in strength, style, and specificity. Such decisions may even vary in their degree of explicitness: some couples become parents without making any conscious decision, while others carefully plan the timing of each birth.

This complexity helps to explain the limited research on fertility decision making. The present paper reviews the literature that does exist on how couple decision making influences fertility, focusing on how communication and dominance or social power affect the demand for children, contraceptive use, and fertility levels. Although most research has focused on the first of these areas--the demand for children--it is important to note that a couple's fertility decision making can also influence the psychic costs of contraception and abortion, and, indirectly, the supply of children. For present purposes, communication can be defined as the verbalization of information, ideas, attitudes, and beliefs to another person, implying, though not requiring, a two-way or multi-way flow of information. Social power or dominance is the ability to influence another person or group. The discussion here generally refers to married couples; however, it applies equally to stable nonmarital sexual unions.

The first section of this paper examines agreement between spouses on fertility intentions and preferences, focusing on the possible effects of such agreement and on the relative importance of the husband's and the wife's attitudes. The second section considers the role of husband-wife communication in the decision process; the relationship between communication and agreement is also examined. The third section explores the role of power in structuring

communication and resolving disagreement. The fourth section examines the conditions under which unilateral, usually surreptitious, fertility decisions are made in stable sexual unions. The fifth section discusses the conditions under which kin or social networks affect couple communication, relative power, and fertility behavior. Finally, the sixth section explores the relationship of macro-level variables to fertility behavior, focusing on how conjugal communication and power mediate the effects of these variables.

PARTNER AGREEMENT

Concurrence, Consensus, and Concordance

The extent to which spouses have similar preferences regarding family size and family planning is called concurrence (e.g., Yaukey et al., 1967; Hill et al., 1959). The concept of concurrence involves both mutually recognized agreement based on discussion (consensus) and coincidentally similar preferences (concordance). Presumably, concurrence is important because it is linked to husband-wife discussion and may influence actual fertility by reducing the psychic costs of fertility regulation.

Yaukey et al. (1967) reported that those successful in guessing their partners' family planning goals most often were projecting their own preferences. Only 21 percent of nonconcurring couples correctly guessed their spouses' responses, as compared to over 70 percent of concurring couples. The authors also concluded that much concurrence between spouses was essentially concordance, i.e., could be attributed to coincidentally similar views. Studies in four other countries comparing husbands' and wives' responses support this conclusion (Coombs and Chang, 1981, for Taiwan; Coombs and Fernandez, 1978, for Malaysia; Hill et al., 1959, for Puerto Rico; United Nations, 1961, for India). Such findings question the predominance of joint fertility decisions. In particular, there may be little need for such decisions in countries where strong shared social norms support certain levels of fertility. In such cases, individuals base behavior on these internalized norms or on assumptions about their partners' attitudes. This pattern, which Hollerbach (1980) labels passive decision making, is more likely to occur in the early stages of the family cycle, when couples still desire more children, or when partners lack contraceptive knowledge. Moreover, since societies with strong pronatalist norms tend to be more traditional and less developed, it follows that concordance between partners is probably associated with high demand for children, low levels of family planning, and high fertility.

High levels of couple concurrence will affect fertility differently if consensus is involved. Although no studies directly compare the effects of concordance and consensus on demand for children, it may be argued that couples who have reached consensus should be more effective in achieving their fertility desires because their decision making is more explicit. Consensus may also be more

characteristic of couples who desire no more children. However, agreement to have no more children must be translated into consistent behavior; if the partners do not practice regulation, agreement alone will not lead to lower fertility.

Female Versus Male Approval of Family Planning

Use of birth control usually requires both the husband's and the wife's approval. Male approval can follow rather than precede contraceptive use; however, research around the world supports the conclusion that contraceptive use is more prevalent and continuous when the husband approves of it, particularly among the lower classes (Latin America: Brody et al., 1974; DESAL, 1968; Hall, 1971; Hass, 1971; Hollerbach, 1980; Kar and Talbot, 1980; Mundigo, 1973; Requena, 1965; Simmons and Culagovski, 1975; Stycos, 1968; Africa: Kar and Talbot, 1980; Asia: ESCAP, 1974; Kim and Lee, 1973; the Middle East: Chamie, 1978). For instance, Chamie (1978) reported that over 40 percent of women who did not return to a clinic for a tubal ligation cited their husbands' objections as a reason. Kim and Lee (1973), analyzing data from a national probability sample of South Korean married women, found that the husband's perceived support for family planning was significantly related to the wife's contraceptive practices: women who did not themselves support family planning but believed their husbands strongly supported it had higher contraceptive adoption rates than women who were favorable toward family planning but perceived their husbands as less supportive. The husband's approval was also related to communication about family planning between the spouses. Less educated women depended more on their husband's support for use of family planning than those with more education.

Abortion decisions are likewise influenced by men's desires, although sometimes indirectly. Kim and Lee's (1973) findings also applied to abortion. Among Colombian women, the man's acceptance or rejection of economic responsibility for the child was the most important single factor in determining whether a woman sought abortion (Browner, 1976). However, surreptitious, unilateral decisions on abortion by women may also be common in some settings, as discussed below.

It should be noted that the biases inherent in the survey questionnaire method of data collection used in most of the above studies may lead to underestimation of the husband's influence on contraceptive use. The majority of respondents to a Mexican survey characterized contraceptive decisions as joint ones, with the remainder stating that they themselves were the final decision makers (PROFAM-PIACT de Mexico, 1979). In contrast, in open-ended same-sex group discussions, although both men and women said the decision should be joint, respondents almost invariably reported that the husband actually made the decision.

These findings do not show conclusively that male attitudes are dominant in contraceptive use; they do present strong evidence that,

in cases of disagreement, the male view frequently prevails. On the other hand, two longitudinal studies in the U.S. and in Taiwan provide evidence that the wife's views are most likely to prevail when partners disagree about additional births (Beckman and Bardsley, 1981; Coombs and Chang, 1981). One possible explanation for these contradictory findings is that, although profertility decisions are controlled by the husband, in lower-fertility countries antinatal decisions are dominated by the wife, who controls most methods of contraception. The distribution of power in the marital dyad is also obviously a factor, as discussed below.

COUPLE COMMUNICATION

Communication in the marital dyad is generally defined as the frequency (or occasionally "openness") of discussion between spouses, as reported by one or both partners. Attempts to measure communication vary in specificity: some researchers note general spouse interaction (e.g., Hill et al., 1959; Mitchell, 1972), whereas others measure communication specific to fertility. For instance, Mitchell (1972) asked how often spouses discussed amusing or interesting incidents, conversations with their friends, and problems or worries; the general communication index consisted of a simple sum of item scores. More specific measures have covered communication on family size and sex preferences (e.g., Coombs and Fernandez, 1978; Rainwater, 1965), use of contraception (Koenig, 1980; Mukherjee, 1975; Rainwater, 1965), and sexuality (Beckman and Bardsley, 1981; Chamie, 1978). Some researchers contend that such fertility-related topics, especially sexuality, are not subject to the same channels and patterns of communication as are more impersonal and instrumental issues (Coombs and Fernandez, 1978; Hollerbach, 1980; Liu and Hutchison, 1974).

It is difficult to evaluate the validity and reliability of retrospective measures of frequency and patterns of communication. The literature on concurrence reveals that spouses do not always agree on the quality and content of communication. Couples frequently disagree about the extent to which family planning has been discussed (Beckman and Bardsley, 1981; Coombs and Chang, 1981; Coombs and Fernandez, 1978; Hill et al., 1959). This may indicate that communication has been of insufficient clarity, duration, or intensity to impress both spouses in the same way (Hill et al., 1959), or it could indicate measurement error.

The majority of studies of couple communication and power have included only wives (Brody et al., 1974; Browner, 1976; Chamie, 1978; Hartford, 1971; Johnson, 1971; Kar and Talbot, 1980; Mukherjee, 1975; Ramakumar and Gopal, 1972; Rosen and Simmons, 1971; Shedlin and Hollerbach, 1981); a few studies consider only men (e.g., Hall, 1971). Some recent surveys have collected information from both men and women (e.g., Coombs and Fernandez, 1978; Koenig, 1980; Liu and Hutchison, 1974). Such studies allow gender comparisons, although, unfortunately, the data are frequently based on samples of unrelated

individuals rather than paired couples. Among the findings in these studies, males in Asia reported more spouse communication than did females (ESCAP, 1974); and Mexican men and women (not paired couples) frequently disagreed on who initiated discussion of family planning (PROFAM-PIACT de Mexico, 1979). These data, however, are too limited to permit firm conclusions about partner differences in perceptions of communication patterns.

Communication and Fertility Behavior

Research on the fertility decision-making process suggests that couple discussion is positively related to contraception and current fertility; conversely, communication is negatively related to demand for children.

Higher levels of family planning discussion have been associated with greater fertility regulation in many studies (Asia: ESCAP, 1974; Kim and Lee, 1973; Lee, 1979; Mukherjee, 1975; Shah, 1974; Africa: Kar and Talbot, 1980; Latin America: Brody et al., 1976; Hill et al., 1959; Kar and Talbot, 1980; PROFAM-PIACT de Mexico, 1979; Simmons and Culagovski, 1975; Stycos and Back, 1964). These studies assessed past and current contraceptive practices, as well as duration and effectiveness of use. The relationship between more general communication and birth control is less well documented, though a similar positive association has been reported in Puerto Rico and Jamaica (Hill et al., 1959; Stycos and Back, 1964), and in several Asian countries (ESCAP, 1974; Jolly, 1976; Mitchell, 1972). On the other hand, Liu and Hutchison (1974), using observational rather than survey measures, found no relationship between general communication and contraception or fertility in the Philippines.

Decisions about specific fertility regulation methods have also been investigated. Latin American data show that the wife is less likely to initiate discussion about abortion than about other types of family planning (Browner, 1976; Scrimshaw, 1978; Shedlin and Hollerbach, 1981); in such cases, decision making may in fact be surreptitious, and the man may be unaware of the pregnancy. Chamie (1978) found that Lebanese women who chose to have a tubal ligation reported higher rates of discussion with their spouses than did women who decided against the procedure. Shah's (1974) data from Pakistan show a strong positive association between spouse communication and use of the IUD. Methods with permanent or long-term effects like these may require more discussion.

The relationship between family planning discussion and fertility is problematic, some studies showing a positive association (ESCAP, 1974; Jolly, 1976), and others no or a negative association (Johnson, 1971; Stycos and Back, 1964). However, lower fertility preferences are related to more family planning discussion, particularly among husbands (Coombs and Fernandez, 1978). Moreover, when preferences and actual fertility are compared, it is found that family planning communication is higher among couples who have reached or exceeded their desired family size (Chamie, 1978; ESCAP, 1974, Jolly, 1976;

Koenig, 1980; PROFAM-PIACT de Mexico, 1979; Shedlin and Hollerbach, 1981).

In the majority of countries in the nine-nation Value of Children study, wives saw being tied down as a greater cost of children than did husbands (Bulatao, 1979a). As a consequence, women may initiate discussions of family planning more often than men; this is confirmed by data from Mexico (PROFAM-PIACT de Mexico, 1979; Shedlin and Hollerbach, 1981). Women also may have greater access to family planning information. On the other hand, Koenig (1980) reported that, in rural India, initiative for discussing family planning rests primarily with the husband. Whether or not males initiate the discussion of family planning may be related to the extent of male dominance in family-size preferences, discussed below.

In some cases, the need for communication itself may increase the psychic cost of fertility regulation. Family planning may be perceived as a sensitive or emotionally loaded issue (PROFAM-PIACT de Mexico, 1979). Communication may also be inhibited by feelings of shyness or modesty on the part of the wife (ESCAP, 1974; Rao, 1959), resulting in unilateral or no fertility regulation.

Communication and Concurrence

One way that communication may affect fertility is through its effect on concurrence. The limited evidence suggests that communication is related to less concurrence; however, communication is associated with greater awareness of the other person's attitudes and views (Hill et al., 1959). Coombs and Fernandez's (1978) Malaysian study suggests that couple discussion brings disagreements about fertility desires into the open. They found that the degree of concurrence was greater among couples who had never discussed the number of children they wanted.

Since concordance between partners has been associated with high levels of demand for children, the effect of communication could be to lower demand. Given the popular belief that men desire large families (see Hollerbach, 1980), ignorance about each other's preferences may lead to higher fertility. In addition, a study of young couples in the United States found that the person who did not want an additional child was likely to prevail in cases of disagreement, especially if that person was the wife (Beckman and Bardsley, 1981). If these results hold more generally, exposing such disagreements through discussion should lead to lower fertility without necessarily affecting the preferences of each spouse.

Possible Causal Connections

Most of the research evidence supports a negative relationship between the desire for children and couple communication, and a positive relationship between communication and the practice of birth control. It might be assumed that a desire to limit childbearing encourages

discussion of family planning, which in turn leads to contraception, although whether communication is really a necessary link in this process remains an unanswered question.

Some contend that husband-wife communication is a correlate or consequence, rather than a determinant, of birth control practice. Hartford (1971) found that in Colombia a "high proportion" began discussing birth control only after initiating it. Other studies suggest that surreptitious use of birth control by the wife is fairly common in cultures where fertility regulation is not widespread (Brody et al., 1974; Shedlin and Hollerbach, 1981). In a qualitative analysis of life in a rural Indian village, Poffenberger (1968) maintains that effective husband-wife communication is not always necessary for birth control adoption; a decision for sterilization or an IUD may involve the whole extended family, but entail little discussion between the husband and wife themselves. On the other hand, if more communication were solely a consequence of birth control practice, it would be difficult to explain the positive association between general communication and contraception. It appears probable that communication is partly a cause and partly a consequence of birth control use, although evidence to support this view is difficult to obtain.

POWER AND EQUALITY IN THE DYAD

Relative social power in the marital dyad is generally measured by asking respondents who makes the "decision" or the "final decision" about family issues (e.g., finances, wife's employment, family planning). This approach, concerned only with the outcome of group choice, relies on the individual's beliefs about what was important in the choice process. The process itself, "how families come to do what they do" (Turk, 1975), has rarely been studied. Perhaps this is because processes are momentary, changeable, and difficult to observe.

The usual approach to measuring power is problematic in several ways. Power does not necessarily reside in the person who wins in a disagreement (Beckman, 1978; Safilios-Rothschild, 1970). Moreover, it is necessary to know not only who makes a decision, but also who delegates the authority to do so. Additionally, in measuring overall decision making, the outcome obviously depends on the particular decisions sampled (Centers et al., 1971; Douglas and Wind, 1978; Safilios-Rothschild, 1970). When specific areas are not clearly defined, or when the decisions sampled happen infrequently (e.g., choice of housing), some disagreement occurs; when specific decision areas are defined, husbands and wives still frequently disagree about their relative influence (Beckman, 1979; Cochrane and Bean, 1976; Coombs and Fernandez, 1978). There are many reasons for such disagreement. It may be difficult for respondents to identify the person who exercises power in the family because they may have to recall experiences occurring months before, and may not be used to conceptualizing family interactions in power terms. Various types of perceptual and reporting biases may also exist.

The problems involved in describing marital power in relation to decision outcomes are illustrated by a study of 104 Japanese-American wives living in Honolulu (Johnson, 1975). When assessment of marital power was based on structured questions about decision-making outcomes, the women reported that their marriages exhibited egalitarian patterns. However, in open-ended discussions, wives saw themselves as clearly subordinate in the family hierarchy, with half reporting that their husbands were dominant. These inconsistencies indicate that husbands may delegate routine decisions to their wives, reserving more important, infrequent decisions for themselves (Safilios-Rothschild, 1970, 1975). Thus, the wives' presumed "power" may actually be based on their husbands' desires and prerogatives. Despite these problems, most studies in developing countries use couple self-reports to measure and describe family power patterns.

The status of women in the family and society is important in any consideration of relative power in the marital dyad. Generally, the higher the status of women and the more egalitarian the roles of husband and wife, the more social power the wife is believed to have vis-a-vis her husband. Although power and couple communication are not necessarily associated, research demonstrates a positive correlation between egalitarian relationships and couple communication (e.g., ESCAP, 1974). It is generally believed that the wife's power positively influences husband-wife communication, rather than the reverse.

Decision-Making Power

It is frequently hypothesized that more egalitarian decision making, or reduced husband dominance, in developing countries is associated with lower demand for children, more effective contraceptive use, and lower fertility. However, research has not provided consistent empirical support for this hypothesis.

Hass (1971) found a relationship between style of decision making and demand for children in only one of seven Latin American cities studied. Contrary to prediction, the more egalitarian the wife reported family decision making to be, the larger her family-size preference.

Research results vary as to the effects of egalitarian decision making on birth control practice. Confirming the hypothesis, Mitchell (1972) found a positive relationship between greater wife influence and contraception among Hong Kong couples. Also, Hill et al. (1959) observed that traditional male-dominated family patterns in Puerto Rico correlated negatively with birth control, although male dominance in decision making by itself was not significantly related to use of birth control. Other data also reveal weak or nonsignificant relationships between decision-making outcomes and contraception, perhaps because husbands see family planning decisions as a female domain (Hass, 1971; Kar and Talbot, 1980; Liu and Hutchison, 1974; Lozare, 1976; Weller, 1968). Kar and Talbot (1980) found that conjugal communication was a much more important predictor of current

contraceptive use than was joint conjugal power, as indexed by decision making. The one study (Liu and Hutchison, 1974) that used observational techniques to measure power processes did not find any significant relationships between power or communicativeness, as measured by a revealed difference technique (Strodtbeck, 1951), and current use of contraception among a small sample of couples in the Philippines. According to one small study, power specific to sexual relations may indirectly influence acceptance of at least one method of contraception--tubal ligation. Lebanese women who chose this method did not differ from those who rejected it in reported equality in sexual relations; however, wives' attitudes toward the value of marital equality in sexual relations were strongly related to the tubal ligation decision (Chamie, 1978).

The relation of egalitarian decision making to actual fertility is complicated by the likelihood that these variables have reciprocal effects: wife equality in decision making may influence fertility negatively through lowered demand and earlier initiation and more effective use of contraception; on the other hand, having many children, particularly sons, may increase the wife's authority in the family in some traditional societies. Most research in developing countries has shown no or only a weak negative relationship between fertility and egalitarian decision making. Rosen and Simmons (1971) do report a negative relationship between family size and equality in conjugal decision making in Brazilian data after industrialization and social status are controlled; Hill et al. (1959) also conclude that less restrictive family types in Puerto Rico have lower fertility. However, less supportive studies also exist (Hass, 1971; Weller, 1968).

Relative power, one might assume, would be most important in cases of disagreement or conflict between spouses. In such cases, the more powerful member of the marital dyad should be able to impose his or her will upon the partner. However, so far there is little support for this assumption in the limited U.S. data examining fertility demand from a conflict-resolution perspective (Beckman and Bardsley, 1981). Most studies of power and fertility do not consider the spouses' respective levels of fertility demand.

Conjugal Role Relationships

Family power and equality should be reflected in relationships between the spouses. Rainwater (1965) sought to assess these relationships from intensive interview data rather than from the brief self-reports usually used to measure power. He developed a three-fold classification of relationships: joint-role relationships, in which husbands and wives share activities, tasks, and decisions; segregated-role relationships, which emphasize a formal division of labor and activities within the family; and intermediate-role relationships, which fall between joint and segregated relationships in the degree to which activities and tasks in the family are formally prescribed. Research using this typology has been done mainly in the United States. Most of the work indicates that less segregated role

relationships are related to earlier and more frequent use of birth control among some population subgroups. The Rainwater (1965) study shows that joint-role relationships are most strongly correlated with coitus-related contraception among lower-class couples after the birth of their last wanted child. Conjugal role relationships were not related to effective contraception among the middle class. However, other studies show that, when age is controlled, women in joint-role relationships have lower fertility than those in segregated-role relationships (Polgar and Rothstein, 1970; Stokes and Dudley, 1972).

Two types of linkages are possible between joint-role relationships and lower fertility: couples in such relationships may want smaller families and, therefore, be more likely to use contraception; or these couples might be more effective at limiting family size (Back and Hass, 1973). Evidence discussed above supports the first of these linkages, while the second is supported by the finding that spouses with more segregated role relationships communicate less on birth control matters and are less effective in limiting family size (Hill et al., 1959; Rainwater, 1965).

Machismo

Power inequality and segregated role relationships may be reinforced by the cultural complex called machismo, which may be defined as exaggerated masculinity reinforced by sex-role stereotypes (Nicassio, 1977). Important facets include exercise of authority over women, sexual prowess, and fatherhood. Machismo, as both a set of prescribed cultural expectations and a personal trait, may be of particular importance in Latin American countries in keeping women's status low. Machismo is demonstrated in a PROFAM-PIACT de Mexico (1979) study revealing sharply different, conflicting cultural perspectives among men and women in Mexico: most women thought it was all right to work outside the home and rejected the notion that women who have many children are better wives; men tended to believe the reverse and supported autocratic attitudes toward women.

Although Hollerbach's (1980) review concluded that there is little evidence that men high on machismo prefer more children, the belief exists, especially among women, that men want larger families (e.g., Nicassio, 1977; PROFAM-PIACT de Mexico, 1979; Van Keep and Rice-Wray, 1973). Regardless of desire for children, however, men in cultures characterized by machismo are more likely than women to disapprove of birth control. About one-third of a sample of Indian and mestizo women in Mexico reported negative attitudes toward birth control among their husbands (Shedlin and Hollerbach, 1981). Other Latin American men objected to women's use of contraception because they feared loss of authority and possible infidelity (PROFAM-PIACT de Mexico, 1979; Stycos, 1968).

UNILATERAL AND SURREPTITIOUS DECISIONS

Under certain conditions, one partner may make a unilateral and frequently surreptitious decision on fertility regulation. This is expecially true for the wife, given the prevalence of female-controlled methods. However, surreptitious fertility regulation is also possible for the husband, primarily through vasectomy, although no data exist on male behavior in this area.

It is difficult to ascertain the prevalence of women's unilateral or surreptitious use of contraception or abortion. However, limited information from Latin America indicates that, when satisfactory methods are available, surreptitious fertility regulation may represent up to 25 percent of users (Brody et al., 1974; Shedlin and Hollerbach, 1981). As mentioned above, studies in Latin America imply more widespread approval of contraception among women than men, which may result in unrevealed use of contraception or abortion.

The determinants of surreptitious fertility regulation by women have rarely been explored. Small-scale studies have found an association between instability of the relationship and unilateral contraception and abortion (Brody et al., 1974; Browner, 1976). Modesty or shyness, making it difficult for the wife to discuss family planning or sexuality with her spouse, may also be a factor (ESCAP, 1974; PROFAM-PIACT de Mexico, 1979). Anxiety about a mate's loyalty during pregnancy may be an important reason for an abortion, frequently a hidden one (Brody et al., 1974; Browner, 1976). In a Jamaican study (Brody et al., 1974), unilateral decision makers reported having experienced less stable sexual relationships, earlier age at initiation of coitus, and more sexual partners; they were also less likely to be currently living with their partners. Their greater economic autonomy and their distrust of men probably resulted in their unilateral decisions.

Hollerbach (1980) has tried to provide a theoretical framework for predicting unilateral versus joint decisions. She argues that the basis on which power is allocated between spouses affects the frequency and quality of discussion between them, and that these two factors together lead to either unilateral or joint decisions: coercive and reward power can lead to passive or unilateral decisions, which can become surreptitious if spouse interaction is inadequate to resolve conflicts; informational, expert, and referent power (distinctions owed to French and Raven, 1959) are more likely to produce negotiation between the partners and to lead to joint decisions. However, no direct empirical support for this formulation has been provided to date.

INFLUENCE OF KIN AND SOCIAL NETWORKS

Sometimes those outside the marital dyad participate in fertility decisions. Extended family and friends may affect fertility decision making by providing information or exerting influence (Dubey and Choldin, 1967; Hill et al., 1959; Kar and Talbot, 1980; Mani, 1970).

Although couples sometimes deny such influences (PROFAM-PIACT de Mexico, 1979), careful probing generally reveals them.

In many traditional cultures, members of the extended family can play an important role in contraceptive decisions. In rural India, for example, the wife is usually brought into the coresidential extended family to benefit the larger family group. In such circumstances, the decision to use birth control is often made by the entire family and is heavily influenced by the husband's mother (Poffenberger, 1968). Mexican wives also reported that one reason for their husbands' disapproval of birth control was their mother-in-law's resistance (PROFAM-PIACT de Mexico, 1979; Shedlin and Hollerbach, 1981). Moreover, mothers often affect their adolescent daughters' contraceptive behavior (Fox and Inazu, 1979 [U.S. data]). Other Latin American data support such influences of kin on contraceptive decisions (Hill et al., 1959).

Besides kin, others close to the couple may affect fertility decisions. Hill et al. (1959) reported friends and neighbors (mentioned by 40 percent of men and 28 percent of women) as the most frequent sources of information and influence regarding contraception; in these data, Puerto Rican women were more vulnerable to influence than were men. Mani's (1970) anthropological study of an Indian village found that the husband's friends and the wife's friends and relatives were the most important influences. In fact, these persons were much more likely to be consulted regarding family planning than was the spouse, although husband-wife communication was stimulated by informal discussions with friends and neighbors (ESCAP, 1974).

Peer groups and confidants may play an especially important role in the adoption and continuation of contraception (Cheong and Suh, 1979), and may be more effective in promoting family planning than the mass media (Cheong and Suh, 1979; Lee, 1979; Mani, 1970; Rogers, 1974; Rogers et al., 1976). Lee (1979) has shown that a woman is more likely to adopt family planning if women in her social network have already done so. Peer contacts provide women not only with information but also with emotional support. Most studies of peer influence concentrate on female groups; male groups are largely ignored, despite their possible role in sustaining norms of machismo (DeHoyas and DeHoyas, 1966; Nicassio, 1977).

Deliberately created groups can also be important. Mothers' Clubs, created partly to distribute oral contraceptives to village women, play an important role in facilitating family planning in South Korean villages (Rogers et al., 1976). At the structured end of the spectrum, the village production brigades in China make collective decisions on which couples should have a child in the next year (Rogers, 1974).

Contact with medical and paramedical personnel can facilitate decisions to adopt or continue using family planning. In data from Mexico (PROFAM-PIACT de Mexico, 1979), doctors were mentioned as influential by half of the respondents who admitted being influenced by external sources. Koenig (1980) reported that contact with family planning workers, especially by husbands, was strongly correlated with both husband-wife communication and contraceptive use in his Indian

sample. Rogers and Solomon (1979) analyzed the role of traditional midwives as family planning communicators in six Asian countries, and concluded that midwives can make an important and unique contribution to adoption of family planning by rural, more traditional women.

These various sources of influence can outweigh the influence spouses have on each other, as Mani's (1970) study suggests. In analyzing influences on contraceptive practices in Venezuela and Kenya, Kar and Talbot (1980) derived findings partly similar to Mani's by using a general measure of social support which combined approval of spouses, friends, and relatives. However, separate examination of the variables showed that, in Venezuela, the approval of relatives and friends was about as important as that of the spouse in determining contraceptive use, whereas in less developed Kenya, approval of spouse was most important. Among external influences, specific communication with individuals outside the marital dyad was a stronger influence in Kenya, and overall social support in Venezuela. In contrast to decisions on contraception, limited data show that abortion decisions tend to be made solely by the couple. In Browner's (1976) study of Colombian women, 91 percent did not tell extraconjugal kin that they were considering an abortion because they feared disapproval. Intensity of interaction with kin was not related to the abortion decision, and only the husband had a role in the decision making process.

SOCIOECONOMIC AND MODERNIZING INFLUENCES

The socioeconomic characteristics that usually change with economic development are related to couple communication and relative power in the dyad. Greater discussion of family planning has been associated with higher education for wives (Caldwell, 1968; ESCAP, 1974; Jolly, 1976; Mitchell, 1972; Ramakumar and Gopal, 1972), higher socioeconomic status (Brody et al., 1976; Caldwell, 1968; ESCAP, 1974; Jolly, 1976; Mitchell, 1972), and urban rather than rural residence (Caldwell, 1968; Kim and Lee, 1973), although the relationship between communication and wife's age and length of marriage is inconsistent across samples (Hill et al., 1959; Kim and Lee, 1973; Koenig, 1980; Mukherjee, 1975). Greater decision-making authority on the part of the wife is likewise associated with her having higher education (Buric and Zecevic, 1967; Rosen and Simmons, 1971; Safilios-Rothschild, 1969). However, a resource theory analysis of power indicates that it is the relative education (or occupation) of the wife vis-a-vis the husband, rather than absolute status, that is significant (Bahr, 1972). In addition, the relative power of the wife is higher if she is employed outside the home, particularly in more prestigious occupations (Kagitcibasi, 1979; Rosen and Simmons, 1971; Weller, 1968).

Modernization and Equality

Changes in both communication and relative dominance within the marital dyad are likely to occur as a by-product of economic development; however, there is only scattered evidence on the effects of such changes on fertility and fertility regulation. The ESCAP (1974) study and Hass (1971) have investigated husband-wife communication cross-culturally, but have not directly related development, communication, and fertility.

Kar and Talbot (1980), comparing data from Kenya and Venezuela, showed a more positive relationship between spouse discussion of family planning and current contraceptive use in Venezuela, which has a higher level of modernization than Kenya. This suggests that couple communication may play a more important role as societies modernize. Rosen and Simmons (1971) found that, among currently mated women in Brazil, smaller family size was associated with higher status levels for women and greater equality in family decision making. Their data indicate that the egalitarian family structure associated with industrial development influences fertility. New educational and employment opportunities accompanying industrialization promote modern conceptions of the woman's role, and thus foster more egalitarian decision making. Moreover, since women tend to want fewer children, shared decision making leads to lower fertility. Bagozzi and Van Loo (1978) suggest that, among wives in Turkey and Mexico, modernization (including increases in a wife's power and authority in the home) is a direct cause of lower fertility.

This is very limited evidence for the intervening role of couple communication and egalitarian conjugal decision making in the relationship between modernization and fertility. Other studies have shown that modernization, higher socioeconomic status, and employment do not always provide women with greater autonomy and freedom, nor do they necessarily lead to lower fertility (Blumberg, 1976; Mernissi, 1976; Piepmeier and Adkins, 1973; Tinker, 1976). The hypothesis that modernization reduces demand for children and fertility through improvements in the status of women in both home and community therefore requires further investigation.

PROPOSITIONS

Partner Agreement

1. Consensus (i.e., mutually recognized agreement) between partners is associated with lower fertility than is concordance (i.e., coincidentally similar preferences). Since consensus requires discussion, the evidence that discussion leads to lower fertility is relevant (Brody et al., 1976; ESCAP, 1974; Hill et al., 1959; Kar and Talbot, 1980; Kim and Lee; 1973; Lee, 1979; Mukherjee, 1975; PROFAM-PIACT de Mexico, 1979; Shah, 1974; Simmons and Culagovski, 1975; Stycos and Back, 1964).

2. In many developing societies, the husband's approval of

contraception is critical to the wife's initiation and continuation of use; on average, the husband's view is more important than the wife's. This is strongly supported by Brody et al. (1974), Browner (1976), Chamie (1978), Hall (1971), Hollerbach (1980), and PROFAM-PIACT de Mexico (1979).

Couple Communication

3. Frequency of husband-wife discussion of birth control and family size (a) is negatively affected by demand for children, (b) positively influences use of contraception, and (c) negatively influences fertility. Support for the three parts of this proposition varies. Research confirms the demand-discussion relationship: discussion tends to increase as the desire to prevent pregnancies becomes stronger (Chamie, 1978; ESCAP, 1974; Jolly, 1976; Koenig, 1980; PROFAM-PIACT de Mexico, 1979; Shedlin and Hollerbach, 1981). The association between couple discussion and contraceptive use in developing countries has even stronger support (e.g., Chamie, 1978; ESCAP, 1974; Hill et al., 1959; Kar and Talbot, 1980; Kim and Lee, 1973; Lee, 1979; PROFAM-PIACT de Mexico, 1979; Shah, 1974; Simmons and Cvlagovski, 1975), although some studies suggest that husband-wife discussion is a correlate rather than a determinant of birth control use (Brody et al., 1976; Browner, 1976; Hartford, 1971; Koenig, 1980; Shedlin and Hollerbach, 1981). The association between discussion and actual fertility is less strongly substantiated: some studies have found high fertility associated with husband-wife discussion (ESCAP, 1974; Jolly, 1976); other studies have found no relationship (Johnson, 1971) or a negative relationship (Stycos and Back, 1964).

4. Frequency (or openness) of general husband-wife communication (a) negatively influences demand for children, (b) positively influences use of contraception, and (c) negatively influences actual fertility. No direct evidence exists for the relationship to demand for children; however, such findings as Rosen and Simmons's (1971) that egalitarian family structures are linked with lower demand imply this relationship. The influence of general communication on contraceptive use is confirmed by the findings of ESCAP (1974), Hill et al. (1959), Jolly (1976), Mitchell (1972), and Stycos and Back (1974). The relationship of general communication to actual fertility is supported by ESCAP (1974) and Jolly (1976).

5. Women initiate discussion of family planning more often than men because they (a) are more affected by the consequences of unplanned pregnancies, and (b) have more access to family planning information. Data on the female initiation of family planning discussions conflict (e.g., Koenig, 1980; PROFAM-PIACT de Mexico, 1979; Shedlin and Hollerbach, 1981). Family planning programs tend to focus on women, who also receive more contraception information from peers than men (Cheong and Suh, 1979; Rogers and Solomon, 1979; Rogers et al., 1976). Women's apparently greater concern about contraception reflects the heavier childcare responsibilities imposed on them in most societies. On the other hand, male prerogatives regarding

contraception are still strong, particularly in traditional cultures (PROFAM-PIACT de Mexico, 1979; Shedlin and Hollerbach, 1981; Stycos, 1968).

6. Couple communication about family planning involves a psychic cost in cultures where birth control is a sensitive issue or where the wife is expected to be shy and modest. Findings from Asia and Mexico tend to bear out this proposition (ESCAP, 1974; PROFAM-PIACT de Mexico, 1979; Shedlin and Hollerbach, 1981; Rao, 1959).

7. Some birth control techniques are more likely to require couple discussion than others. Data from Pakistan and Lebanon indicate that permanent or long-term methods are linked more than others to couple communication (Chamie, 1978; Shah, 1974). Abortion is linked with low levels of couple communication, possibly because, in a relatively large number of cases, the decision is unilateral and surreptitious (Browner, 1976; Scrimshaw, 1978; Shedlin and Hollerbach, 1981).

Power in the Dyad

8. Egalitarian couple authority in the marital dyad (a) negatively influences demand for children, (b) positively influences use of contraception, and (c) lowers fertility. The research does not support the relationship between joint couple authority and demand for children. In only one Latin American country of seven studied was there a correlation between decision making and demand, and there the results contradicted expectations (Hass, 1971). Data on relative dominance and birth control use are conflicting and on balance only weakly support the proposition (Chamie, 1978; Hass, 1971; Hill et al., 1959; Kar and Talbot, 1980; Liu and Hutchison, 1974; Lozare, 1976). The relationship between fertility and power is also not clearly documented by the studies (Hass, 1971; Rosen and Simmons, 1971; Weller, 1968), although the insignificant associations may be due to difficulties in adequately measuring power.

9. Fertility increases the wife's power in the marital dyad, even after the effects of her age have been controlled. Data suggest a progression from enforced dependence to greater independence for wives over time; this change in status is linked to fertility (Chulasai, 1975; Hollerbach, 1980; Poffenberger, 1968; Scrimshaw, 1978).

10. Joint-role relationships among lower-class couples are associated with (a) lower demand for children, (b) greater birth control use, and (c) lower fertility. Rainwater (1965) found a negative relationship between these relationships and number of children among lower-class couples in the United States, but the results did not hold for middle-class families (see also Polgar and Rothstein, 1970; Stokes and Dudley, 1972).

11. Machismo is related to disapproval of birth control on the part of Latin American men. Limited evidence suggests that lower-class and rural Latin American men are more negative toward birth control than their wives (Shedlin and Hollerbach, 1981). This is explained by aspects of machismo specifying male authority over the

wife, fatherhood, and female fidelity (PROFAM-PIACT de Mexico, 1979; Shedlin and Hollerbach, 1981; Stycos, 1968).

12. In cases of disagreement over fertility preferences, the views of the more powerful spouse will prevail. This hypothesis is largely speculative. The limited U.S. data examining fertility demand from a conflict-resolution point of view provide little support (Beckman and Bardsley, 1981).

13. Egalitarian couple relationships are related positively to couple communication, as demonstrated by the ESCAP (1974) study.

Unilateral Decisions

14. A significant minority of persons, mainly women, use fertility regulation without their partners' knowledge. The exact proportion of women who contracept or abort surreptitiously is unknown and difficult to estimate. Those who do so may never tell their partners (Brody et al., 1974; Browner, 1976; Shedlin and Hollerbach, 1981). An important determinant of surreptitious regulation may be the woman's expectation that she can successfully hide her behavior.

15. Unilateral and surreptitious use of fertility control is more likely to occur in unstable relationships. The studies of Brody et al. (1974) and Browner (1976) support this contention.

16. Reward and coercive power are associated with (a) passive decision making in which no communication occurs and persons act in accordance with internalized social norms, and (b) unilateral decision making; expert, informational, and referent power are associated with joint decision making. These propositions are based on a theoretical rationale recently advanced by Hollerbach (1980) for which empirical support is unavailable.

Influence of Kin and Social Networks

17. Communication with friends, other family members, confidants, and opinion leaders influences the initiation and continuation of contraception. This is supported by numerous studies (Cheong and Suh, 1979; Dubey and Choldin, 1967; ESCAP, 1974; Hill et al., 1959; Hollerbach, 1980; Kar and Talbot, 1980; Koenig, 1980; Lee, 1979; Fox and Inazu, 1979; Mani, 1970; Poffenberger, 1968; PROFAM-PIACT de Mexico, 1979; Rogers, 1974; Rogers and Solomon, 1979; Rogers et al., 1976; Shedlin and Hollerbach, 1981).

18. Communication with friends, other family members, confidants, and opinion leaders is associated with initiation of contraception because it stimulates husband-wife discussion. The ESCAP (1974) study suggests this hypothesis. However, supporting data from the couple-interaction literature specific to developing countries are slim. Of course, it is possible for communication with peers, kin, and opinion leaders to be associated with birth control use without any increase in husband-wife discussion of family planning.

19. Female peer groups provide women with informational or expert

bases of power to use in communicating with their partners. The studies done to date have not examined peer influence in these terms. However, Cheong and Suh (1979) have shown that peers can play an important role in providing information on contraception. Moreover, the ESCAP (1974) study suggests that husband-wife communication is stimulated by informal discussion with friends and neighbors.

20. In traditional societies, demand for children on the part of the husband's mother or other kin may block birth control use by the couple. Limited supporting data on the role of the mother-in-law are available for India (Poffenberger, 1968) and Mexico (PROFAM-PIACT de Mexico, 1979; Shedlin and Hollerbach, 1981).

21. Extended kin usually play no role in abortion decisions. This conclusion is based on retrospective data from a small sample of women in Cali, Colombia (Browner, 1976). To the degree to which abortion is approved in other societies, information flow, family structure, and decision-making patterns might produce different findings.

Socioeconomic Determinants

22. Both general and family planning-specific communication are greater among couples (a) of higher socioeconomic status, (b) with more highly educated wives, and (c) with urban rather than rural residence. A moderate amount of data supports these propositions (Brody et al., 1976; Caldwell, 1968; ESCAP, 1974; Jolly, 1976; Kim and Lee, 1973; Mitchell, 1972; Ramakumar and Gopal, 1972).

23. Greater wife decision-making authority is associated with (a) higher family socioeconomic status, (b) a higher educational level for the wife, (c) greater employment opportunities for the wife, and (d) the wife's age. The first two of these factors are associated with a more egalitarian division of decision-making authority (e.g., Buric and Zecevic, 1967; Rosen and Simmons, 1971; Safilios-Rothschild, 1969); there is also evidence of a similar association for the third (Kagitcibasi, 1979; Rosen and Simmons, 1971; Weller, 1968) and fourth (Chulasai, 1975; Poffenberger, 1968; Scrimshaw, 1978). Support also exists for the alternative proposition that equality of couple education rather than the wife's absolute level of education is predictive of egalitarian decision making (Bahr, 1972).

24. Husband-wife discussion and more egalitarian power relations are intervening variables through which demographic and socioeconomic factors affect fertility. Higher levels of education and wider employment opportunities for wives, as well as higher family socioeconomic status, may directly influence discussion and egalitarian decision making in the marital dyad, leading in turn to more effective contraceptive use. This is indicated by the preceding propositions, and partly supported by Rosen and Simmons (1971) and Bagozzi and Van Loo (1978). Some contrary evidence indicates, however, that modernization, higher socioeconomic status, and employment do not necessarily grant women greater autonomy, power, or freedom (Blumberg, 1976; Mernissi, 1976; Piepmeier and Adkins, 1973;

Tinker, 1976), nor are these factors always associated with lower fertility.

BIBLIOGRAPHY

Armijo, R., and T. Monreal (1965) Epidemiology of provoked abortion in Santiago, Chile. Journal of Sex Research 1:143-159.

Back, K. W., and P. H. Hass (1973) Family structure and fertility control. In J. T. Fawcett, ed., Psychological Perspectives on Population. New York: Basic Books.

Bagozzi, R. P., and M. F. Van Loo (1978) Toward a general theory of fertility: A causal modeling approach. Demography 15:301-320.

Bahr, S. J. (1972) Comment on "The study of family power structure: A review 1960-1969." Journal of Marriage and the Family 34:239-243.

Beckman, L. J. (1978) Couples' decision-making processes regarding fertility. In K. Taeuber, L. Bumpass, and J. Sweet, eds., Social Demography. New York: Academic Press.

Beckman, L. J. (1979) The Process of Couples' Fertility Decision-Making. Paper presented at the Family Planning, Contraception and Abortion Symposium of the American Psychological Association, New York.

Beckman, L. J. (in press) Measuring the decision-making process regarding fertility. In G. L. Fox, ed., Decision-Making, Family Planning and Child-Bearing. Beverly Hills, Calif.: Sage Publications.

Beckman, L. J., and P. E. Bardsley (1981) Couples' Motivation for Parenthood, Decision-Making and Fertility Regulation. Final Report (contract HD-52807) prepared for Center for Population Research, National Institute of Child Health and Human Development. Washington, D.C.: U.S. Department of Health and Human Services.

Blumberg, R. L. (1976) Fairy tales and facts: Economy, family, fertility, and the female. In I. Tinker, M. B. Bramsen, and M. Buvinic, eds., Women and World Development. New York: Praeger Press.

Brody, E. B., F. Ottey, and J. LaGranade (1974) Couple communication in the contraceptive decision-making of Jamaican women. The Journal of Nervous and Mental Disease 159:407-412.

Brody, E. G., F. Ottey, and J. LaGranade (1976) Fertility-related behavior in Jamaica. In Cultural Factors and Population in Developing Countries, ICP Work Agreement Reports, Occasional Monograph Series, No. 6. Washington, D.C.: Smithsonian Institution.

Browner, C. (1976) Poor Women's Fertility Decisions: Illegal Abortion in Cali, Colombia. Unpublished Ph.D. dissertation. University of California, Berkeley.

Bulatao, R. A. (1979a) On the Nature of the Transition in the Value of Children. Paper No. 60-A. Honolulu: East-West Population Institute.

Bulatao, R. A. (1979b) Further Evidence of the Transition in the Value of Children. Paper No. 60-B. Honolulu: East-West Population Institute.

Buric, O., and A. Zecevic (1967) Family authority, marital satisfaction and the social network in Yugoslavia. Journal of Marriage and the Family 29:325-336.

Caldwell, J. C. (1968) The control of family size in tropical Africa. Demography 5:598-619.

Centers, R., B. H. Raven, and A. Rodrigues (1971) Conjugal power structure: A reexamination. American Sociological Review 31:1073-1082.

Chamie, M. J. W. (1978) Middle Eastern Marriages and Contraceptive Decisions: Toward a Sociopsychological Understanding of Fertility Behavior. Unpublished Ph.D. dissertation. University of Michigan, Ann Arbor, Mich.

Cheong, C. K., and M. H. Suh (1979) Intra Village Communication Networks and Family Planning Acceptance in Rural Korea. Seoul: Korean Institute for Family Planning.

Chulasai, L. (1975) The Roles of Husbands and Fathers in Family Planning in Rural Chiang Mai. SEAPRAP Research Report, No. 3. Chiang Mai, Thailand: Chiang Mai University.

Cochrane, S. H., and F. D. Bean (1976) Husband-wife differences in the demand for children. Journal of Marriage and the Family 38:297-307.

Coombs, L. C., and M. C. Chang (1981) Do husbands and wives agree? Fertility attitudes and later behavior. Population and Environment 4:109-127.

Coombs, L. C., and D. Fernandez (1978) Husband-wife agreement about reproductive goals. Demography 15:57-73.

DeHoyas, A., and G. DeHoyas (1966) The amigo system and alienation of the wife in the conjugal Mexican family. In B. Farber, ed., Kinship and Family Organization. New York: John Wiley and Sons.

DESAL (Center for the Social and Economic Development of Latin America) (1968) Comportamientos Anticonceptivos en la Familia Marginal. Cuadernos de Discusion #1. Santiago: DESAL.

Douglas, S. P., and Y. Wind (1978) Examining family role and authority patterns: Two methodological cases. Journal of Marriage and the Family 40:35-47.

Dubey, D. C., and H. M. Choldin (1967) Communication and diffusion of the IUD: A case study in urban India. Demography 4:601-614.

ESCAP (1974) Husband-Wife Communication and Practice of Family Planning. Bangkok Asian Population Studies Series, No. 16. New York: United Nations.

Fox, G. L., and J. K. Inazu (1979) The Effect of Mother-Daughter Communication on Daughter's Sexual and Contraceptive Knowledge and Behavior. Paper presented at the annual meeting of the Population Association of America, Philadelphia, Pa.

French, J. R. P., Jr., and B. H. Raven (1959) The bases of social power. In D. Cartwright, ed., Studies in Social Power. Ann Arbor, Mich.: University of Michigan Press.

Hall, F. (1971) Family planning in Santiago, Chile: The male viewpoint. Studies in Family Planning 2:143-147.

Hartford, R. B. (1971) Attitudes, information, and fertility in Medellin, Colombia. In J. M. Stycos, ed., Ideology, Faith and Family Planning in Latin America. New York: McGraw Hill.

Hass, P. H. (1971) Maternal Employment and Fertility in Metropolitan Latin America. Unpublished Ph.D. dissertation. Duke University, Durham, N.C.

Hill, R., J. M. Stycos, and K. W. Back (1959) The Family and Population Control. Chapel Hill, N.C.: University of North Carolina Press.

Hollerbach, P. E. (1980) Power in families, communication, and fertility decision-making. Population and Environment 3:146-173.

Johnson, C. (1975) Authority and power in Japanese-American marriages. In R. E. Cromwell and D. H. Olson, eds., Power in Families. New York: Sage Publications.

Johnson, E. J. (1971) Lower-income mothers in Bogota. In J. M. Stycos, ed., Ideology, Faith and Family Planning in Latin America. New York: McGraw Hill.

Jolly, S. K. G. (1976) Impact of inter-spouse communication on family planning adoption. Journal of Family Welfare 23:38-44.

Kagitcibasi, C. (1979) Effects of Employment and Children on Women's Status and Fertility Decisions. Paper presented at the International Development Research Center Workshop on Women's Roles and Fertility, Ottawa, Canada.

Kar, S. B., and J. M. Talbot (1980) Attitudinal and non-attitudinal determinants of contraception: A cross-cultural study. Studies in Family Planning 11:51-64.

Kim, C. H., and S. J. Lee (1973) Role of husband in family planning behavior. Psychological Studies in Population/Family Planning 1(5). Seoul: Korean Institute for Research in the Behavioral Sciences.

Koenig, M. (1980) Husband-Wife Interaction and Contraceptive Adoption in Rural India. Paper presented at the Workshop on Psychosocial Factors in Population Research, Denver, Colo.

Lee, S. B. (1979) Communication Networks and Family Planning in Korean Villages. Seoul: Korean Institute for Family Planning.

Liu, W. T., and I. W. Hutchison (1974) Conjugal interaction and fertility behavior: Some conceptual problems in research. In H. Y. Lien and F. D. Bean, eds., Comparative Family and Fertility Research. Leiden: E. J. Brill.

Lozare, B. V. (1976) Communication between couples and decision-making in relation to family planning. In R. A. Bulatao, ed., Philippine Population Research. Makati, Rizal: Population Center Foundation.

Mani, S. B. (1970) Family Planning Communication in Rural India. Unpublised Ph.D. dissertation, Syracuse University, Syracuse, N.Y.

Mernissi, F. (1976) The Moslem world: Women excluded from development. In I. Tinker, M. B. Bramsen, and M. Buvinic, eds., Women and World Development. New York: Praeger.

Miller, W. B., and R. K. Godwin (1977) Psyche and Demos. New York: Oxford University Press.

Mitchell, R. E. (1972) Husband-wife relations and family-planning practices in urban Hong Kong. Journal of Marriage and the Family 34:139-146.

Mukherjee, B. N. (1975) The role of husband-wife communication in family planning. Journal of Marriage and the Family 37:655-667.

Mundigo, A. I. (1973) Honduras revisited: The clinic and its clientele. In J. M. Stycos, ed., Clinics, Contraception, and Communication. New York: Appleton-Century-Crofts.

Nicassio, P. M. (1977) Social class and family size as determinants of attributed machismo, femininity, and family planning: A field study in two South American communities. Sex Roles 3:577-598.

Piepmeier, K. B., and T. S. Adkins (1973) The status of women and fertility. Journal of Biosocial Science 5:507-520.

Poffenberger, T. (1968) Motivational aspects of resistance to family planning in an Indian village. Demography 5:757-766.

Polgar, S., and F. Rothstein (1970) Family planning and conjugal roles in New York City poverty areas. Social Science and Medicine 4:135-139.

PROFAM-PIACT de Mexico (1979) Family Planning in Mexico. New York: Population Council.

Rainwater, L. (1965) Family Design: Marital Sexuality, Family Size and Contraception. Chicago: Aldine Publishing Co.

Ramakumar, S. R., and S. Y. S. Gopal (1972) Husband-wife communication and fertility in a suburban community exposed to family planning. Journal of Family Welfare 18:30-36.

Rao, K. (1959) Progress in family planning in Bangalore. Journal of Family Welfare 6:16-23.

Requena, B. M. (1965) Studies of family planning in the Quinta normal district of Santiago: The use of contraceptives. Milbank Memorial Fund Quarterly 43:69-99.

Rogers, E. M. (1974) Communication for Development in China and India: The Case of Health and Family Planning at the Village Level. Paper presented at the Summer Program of Advanced Study on Communication and Development, East-West Communication Institute, Honolulu.

Rogers, E. M., and D. S. Solomon (1979) Traditional Midwives as Family Planning Communicators in Asia, Case Study 1. Honolulu: East-West Communication Institute.

Rogers, E. M., H. J. Park, K.-K. Chung, S. B. Lee, W. S. Puppa, and B. A. Doe (1976) Network analysis of the diffusion of family planning innovations over time in Korean villages: The role of Mothers' clubs. In G. C. Chu, S. A. Rahim, and K. L. Kincaid, eds., Communication Monographs, No. 2. Honolulu: East-West Communication Institute.

Rosen, B. C., and A. B. Simmons (1971) Industrialization, family and fertility: A structural-psychological analysis of the Brazilian case. Demography 8:49-69.

Safilios-Rothschild, C. (1969) Patterns of familial power and influence. Sociological Focus 2:7-19.

Safilios-Rothschild, C. (1970) The study of family power structure: A review 1960-1969. Journal of Marriage and the Family 32:539-552.

Safilios-Rothschild, C. (1975) A Macro- and Micro-Examination of Family Power and Love: An Exchange Model. Paper presented at the Dynamics of Family Ecology Session of the ISSBD Symposium, Surrey, England.

Scrimshaw, S. C. M. (1978) Stages in women's lives and reproductive decision-making in Latin America. Medical Anthropology 2:41-58.

Shah, N. M. (1974) The role of interspousal communication in adoption of family planning methods: A couple approach. Pakistan Development Review 13:454-469.

Shedlin, M. G., and P. E. Hollerbach (1981) Modern and traditional fertility regulation in a Mexican community: Factors in the process of decision-making. Studies in Family Planning 12:278-296.

Simmons, A. B., and M. Culagovski (1975) If They Know, Why Don't They Use? Selected Factors Influencing Contraceptive Adoption in Rural Latin America. Paper presented at the annual meeting of the Population Association of America, Seattle, Wash.

Stokes, C. S., and C. J. Dudley (1972) Family planning and conjugal roles: Some further evidence. Social Science and Medicine 6:157-161.

Strodtbeck, F. L. (1951) Husband-wife interaction over revealed differences. American Sociological Review 16:468-473.

Stycos, J. M. (1968) Human Fertility in Latin America. Ithaca, N.Y.: Cornell University Press.

Stycos, J. M., and K. W. Back (1964) The Control of Human Fertility in Jamaica. Ithaca, N.Y.: Cornell University Press.

Tinker, I. (1976) The adverse impact of development on women. In I. Tinker, M. B. Bransen, and M. Buvinic, eds., Women and World Development. New York: Praeger.

Turk, J. L. (1975) Users and abusers of family power. In R. E. Cromwell and D. H. Olson, eds., Power in Families. New York: Sage Publications.

United Nations, Department of Economic and Social Affairs (1961) The Mysore Population Study. Population Studies, No. 34. New York: United Nations.

Van Keep, P. A., and E. Rice-Wray (1973) Attitudes towards family planning and contraception in Mexico City. Studies in Family Planning 4:305-309.

Weller, R. H. (1968) The employment of wives, dominance and fertility. Journal of Marriage and the Family 30:437-442.

Yaukey, D., W. Griffiths, and B. J. Roberts (1967) Couple concurrence and empathy on birth control motivation in Dacca, East Pakistan. American Sociological Review 32:716-726.

Chapter 30

SEQUENTIAL DECISION MAKING AND THE LIFE COURSE

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Over the past 25 years, fertility analysis has increasingly emphasized the importance of sequential decision making.[1] According to this perspective, each birth is influenced by a different set of motivational, cultural, and family conditions.[2] Among these changing conditions are the individual births themselves: each birth changes family circumstances and so affects the probability and timing of subsequent births (Mishler and Westoff, 1955).

The subsections that follow address 15 specific propositions having roots in the sequential perspective.[3] Three of these relate to characteristics of fertility plans and behavior linked to the life course; six to plan revisions and plan-implementation failures; two to the extrafamilial context of reproduction and three to the familial context; and one to the statistical interaction between the life course and the reproduction context. The empirical support, if any, available for each proposition is examined, though no attempt is made to give an exhaustive review of the relevant data.

PROPOSITIONS

Characteristics of Fertility Plans and Behavior Linked to the Life Course

The following three hypotheses relate to the general idea that fertility plans and behavior are influenced by different factors, or differently influenced by the same factor, at different stages of life.

Proposition 1 A couple's reasons for having the nth child are different from those for having other children. Another way to say this is that children of different birth orders have different values and disvalues.

This hypothesis is based on the considerations that the first child confers the unalterable state of parenthood on a couple, and

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probably cements the relationship between the parents in a unique way; the second child brings companionship to the first; and so on. It is, of course, the subjective perception of these alterations that is relevant to the proposition. The most ambitious attempts to examine this idea used data from the Value of Children study (Arnold et al., 1975). For wives and husbands from the Philippines, Korea, and the United States, Bulatao (1981) reports the following predominant values placed on various birth orders: for the first child, bringing the spouses closer, having someone to love and care for, and carrying on the family name; for the second to fifth child, sibling companionship, gender preference, and the pleasure of watching children grow; for the sixth and higher-order births, economic benefits. As for disvalues, the one most prominantly mentioned in connection with the first few births is loss of time to spend with one's spouse; for higher births, most prominent is the financial burden. Similar patterns are reported in Bulatao and Arnold (1977), Beckman (1976), and Fawcett (1978).

It would be interesting to see whether such patterns prevail in longitudinal data. Such studies could also show whether a couple's reasons for having the nth child change as they move from one parity to the next. For example, it might be determined whether the reasons for having a third child are the same when a couple are at zero parity as when they move up to first or second parity.

Proposition 2 (a) In any given population,[4] there exists a normative family-size floor. (b) Fertility plans and behavior of couples below that floor are primarily determined by normative pressures; above the floor, cost-benefit calculations and similar considerations are primary (Fawcett et al., 1972; Kammeyer, 1972:117; Blake, 1968).[5]

The empirical support for the first part of this hypothesis--the existence of a normative family-size floor--is examined in detail by Mason (in these volumes). Three observations are relevant. First, childlessness is preferred by only a small minority of couples in every population, and then generally because of pregnancy problems and the like. Second, final parity preferences, determined according to psychological measurement theory, show a great distance between very low parities (0 and 1) and middle-level parities (2 and 3); moreover, the middle-level ones are bunched together (see, e.g., Goldberg and Coombs, 1963). Finally, some studies have shown that reinforcing sanctions are associated with pronatalist norms do exist, and are especially strong in cases of extreme deviance (Ory, 1978; Miller and Newman, 1978).

The second part of the hypothesis--that fertility behavior and plans are influenced by different sets of factors below and above the normative family-size floor--can be examined empirically in light of studies on factors affecting successive-parity progressions. These studies offer conflicting evidence. Namboodiri (1974) found that only at higher parities do such variables as wife's education, husband's income, and wife's religion have significant influence on couples' decisions to have additional children. However, when the same data were analyzed by Rosenzweig and Seiver (1975), using a different

specification, socioeconomic predictors were found to have significant impact on expected parity progressions of women at lower parities as well. Hout (1978) found that wife's "potential earnings" had significant negative effects on fertility only at parities above 2. Kyriazis (1979), using a different data set, could not confirm Hout's results, however. With reference to the hypothesized primacy of social pressures as determinants of progressions below the normative family-size floor, Bulatao (1981:21,3) remarks that, in the Value of Children study, "rather than pleading social necessity, respondents considering low-parity births provided a cogent hierarchy of emotional gains from children" and that "social influences were very seldom cited" among the advantages of having children.

These inconsistencies might suggest that the second part of Proposition 2 has no solid empirical foundation (Bulatao and Fawcett, 1981). However, this conclusion seems to be premature in view of the difficulties involved in empirically testing this hypothesis: normative pressures operate subtly and may not even be recognized as such by those being influenced; moreover, the institutional pathways of such pressures are so complex that they are difficult to trace through survey interviews.

It should also be noted that all norms pertain to specific occasions and social positions; thus subgroups within a society may differ in their normative family-size thresholds. For example, childlessness may not be regarded as so terrible by all population subgroups in a society; an only child may be "allowable" in some status groups in some time periods. Thus if an analyst is only partially successful in using a social or economic variable to distinguish between those who stay at a given low parity and those who move up, this does not mean that normative pressures are either nonexistent or inoperative. A fair test of the present hypothesis would therefore involve establishing the normative family-size threshold, if any, characteristic of specified population subgroups, and then examining whether parity progressions below the subgroup threshold are primarily governed by generalized disapproval of and sanctions against alternative behavior. In such a study, the survey interview may not be the best method of data collection.

Proposition 3 The effect of individual factors on fertility plans and behavior changes with parity. (This is a more general version of the second part of Proposition 2.)

A number of studies have empirically examined this hypothesis.[6] These studies generally use cross-sectional data, mostly from the United States, and differences in the methods they employ make comparisons difficult.[7] However, they typically show that the effects of selected independent variables on fertility plans and behavior change with increasing parity. For example, Snyder (1978) reports that, for a United States sample, permanent household income affects parity progressions positively at low parities but negatively at higher parities. Goldberg (1960b) reports for a Detroit sample that the degree to which the wife's leisure pursuits are home-centered has a significant (positive) effect on expectations about future

reproduction only for women at low (0 or 1) parities. Hout (1978) reports for the United States that the effects of a number of variables on the propensity to increase the size of the family during a given period vary substantially across parities.

Thus, cross-sectional studies have provided some empirical support for this hypothesis; however, it has not yet been tested with longitudinal data. Also, the differences in the effects of particular independent variables on different parities need to be satisfactorily explained. For example, although many studies have reported a negative permanent income effect on the propensity to have additional children at higher parities, there is no consensus on why this is so.[8]

Plan Revisions and Failures

The following six hypotheses relate to the idea that fertility plans are revised according to changing circumstances, and that plans can fail to be implemented because of various unpredictable factors.

Proposition 4 Reformulations of fertility plans and plan-implementation failures do occur.

Data in support of this hypothesis come from longitudinal studies recording fertility plans at successive points in time; from panel studies comparing plans at one point in time to subsequent plans; and from cross-sectional studies comparing current and past plans, with the latter determined through retrospective questions.[9] Data from several United States studies provide general empirical support (Goldberg et al., 1959; Freedman et al., 1980; Westoff et al., 1957, 1961; Westoff and Ryder, 1977a), and comparable data are reported in two Taiwan studies (Hermalin et al., 1979; Nair and Cho, 1980). However, Taiwanese women appear to be less successful than their U.S. counterparts in preventing unwanted births, but more likely to carry out intentions to have more children.

The data therefore indicate that intentions are not always translated into behavior. Along with some measurement error (between-interview instability, test-retest unreliability) associated with the preference indicator,[10] three other factors, discussed in the hypotheses below can be seen as responsible for the inconsistencies between intentions and behavior: the general tendency to revise preferences to suit changing circumstances (Propositions 8 and 9); accidental or unplanned pregnancies (Proposition 7); and the onset of infecundity and other involuntary phenomena (Proposition 5).

Proposition 5 Fecundity impairment is one of the unpredictable causes of plan-implementation failures.

The risk of permanent sterility increases with age, as Bongaarts (in these volumes) reports, but there is no way to predict at what age a particular woman will become sterile. This unpredictability is intensified by the possibility of pathological damage to the reproductive system. The role of fecundity impairments in changing

fertility plans is supported by a number of empirical studies (United Nations, 1976, 1980; Westoff and Ryder, 1977a; Whelpton et al., 1966). However, there is a need for more systematic data on this hypothesis.[11]

Proposition 6 Marital disruption is associated with reformulation of fertility plans and plan-implementation failures.[12]

A number of factors are involved in this association (see Burch, in these volumes). First, divorce, separation, and widowhood involve a period outside the married state, which reduces lifetime exposure to fertility. This loss of exposure time is, of course, a function of the probability of remarriage (Henry, 1956; Nag, 1962; Davis, 1946; Dandekar, 1961) and the length of the waiting time outside the married state. Second, divorce may be preceded by a period of separation, and separation by an interval of low frequency of coitus within marriage (Thornton, 1978; Caldwell et al., 1980). Third, sterility or low fertility may be a direct cause of a divorce or may facilitate it (Caldwell et al., 1980); conversely, the presence of children, particularly young ones, often deters separation and divorce (Cherlin, 1977; Glick, 1967; see, however, Veevers, 1973). Finally, when divorced or widowed persons enter new unions, they may make up for lost reproduction time by adopting a relatively older age pattern of childbearing (Thornton, 1978). Many people tend to want at least one additional child in each marital union.

Empirical data in support of this proposition are rather sparse, perhaps because it is considered obvious. However, some support is provided by Coombs (1979), who reported that when the preference goal stated at an initial interview was used to predict final parity, the relationship was weaker in the total group than in the subgroup consisting only of continuous marriages. The greatest difference was observed among women who had just been married at the time of the first interview--the group that also had the highest incidence of interrupted marriages. Similarly, cross-sectional data, such as those from the World Fertility Survey, show a clear association between termination of marriage and low fertility (e.g., Caldwell et al., 1980). Again, however, these data are not sufficient to provide clear insight into the subtleties of the hypothesis.

Proposition 7 Unintended pregnancies occur with some frequency, and are traceable to inadequacies in the couple's fertility decision-making process or the ineffectiveness of their implementation strategies.

Specifically, the causes of unintended pregnancies may consist of the following: (a) inability to understand fertility options or their implications; (b) limited information; (c) conflicts, such as those between individual desires and social norms; (d) crises at the personal, familial, or higher levels, creating stress and preventing clear and decisive thinking; and (e) uncertainty about the outcome of a contemplated course of action (e.g., even sterility may not be 100 percent effective) (Miller and Godwin, 1977:103-109).

Data on unintended pregnancies come from various sources. In

several cross-sectional surveys, the number of children wanted or planned by respondents at the time of their marriage was ascertained through retrospective questions; these responses were then compared with current statements about ideal or expected family size (e.g., United Nations, 1976:142-146; Hill et al., 1959). If current expectations exceed the number wanted at the time of marriage, the inference can sometimes be drawn that unintended births have occurred (United Nations, 1976:147). On the other hand, the discrepancies could also be due to revised fertility goals since marriage, or to measurement errors associated with responses to retrospective questions on family-size preferences (United Nations, 1976, 1980). Another question often included in cross-sectional surveys is whether the last birth was wanted: "Thinking back to the time before you became pregnant with your (last) child, had you wanted to have any more children?" The World Fertility Survey included this question in the optional fertility regulation module, which approximately two-thirds of the participating countries elected to use. Primarily from responses to this question, and secondarily from desired and ideal family sizes, Westoff (1980) estimated that substantial proportions of births in Indonesia, Korea, Sri Lanka, Colombia, Panama, and Peru could be classified as unwanted (see also Udry et al., 1973).

A number of longitudinal studies also support the hypothesis. These include the 1970-75 rounds of the U.S. National Fertility Survey (Jones et al., 1980); the Princeton Study (Bumpass and Westoff, 1970); the National Longitudinal Study of Social, Economic, and Demographic Change in Thailand (Knodel and Pitaktepsombati, 1975); and longitudinal studies in Taiwan (Hermalin et al., 1979).

Analysis of the empirical data also leads to a number of generalizations.

7.1. Delaying conception for a long time may lead to the unintended consequence of delaying conceptions forever (Freedman et al., 1975:267). This may be explained in part by the unpredictable intervention of infecundity (see Proposition 5). However, it is also true that some couples change their plans from later to never as they become committed to nonchild-centered activities (Rindfuss and Bumpass, 1978).

7.2. The higher the age at marriage, the fewer the number of unwanted births and the lower the likelihood of contraceptive failure. This may be primarily due to the selectivity of who marries at what age: better-educated persons capable of making sound decisions and effectively carrying them out may marry at disproportionately higher ages (Westoff, 1980; Jones et al., 1980).

7.3. The probability of contraceptive failure is higher for couples who aim to delay a pregnancy than for those who want to prevent further childbearing altogether (Westoff et al., 1963; Jones et al., 1980).[13]

Proposition 8 Fertility plans change according to the couple's experience with infant deaths. Some couples may include extra births in their plans to insure against potential losses. However, such

forecasts may and do go wrong, and hence even these couples often revise their plans in accordance with actual experience.

Heer's paper (in these volumes) contains an extensive review of the empirical data on this hypothesis. Some studies have found no support for it; others have claimed some, but many such claims are questionable on methodological grounds. Some more or less defensible support is provided by cross-sectional studies showing that, at any given parity, there is a significant negative association between experience with child deaths and readiness to cease childbearing, this association vanishing when number of living children, instead of parity, is used as the control (United Nations, 1980).

Proposition 9 Fertility plans are adjusted if the preferred and actual sex compositions of children are incongruent. Because the sex of each child is randomly determined,[14] a discrepancy may develop between what a couple prefer and what they get. Fertility plans are usually revised upward to counteract a less-preferred sex composition of offspring. On the other hand, couples may decide to terminate childbearing without having achieved the preferred composition (McClelland, 1979), depending on the perceived likelihood of the next birth yielding the desired sex; the values and disvalues attached to the status quo; and the perceived costs and benefits of success or failure in achieving the desired sex at the next birth. Some couples may prefer the status quo to risking a less desirable alternative; in that case, sex preference may lead to a downward revision of fertility plans.

Empirical data related to this hypothesis receive treatment elsewhere (McClelland, in these volumes). Generally, however, sex preference for children varies widely among populations, sometimes being associated with the propensity to have larger families (Williamson, 1976; Freedman and Coombs, 1974; United Nations, 1980). It may also be noted that, in cross-sectional surveys, it has been found that gender preference as a reason for wanting additional children is mentioned more often by couples at medium parities (e.g., 3 or 4) than by those at either end of the parity range (Bulatao, 1981).

The Extrafamilial and the Familial Contexts of Reproduction

This section addresses shifts in the reproduction context. Two general points are relevant. First, when this context changes, the previous context will have a carry-over and the new context a current influence. Second, a couple's fertility plans and behavior themselves may be partly responsible for changes in the reproduction context.

The Extrafamilial Context

Proposition 10 Social mobility and fertility are reciprocally related. A mobile couple's class of origin has a carry-over effect

and their class of destination a current effect on their postmobility fertility plans and behavior.[15]

The term mobility is used broadly to include movement from one occupational class to another, from below to above the poverty line, from being a landless laborer to being an owner-cultivator, etc. It should also be noted that mobility may be reckoned in terms of a time interval starting either before or after the beginning of a couple's reproductive career. Thus, for example, if a woman brought up in a landless laborer's household marries a landowner, she is regarded as mobile, as is one whose husband experiences mobility after marriage.[16] Finally, the hypothesis is of primary interest only if intrinsic class differences exist in family-building patterns.

This hypothesis has received empirical support from a number of studies in developed countries (Andorka, 1978; Berent, 1951; Blau and Duncan, 1967; Bumpass and Westoff, 1970; Duncan, 1966; Duncan et al., 1972; Hope, 1972; Zimmer, 1979). As for less developed countries, more data are needed. Opportunities for gathering such data are offered by the social experimentation now underway in many of these countries (Murdock, 1980). Specific research questions worth investigating concern the effect on fertility of upward mobility from being a landless laborer or tenant farmer to being a landowner, and of downward mobility from being a landlord of a relatively large estate to being the owner-cultivator of a small parcel of land.[17]

Proposition 11 Geographic mobility and fertility are reciprocally related. A migrant couple's place of origin has a carry-over effect and their place of destination a current effect on their postmigration fertility plans and behavior.

There is a vast literature on the relationship between migration and fertility (see Macisco et al., 1969, for an extensive bibliography). It is generally believed that the relationship runs in both directions. However, most of the empirical work to date has treated migration as an antecedent and fertility as a consequence; moreover, the results of such studies have not been conclusive (Macisco et al., 1969; United Nations, 1973:182-183).

Empirical material relevant to the second part of the hypothesis comes mostly from studies in the United States. Blau and Duncan (1967) found in their 1962 U.S. Occupational Change in a Generation Survey that women who moved away from a farm background had an average terminal parity intermediate between that of women remaining on farms and that of women with a nonfarm background. Similar patterns were observed earlier in other sets of data (Goldberg, 1959, 1960a; Freedman and Slesinger, 1961; see also Duncan, 1965; Ritchey and Stokes, 1972), although Kiser (1959) observed a different pattern.[18]

The Familial Context

The familial context comprises a number of complex elements, including, for example, the influence of the extended family on a couple, the availability of mother surrogates, and the degree of

independence of the generations. Changes in any of those elements will affect the familial context as a whole; moreover, changes in one element may well be dependent on changes in the others. In general, it should also be noted that, when such changes do occur, a couple's behavior may continue for some time to be influenced by past conditions; thus, for example, the extended family's hold on a couple may prevail even after the couple move into a separate residence.

The following three hypotheses relate to three dimensions of the family context: the family living arrangements, the wife's extrafamilial involvement, and the marital power structure.

Proposition 12 The fertility plans and behavior of a couple who move from one living arrangement (or household composition) to another are influenced by the original as well as by the new arrangement. There is fertility selectivity in the move from one arrangement to another.

Very little empirical research has been done on the second part of this hypothesis. Even on the first part, most research has merely compared the average fertility of couples in different living arrangements. Moreover, the results of this research have been inconclusive (Freedman, 1961/62), mainly because of inconsistencies in the concepts and methodology used (Burch and Gendell, 1970). Only recently have scholars begun to realize that misleading inferences can be drawn from a classification based exclusively on living arrangements. Several studies do report data on living arrangements over the life course (e.g., Bebarta, 1977; Karim, 1974; Palmore, 1972), but the relationship between these data and fertility has not been systematically explored.

Bebarta's (1977) study indicates that those who change living arrangements during the childbearing years have a higher final parity than those who do not, the latter group (nonchangers) showing no marked difference in fertility by the type of family unit involved. Thus the data imply that type of household does not influence fertility, but any change in household composition does; in other words, there may be a special mobility effect. If such data are to be useful in testing the hypothesis, one must know: (a) in which setting the couple received socialization and training; (b) at what stages in life any changes in living arrangements took place; and (c) whether selectivity (in fertility level) was operating on those who changed living arrangements.

Proposition 13 (a) A woman's plans for and actual participation in extrafamilial activities (such as work outside the home) affect and are affected by her fertility plans and behavior, and the influences in both directions have long-term as well as short-term components. (b) The effects in question are conditional on the various dimensions of the familial context.

Standing (in these volumes) and Oppong (in these volumes) review a number of studies bearing on one aspect or another of this hypothesis. In general, however, a number of points may be noted.

First, relatively little empirical data exist on the reciprocal

relationship between women's work and fertility in developed countries; even less exist for the developing countries. Most of the research to date has been concerned with whether the two variables (work and fertility) are associated at all. Although a negative relationship between the two variables has been observed in the developed countries, the corresponding results for developing country populations have been inconsistent, sometimes showing a positive relationship between the variables, sometimes a negative relationship, and sometimes none at all. In theory, it is recognized that the familial context of childbearing and rearing has a conditioning influence on the work-fertility relationship; however, the specific components of this influence have not yet been systematically studied. It is known that, in the developed countries, the recent occurrence of a live birth has a short-term depressant effect on the mother's propensity to participate in the labor force (Cramer, 1980; Smith-Lovin and Tickamyer, 1978; Hout, 1978). It should be noted, however, that this pattern is conditional on such factors as the separation of the work place from the home, the unavailability of socially acceptable mother surrogates, and the unconventionality of caring for the child at the work place. Because such conditions are not the rule in the developing countries, the applicability of this depressant effect to those countries is questionable.

Finally, the long-term effect of each birth on the mother's work participation will not be clear until longitudinal data covering relatively long segments of the couple's life course are available. On the other hand, a woman's work participation, especially before marriage and early in the marriage, is taken to affect her fertility in both the short and long term via her work commitment and the delay of marriage and first birth (Standing, in these volumes; Cramer, 1980). A careful analysis of the work-history data in the World Fertility Survey might shed light on these effects.

Proposition 14 (a) The marital power structure is affected by and affects the couple's fertility plans and behavior. (b) The effects in both directions are conditional on the various dimensions of the familial context of reproduction. It should be noted that very little attention has been given to the reciprocal aspect of this relationship; most of the research has treated fertility as a consequence and the marital power structure as an antecedent.

In the empirical research, the marital power structure has been measured in a number of different ways (see Bagozzi and Van Loo, 1978b, following Goldberg, 1975; Blood and Wolfe, 1960; Cromwell and Olsen, 1975; Hill et al., 1959; Ridley, 1968; Safilios-Rothschild, 1970; Scanzoni and Scanzoni, 1981). Because of these differences in operational definitions, it is inevitable that the results of these studies will not be entirely comparable. However, even taking this into account, the empirical evidence for the hypothesis is at present sketchy. For example, the Hill et al. (1959) study in Puerto Rico reports virtually no association between a husband-dominance index and any of these measures of contraceptive use: ever-use, length of use, and contraceptive success. On the other hand, their couple

communication index, which in a sense may be regarded as including husband-wife power relations, is reported to have been one of the better predictors of fertility control behavior. Similar inconsistencies exist on whether the marital power structure changes over the life course, and, if so, in what pattern. There are those who believe that, in industrialized societies, most marriages begin on a more or less egalitarian footing, only to change eventually into a pattern where each spouse is dominant in selected domains (Miller and Godwin, 1977:76). Then there are those who speculate that most marriages, at least in the developed world, are in the beginning characteristically wife-dominant, as far as fertility behavior is concerned, but become egalitarian or husband-dominant later in the life course (Goldberg, 1960a, 1960b). If such speculations are correct, it seems plausible that fertility decisions are monopolized by one spouse at one stage in the life course, and by the other at another stage. However, the data are simply not sufficient to test this empirically. It may also be noted that the data on the work-fertility relationship (see Proposition 13) are also pertinent to the present discussion insofar as that relationship is mediated by marital power structures, as some scholars believe (Ridley, 1968; Weller, 1968; see also Namboodiri, 1966).

Interaction Between the Life Course and the Reproduction Context

The following hypothesis addresses the interactional effect of the life course and the reproduction context on fertility plans and behavior.

Proposition 15 The impact on the couple's fertility plans and behavior of a change in the reproduction context depends on the life-course stage at which that change occurs.

This hypothesis has one of its roots in the primitive notion of the cohort approach to the study of social phenomena, which holds that "transformations of the social world modify people of different ages in different ways" (Ryder, 1965:859). The hypothesis may also be viewed from the commonplace perspective that reproduction tends to be concentrated in certain age groups. Although this is partly due to the age pattern of fecundity, it is also due to social and economic factors, such as the belief that grandparents are not supposed to give birth. With the age concentration of childbearing, it is reasonable to expect a stimulus to have the greatest impact on reproduction when childbearing activity is at its peak. Obviously, the greater the age concentration, the more relevant this observation will be. Proposition 15 may also be viewed according to the underlying theme of Propositions 1, 2, and 3--that fertility plans and behavior are affected by different sets of factors or differently affected by particular factors at different stages of the life course. Thus, for example, it is logical to expect that couples below a normative family-size floor are less likely than those above the floor to

respond to a family-planning program that emphasizes sterilization.

The empirical data relevant to Propositions 1, 2, and 3 are also relevant to the present hypothesis. Other pertinent data include those on differentials by life-course stage in the receptivity of couples to organized family planning programs. Also worth mentioning is Namboodiri's (1981) analysis of the U.S. cohort fertility data; this study indicates a heavy concentration of age-period interactions in the age group 20 to 24, reflecting extra sensitivity in this group to environmental shifts.

CONCLUSIONS

Although the sequential approach to fertility decision making is intuitively more appealing than the single-decision approach, its much greater complexity generates tremendous data needs (Heckman and Willis, 1976). Data are especially needed on changes over the life course (by age, parity, or length of the reproductive career) in the following areas:

a. the familial and extrafamilial contexts of reproduction (e.g., shifts in the marital power structure, work history, mobility and migration history, and changes in economic conditions),
b. the proximate determinants of fertility (e.g., coital frequency, onset of infecundity due to various causes, and fetal wastage), and
c. contraceptive and noncontraceptive behavior.

Such longitudinal panel data, together with detailed fertility histories, would permit comparisons of the adequacy of the sequential approach against other, more easily implemented, approaches. These would answer the question whether the sequential model is capable of delivering explanatory or predictive power commensurate with the conceptual complexity it introduces and the magnitude of its data requirements.

The form these data should take, the design of their collection, and the methods for their analysis are equally important considerations. New methodology may need to be developed to handle such longitudinal data, as well as some existing longitudinal data from fertility surveys.

The hypotheses presented in this paper offer a number of opportunities to apply the sequential approach through collection of the necessary empirical data. The following are examples of topics needing further research:

a. What are the changes in parents' reasons for having their nth child as they move from 0 to n-1 parity? For example, are the reasons for having the third child the same before and after the second child is born?

b. What explains the parity differences in the effects of various factors on the probability of parity progression?
c. What is the precise relationship between a woman's work history and her fertility history?

Another question to be answered empirically is whether the sequential approach is universally applicable. For example, can it be applied where families are not planned? Because the sequential model includes factors that are not deliberately manipulated, its application to populations in which large-family or "supply-side" norms prevail cannot be dismissed.

NOTES

1. Recently, some scholars (e.g., Bulatao, 1981) have begun to use the term successive decisions to refer to what used to be called sequential decisions. Because the latter term has been in use for a long time, it has been adopted in the present paper. It should be noted, however, that scholars have used the term sequential decisions in more than one sense: it has been applied to the hierarchical arrangement of lower-level decisions within higher-level ones, as well as to the horizontal sequencing of a number of decisions of the same level. An example of the former is the following: a teenager decides to seek contraceptive protection; she (he) is then faced with deciding what contraception to use, where to go for the needed supplies or services, where to store the supplies (if necessary), and so on. An example of the latter type is the decision to have the first birth, followed by the decision to have the second, and then to have the third, and so on. This paper is concerned with this latter type.
2. A number of studies have focused on sequential decision-making, or used this theory as their point of departure. These include the following: Bulatao (1981), Bulatao and Arnold (1977), Bumpass and Westoff (1970), Coombs (1979), Freedman et al. (1965, 1980), Fried et al. (1980), Goldberg (1960b), Hout (1978), Khan and Sirageldin (1977), Kyriazis (1979), Lee and Khan (1978), Miller and Newman (1978), Mishler and Westoff (1955), Namboodiri (1974), Park (1978), Rosenzweig (1976), Rosenzweig and Seiver (1975), Seiver (1978), Simon (1975a, 1975b), Snyder (1978), Terhune (1974), West (1980), and Westoff et al. (1961). Theoretical expositions of the sequential perspective can be found in Cochrane (1979), Hass (1974), Heckman and Willis (1976), and Namboodiri (1972a, 1980). Relevant discussions can also be found in Bagozzi and Van Loo (1978a), Leibenstein (1979), Turchi (1975, 1979), and Lee (1980).
3. See Namboodiri (1980) for a development of the sequential perspective based on some of the ideas of temporary equilibrium theory in economics (Grandmont, 1977).

4. The term population is used advisedly here: the reference is not always to a society or a country as a whole, but includes any aggregate of humans having a unit character, in the sense of an interdependence, resulting in a separate identity.
5. This notion of a normative family-size floor parallels the stipulation in economics that, for the consumer, there is a "subsistence level" for certain items in the consumption basket, and that there are trade-offs between consumption programs only if that subsistence level is equalled or exceeded in each program (see, e.g., Hakansson [1972] also see Namboodiri [1980:79], for a discussion of the relationship between this notion and Maslow's [1954] postulate of a hierachy of human needs; and Georgescu-Roegen [1968] for a discussion of the roots of the subsistence-level notion and needs hierarchies in early economic thought).
6. See, for example, Bernhardt (1972), Fried et al. (1980), Goldberg (1960b), Hout (1978), Khan and Sirageldin (1977), Kyriazis (1979), Lee and Khan (1978), Namboodiri (1974), Rosenzweig (1976), Rosenzweig and Seiver (1975), Seiver (1978), Simon (1975a, 1975b), Synder (1978), and West (1980).
7. To give an example, in some studies, wife's education has been used as a proxy for the value of the wife's time. However, in other studies where the latter variable has been exogenously estimated using instrumental variables, it has been found that wife's education and the value of her time exert opposite influences on the decision to have additional children (see, e.g., Snyder, 1978). Those who have used instrumental variables to estimate the value of the wife's time have, however, ignored the potential problems stemming from selectivity bias (Heckman, 1980).
8. To explain this empirical regularity, some authors have pointed to the higher contraceptive efficacy among higher-income couples; some have invoked the idea that high-income groups invest more in quality than in quantity of children; some have proposed that high-income couples have different tastes; and some believe that the observed income effect reflects the interaction of income with some other variable such as education (see Simon, 1975a; Hout, 1978; Bulatao and Fawcett, 1981).
9. For example, the fertility regulation module of the World Fertility Survey includes the following question: "Thinking back to the time before you became pregnant [with your (last) child], had you wanted to have any (more) children?" Another example is the following: "Before you had your first child, did you think a great deal about how many children you wanted to have, or didn't you think about it? [If yes] How many children did you want to have?" (Hill et al., 1959).
10. Better measures of preferences, such as those based on psychological measurement theory, have been shown to have greater predictive power as far as subsequent behavior is concerned (Coombs, 1979).

11. There is ample evidence for the prevalence of sterility due to both pathological and nonpathological causes; what is lacking is the classification of sterile women according to their fertility plans before they became aware of their sterility.
12. Marital unions are understood broadly here to include all sexual unions, regardless of whether they have been legally recognized as marriages.
13. This was first observed as an empirical regularity in the Princeton Fertility Study, and has since then been noted in all major investigations of contraceptive efficacy.
14. Current medical technology permits ascertaining the sex of the fetus early in the pregnancy. It is therefore possible through sex-selective abortion to prevent the birth of infants of the undesired sex. Similarly, it is possible through sex-selective infanticide to ensure that only infants of the desired sex survive. Both of these possibilities are ignored in the present context on the grounds that very few parents currently adopt either of these strategies.
15. In early formulations of the mobility-fertility relationship, fertility was seen as the antecedent and mobility the consequence (Fisher, 1929; Dumont, 1890); however, in many later formulations, fertility has been treated as the consequence and mobility the antecedent.
16. Defined in this broad fashion, mobility is becoming very common in less developed countries. The fact that this is occurring when fertility levels are also changing offers an opportunity to investigate the applicability of this hypothesis.
17. Similarly, the relationship between fertility as an antecedent and fragmentation of landholdings as a consequence in these countries remains to be carefully examined (Merrick, 1978).
18. It may be noted that the extrafamilial context may include other components besides those covered in Propositions 10 and 11. It has often been held, for example, that, when times are good economically, people feel freer to have children (Easterlin, 1978). This would suggest that, if a shift occurs in a couple's economic state, the old economic conditions will have a carry-over and the new ones a current effect on their subsequent fertility plans and behavior.

BIBLIOGRAPHY

Andorka, R. (1978) Determinants of Fertility in Advanced Societies. New York: The Free Press.

Arnold, F., R. A., Bulatao, C. Buripakdi, B. J. Chung, J. T. Fawcett, T. Iritani, S. J. Lee, and T.-S. Wu (1975) The Value of Children: Introduction and Comparative Analysis, Vol. I. Honolulu: East-West Population Institute.

Bagozzi, R. P., and M. F. Van Loo (1978a) Fertility as consumption: Theories from the behavioral sciences. Journal of Consumer Research 4:199-288.

Bagozzi, R. P., and M. F. Van Loo (1978b) Toward a general theory of fertility: A causal model approach. Demography 15:301-319.

Bebarta, P. C. (1977) Family Type and Fertility in India. North Quincy, Mass.: Christopher Publishing.

Beckman, L. J. (1976) Values of Parenthood among Women Who Want an Only Child. Paper presented at the annual meeting of the American Psychological Association, Washington, D.C.

Berent, J. (1951) Fertility and social mobility. Population Studies 5:244-260.

Bernhardt, E. M. (1972) Fertility and economic status--Some recent findings on differentials in Sweden. Population Studies 26:175-184.

Blake, J. (1968) Are babies consumer durables? A critique of the economic theory of reproductive motivation. Population Studies 22:5-25.

Blau, P. M., and O. D. Duncan (1967) The American Occupational Structure. New York: Wiley.

Blood, R. O., Jr., and D. M. Wolfe (1960) Husbands and Wives. New York: The Free Press.

Bulatao, R. A. (1981) Values and disvalues of children in sequential childbearing decisions. Demography 18:1-26.

Bulatao, R. A., and F. Arnold (1977) Relationships between the value and cost of children and fertility: Cross-cultural evidence. Pp. 141-156 in International Population Conference, Mexico, 1977, Vol. I. Liege: International Union for the Scientific Study of Population.

Bulatao, R. A., and J. T. Fawcett (1981) Dynamic perspectives in the study of fertility decision-making: Successive decisions within a fertility career. Pp. 433-449 in International Population Conference, Manila, 1981, Vol. 1. Liege: International Union for the Scientific Study of Population.

Bumpass, L. L., and C. F. Westoff (1970) The Later Years of Childbearing. Princeton, N.J.: Princeton University Press.

Burch, T. K., and M. Gendell (1970) Extended family structure and fertility: Some conceptual and methodological issues. Journal of Marriage and the Family 32:227-236.

Caldwell, J. C., P. F. McDonald, and L. T. Ruzicka (1980) Interrelationships between Nuptiality and Fertility: The Evidence from the World Fertility Survey. Paper presented at the World Fertility Survey Conference, London.

Cherlin, A. (1977) The effect of children on marital dissolution. Demography 14:265-272.

Cochrane, S. H. (1979) Fertility and Education: What Do We Really Know? World Bank Staff Occasional Papers, Number 26. Baltimore, Md.: The Johns Hopkins University Press.

Coombs, L. C. (1976) Are Cross-Cultural Preference Comparisons Possible?: A Measurement-Theoretic Approach. IUSSP, No. 5. Liege: International Union for the Scientific Study of Population.

Coombs, L. C. (1979) Reproductive goals and achieved fertility: A fifteen-year perspective. Demography 16:523-534.

Cramer, J. C. (1980) Fertility and female employment. American Sociological Review 45:167-190.

Cromwell, R. C., and D. H. Olsen (1975) Power in Families. New York: Wiley.

Dandekar, K. (1961) Widow remarriage in six rural communities in western India. Pp. 191-207 in International Population Conference, New York, Vol. 2. Liege: International Union for the Scientific Study of Population.

Davis, K. (1946) Human fertility in India. American Journal of Sociology 52:243-254.

Dumont, A. (1890) Depopulation et Civilisation. Paris: Lecrosnier-Babe.

Duncan, O. D. (1965) Farm background and differential fertility. Demography 2:240-249.

Duncan, O. D. (1966) Methodological issues in the analysis of social mobility. Pp. 51-97 in J. J. Smelser and S. M. Lipset, eds., Social Structure and Social Mobility in Economic Development. Chicago: Aldine.

Duncan, O. D., D. L. Featherman, and B. Duncan (1972) Socioeconomic Background and Achievement. New York: Seminar Press.

Easterlin, R. A. (1978) The economics and sociology of fertility: A synthesis. Pp. 57-133 in C. Tilly, ed., Historical Studies of Changing Fertility. Princeton, N.J.: Princeton University Press.

Fawcett, J. T. (1978) The value and cost of the first child. Pp. 244-265 in W. B. Miller and L. F. Newman, eds., The First Child and Family Formation. Chapel Hill, N.C.: Carolina Population Center, University of North Carolina.

Fawcett, J. T., S. Albores, and F. Arnold (1972) The value of children among ethnic groups in Hawaii: Exploratory measurements. Pp. 234-257 in J. T. Fawcett, ed., The Satisfactions and Costs of Children: Theories, Concepts, Methods. Honolulu: East-West Population Institute.

Fisher, R. A. (1929) The General Theory of Natural Selection. New York: Dover.

Freedman, D. (1963) The relation of economic status to fertility. American Economic Review 53:414-426.

Freedman, R. (1961/62) The sociology of human fertility: A trend report and bibliography. Current Sociology X/XI:35-121.

Freedman, R. (1963) Norms for family size in underdeveloped areas. Proceedings of the Royal Statistical Society 159:220-234.

Freedman, R. (1975) The Sociology of Human Fertility: An Annotated Bibliography. New York: Irvington Publishers.

Freedman, R., and L. Coombs (1974) Cross-Cultural Comparisons: Data on Two Factors in Fertility Behavior. New York: Population Council.

Freedman, R., and D. P. Slesinger (1961) Fertility differentials for the indigenous non-farm population of the United States. Population Studies 15:161-173.

Freedman, R., L. C. Coombs, and L. Bumpass (1965) Stability and change in expectations about family size: A longitudinal study. Demography 2:250-275.

Freedman, R., A. J. Hermalin, and M. C. Chang (1975) Do statements about desired family size predict fertility? The case of Taiwan 1967-1970. Demography 12:407-416.

Freedman, R., D. S. Freedman, and A. D. Thornton (1980) Changes in fertility expectations and preferences between 1962 and 1977: Their relation to final parity. Demography 17:365-378.

Fried, E. S., S. L. Hofferth, and J. R. Udry (1980) Parity-specific and two-sex utility models of reproductive intentions. Demography 17:1-11.

Georgescu-Roegen, N. (1968) Utility. In D. Sils, ed., International Encyclopedia of the Social Sciences. New York: MacMillan and The Free Press.

Glick, P. (1967) Marriage and family variables related to fertility. Pp. 210-213 in Proceedings of the World Population Conference, Belgrade, Vol. II. New York: United Nations.

Goldberg, D. (1959) The fertility of two-generation urbanites. Population Studies 12-214-222.

Goldberg, D. (1960a) Another look at the Indianapolis study fertility data. Milbank Memorial Fund Quarterly 38:23-36.

Goldberg, D. (1960b) Some recent developments in American fertility research. In National Bureau of Economic Research, Demographic and Economic Change in Developed Countries: A Conference of the Universities-Committee for Economic Research. Princeton, N.J.: Princeton University Press.

Goldberg, D. (1975) Socioeconomic theory and differential fertility: The case of the LDCs. Social Forces 54:84-106.

Goldberg, D., and C. H. Coombs (1963) Some applications of unfolding theory to fertility analysis. Pp. 105-129 in Emerging Techniques in Population Research. New York: Proceedings of the 1962 Annual Conference of the Milbank Memorial Fund.

Goldberg, D., H. Sharp, and R. Freedman (1959) The stability of expected family size. Milbank Memorial Fund Quarterly 37:369-385.

Goldberger, A. S. (1971) Econometrics and psychometrics: A survey of communalities. Psychometrika 36:83-105.

Goldscheider, C. (1967) Fertility of the Jews. Demography 4:196-209.

Grandmont, J. M. (1977) Temporary general equilibrium theory. Econometrika 45:535-573.

Hakansson, N. H. (1972) Sequential investment-consumption strategies for individuals and endowment funds. In J. L. Bicksler, ed., Methodology in Finance-Investments. Lexington, Mass.: D. C. Heath and Company.

Hass, P. H. (1974) Wanted and unwanted pregnancies: A fertility decision-making model. The Journal of Social Issues 30:125-165.

Heckman, J. J. (1980) Sample selection bias as a specification error with an application to the estimation of labor supply functions. Pp. 206-248 in J. P. Smith, ed., Female Labor Supply: Theory and Estimation. Princeton, N.J.: Princeton University Press.

Heckman, J. J., and R. J. Willis (1976) Estimacion of a stochastic model of reproduction: An econometric approach. Pp. 99-138 in N. Terleckyj, ed., Household Production and Consumption. New York: Columbia University Press.

Henry, L. (1956) Caracteristiques demographiques des pays sousdevelopes: Natalite, nuptialite, fecondite. Pp. 149-173 in G. Balandier, ed., Le "Tiers Monde": Sous-developpement et Development. Institut National d'Etudes Demographiques Travaus et Documents Cahier No. 27.

Hermalin, A. I., R. Freedman, T.-H. Sun, and M. C. Chang (1979) Do intentions predict fertility: The experience in Taiwan, 1967-74. Studies in Family Planning 10:75-95.

Hill, R., J. M. Stycos, and K. W. Back (1959) The Family and Population Control. Chapel Hill, N.C.: University of North Carolina Press.

Hope, K., ed. (1972) The Analysis of Social Mobility: Methods and Approaches. Oxford, Eng.: Clarendon Press.

Hout, M. (1978) The determinants of marital fertility in the United States, 1968-1970: Inferences from a dynamic model. Demography 15:139-159.

Jones, E. F., L. Paul, and C. F. Westoff (1980) Contraceptive efficacy: The significance of method and motivation. Studies in Family Planning 11:39-50.

Kammayer, K. C. (1972) An Introduction to Population. London: International Textbook Co.

Karim, M. S. (1974) Fertility differentials by family type. Pakistan Development Review 13:129-144.

Khan, M. A., and I. Sirageldin (1977) Son preference and the demand for additional children in Pakistan. Demography 14:481-495.

Kiser, C. V. (1959) Fertility rates by residence and migration. Pp. 273-286 in International Population Conference, Vienna. Liege: International Union for the Scientific Study of Population.

Knodel, J., and P. Pitaktepsombati (1975) Fertility and family planning in Thailand: Results from two rounds of a national study. Studies in Family Planning 6:402-413.

Kyriazis, N. (1979) Sequential fertility decision making: Catholics and Protestants in Canada. Canadian Review of Sociology and Anthropology 16:275-286.

Lee, C. F., and M. M. Khan (1978) Factors related to the intention to have additional children in the United States: A reanalysis of data from the 1965 and 1970 National Fertility Studies. Demography 15:337-344.

Lee, R. D. (1980) Aiming at a moving target: Period fertility and changing reproductive goals. Population Studies 34:205-226.

Leibenstein, H. (1979) Comments on "Fertility as consumption: Theories from the behavioral sciences." Journal of Consumer Research 5:287-290.

Lenski, G., and J. Lenski (1978) Human Societies: An Introduction to Macrosociology, 3rd ed. New York: McGraw Hill.

MacDonald, M. M., and R. R. Rindfuss (1980) Earnings, Relative Income, and Family Formation. Chapel Hill, N.C.: Carolina Population Center, University of North Carolina.

Macisco, J. J., L. F. Bouvier, and M. J. Renzi (1969) Migration status, education and fertility in Puerto Rico, 1960. Milbank Memorial Fund Quarterly 47:167-187.

Maslow, A. H. (1954) Motivation and Personality. New York: Harper and Row.

McClelland, G. (1979) Determining the impact of sex preference on fertility: A consideration of parity progression ratio, dominance, and stopping rule measures. Demography 16:377-388.

Merrick, T. W. (1978) Fertility and land availability in rural Brazil. Demography 15:321-336.

Miller, W. B., and R. K. Godwin (1977) Psyche and Demos. New York: Oxford University Press.

Miller, W. B., and L. F. Newman, eds. (1978) The First Child and Family Formation. Chapel Hill, N.C.: Carolina Population Center, University of North Carolina.

Mishler, E. G., and C. F. Westoff (1955) A proposal for research on social psychological factors affecting fertility: Concepts and hypotheses. In Current Research in Human Fertility. New York: Milbank Memorial Fund.

Murdoch, W. W. (1980) The Poverty of Nations: The Political Economy of Hunger and Population. Baltimore, Md.: The Johns Hopkins University Press.

Nag, M. (1962) Factors Affecting Human Fertility: A Cross-Cultural Study. Yale University Publication in Anthropology No. 66. New Haven, Conn.: Yale University.

Nair, N. K., and L. P. Cho (1980) Fertility intentions and behavior: Some findings from Taiwan. Studies in Family Planning 11:255-263.

Namboodiri, N. K. (1966) Another look at structural-functional analysis: An exercise in axiomatic theory construction. Sociological Bulletin 15:75-89.

Namboodiri, N. K. (1972a) Some observations on the economic framework for fertility analysis. Population Studies 26:185-206.

Namboodiri, N. K. (1972b) The integrative potential of a fertility model: An analytic test. Population Studies 26:465-485.

Namboodiri, N. K. (1974) Which couples at given parities expect to have additional births? An exercise in discriminant analysis. Demography 11:45-56.

Namboodiri, N. K. (1975) Review symposium on "Economics of the Family: Marriage, Children, and Human Capital," T. W. Schultz, ed. Demography 14:551-569.

Namboodiri, N. K. (1980) A look at fertility model building from different perspectives. Pp. 71-90 in T. K. Burch, ed., Demographic Behavior: Interdisciplinary Perspectives on Decision-Making. AAAS Selected Symposium, 45. Boulder, Colo.: Westview Press.

Namboodiri, N. K. (1981) On factors affecting fertility at different stages in the reproduction history: An exercise in cohort analysis. Social Forces 59:1114-1129.

Ory, M. G. (1978) The decision to parent or not: Normative and structural components. Journal of Marriage and the Family 40:531-539.

Palmore, J. A. (1972) Population change, conjugal status and the family. In Population Aspects of Social Development. Asian Population Studies, Series No. 11. Bangkok: United Nations.

Palmore, J. A., and M. B. Concepcion (1980) Desired Family Size and Contraceptive Use. Paper presented at the World Fertility Survey Conference, London.

Park, C. B. (1978) The fourth Korean child. The effect of son preference on subsequent fertility. Journal of Biosocial Science 10:95-106.

Ridley, J. C. (1968) Demographic change and the roles and status of women. The Annals of the American Academy of Political and Social Sciences 375:15-25.

Rindfuss, R. R., and L. L. Bumpass (1978) Age and the sociology of fertility: How old is too old? Pp. 43-56 in K. Taeuber et al., eds., Social Demography. New York: Academic Press.

Ritchey, P. N., and C. S. Stokes (1972) Residence background, migration, and fertility. Demography 9:217-230.

Rosenzweig, M. (1976) Female work experience, employment status, and birth expectations: Sequential decision-making in the Philippines. Demography 13:339-356.

Rosenzweig, M., and D. A. Seiver (1975) Comment on Namboodiri's "Which couples at given parities expect to have additional births?" Demography 12:665-668.

Ryder, N. B. (1965) The cohort as a concept in the study of social change. American Sociological Review 30:843-886.

Safilios-Rothschild, C. (1970) The study of family power structure: A review, 1960-1969. Journal of Marriage and the Family 32:539-552.

Scanzoni, L. D., and J. Scanzoni (1981) Men, Women, and Change: A Sociology of Marriage and Family, 2nd ed. New York: McGraw-Hill.

Seiver, D. A. (1978) Which couples at given parities have additional births. Research in Population Economics 1:309-319.

Simon, J. A. (1975a) Puzzles and further explorations in the interrelationship of successive births with the husband's income, spouse's education and race. Demography 12:259-274.

Simon, J. A. (1975b) The effect of income and education upon successive births. Population Studies 29:109-122.

Smith-Lovin, L., and A. R. Tickamyer (1978) Labor force participation, fertility behavior, and sex-role attitudes. American Sociological Review 43:541-556.

Snyder, D. (1978) Economic variables and the decisions to have additional children: Evidence from the Survey of Economic Opportunities. American Economics 22:12-16.

Terhune, K. W. (1974) Rationality and Rationalization in the Perceived Consequences of Family Size. Paper presented at the 82nd Annual Convention of the American Psychological Association, New Orleans.

Thornton, A. (1978) Marital dissolution, remarriage, and childbearing. Demography 15:361-380.

Turchi, B. A. (1975) The Demand for Children: The Economics of Fertility in the United States. Cambridge, Mass.: Ballinger.

Turchi, B. A. (1979) Comments on "Fertility as consumption: Theories from the behavioral sciences." Journal of Consumer Research 5:293-296.

Udry, J. R. (1980) Do Couples Make Fertility Decisions One at a Time? Unpublished paper presented at a seminar organized by the Carolina Population Center, University of North Carolina, Chapel Hill.

Udry, J. R., K. E. Bauman, and C. L. Chase (1973) Population growth rates in perfect contraceptive populations. Population Studies 27:365-371.

United Nations (1961) The Mysore Population Study. Population Studies No. 34 (ST/SOA/Ser. A/34). New York: United Nations.

United Nations (1973) The Determinants and Consequences of Population Trends. New York: United Nations.

United Nations (1976) Fertility and Family Planning in Europe Around 1970: A Comparative Study of Twelve National Surveys. (ST/ESA/SER A/58). New York: United Nations.

United Nations (1980) Selected Factors Affecting Fertility Preferences in Developing Countries: Evidence from the First Fifteen WFS Country Reports. Paper prepared by the Population Division and presented at the World Fertility Survey Conference, London.

Veevers, J. E. (1973) The child-free alternative: Rejection of the motherhood mystique. Pp. 183-199 in M. Stephenson, ed., Women in Canada. Toronto: New Press.

Weller, R. H. (1968) The employment of wives, dominance and fertility. Journal of Marriage and the Family 30:437-442.

West, K. (1980) Sequential Fertility Behavior: Study of Socio-Economic and Demographic Determinants of Parity Transitions. Unpublished Ph.D. dissertation, University of North Carolina, Chapel Hill, N.C.

Westoff, C. F. (1980) Unwanted Fertility in Six Developing Countries. Paper presented at the World Fertility Survey Conference, London.

Westoff, C. F., and N. B. Ryder (1977a) The predictive validity of reproductive intentions. Demography 14:431-453.

Westoff, C. F., and N. B. Ryder (1977b) The Contraceptive Revolution. Princeton, N.J.: Princeton University Press.

Westoff, C. F., E. G. Mishler, and E. L. Kelly (1957) Preferences in size of family and eventual fertility twenty years later. American Journal of Sociology 62:491-497.

Westoff, C. F., R. G. Potter, Jr., P. C. Sagi, and E. G. Mishler (1961) Family Growth in Metropolitan America. Princeton, N.J.: Princeton University Press.

Westoff, C. F., R. G. Potter, Jr., and P. C. Sagi (1963) The Third Child. Princeton, N.J.: Princeton University Press.

Whelpton, P. K., G. A. Campbell, and J. E. Patterson (1966) Fertility and Family Planning in the United States. Princeton, N.J.: Princeton University Press.

Williamson, N. E. (1976) Sons or Daughters: A Cross-Cultural Survey of Parental Preferences. Beverly Hills, Calif.: Sage Publications.

Willis, R. J. (1973) A new approach to the economic theory of fertility behavior. Journal of Political Economy 81:S14-S64.

Zimmer, B. G. (1979) Urban Family Building Patterns: The Social Mobility-Fertility Hypothesis Re-Examined. Bethesda, Md.: National Institute of Child Health and Human Development.

Chapter 31

AGE AT MARRIAGE AND PROPORTIONS MARRYING: LEVELS AND TRENDS, FERTILITY IMPACT, AND DETERMINANTS

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INTRODUCTION

The importance of marriage and family institutions to both individuals and social groups is unmistakable. For individuals, marriage marks maturity and permits a range of adult behavior, including childbearing; it is a crucial rite of passage. At the societal level, marriage creates new family nuclei and realigns households as units of consumption, savings, labor use, and production. Marriage both creates and satisfies intergenerational responsibilities and alliances.

Marriage systems--the sets of social arrangements surrounding and defining sexual unions--can be studied from many perspectives. This paper focuses on research concerned with two demographic features of marriage that are directly relevant to the study of fertility: variations and trends in the timing of first marriage within individual lives, and differences in the chances that individuals will ever enter marriage. Viewed as characteristics describing whole societies, these can be expressed as the average age at marriage and the proportions every marrying, or the timing and prevalence of marriage. Throughout this paper, the phrase "marriage pattern" refers to these two features of any marriage system.

This review is limited to first marriages; marital dissolution and remarriage patterns are considered by Burch in the next chapter. The phrase "marital structure" as used here thus refers to percentages ever or never married by age. The discussion concentrates on female marriage patterns, though male patterns are not entirely ignored, and has little to say about nonmarital fertility except where it has a direct bearing on the first marriage pattern. At both the individual and societal levels of analysis, researchers from numerous disciplines have worked to disentangle the various sociocultural and economic influences on marriage patterns. This review addresses a wide range of possible social and economic determinants of marriage timing and prevalence; in so doing, it draws on literature whose focus ranges from pretransition to modern settings and spans a variety of cultures. This literature is voluminous, and is based on a broad spectrum of evidence: historical materials, largely from Europe since about 1700, encompassing aggregate statistics and various other kinds of documents; contemporary national data, including both census

materials for subareas and survey data for individuals or couples; and various specialized studies, including sample surveys and geographically focused field investigations. The present review must therefore be selective, particularly for topics that have been examined in numerous settings with similar results.

The discussion is organized around a series of propositions expressing relationships between marriage patterns and various determinants, and between marriage and fertility. To avoid excessive interruption, these propositions are presented within the discussion, but are identified by numbers given in brackets, from [1] to [69]. Assertions that are only weakly supported by research are sometimes mentioned, but are not numbered. These propositions do not form an exhaustive list, nor are they axiomatically or hierarchically organized. Instead, they vary in specificity and geographic scope, and are often used only to illustrate larger groups of propositions. The discussion here draws on an extensive listing of propositions on family patterns provided by Goode et al. (1971); other listings have also been consulted, including those of Bartz and Nye (1970) and Otto (1979).

This paper is organized as follows. The first section discusses areal variations in the levels of marriage timing and prevalence, and the next considers national trends. The third section examines the fertility implications of these national levels and trends. The fourth section summarizes what is known about the demographic and socioeconomic determinants of levels and changes in marriage timing. Though much of this material bears on the prevalence of marriage as well, findings related to prevalence are considered separately in the next section. The final section presents concluding observations.

AREAL VARIATION

There are systematic variations in marriage patterns across the world's regions, and areas of pronounced homogeneity within those regions. A variety of patterns has been documented on the basis of various sources: worldwide data (Bogue, 1969; Bourgeois-Pichat, 1965; Dixon, 1971; Henry and Piotrow, 1979; International Center for Research on Women [ICRW], 1979a; United Nations, 1973, 1976b, 1980:104-107; Whiting et al., 1982); data for specific regions such as Asia (Agarwala, 1969; Blayo, 1978; D'Souza, 1979; P. Smith, 1980), the West Indies (Roberts, 1979), Africa (van de Walle, 1968), Latin America (Arretx, 1969; Henriques, 1979), the Pacific (McArthur, 1961), and Europe (Hajnal, 1965; Watkins, 1981); or data from a particular source, such as the World Fertility Survey (Durch, 1980; Caldwell et al., 1980; D. Smith, 1980). With the percentage ever married among women aged 15-19 serving as an indicator of marriage timing, Henry and Piotrow (1979:M106) presented data for world regions ranging from a negligible two percent in late-marrying East Asia to 58 percent on the early-marrying Indian subcontinent. The ICRW compilation (1979a:Table 3) includes countries with mean ages at marriage ranging from below 16 to well above 22.

A few authors have advanced beyond simple description to regional classification of populations along an early/late dimension. For example, examining the percentages currently married for 51 populations between 1926 and 1961, Bourgeois-Pichat (1965) identified five levels of age at marriage, ranging from early in sub-Saharan Africa, through intermediate in North Africa, Asia, and Latin America, to late in Europe. Following Hajnal (1965), Dixon (1971) looked at percentages never married for 57 countries around 1960 and distinguished "European" and "traditional" populations: the former, located northwest of his infamous imaginary line from Trieste to Leningrad, have ages at marriage several years older than those of populations southeast of the line. ICRW (1979a) examined 43 countries around 1970, also distinguishing geographic regions, whereas analysis by the United Nations (1980:104-107) distinguished Europe, Latin America, and North America as a group from Africa and Asia. Focusing on the Western European countries, Lesthaeghe (1977) distinguished three nuptiality regions: France; Belgium, the Netherlands, and Germany; and the remainder of Western Europe. Sklar (1974) described two patterns within Eastern Europe. In another regional study, P. Smith (1980) distinguished three zones within Asia, finding variations of more than seven years for females and five years for males. Similar analyses have been carried out with data on geographic areas within individual countries. For example, Chojnacka (1976) distinguished northern, central, and southern regions of European Russia in 1897 (also see Coale et al., 1979a); Knodel (1974) found three nuptiality zones in Germany; Livi-Bacci (1971) found distinct northern and southern zones in Portugal; and P. Smith (1980) found geographic patterns within each of ten Asian countries examined.

These contributions are useful because they organize an array of data that demonstrates the considerable variation that exists in marriage patterns. However, few studies test for homogeneity statistically, and without statistical controls it is often unclear whether cultural or developmental factors underlie the variations observed. Some authors stress sociocultural determinants of nuptiality differences (ICRW, 1979a, and Dixon, 1971, both stress family systems, for example), and others the level or pattern of economic development. The most prominent global difference--that between traditional late marriage in northwestern Europe and marriage several years earlier in most other populations--can clearly be traced to both. This issue is never resolved, and leads to a first proposition: that geographic regions tend to have internally homogeneous marriage patterns, and that this reflects both common cultural features and common developmental levels [1]. It should be noted that the stock of cross-national data on marital status has expanded rapidly in recent years; it now provides sufficient coverage and comparability to support the multivariate analysis that is needed to disentangle sources of global variation in marriage patterns.

Most of the literature on areal variations in nuptiality is concerned with marriage timing and only by inference with marriage prevalence or the relationship between the two. It is generally assumed that early marriage is associated with a high proportion

eventually marrying. The implicit assumption here--that marriage timing and prevalence have common determinants--is taken up later in this discussion.

A set of observations on the relationship between female and male marriage patterns can also be noted [2]. That age at marriage for males exceeds that for females is virtually always true on average, but is not the case for at least a minority of couples within any population. Variation in the mean age gap between spouses has been shown to be an important aspect of family systems (Cox, 1970; Laslett, 1977; Drake, 1969b; Wrigley, n.d.). It may also be stated that the timing of marriage for females and males is positively associated across populations, as is the prevalence of marriage for each sex; the only exceptions to these patterns are found in settings dominated by sex-ratio distortions, a point discussed further below.

TRENDS

The Historical European Transitions

There are many studies of historical changes in Europe, some very rich in detail, that address marriage patterns. These include well-known studies of particular countries (e.g., Connell, 1950, on Ireland; Drake, 1969b, on Norway), or even of regions or localities within countries (Chambers, 1957 on the Vale of Trent); they also include analyses with broader coverage, such as the series of country volumes resulting from the Princeton European Fertility Study (Livi-Bacci, 1971, 1977; Knodel, 1974; van de Walle, 1974; Lesthaeghe, 1977; Coale et al., 1979a). The overall comparative findings have been summarized by Coale and Treadway (1979) and the comparative results on marriage by Watkins (1981). The Princeton European Fertility Study reports, based on local-area census data, necessarily emphasize areal patterns. Pretransition European marriage patterns have been interpreted by Hajnal (1965), while further descriptive material has been assembled by Gaskin (1978) and D. Smith (1977) from reconstitution studies. Many studies of nuptiality change in eighteenth- and nineteenth-century Europe have posited that much of the rapid population growth during the Industrial Revolution resulted from a shift to earlier marriage. It has generally been concluded, however, that a decline in age at marriage did indeed contribute, but not significantly--certainly not enough to account for much of the increase in the population growth rate, as discussed further below (Crafts and Ireland, 1976; Drake, 1969a; McKeown et al., 1972; Outhwaite, 1973; Razzell, 1965; Wrigley and Schofield, 1981).

From these historical studies, a series of assertions about areal patterns of nuptiality change can be drawn [3]. Both across and within European countries, a progressive diminution of areal variations is observed as the extremes of early and late marriage disappear. The Watkins (1981) and Coale and Treadway (1979) summaries suggest a two-stage process: first, the industrial areas ceased to be early-marrying outliers as other areas caught up with them; then the

late-marrying outliers disappeared as the transition process was completed (also see Coale et al., 1979a). Similar results are reported for twentieth-century Japan (Kobayashi and Tsubouchi, 1979; Mosk, 1980a). In general, though, studies like these indicate very little restructuring of subarea differentials as the changes occurred; areas of relatively early and late marriage maintained these relative positions even as their absolute levels shifted.

Recent Trends in LDCs

Although less developed countries (LDCs) are quite diverse in their current levels of nuptiality, they are remarkably similar in their recent trend toward later marriage. Both global studies (Durch, 1980; Caldwell et al., 1980; Henry and Piotrow, 1979; ICRW, 1979a) and those that focus on specific regions (e.g., Chamie and Weller, 1982, on the Middle East and North Africa; P. Smith, 1980, for Asia) show upward trends in national percentages single in the younger age groups and in mean ages at marriage for virtually all the countries studied. Numerous countries have experienced marriage delays of two or three years over as many decades among females; in a few countries, such as Korea, the shift to later marriage has been extremely rapid (Coale et al., 1979b). Whenever geographic subareas are considered (e.g., P. Smith, 1980), uniform changes across them are found as well.

The data for LDCs also support the findings summarized earlier concerning the convergence of areal patterns over time. For those LDCs where very early marriage prevails, it may also be observed that, when marriage is initially very early, a rise in the mean age at marriage is just as likely to accompany modernization as is a decline in marital fertility [4] and may well occur first (Coale et al., 1979a:146).

The universality of marriage delays across countries varying widely in sociocultural features and development levels is a remarkable aspect of the observed pattern in LDCs. Another puzzle is the absence of any indication of accompanying declines in marriage prevalence. Both of these issues are considered below.

MARRIAGE AND FERTILITY

The links between marriage and fertility are at least superficially obvious. Rising mean ages at marriage and rising percentages single are associated with declines in period measures of fertility such as the birth rate; the women who marry latest in any population ultimately have the fewest children on average. However, even at the aggregate level, a closer look reveals contrary evidence, and at the individual level the mechanisms linking marriage timing and fertility are not always obvious.

There are serious problems associated with assessing the impacts of marriage patterns on fertility. Definitions of marriage, in contrast to those related to childbearing, are not entirely clear or

consistent across societies, though de facto concepts generally prevail. Moreover, definitions of marriage sometimes subtly involve parenthood; thus, youth may more readily define themselves as married when they are parents. Even apart from these definitional and conceptual problems, the direction of causal influence is frequently elusive. It is often argued, at least implicitly, that marriage timing is guided by fertility intentions [5]. Certainly, normative systems create a "fundamental complementarity" between marriage and childrearing (Schultz, 1981:26ff.), and the cultural pressure toward parenthood, whatever its origins or functions, may influence marriage patterns. It is claimed, for example, that marriage timing will be later and prevalence lower when social penalties for childlessness are low, whereas concern over the number of surviving sons--greatest when mortality is high or natural fertility low--is thought to motivate early marriage (e.g., Mosk, 1981a, on Japan). Of course, these arguments assume an exceptionally distant planning horizon, and direct evidence that this kind of planning actually occurs is scant.

The reasons for an association between marriage timing and fertility were catalogued some time ago by Coale and Tye (1961), Ryder (1960), and others. Later marriage reduces the total duration of fecund exposure to sexual activity, and shifts it to the older ages of lower fecundity [6]. Moreover, when marriage is later, a greater fraction of each cohort will not survive to marry [7]. Delay also reduces the tempo of population change as the mean length of a generation is extended [8]. Finally, there is a temporary "translation" effect on period fertility as any shift in marriage timing occurs [9].

Analytic problems arise in efforts to measure these influences, mainly because of the very strong selectivities that can operate to create spurious associations between marriage timing and fertility. Another complication is the need to sort out deliberate volitional aspects from nonvolitional exposure effects of marriage timing on fertility. These and other issues arise in research findings at both the aggregate and micro levels.

Aggregate-level Relationships

Several techniques are used to study aggregate marriage-fertility links. One straightforward approach is to examine correlations between marriage timing and fertility across countries or other areal units. These correlations generally indicate an association of late marriage and low birth rates [10]. One rule of thumb states that a threshold level of 80 percent single among women aged 15-19 is associated with a crude birth rate below 35 per thousand (Mauldin and Berelson, 1978). Another common approach involves attributing changes in fertility over time to changes in marriage patterns and marital fertility. This literature is concerned not only with simple decomposition (e.g., Wunsch, 1979), but also with a much broader set of questions concerning the interplay of nuptiality and fertility in an equilibrium or homeostasis model of society, discussed in further

detail below. Decomposition into marriage pattern and marital fertility components is also used to examine recent fertility declines in LDCs (Cho and Retherford, 1973; Lee and Chao, 1973), generally for the purpose of assessing the direct effects of family planning programs. "Extraneous" changes in fertility due to delayed marriage have been found to be quite important; for example, Mauldin and Berelson found that among the ten countries with major fertility declines over the 1962-77 period, delayed marriage accounted for about 40 percent of the fertility change. Another approach involves aggregate simulation or projection. Simulation has been employed in the debate over eighteenth- and nineteenth-century England (Crafts and Ireland, 1976; Mendels, 1978); in projecting the marriage and marital fertility components of future LDC fertility levels (Lesthaeghe, 1971, 1973); and in sorting out the various impacts of nuptiality change on fertility (Trussell et al., 1979).

This research has produced a series of assertions. The projections of Lesthaeghe and others disaggregating assumed nuptiality and marital fertility changes indicate that the effects of the two components are cumulative (an arithmetic result), and that, when they change at the same time, the impact of nuptiality changes is felt sooner [11]. Some research has distinguished components of nuptiality change. Projecting alternate changes in the age at which the marriage process begins for a cohort and the tempo or time required for the process to be completed, Lesthaeghe (1971, 1973) found that the impact of changes in marriage tempo is greatest, but also that upward movement in the age at which the process begins may be compensated by an accelerating tempo [12].

Various other complex interactions of aggregate marriage and fertility levels are also noted [13]. Some relate to compensating changes between age at marriage and marital fertility (Matras, 1965; McDonald, 1981). Others suggest institutional changes as nuptiality delay occurs, for example, changing linkages between formal union and cohabitation, resulting in a shorter interval between the two (Wyon and Gordon, 1971).

Individual-level Relationships

The aggregate-level connection between marriage timing and fertility levels must ultimately reflect an association at the individual level. At this level, direct effects are clear. Ceteris paribus, less total exposure will reduce completed fertility [14]. Lower fecundity during that exposure will create greater spacing of births and further reduce completed fertility [15]. For another fraction of persons, delaying marriage will increase the probability of never marrying and thus eliminate some fertility [16]. The factors held constant here include several proximate determinants, including probabilities of intercourse, conception, successful gestation, and live birth.

It is widely held that in natural-fertility populations--those in which there is no deliberate (parity-dependent) fertility control

behavior--exposure times and fecundity levels alone determine the association between marriage timing and fertility [17]. Likewise, it is held that, when fertility control is widespread in a population, exposure times and fecundity levels are irrelevant; that is, there need be no direct connection between marriage timing and fertility at all, only spurious correlations resulting from the association of both marriage timing and fertility with other variables [18]. However, the growing body of research on these relationships suggests a number of complications and caveats. Research on natural-fertility populations shows that the later marriage-lower fertility relationship frequently persists even after exposure time is controlled (e.g., Caldwell et al., 1980). Just as unexpectedly, a marriage timing-fertility association is sometimes found in populations practicing fertility control (Busfield, 1972; Bumpass and Mburugu, 1977; Day, 1979).

It is obviously necessary to consider additional connections between marriage timing and fertility in both kinds of society. Several speculative catalogs of such connections have been compiled, motivated mainly by the surprising persistence of fertility differentials with age at marriage in contracepting societies, but often relevant to LDCs as well. Busfield (1972) distinguishes "social causation" and "social selection" models. The former encompasses "genuine" linkages operating through one or another of the exposure schedules for rates of intercourse, conception, or fetal wastage; each of these has a regular schedule with age, such that late marriage generally prevents exposure when the probabilities of outcomes leading to births are highest. The "social selection" model identifies factors that link marriage timing and fertility through their associations with other variables. Bumpass and Mburugu (1977) distinguish "demographic" components, essentially the same as Busfield's exposure factors, and "social" components, which include factors governing the chances of contraceptive failure, selective marriage patterns, and two sociological elements involving life-cycle and age-norm considerations. Day (1979) proposes a more exhaustive list of 20 possible factors.

Although these three schema are useful, they are not easily synthesized. However, the core exposure variables appear in each. One of these is the age-curve of intercourse frequencies. Though there is little supporting evidence, frequencies probably decline with age as well as with marriage duration, but may not vary much within the usual range of marriage ages. Second is the age-curve of fecundity, which is well documented (Henry, 1961) and peaks at above the prevailing age at marriage in most societies. The Coale and Trussell (1974) model of marriage-pattern impacts on marital fertility incorporates this age-fecundity relationship, and Page (1977) has shown an equally close relationship between duration of marriage and marital fertility. These relationships are widely evident in survey data (e.g., Caldwell et al., 1980, with WFS data; P. Smith, 1982, on Indonesia and the Philippines). Third is the age-curve of fetal wastage, which is U-shaped. Since fecundity is curvilinear with

age, the effect of marriage delay on marital fertility via these exposure variables is indeterminate and governed by the range involved. A small upward shift from a very young age at marriage may well increase marital fertility, while an upward shift toward a very late age at marriage should reduce marital fertility [19].

Also common to all societies is a series of possible selectivities involving the core exposure variables that can create an association between fertility levels and marriage timing. It is commonly suggested that early adolescent fecundity (e.g., resulting from early menarche) leads to early marriage [20]. For many societies, this link may involve premarital conception (Lowrie, 1965), which would also produce a short or negative first birth interval, though fear of conception (by inference from the experience of others) might be a sufficient motivation to marry early. Though the opposite claim is also made (Freedman and Casterline, 1979), it is sometimes speculated that a high coital frequency is associated with early marriage [21]. Evidence for this is lacking, but it might occur because premarital coital behavior accelerates entrance into marriage (due either to pregnancy or fear of pregnancy) and in turn is associated with high coital frequencies and thus higher fertility within marriage. Also, high coital frequencies might be associated with other background characteristics, such as social class, that are associated with early marriage, thus leading to a link between early marriage and high fertility. Another suggestion, though as yet with little supporting evidence, is that early marriers have relatively low contraceptive efficiencies. Inefficient contraceptive use might lead to premarital pregnancy and thus to early marriage; by persisting during marriage, inefficient use would lead to higher marital fertility and hence an association between early marriage and fertility despite the use of contraception. Further, a set of such associations might be generated by a background connection with a variable like social class.

Another set of possibilities has to do with indirect causal links between delayed marriage and fertility. It is argued that a period of adolescent or adult status before marriage can permit the formation of role definitions antithetical to high fertility within marriage (Call and Otto, 1977; see also Oppong, in these volumes) [22]. More generally, later marriage may be associated with relaxation of the cultural pressure for high fertility (McDonald, 1981). Other life-cycle arguments involve age norms for appropriate parities [23] (Bumpass and Mburugu, 1977). For example, late marriage may lead to the perception that parities in the early years of marriage are too low, and thus to "catching up" behavior through shorter birth intervals. At longer marriage durations (and therefore at older ages), age norms may dictate termination of childbearing at relatively low parities; it has been suggested, for instance, that norms may press for an end to a woman's childbearing once one of her daughters has married or borne a grandchild.

For a variety of reasons, the relationship between marriage timing and fertility can be weak or complex. Because the fecundity age pattern is curvilinear, upward movement from early and intermediate

levels of marriage timing can have opposite effects on early childbearing and even on completed fertility. Moreover, the causal connection may be reversed; that is, high pregnancy wastage and even childlessness might be direct physiological consequences of early childbearing due to early marriage.

Marriage timing can affect other social patterns bearing on fertility in ways that obscure the timing-fertility relationship [24]. Thus, early marriage is generally associated with higher divorce rates and with widowhood (Moore and Waite, 1981), especially when the age gap between spouses is greatest among early marriers. Also, in some settings (see Wyon and Gordon, 1971, on India), a rise in marriage timing from a very early age may not indicate a commensurate rise in the age at cohabitation. Similarly, late marriage may be associated with shorter periods of breastfeeding and thus with higher fertility (Coale et al., 1979b; Freedman and Casterline, 1979). As noted previously, shorter birth intervals may be found among late marriers trying to "catch up" with the fertility of others in their age group. Premarital pregnancy may be most common when marriage is either very early or very late relative to the societal norm, though most investigators suggest that the dominant association is with early marriage. Finally, childhood coresidence associated with very early marriage may reduce intercourse frequencies and thus fertility, though the evidence for this claim is especially weak (see Wolf, 1974, on Taiwan).

In principle, the associations and selectivities discussed here can account for both the association of marriage timing and fertility net of exposure times in LDCs and the association of marriage timing and fertility despite contraceptive use in MDCs. However, there is insufficient research on these selectivities for developed countries. The principal problems are a lack of understanding of how selectivities operate in different settings and poor measurement of key variables such as frequencies of intercourse. Few efforts have been made to adjust for components of exposure time, or to document specific selectivities that might link marriage timing and fertility. There is still less empirical attention to these issues in developing countries, other than descriptions of differentials.

DETERMINANTS OF MARRIAGE TIMING

Levels and trends in nuptiality have been examined from every disciplinary and topical perspective, at levels of aggregation from the individual to the global; studies range from the purely descriptive to those focused on explicit testing of theoretical propositions. The review of the literature in this section proceeds from the societal to the individual level of marriage patterns, focusing in particular on marriage timing; findings related specifically to marriage prevalence will be discussed in the next section. First, this section examines the complex of interdependencies known as the "demographic system," and the influences of demographic structure, specifically sex ratios. Next,

the discussion turns to the impact on nuptiality patterns of the major institutional changes associated with socioeconomic development: changes in family, household, and kinship institutions; in urbanization; in education; and in labor markets and occupations, including the influences of wage levels and accumulated wealth.

Demographic Determinants

Nuptiality in the Demographic System

Analysts have found it useful to view populations as socioeconomic systems that depend on homeostatic or feedback mechanisms, institutional or biological, to hold the rate of population growth near zero and thus preserve living standards (Davis, 1963; Lee, 1977, 1978; Lesthaeghe, 1980; D. Smith, 1977). Nearly all of the research based on this framework relates to Europe or Japan, although some pertain to very high mortality settings in general without regard to specific institutional arrangements, whereas some focus on the "European Demographic System" in the context of European social arrangements.

In pretransitional settings, where mortality is at a level very close to the level of fertility and population growth is difficult to maintain, fluctuations in mortality can generate alternating periods of population growth and decline. In these settings, it is argued, early marriage occurs because it is necessary to maintain long-run population equilibrium [25] (Ohlin, 1961; Lee, 1977; Mosk, 1980a; Wrigley, 1978). Long-run equilibrium and short-run adjustment arguments can be distinguished (R. Smith, 1981), but their basic ideas are common. Support for this putative marriage-mortality linkage is provided by ethnographic evidence on pretransition populations (Nag, 1962); by time-series information for specific localities (e.g., Herlihy, 1977, on Tuscany); and by cross-sectional evidence (D. Smith, 1977).

One major objective for empirical research in this area is to establish plausible connections between needs and goals at the societal level and the behavior of individuals (McNicoll, 1980; Lesthaeghe, 1980). The negative association across populations between marriage timing and mortality levels (all high-mortality, primitive populations have early marriage) does not establish a necessary connection between group needs and individual behavior, since the association could be caused by the disappearance from observation of any high-mortality populations where marriage was typically late. The theoretical literature on this topic is diverse, and much of it figurative or otherwise unclear (see the comments in Lesthaeghe, 1980). Two examples illustrate. Davis (1963) argues strongly that the linkage is fundamentally at the micro level: that individuals are motivated by a desire to seize upon perceived opportunities provided by the surrounding society. However, he does not address the question of how the sum of individual self-interested actions meets the aggregate needs of society. Wrigley (1978)

unabashedly calls on something he labels "unconscious rationality" to link individuals and the group; he stresses "heirship strategies"--behaviors aimed at maximizing outcomes for families and households that somehow achieve society's aggregate goals.

Most of the arguments made about the link between individuals and the group involve institutional or structural arrangements, particularly family systems and inheritance patterns. The general view, discussed further in a later section, is that mortality decline places strains on traditional family institutions and thus not only allows but even motivates later marriage. Much of this discussion focuses on the particular institutional context provided by northwestern Europe. The model of the European demographic system that emerges (Flinn, 1980; D. Smith, 1977; Lee, 1977, 1978; Lesthaeghe, 1977) involves a natural-fertility regime combined with Malthusian control over population growth--high and fluctuating mortality associated with fluctuations in economic conditions, combined with a marriage institution governed by the principle of economic viability. This "establishment" view of marriage is crucial because it links the timing of marriage and the availability of resources, creating a "nuptiality valve" that compensates for high mortality by tapping a "reproductive reserve" through declining ages at marriage (Lesthaeghe, 1977).

The long-run European population equilibrium was thrown into imbalance in the seventeenth and eighteenth centuries, and quite rapid rates of population growth (relative to the general European experience) were common in the nineteenth century. There has been considerable argument over whether this burst of population growth was due mainly to the elimination of crisis mortality or to increases in fertility. There is also dispute over whether increases in fertility were due to a decline in the age at marriage or to increases in age-specific marital fertility. Much of the argument is over how inheritance systems (a) link marriage timing and economic conditions; (b) link marriage and mortality; and (c) determine whether control of marriage or control of fertility within marriage is the major mechanism employed. These arguments are taken up in greater detail below, but some findings on the last of these issues can be summarized here.

One viewpoint is that control of marriage timing and control of marital fertility are alternatives (Demeny, 1968), especially when one or the other is proscribed by culture (Easterlin, 1978); another view is that increased control over population growth by one mechanism permits a relaxation in use of the other mechanism, provided that fertility is under some cultural control initially. Both of these arguments suggest a negative association between marriage timing and the level of marital fertility [26]. On the other hand, as noted earlier, a positive association between earlier marriage and higher marital fertility is predicted by the supposed connections between both of these factors and high mortality. A combination of cross-sectional and over-time evidence has been brought to bear on this issue, with inconsistent results: a negative association between marital fertility levels and marriage timing is found in

industrializing Austria-Hungary (Demeny, 1968) and Italy (Livi-Bacci, 1977), but positive correlations are found for Russia (Chojnacka, 1976) and Belgium (Lesthaeghe, 1977). Recent over-time evidence for developing countries suggests negative associations (e.g., Coale et al., 1979b, on Korea; Kobayashi and Tsubouchi, 1979 and Mosk, 1981a, on Japan).

Many points in this literature remain to be clarified, for example, the distinction between short- and long-run interactions, and the problem of sorting out homeostatic control via nuptiality versus control by means of limits on marital fertility. Most critical, though, is how relevant these analyses and the European model are to contemporary developing countries. In some of the latter populations, substantial rates of population growth have prevailed for some time, and in many cases land has been abundantly available until very recently. Also, in many of these societies, the "establishment" characteristic of the European marriage institution is essentially absent because of the existence of joint family systems or other mechanisms for sharing the costs of marriage. There is as yet virtually no research on homeostatic mechanisms involving marriage in societies outside Europe and Japan.

The Impact of Demographic Structure on Marriage Timing: Sex Ratios

One of the most obvious of the possible determinants of marriage timing is the sheer availability of potential spouses. The effects of sex ratios are sometimes explicit in theoretical models (e.g., Dixon, 1971) and sometimes only implicit. In empirical work, sex ratios sometimes appear as independent variables, but sex composition is most often entered as a control, an extraneous factor to be adjusted for before other effects can be interpreted properly. This section summarizes literature on the cross-sectional and over-time associations between sex ratios and marriage timing. Research has uncovered weak or even unexpected associations in cross-section analyses, but stronger and more plausible associations between changes in sex ratios and age at marriage over time. Some general propositions are given here, along with propositions that illustrate aspects of the marriage market structure and the marriage decision process that might influence outcomes.

Under stringent stable population assumptions, the effects of birth and death rates on the sex ratios at marriageable ages in a population are given by a formal relationship:

$$\frac{M_x}{F_y} = 1.05 \frac{l_x^m e^{-rx}}{l_y^f e^{-ry}},$$

where F_y and M_x are numbers of marriageable women and men at their prevailing ages at marriage y and x (we suppose that everyone of each sex marries at the same age; so that d = x - y, the age gap between

husband and wife is constant); l_y and l_x are probabilities of survival to the various ages at marriage; and r is the intrinsic rate of population change. Under these assumptions, and given a sex ratio at birth of 1.05, males are in shortest supply relative to females when d and r are large and positive.

A more realistic model would incorporate recent changes or fluctuations in r and in survivorship, and there is of course the further problem of defining the level of aggregation that best approximates true marriage markets--the arenas within which options are considered and choices made. This in turn raises some vexing issues of marriage rules based on proximity, social class, and the like. There is also the complication raised by movements from one marriage market to another.

Some general points may be made here about the major kinds of variation in age-sex structure likely to be found that bear on nuptiality. In historical Europe, population growth rate (r) and the age gap between spouses (d) were both relatively slight. Because these are often considerable in today's LDCs, the potential for an impact on marriage timing in these countries clearly exists. As discussed further below, rural-to-urban population transfers were substantial in Europe, involving single youth of both sexes, but females disproportionately (Weber, 1899). Although single youth also predominate in urban-bound migration streams in contemporary LDCs, the sex composition of the migration varies considerably, along cultural lines for the most part: rural-to-urban migration is heavily male in South and East Asia, the Muslim world, and Africa, but disproportionately female in Southeast Asia and Latin America (ICRW, 1979b). Another source of sex-ratio variations in LDCs results from rapid post-World War II improvements in survivorship combined with the sometimes substantial traditional age gap between spouses, creating temporary marriage squeezes among females. Finally, there are many historical instances of one-time but massive sex ratio distortions due to sex-selective migration--as with the overseas Chinese throughout Southeast Asia (Barclay, 1954; Caldwell, 1963), and, more recently, the temporary migration overseas of large numbers of male workers from countries like Pakistan and the Philippines.

The general proposition from all of this is that the availability of potential spouses (the sex ratio) will be important in marriage trends when the age gap between spouses is great; when fluctuations in fertility and (to a lesser degree) mortality have occurred in the past; and, in the stable case, when the underlying population growth rate is positive and substantial [27]. The basic proposition relating sex ratios and marriage patterns is, of course, that when one sex is in relative oversupply, timing will be later and prevalence lower than otherwise [28].

Research has uncovered many instances of cross-sectional association between sex-ratio differences and variations in marriage timing; as a rule, however, these associations are weak or even in unexpected directions, indicating the simultaneous influence of other factors. Dixon's (1971) analysis of data for 57 countries around 1960 produced very weak correlations: 0.25 among Western countries; 0.16

among the remaining countries; and 0.11 for all the countries combined. Moreover, among the Western countries, the directions of correlation are, unexpectedly, the same for males and females. P. Smith's (1980) analysis of data from 523 Asian states and provinces around 1970 produced generally stronger correlations, although, again, the signs within each country are the same for males and females. On the other hand, the cross-sectional relationship across the counties of England and Wales in 1861 (Anderson, 1976) is both strong and in the expected direction.

Because male marriage patterns in LDCs have received relatively little attention, there is scant basis for evaluating the expectation, based on sex-ratio considerations, that changes in female and male ages at marriage move in opposite directions. Though few supporting examples can be cited (e.g., Wrigley, 1966, for Colyton during some time periods), the evidence available from LDCs suggests that male ages at marriage have in fact moved upward along with female ages.

The effects of sex-ratio changes on marriage patterns within a given population have been studied ever since Sundt's (1980) nineteenth-century analysis of Norway (e.g., Akers, 1967). One focus of interest is on the potential impacts of the combined rapid mortality decline and baby boom immediately following World War II in developing countries. The suggestion here is that the availability effect of the postwar mortality decline has been to temporarily encourage later female marriage (Fernando, 1975). Although such postwar marriage-squeeze effects are likely, it is improbable that these account for the near-universal shift in marriage timing around the world, particularly since, as noted above, male ages at marriage are also shifting upward.

Three general observations seem warranted. First, the availability of prospective spouses is apparently a significant factor in research only when operative marriage markets have been properly identified; that is, the closer researchers come to identifying actual marriage markets by disaggregating the society into large endogamous cultural or class groups, the stronger their correlations will be (McFarland, 1970, 1972). Second, the availability of potential spouses can be important for marriage trends, even when unimportant in cross-sectional patterns. Third, the sex-ratio effect is usually overwhelmed by other aspects of social change that influence both sex ratios and marriage timing, often creating spurious correlations.

Two areas need to be explored much more thoroughly if sex-ratio effects are to be more clearly understood: the effects of structures within marriage markets, and the ways in which the marriage decision process can be flexible in the face of marriage-market characteristics. As an example of the first of these issues, for a given sex ratio, more heterogeneous populations may have later marriage because greater sex-ratio variations within the smaller marriage markets in such populations result in less efficient marriage markets overall. Similarly, for a given sex ratio, more dispersed populations may have later marriage because of the high search costs associated with dispersed marriage markets; this may be one of the factors underlying the later marriage found in heterogeneous LDC urban

areas, for example.

Studies of mate selection make it clear that decision criteria in marriage markets can be quite flexible in the face of market characteristics, creating a variety of social adjustments along with or even in place of change in marriage timing. As one illustration of these possible social adjustments, when a sex is in oversupply, the range of acceptable ages for spouses may shift (Hirschman and Matras, 1971), though perhaps only temporarily. The work of Henry (1972, 1975) in modeling "marriage circles" and related work by McFarland (1975) are examples of theoretical development along these lines. Another possibility is that marriage squeezes (for example, due to post-war population growth) result in a reduction of the age gap between spouses. Reductions in the age gap seem to be a general feature of modernizing societies (Presser, 1975); th may have important further ramifications, for example, for couple fertility decision making. Finally, flexibility in individual decision making can be matched by variation in decision rules across cultures. Polygyny, for example (Chojnacka, 1980), is found to be associated with early marriage for females and late marriage for males, and to promote universal marriage among women [29].

Socioeconomic Determinants

Family Institutional Changes

Implicit in much of this literature is the claim that the traditional spectrum of subsistence-based family systems worldwide is rapidly being homogenized, first by intrusion of the cash nexus into agriculture, followed by industrialization. At best, this theme is a useful way to organize a disparate body of materials; at worst, the claim that homogenization is occurring has served constructively as a foil for those wishing to argue otherwise. The aggregate results reviewed earlier seem to provide some initial support for a convergence view.

Arguments for the convergence of family systems under the force of industrialization were advanced forcefully in functionalist terms two decades ago. Goode (1963) described a narrowing of family functions as economy and state take over various roles and increasingly dominate the decisions of individuals about work, residence, marriage, and the like (see also Aries, 1977; Lasch, 1977). More recently, and with more explicit reference to demographic behavior, Caldwell (1981; in these volumes) has written of changing "modes of production" and their role in eroding the "cultural superstructure," including family systems. For present purposes, the key transformation is from the subsistence household mode of production to production in and for the market; the central features of importance here include the separation of work from family activities and the rise of wage-based relative to family-based labor markets. Other transformations include a trend toward "emotional nucleation"; more intensive dyadic bonding within nuclear units (Aries, 1977; Shorter, 1975; Caldwell, 1976); the

related separation of family units from other kin (Goode, 1963; Shorter, 1975); and important changes in intergenerational relations within families as parental control diminishes (Goode, 1963) and the resource transfers across generations begin to favor children (Caldwell, 1976). These changes can clearly affect the timing of the marriage of offspring, since marriage can mark a significant change in resource distribution and in the supply and allocation of household labor. This section examines these potential effects, focusing first on peasant marriage systems and the protoindustrial family, and then on some additional findings about family background and certain intrafamily influences on marriage timing.

The "cultural superstructure" of any agricultural system includes such social arrangements as family types, residence rules, inheritance systems, and, at least indirectly, marriage patterns. Research on this complex topic frequently focuses on particular issues and variables while leaving others in the background. One emphasis has been on the labor strategies of agricultural households as they relate to marriage patterns. The household developmental cycle is said to create cyclical fluctuations in both consumption needs and labor supply. Since the two cycles often are not synchronized with each other or with changes in the availability of key resources such as land or other capital, much of the demography of agricultural households reflects strategies for cyclically redistributing labor in relation to other inputs. Along with permanent and circular migration, servanthood, and adjustments in the intensity of agricultural labor use (e.g., redistributing land instead of labor; see Ankarloo, 1979), marriage is a significant tool for such redistribution. For example, the importance of household labor strategies for the marriage timing of offspring under stem family conditions in Japan is highlighted by T. Smith (1977). A daughter's marriage is described as a "complex and dangerous transition in the life of families"; one daughter-in-law is added when a son is married, but all other offspring depart before the marriage or soon thereafter. It is generally thought that the offspring of large agricultural households marry relatively late [30], though evidence on this point is sparse; moreover, Smith's study, for example, illustrates the case where labor needs in small families with few working members encourage late marriage. It may also be noted that, since marriage involves exchanges and transfers across generations as well as across households, a persistent dilemma of household strategy is a conflict between current consumption and accumulation for transmission to the next generation.

Relationships between farm household resources and household size and composition are expected to be clearest in societies in which individual family farms are operated independently. Thus it is commonly claimed that, where the nuclear or conjugal family type prevails, marriages will occur later than in extended family systems [31] (Sklar, 1974); the well-documented European marriage pattern illustrates this proposition (Hajnal, 1965; Habakkuk, 1955). The argument that the extended family encourages early marriage is commonly, but not easily, made. First, it is necessary to distinguish

"patriarchal/extended," "joint," and "stem" family types since they can have quite different impacts on marriage timing (Timur, 1977). The former two types are said to encourage early marriage because in both there is only the weakest of connections between marriage and material independence. In sharp contrast, the stem family incorporates the principle of impartible inheritance. The European example generally takes the form of primogeniture, in which the male heir delays marriage until his father's death or serious illness, whereas other sons and perhaps even daughters are placed in wage labor in the community or are expected to migrate elsewhere. It is argued that, in a single-heir system such as this, male marriage is quite late on average; male celibacy is relatively likely among nonheirs, and is most likely among the sons of farmers with the least resources. There is considerable evidence to support these propositions in Europe, but little research elsewhere. Apparent counterexamples deserve further study: Korea before 1930 was characterized by early marriage and low celibacy despite its stem family system, while contemporary Korea is characterized by late marriage and low celibacy (Coale et al., 1979b); stem family arrangements in Thailand have also generated low levels of celibacy (Foster, 1977).

Much of the literature on family systems addresses issues involving inheritance. It is generally argued that resource scarcity is associated with impartible inheritance systems and thus with both late marriage and high celibacy; conversely, land abundance is associated with bilateral kinship and early marriage [32] (see e.g., Wolf, 1966:73). Others have associated bilateral/nuclear family systems with relatively high status for women and thus with late marriage (Goldschmidt and Kunkel, 1971). Two features of inheritance systems are frequently stressed: the degree of partibility of land, and the degree to which independent household formation with its accompanying economic requirements is an integral aspect of marriage.

The study of inheritance systems in relation to population behavior has suffered from an early and influential statement by Davis (1963) asserting its unimportance (see also Davis and Blake, 1956). More recently, others have properly emphasized the remarkable flexibility of inheritance systems, presenting an image not of an irrelevant institution, but one that is used imaginatively to achieve family goals. The classic European example of impartibility and its impact on marriage patterns is Ireland (Arensberg and Kimball, 1968; Kennedy, 1973), but much of the literature discusses less clearcut situations revealing a good deal of subtlety in the application of inheritance rules (Berkner, 1977; Berkner and Mendels, 1978; Hammel and Wachter, 1977; Hermalin and van de Walle, 1977; Chojnacka, 1976). Studying Japan, for example, Mosk (1981a) argues that a link between marriage and inheritance affects males directly; it affects females only indirectly through the competing goals of old age insurance and dowry accumulation, with the former pressing for early marriage of daughters and the latter for later marriage. As noted earlier, inheritance arrangements lie at the base of Hajnal's (1965) classic distinction between European and Eastern European marriage patterns,

and at the heart of the "European Demographic System" (Lee, 1977:3).

Another closely related issue involves the direct costs of marriage, that are defined by prevailing social arrangements: it is asserted that age at marriage is late where the direct costs of marriage (both ceremonial and transfer costs) are high [33]. This relationship can involve institutionalized payments of any kind, such as bridewealth and dowry. The marriage delay associated with high costs is generally attributed to the time needed to accumulate resources (e.g., Mosk, 1981a, on Japan); it is also argued, however, in apparent contradiction, that marriage is earliest among nobilities and other elites for whom direct marriage costs can be very high, and that the highest payments go for the youngest brides.

The impingement of markets on traditional family systems is more fully considered below in relation to specific aspects of urbanization and industrialization. The discussion here briefly summarizes work on marriage patterns under the historical conditions labeled "protoindustrialization" (Braun, 1978; Levine, 1977; Mednick, 1976; Thadani, 1980; Tilly, 1978); this work is limited entirely to Europe in the eighteenth and nineteenth centuries.

The rise of manufacturing activity outside the factory system in many of the agricultural regions of Europe removed traditional land-based constraints on marriage and thus led to both earlier marriage and higher fertility. Wage earning based on labor power alone fulfilled the economic requirements for marriage, even among those for whom an adequate land inheritance was impossible, enabling men and women who would have been forced to delay their marriages to marry relatively early. The argument is sometimes carried further to suggest that very low protoindustrial wage rates necessitated an overall labor-intensive strategy for households. In essence, the traditional family system is said to have generated new marriage and fertility behavior by pursuing traditional goals under new labor market conditions; the result was early marriage and an expansive labor strategy involving full-time employment for both husband and wife (Thadani, 1980). A further argument relates protoindustry to higher fertility, motivated by the need to create an ever-larger family labor force. This is seen as a destabilizing influence: earlier marriage resulted in population growth, which in turn encouraged the creation of a rural proletariat and "eroded the European marriage pattern and its sense of social stability" (Gutman and Laboutte, 1980). There is some empirical support for these ideas (Levine, 1977; Anderson, 1976; Mendels, 1968). In contrast, Gutman and Laboutte (1980) found that in eastern Belgium, the age at marriage remained high despite the rise of rural industry. However, this apparent exception is thought only to prove the rule: the rural industry prevalent in eastern Belgium required substantial at-home training; the result was continued family control over offspring, and an expectation that young couples would acquire property before they married.

A few additional relationships between marriage timing and various facets of family background may be noted. One claim frequently made is that parental levels of living are positively associated with the

ages at marriage of offspring [34]. According to this variant on the relative income hypothesis (Easterlin, 1971), at any level of parental education or income, the high material aspirations passed on by parents make marriage seem costly (see Lee, 1977). However, intergenerational linkages like these have not been studied sufficiently, and there is also some contrary evidence (e.g., MacDonald and Rindfuss, 1980).

Another common observation is that unsatisfactory family situations lead to early marriage [35]. For example, it is claimed that those whose parents were unhappy, whose mothers worked when they were adolescents, and whose families were disrupted by mortality or marriage dissolution marry earlier (Carlson, 1979).

A third set of findings relates to intrafamily differences in marriage timing. For example, in single-heir inheritance systems, the brothers and sisters of the inheritor tend to remain single [36]. It has also been observed that only sons marry early, and that first-borns marry earlier than their siblings [37] (Prothero and Diab, 1968). Such intrafamily differences have not been examined systematically across cultures; moreover, competing claims are made, such as that sibling position affects age at marriage for females, but not for males (Altus, 1970; but see Walsh, 1973, for a clear relationship among Irish males).

One variable discussed in much of the literature on family systems and marriage patterns is the degree of parental control over marriage decisions. The general view is that strong parental control over marriage negotiations leads to early marriage [38]. Parental preferences are said to dominate when their resources are great or when much is at stake in the marriage for other family or kin group members, conditions that of course tend to occur together. Some results, if confirmed, would serve to specify this relationship. For example, Lesthaeghe (1977) suggests that parental control mainly increases the tempo of marriage (reduces variation in marriage timing). Another claim is that family control focusing on unmarried females leads to later marriage for men as they seek to better their positions in the marriage market; this implies a wider age gap between spouses when parental control is great. On balance, the evidence for propositions about parental control is mixed. Clear support comes from settings like the People's Republic of China, where parental controls have been weakened and marriage is now much later than in the past, although there as elsewhere numerous other changes are occurring that might also influence marriage timing. Then there are settings like northwestern Europe, where a shift to earlier marriage accompanied reduced parental control.

Another important element of change in family systems has been the degree of parental control over sexual access. Relaxation of that control seems to be a universal feature of modernization. The general assertion in this area is that, comparing societies, late marriage and premarital sexual relations tend to occur together [39]. Some of these claims distinguish the sexes: it is said that male marriage is late where social arrangements permit common law liaisons or prostitution, and that a decline in the double standard will increase

the female age at marriage, reduce the age range of marriages, and, especially, reduce teenage marriage among women.

Finally, it is important to note a biological factor in marriage behavior that is closely associated with family background--the age at menarche. Because of its dependence on nutritional levels, the age at onset of menarche declines with economic development. Since the age at marriage among LDCs is rising with development, the cross-national correlation between ages at menarche and marriage is probably negative. However, at the individual level within societies, a positive association is often observed and a causal connection suggested, though the specific linkages are disputed (Buck and Stavrasky, 1967; Chowdhury et al., 1977; Kiernan, 1977; Udry and Cliquet, 1982). The appropriate proposition based on this literature seems to be that early menarche hastens marriage, but only (or at least particularly) in traditional settings, where marriage is relatively early and female virginity at marriage is a concern [40].

Urbanization and Urban Residence

Most descriptive studies of marriage patterns include a classification by place of residence and often one by birthplace; occasionally, information is presented on urban areas by size or type as well. Research on LDCs almost always covers only recent periods of time, but studies of Europe and Japan often include time series depicting rural-urban differences over the course of demographic transition. Most notable in these studies is the contrast between LDCs today and Europe in its period of rapid development: urban marriage came earlier than rural marriage in most nineteenth-century European populations; in today's LDCs, urban residence is all but universally associated with marriage delay [41]. Contemporary urban-rural differences across world regions are also interesting (United Nations, 1973, 1976b, 1980:104-107). Urban percentages single exceed rural percentages single for each of the sexes by a substantial margin in Asia and Africa, but this is true only for females in Europe, Northern America, and Latin America. Also, the age gap between spouses is smaller in urban than in rural sectors.

It has been suggested that urban-rural differences in marriage timing are only derivative patterns; that is, they are explained not by urban versus rural residence as such, but by differences in the composition of urban and rural populations. Efforts to account for urban-rural differences by controlling for population characteristics such as levels of schooling generally do reduce observed urban-rural differences, but rarely eliminate them entirely (although see Rindfuss et al., 1981). There are many features of urban versus rural life that may account for observed urban-rural differences; however, most cannot be explored with existing census or survey data. Urban institutional arrangements need to be studied, including, notably, the workings of the urban family in different cultural settings. For example, it is argued that one important element in later female marriage in urban Hong Kong is a loss of familial control over the

marriage choices of daughters (Mitchell, 1971). Another important institution is the urban marriage market. It seems likely that marriage will be delayed wherever institutional arrangements for meeting and evaluating potential spouses are weak or inefficient (Hirsch, 1978; Keeley, 1977, 1979; Wessels, 1976); this may be especially important for recent migrants from rural areas (e.g., Salaff, 1976, on Hong Kong). Other institutions in need of study are urban labor markets and educational institutions, both of which are considered below.

The pattern of empirical findings on this topic strongly suggests the need for a more systemic view of urban-rural differentials and their relationship to marriage patterns. For example, the claim that women in industrial societies have a higher mean age at marriage and a higher proportion never marrying is not supported. Instead, whether industrialization leads to a rise or a fall in the age at marriage may depend upon the traditional agrarian system, a possibility supported by the differing marriage patterns of Europe and the LDCs. As noted earlier, delayed marriage is an important part of the European Demographic System, holding down rural population growth; in contrast, rural systems in most LDCs do not achieve significant control over either marital timing or population growth.

One feature of agrarian systems that relates directly to urban-rural marriage (as well as other) differentials is the pattern of migration (Chambers, 1972:44-50). An important element here is local and longer-distance marriage migration, and the nature of rural marriage markets generally. There are important variations in marriage migration that need to be studied (see Hugo, 1978:146ff., on Java, for example); the contrast between village-exogamous northern India and village-endogamous southern India illustrates the possibilities (Libbee and Sopher, 1975). Also of importance are rural-to-urban migration streams that need to be examined from both rural and urban standpoints. It is apparent that the age and sex structures of contemporary (ICRW, 1979b; United Nations, 1980) and historical (Weber, 1899) urban and rural populations largely reflect age and sex selectivities in rural-to-urban population transfers: in all countries, it is disproportionately youth who move to the cities. Since youth are disproportionately single, this in turn affects rural and urban marital status distributions (Moch, 1981). There is also a close association globally between rural-urban marital status differences and resulting differences in rural and urban age-sex structures (United Nations, 1973, 1976b), especially for males (United Nations, 1980). An anomalous pattern occurs among urban females in Africa and Asia, for whom high urban sex ratios do not result in lower percentages single (United Nations, 1980:105).

One illustration of the bearing of rural-urban migration on marriage patterns relates to military service, including conscription. Since military service involves young single males almost entirely, and since military bases are quite often in urban places (Weber, 1899), large militaries reduce rural sex ratios. When control over personnel is rigid, military service may effectively lower urban sex ratios as well, at least temporarily. On the other

hand, urban exposure through the military can lead former soldiers to take up urban residence. The role of "military migration" has been considered only occasionally in the European literature (Knodel and Maynes, 1976; Weber, 1899) and needs careful study in today's LDCs, where military establishments are often of large but unknown size and may be having dramatic but unmeasured effects on marriage patterns.

Education

The rise of mass literacy and the spread of basic education are central features of the development process in LDCs today, just as they were important in Europe. In LDCs, the educational revolution is notable for its rapid pace, for its starting point near total illiteracy in many societies, and for its inclusion of women, which has resulted in the rapid decline of educational sex differentials in many societies. It has also had a distinctly secular and even a western flavor, not only resulting from colonial rule, but also reflecting the global Westernization that is so much a part of twentieth-century economic change.

Research on the impacts of education on marriage and fertility emphasizes education's complex character as an independent variable (Caldwell, 1980; Cochrane, 1979, in these volumes; Holsinger and Kasarda, 1976; Jain, 1981; Kasarda, 1979). Underlying much of this research is the assumption that marriage follows school leaving in the life cycle, with the timing of the latter influencing the timing of the former. Although this assumption is probably appropriate for most LDCs, it has not been examined carefully; in fact, research on the United States shows that this chronology is often reversed (Davis and Bumpass, 1976; Modell et al., 1976) and that the causality is unclear (Alexander and Reilly, 1981).

Much of the research on education and marriage has been done within a causal life-cycle modeling framework in which age at marriage is one of several status attainment variables (Bayer, 1969b; Elder and Rockwell, 1976; Modell et al., 1978). These studies indicate that the educational attainments of both parents are important determinants of the status attainments of their offspring, and that an individual's schooling influences his or her marriage timing both directly and by transmitting parental and other background influences [42] (Bayer, 1969a, 1969b; Carlson, 1978, 1979; Marini, 1978; Voss, 1977; Call and Otto, 1977). The most direct effect of education occurs mainly at the highest attainment levels, where it acts as a competing use of time [43]. College attendance has been associated with late marriage in the United States for this reason (Hogan, 1978a), and college-going elites in LDCs marry late as well. The average difference in age at marriage between those with no schooling and those with a college education is sometimes six years or more.

Another kind of explanation emphasizes the labor market value of the years spent in school, which of course rises with educational attainment. This labor market impact on marriage timing is predicted to be positive for women, but negative for men [44] (Becker, 1975;

Cochrane, 1979). Among females, more education is seen to raise the opportunity cost of marrying and remaining outside the labor force; it also reduces the pool of eligible males with similar or higher educational attainments. Since males are expected to utilize their labor power fully whether single or married, more schooling increases their earning capacity without creating any opportunity cost of marrying; the income effect of education is expected to predominate and push age at marriage downward, other things being equal. However, these assumptions about the effects of education on marriage timing need to be examined more closely.

Comparative analysis of World Fertility Survey data from the 1970s in a number of countries, as well as numerous studies of individual countries, does show positive relationships between schooling and marriage timing among females. However, in these cross-sectional surveys, the most highly educated women are disproportionately in the younger cohorts and have characteristics other than education which might also influence marriage timing. Still, multivariate analysis has shown common positive net effects of schooling on marriage timing for females (e.g., Rindfuss et al., 1981). Nevertheless, even where the overall association is clearly positive, a further look suggests more complex patterns. In many societies, those in the lowest educational category (especially those with no schooling at all) marry somewhat later than do those in the next higher educational group (Cochrane, 1979:83ff; Preston and Richards, 1975). Cochrane observes that the effect of a small amount of schooling versus no schooling at all is small, but that a similar increment higher on the educational ladder has greater effects on marriage timing. She also notes that urban-rural interactions with education in relation to marriage timing are inconsistent.

The assumption that male age at marriage declines with educational attainment also requires further examination. For one thing, it has not been adequately explored in LDCs, partly because so much analysis for these countries is based on samples of women. Country-level correlations introduce further complications. Examining data for the period around 1960, Dixon (1971) found that, worldwide, the correlations between percentages single and literate were positive for both sexes, except in Western Europe. Dixon attributes this latter result to a connection between poverty (indexed by years of schooling) and late marriage in nuclear-family cultures.

Other findings in the literature relate to aspects of the educational process itself. Marriage is said to be later among those with higher academic performances [45] (Call and Otto, 1977). Other things being equal, interruptions in education are said to lead to earlier marriage [46], and it is claimed by Alexander and Reilly (1981) that, in the U.S., marriage generally terminates schooling for women, but not for men [47]. For any level of female schooling, the greater the educational advantage of males, the lower the female age at marriage [48]. Finally, across societies, a high level of education is said to be associated with a reduction in variations in age at marriage [49].

The Labor Market

Historically, transformations in economic activity have been associated with widespread social changes, including transformations in marriage patterns. Since societies differ in their urbanization processes and in the structure of their labor markets, there are corresponding variations in the timing and quantity of marriage among countries at similar development levels. There are also substantial within-country variations in nuptiality across occupational categories, whether these are defined according to home or class background or immediate work setting.

It is necessary to distinguish several kinds of occupational effect. Social and economic background is defined in part by parental occupational status, which may influence marriage timing by determining the quantity of resources available for marriage, defining the cultural milieu in which attitudes about marriage are formed, and providing the social networks in which spouses are sought. An individual's own occupation or occupational prospects define (especially for women) the opportunity costs of marrying. The individual's occupational setting can also be instrumental in defining available resources, fixing attitudes toward marriage, and creating marriage opportunities. It is also necessary to consider indirect effects resulting from associations between occupational status and such personal characteristics as education, as well as such group characteristics as local sex ratios. Finally, occupational changes can create other changes in opportunity structures, which can in turn lead to new nuptiality patterns. Such links between historical occupational transformations and nuptiality change are not readily captured by simple propositions. Certainly, the common idea that, across countries, industrialization is associated with later marriage needs to be qualified. Though this is true for today's LDCs, the occupational transformation of Europe was associated with steady or sometimes declining rather than rising marriage ages.

Researchers have addressed three basic areas in exploring the effects of occupation on nuptiality: links between marriage timing and work force participation; marriage patterns in specific occupational settings; and income, wealth, and other effects of occupation that may relate to individuals, families, or households.

Important empirical differences in female labor force participation rates are evident across as well as within societies (Durand, 1975). Although there is little variation in these rates for single and currently married men in any age group, there are two notable patterns among women: in some societies, labor force participation rates are relatively high among adolescent and young adult single women but are much lower among married women of the same age; in other societies, labor force participation rates are exceptionally low among single women but may rise substantially after marriage (United Nations, 1962, 1976a). The issues of relevance here are the structure of social and economic opportunities inside versus outside of marriage, and the tradeoff between utility from personal earnings and husband's earnings (Santos, 1975).

It is difficult to sort out economic need versus equal or desirable work opportunities as determinants of female labor force participation; it is equally difficult to determine how each of these factors might influence marriage timing. Conceptual and measurement problems with assessing labor force participation help make successful cross-national generalization difficult. One claim is that easy access to equal or desirable work opportunities leads women to marry later [50]. Although some research supports this claim, in many other settings, high labor force participation rates indicate economic need rather than opportunity and are associated with early marriage (on the Javanese, see Hull and Hull, 1977). On the other hand, when over-time fluctuations in labor force participation are related to marriage rates within a given population, a positive relationship is found consistently: work opportunities for women delay their marriages [51] (see Preston and Richards, 1975; Freiden, 1972; Tella, 1960; Becker, 1975; Basavarajappa, 1971; Walsh, 1970; but also see White, 1981).

Turning to the effects of occupational setting, European urbanization involved occupational changes that had varying impacts on marriage timing (Outhwaite, 1973; Ogle, 1980). Some urban centers grew up around mineral resources and their associated heavy industries; these cities attracted primarily male workers, and the resulting high sex ratios resulted in early marriage for women. Other cities featured lighter industrial development. Those dominated by clerical-administrative employment or by domestic service attracted disproportionate numbers of female migrants, who tended to marry late. Domestic service for females (Tilly and Scott, 1978; Laslett, 1977) and military service for males (Hogan, 1978b) have been shown to have significant impacts on marriage patterns; these occupations involve a substantial fraction of the youth in LDCs, and their nuptiality effects may therefore be considerable.

Some generalizations relate to certain socioeconomic characteristics of occupations rather than to specific occupational settings. It is argued, for example, that those in occupations with the lowest schooling and other requirements marry earliest; it is also argued that occupations with the highest socioeconomic characteristics contain a high percentage of single females, but a low percentage of single males [52].

Nearly all of the empirical literature on occupations and marriage is focused on Europe. There are remarkably few data for LDCs on the marriage patterns of specific occupations, and there is relatively little analysis of the data that do exist. Thus, LDC censuses and surveys rarely tabulate the marital status distributions of occupational groups (United Nations, 1962, shows data for only 11 countries); the sample sizes of surveys allow only the broadest occupational groups to be tabulated in this way. Even easily obtained census tabulations of current labor force participation or current occupation against current marital status are rare.

Finally, as for the impact of wages and wealth on marriage timing, a number of propositions derive from a household production model of marriage and labor force decisions (Becker, 1975, 1981b; Santos, 1975;

Nerlove, 1974; Manser and Brown, 1980). Among these are the claim that a high wage rate for single relative to married women is associated with late marriage, and that a low female wage relative to the male wage is associated with early marriage [53]. However, other institutions can intervene. In Bangladesh, for example, it is found that relative decreases in the female wage have shifted the burden of marriage payments toward the daughters' parents and thus have led to later marriage (Lindenbaum, 1981). Another proposition is that female marriage is delayed as women's real absolute wage rises, regardless of its relationship to male wages [54] (Ermisch, 1981). It is claimed that this association is frequently concealed by certain other effects of real wage increases, including reduced financial constraints on household formation, which would cause earlier marriage. On the other hand, the increased time costs of searching for a spouse and of providing a family life style associated with rising real wages would delay marriage and reinforce the relationship. A related proposition associates male unemployment and late marriage for females [55]; an important LDC example is Sri Lanka (Weekes-Vagliani, 1979).

Income and accumulated wealth are broader concepts related to standard and style of living as determinants of marriage behavior. Here the dominant proposition posits an association between wealth level or level of living and early marriage (e.g., Waite and Spitze, 1981), and includes the ability of wealthier populations to handle the transaction costs of marriage [56]. This relationship is thought to be clearest in neolocal societies where new household formation is a part of marriage. However, the comparative evidence is very mixed, ranging from traditional China and Tokugawa Japan, where the children of wealthy farmers married earliest (Gamble, 1954; Goode, 1963:286ff; Hayami, 1980), to an association between poverty and earlier female marriage in contemporary Latin America (Yaukey, 1973).

The relationship between wealth and marriage timing is complicated by a number of factors. First, it is found to differ by sex, within families, or between urban and rural settings. Another complicating factor is the transfer of wealth from traditional to modern forms, such as investments in human capital; these different forms of wealth may have different effects on marriage timing. Finally, the wealth of an individual woman is thought to increase her age at marriage, but a more complete statement suggests the reverse relationship for men (e.g., Anderson, 1981, on Malaysia).

Other propositions relate more directly to the income and wealth implications of choice of spouse. It is argued that the upwardly mobile marry relatively late and the downwardly mobile relatively early, and, similarly, that heterogeneous marriages tend to be later than homogeneous ones [57]. The propositions in Goode et al. (1971) include racial/ethnic and religious cases of this kind. However, marriage delay associated with heterogeneous unions may reflect the higher search costs in a heterogeneous population, or simply a relaxation of search goals as time passes.

DETERMINANTS OF MARRIAGE PREVALENCE

The timing and prevalence of marriage are distinct features that share many determinants, but frequently relate to those determinants in different ways. With regard to fertility, the prevalence of marriage is certainly less important than its timing; however, from a broader perspective, prevalence can be a significant indicator of social organization. This section reviews some of the literature on marriage prevalence and its determinants, beginning with some findings and propositions about the aggregate, cross-sectional associations between marriage timing and prevalence, and some observations about the relationship between changes in these two features of the marriage pattern. This is followed by some propositions concerning marriage prevalence at the individual level.

Aggregate, Cross-sectional Patterns

It is widely held that wherever marriage is late, its prevalence is low [58]. Although the reasoning behind this proposition is rarely elaborated, the assumption seems to be that similar causal influences operate on each. Dixon (1970, 1978) offers four explicit arguments for a close relationship between marriage timing and prevalence. First, where the economic feasibility of marriage is high, both the prevalence and timing of marriage will be affected [59]. As was noted earlier, economic feasibility is thought to be high in extended family systems, and marriage is thus expected to be both early and universal in those systems. Second, where marriage is highly desirable--in part due to the absence of attractive social or economic alternatives, particularly for females--it will not only be earlier for females, but also more prevalent [60]. Third, where the opposite sex has been in short supply for a substantial period of time, the prevalence of marriage will be low [61]. Fourth, wherever marriage decisions are controlled by parents, marriage will be more prevalent [62].

Some additional aggregate-level patterns and differentials in the prevalence of marriage are worth noting. It is frequently observed, for example, that levels of celibacy are at least slightly higher in urban than in rural areas [63] (Livi-Bacci, 1977). It has also been noted that celibacy levels are relatively high in certain occupational categories, including, for example, domestic service and secondary-school teaching. It is an unresolved issue whether such patterns are causal in nature or only reflect the selectivity of individuals into the particular residential or occupational categories. A relatively low prevalence of marriage has been linked to a variety of societal features [64], including corporate village allocation of land, sex equality, and the existence of socially approved adult single roles. As noted earlier, there is also a substantial body of literature on agricultural populations linking inheritance systems and celibacy. The general claim is that the nonheirs in a sibling set are least likely to marry [65]; thus in partible heirship systems, the celibacy level can be quite low,

whereas in impartible systems of various kinds, it may be intermediate or even fairly high [66].

Some research has examined the relationship between changes in marriage timing and in marriage prevalence over time. Closely related to the presumed association between marriage timing and prevalence discussed above (as proposition 58) is the proposition that a shift towards later marriage is accompanied by a shift towards a lower prevalence of marriage [67] (e.g., Caldwell et al., 1980). Although this seems intuitively straightforward, the evidence is mixed. It is supported by the historical shift throughout Europe from late marriage and high celibacy toward a pattern of earlier and more universal marriage. From this European evidence, Hajnal (1965) has drawn the general conclusion that modernization reduces the level of celibacy, although this is of course a historically limited observation. Contrary evidence includes, for example, trends in Japan over roughly the same period of time (Dixon, 1978). As a late-marriage pattern shifted toward an early one and then back again, there was a steady decline in the percent celibate toward the modern very low celibacy level. Ireland is another counterexample: although that country has seen substantial fluctuations in the prevalence of marriage, marriage timing has remained essentially constant (Dixon, 1978). Finally, and of greatest practical significance, the proposition is not supported by recent patterns in LDCs, where a shift to later marriage is very widespread, but rarely associated with a shift towards a lower prevalence of marriage. It is true, however, that the evidence is not yet in for the most recent cohorts (P. Smith et al., 1982).

Research is needed to investigate under what conditions changes in marriage timing and in marriage prevalence are alternative responses (Davis, 1963), and when they are complementary, multiphasic responses. Dixon (1978), for example, has argued that marriage timing and prevalence can be affected in the same or in opposite directions, depending upon the institutional setting.

Individual-level Studies

At the individual level, research on marriage prevalence explores what sorts of individuals never marry, distinguishing males from females, positive from negative influences, and voluntary from involuntary determinants. One set of propositions deals with the low marriage chances of those with extreme or noticeable physical impairments, mental illness, or low intelligence [68]. Psychological correlates of celibacy have also been suggested (Najmi, 1980), along with various characteristics of the family of orientation (Spreitzer and Riley, 1974). Other propositions relate low marriage chances to poverty backgrounds [69]. Personal socioeconomic characteristics are thought to relate to celibacy differently for men and women; thus, for example, women's marriage chances are said to decline with schooling, whereas men's chances rise. Other propositions pertain to the institutional settings that more or less mandate fixed levels of celibacy. This research tries to identify who the celibates in these

settings are likely to be; for example, in the patriarchal, patrilocal system of Taiwan (Wolf, 1974, 1976), girls without older brothers in their sibling sets have a significant chance of remaining celibate.

CONCLUDING OBSERVATIONS

This section highlights some weaknesses in the field of nuptiality research, traces a few implications for policy making in developing countries, and suggests some promising new research directions.

Some weaknesses in the field stem from its heavy focus on the fertility implications of nuptiality patterns. Because female marriage timing bears upon fertility so directly, it is often treated as a linchpin in the set of arrangements surrounding marriage rather than as a product of those arrangements. There is insufficient attention paid to other aspects of marriage, including, for example, male patterns and the connections between male and female nuptiality.

A second problem, growing in part out of the first, is the inadequacy of the data base available. The surveys of knowledge, attitudes, and practices in family planning (KAP) and other fertility surveys commonly available generally fail to provide information for males or for persons of either sex who are not yet married. Complete data for birth cohorts are needed if determinants of decisions to marry are to be examined (Weekes-Vagliani, 1979). Moreover, the independent variables available in most fertility surveys limit the scope of nuptiality studies: rarely do they describe the time in life when marriage decisions were being made. Finally, the areal focus of much of the available census data often leads researchers to ignore important class differentials in marriage.

A third problem is the lack of a unifying theoretical framework. As with other fields, it is difficult to judge at what point in the evolution of knowledge a conceptual framework would serve to encourage rather than suppress significant insight. Although the disparate character of nuptiality research to date has probably had some benefits, it is now time to introduce some order. Vigorous pursuit of several models is probably preferable to the imposition of a single model at this stage. Just as with fertility theory, the task is to understand both micro-level patterns--marriage decision making--and relationships between marriage patterns and other societal changes at the macro level. The elements of a promising theoretical framework are contained in the household decision-making perspective of Becker (1975, 1981b) and others. The time allocation perspective (Birdsall et al., 1979; Gronau, 1970; Grossbard, 1978; Grossbard-Shechtman, 1981) encourages consideration of marriage, labor, and other decisions as jointly determined. Other contributions that may be especially useful for conceptualizing nuptiality decisions include efforts to address intergenerational issues (Willis, 1981; Ben-Porath, 1980); work on risk sharing and social control on the family level (Lesthaeghe, 1980); the incorporation of intrafamily exchanges (Ben-Porath, 1980; Becker, 1981a); and the introduction of passive and segmented decision making into the framework (Leibenstein, 1981;

McNicoll, 1980). Leibenstein singles out marriage decision making as a realm in which models of passive decision making may well be especially appropriate; the Leibenstein and McNicoll perspectives are notable because they admit social norms and structures into individual-level models of marriage decisions.

Research directly related to policy is sparse, but ranges widely from studies of elite perceptions of marriage patterns and legislative possibilities (Duza and Baldwin, 1977; Baldwin, 1977) to models of the impact upon fertility of induced nuptiality changes. The views expressed range from pessimistic (De Tray, 1977) to optimistic (Lesthaeghe, 1971, 1973). However, there is widespread agreement that policies will not have major influences "unless institutional structures surrounding behavior are changed" (Sklar, 1974:247). For example, Blake (1965) urges weakening parental controls and encouraging an instrumental view of marriage. Dixon (1970) proposes the removal of disadvantages associated with nonmarriage. Lesthaeghe (1973) argues that marriage legislation can influence only the age at onset of marriage, while only social change can affect the tempo of nuptiality. Direct legislative change to increase the legal age at marriage has been the policy alternative most commonly implemented (Peipmeir and Hellyer, 1977). However, research assessing the impact of legislative changes has been limited, and that which has been done generally suggests that legislative change follows rather than promotes changes in marriage patterns (see Parish and Whyte, 1978; Potter, 1981; Croll, 1981; Duza and Baldwin, 1977; Katz and Katz, 1978; McDonald and Kasto, 1978).

Numerous topics are in need of study in LDCs. Many are analogous to topics already explored for Western countries and Japan, and need not be listed here; others are of special revelance for contemporary LDCs. A few illustrations will suffice. The implications of stem family systems for nuptiality are well understood; however, there is a need to focus on the workings of joint, bilateral, and other family systems since these are common in LDCs, while the stem system, with its characteristic rules of behavior (R. Smith, 1981), is not. It is likely that the important cross-national differences in the relationship between family systems and nuptiality reflect not only differing levels of development, but also distinct sociocultural features of European societies bearing on nuptiality. Studies of marriage in agricultural populations must address the exceptionally small farm sizes typical in many LDCs, as well as the rise of landlessness as a historically unprecedented condition in many LDC settings. In the European setting, proletarianization "dissolved the nexus among employment, household position, marriage, procreation, inheritance, and the maintenance of household continuity" (Tilly, 1978:40); the effects of landlessness on marriage in LDCs have not yet been examined. Twentieth-century demographic transitions are occurring in the context of a highly developed world economic system; the implications of this for nuptiality have not been examined. Thus, the exceptionally large tertiary sectors in many contemporary LDCs--a distinct feature of twentieth-century development--may exhibit distinct nuptiality patterns. Educational systems in LDCs generally

convey global or even Western values and aspirations (Caldwell, 1980; Freedman, 1979), perhaps leading to a distinct role for education in LDC nuptiality patterns. These topics illustrate the range of issues that might be explored.

Researchers in the field of nuptiality face real difficulties. Marriage behavior and living arrangements are growing more diverse in all regions of the world, and our concepts and data for monitoring these changes are becoming less and less satifactory. Moreover, experience shows that, unlike the fertility and mortality transitions, a nuptiality transition can reverse itself. For LDCs, more marriage delay seems likely in the short run, but a long-run projection would be foolhardy. World nuptiality patterns may well present a very complex reality in the future.

BIBLIOGRAPHY

Abelson, A. (1978) Inheritance and population control in a Basque Valley before 1900. Peasant Studies 7:1-10.

Agarwala, S. N. (1969) Pattern of marriage in some ESCAP countries. International Population Conference, Vol. 3. Liege: International Union for the Scientific Study of Population.

Akers, D. S. (1967) On measuring the marriage squeeze. Demography 4:907-924.

Alexander, C. L., and T. W. Reilly (1981) Estimating the effects of marriage timing on educational attainment: Some procedural issues and substantive clarifications. American Journal of Sociology 87:143-156.

Altus, W. D. (1970) Marriage and order of birth. Pp. 361-362 in Proceedings, 78th Annual Convention of the American Psychological Association. Washington, D.C.: American Psychological Association.

Anderson, K. (1981) Age at Marriage in Malaysia. Paper presented at the annual meeting of the Population Association of America, Washington, D.C.

Anderson, M. (1976) Marriage patterns in Victorian Britain: An analysis based on registration district data for England and Wales 1861. Journal of Family History 1:55-78.

Ankarloo, B. (1979) Agriculture and women's work: Directions of change in the West, 1700-1900. Journal of Family History 4:111-120.

Arensberg, C. M., and S. T. Kimball (1968) Family and Community in Ireland, 2nd ed. Cambridge, Mass.: Harvard University Press.

Aries, P. (1977) The family and the city. Daedalus 106:227-235.

Arretx, C. (1969) Nuptiality in Latin America. Pp. 2127-2153 in International Population Conference, Vol. 3. Liege: International Union for the Scientific Study of Population.

Baldwin, C. S. (1977) Policies and realities of delayed marriage. PBS Report 1(4).

Barclay, G. W. (1954) Colonial Development and Population in Taiwan. Princeton, N.J.: Princeton University Press.

Bartz, K. W., and F. I. Nye (1970) Early marriage: A propositional formulation. Journal of Marriage and the Family 32:258-268.

Basavarajappa, K. G. (1971) The influence of fluctuations in economic conditions on fertility and marriage rates, Australia, 1920-21 to 1937-38 and 1946-47 to 1966-67. Population Studies 25:39-53.

Bayer, A. E. (1969a) Life plans and marriage age: An application of path analysis. Journal of Marriage and the Family 31:551-558.

Bayer, A. E. (1969b) Marriage plans and educational aspirations. American Journal of Sociology 75:239-244.

Becker, G. (1975) A theory of marriage. In T. W. Schultz, ed., Economics of the Family: Marriage, Children, and Human Capital. Chicago: University of Chicago Press.

Becker, G. (1981a) Altruism in the family and selfishness in the market place. Economics 48:1-15.

Becker, G. (1981b) A Treatise on the Family. Cambridge, Mass: Harvard University Press.

Ben-Porath, Y. (1980) The F-connection: Families, friends, and firms and the organization of exchange. Population and Development Review 6:1-30.

Berkner, L. K. (1977) Peasant household organization and demographic change in lower Saxony (1689-1766). In R. D. Lee et al., eds., Population Patterns in the Past. New York: Academic Press.

Berkner, L. K., and F. S. Mendels (1978) Inheritance systems, family structure, and demographic patterns in western Europe, 1700-1900. In C. Tilly, ed., Historical Studies of Changing Fertility. Princeton, N.J.: Princeton University Press.

Birdsall, N., J. Fei, S. Kuznets, G. Ranis, and T. P. Schultz (1979) Demography and development in the 1980s. In P. M. Hauser, ed., World Population and Development. Syracuse, N.Y.: Syracuse University Press.

Blake, J. (1965) Parental control, delayed marriage and population policy. Pp. 132-136 in World Population Conference, Vol. 2. New York: United Nations.

Blayo, Y. (1978) First marriages of women in Asia. Population 33(4-5).

Bogue, D. (1969) Families, households, and housing conditions. Pp. 367-391 in Principles of Demography. New York: John Wiley & Sons.

Bourgeois-Pichat, J. (1965) Les facteurs de la fecondite non dirigee. Population 20:383-424.

Brandes, S. H. (1976) La solteria, or why people remain single in rural Spain. Journal of Anthropological Research 32:205-233.

Braun, R. (1978) Proto-industrialization and demographic changes in the Canton of Zurich. Pp. 289-334 in C. Tilly, ed., Historical Studies of Changing Fertility. Princeton, N.J.: Princeton University Press.

Buck, C., and K. Stavrasky (1967) The relationship between age at menarche and age at marriage among childbearing women. Human Biology 39:93-102.

Bumpass, L. (1969) Age at marriage as a variable in socio-economic differentials in fertility. Demography 6:45-54.

Bumpass, L., and E. K. Mburugu (1977) Age at marriage and completed family size. Social Biology 24:31-37.

Busfield, J. (1972) Age at marriage and family size: Social causation and social selection hypotheses. Journal of Biosocial Science 4:117-134.

Caldwell, J. C. (1963) Fertility decline and female chances of marriage in Malaya. Population Studies 17:20-32.

Caldwell, J. C. (1976) Toward a restatement of demographic transition theory. Population and Development Review 2:321-366.

Caldwell, J. C. (1980) Mass education as a determinant of the timing of fertility decline. Population and Development Review 6:225-255.

Caldwell, J. C. (1981) The mechanisms of demographic change in historical perspective. Population Studies 35:5-27.

Caldwell, J. C., P. F. McDonald, and L. C. Ruzicka (1980) Interrelationships Between Nuptiality and Fertility: The Evidence from the World Fertility Survey. Paper prepared for the World Fertility Survey Conference, London.

Call, V. R. A., and L. B. Otto (1977) Age at marriage as a mobility contingency: Estimates for the Nye-Berardo Model. Journal of Marriage and the Family 39:67-79.

Carlson, E. (1978) Social Influences on the Timing of Marriage for American Women. Unpublished Ph.D. dissertation, University of California, Berkeley.

Carlson, E. (1979) Family background, school and early marriage. Journal of Marriage and the Family 41:341-353.

Chambers, J. D. (1957) The Vale of Trent, 1670-1800: A regional study of economic change. Economic History Review, Supplement 3:44-46.

Chambers, J. D. (1972) Population, Economy and Society in Pre-Industrial England. Oxford, Eng.: Oxford University Press.

Chamie, J., and R. Weller (1982) Levels, Trends and Differentials in Nuptiality in the Middle East and North Africa. Paper presented at the annual meeting of the Population Association of America, San Diego, Calif.

Cho, L.-J., and R. D. Retherford (1973) Comparative analysis of recent fertility trends in East Asia. In International Population Conference, Vol. 3. Liege: International Union for the Scientific Study of Population.

Chojnacka, H. (1976) Nuptiality patterns in an agrarian society. Population Studies 30:203-226.

Chojnacka, H. (1980) Polygyny and the rate of population growth. Population Studies 34:91-107.

Chowdhury, A. K. M. A., S. L. Huffman, and G. T. Curlin (1977) Malnutrition, menarche, and marriage in rural Bangladesh. Social Biology 24:316-325.

Coale, A. J., and R. Treadway (1979) A Summary of Changing Fertility in the Provinces of Europe. Paper prepared for the summary conference on European Fertility, Princeton, N.J.

Coale, A. J., and T. J. Trussell (1974) Model fertility schedules: Variations in the age structure of childbearing in human populations. Population Index 40:185-258.

Coale, A. J., and C. Y. Tye (1961) The significance of age-patterns of fertility in high fertility populations. Milbank Memorial Fund Quarterly 39:631-646.

Coale, A. J., B. Anderson, and E. Harm (1979a) Human Fertility in Russia Since the Nineteenth Century. Princeton, N.J.: Princeton University Press.

Coale, A. J., N. Goldman, and L.-J. Cho (1979b) Nuptiality and fertility in the Republic of Korea. Paper presented at the International Union for the Scientific Study of Population Seminar on Nuptiality and Fertility, Bruges.

Cochrane, S. L. (1979) Fertility and Education: What Do We Really Know? Baltimore, Md.: The Johns Hopkins University Press.

Connell, K. H. (1950) Population of Ireland, 1750-1845. Oxford, Eng.: Clarendon Press.

Cox, P. R. (1970) International variations in the relative ages of brides and grooms. Journal of Biosocial Science 2:111-121.

Crafts, N. F. R. (1978) Average age at first marriage for women in mid-nineteenth century England and Wales: A cross-sectional study. Population Studies 32:21-25.

Crafts, N. F. R., and N. J. Ireland (1976) A simulation of the impact of changes in age at marriage before and during the advent of industrialization in England. Population Studies 30:495-510.

Croll, E. (1981) The Politics of Marriage in Contemporary China. Cambridge, Eng.: Cambridge University Press.

Davis, K. (1963) The theory of change and response in modern demographic history. Population Index 29:345-366.

Davis, K., and J. Blake (1956) Social structure and fertility: An analytic framework. Economic Development and Cultural Change 4:211-235.

Davis, N. J., and L. L. Bumpass (1976) The continuation of education after marriage among women in the United States: 1970. Demography 13:161-174.

Day, L. H. (1979) Fertility and Wife's Age at Marriage: A Causal Framework. Unpublished paper. Australian National University, Canberra.

Demeny, P. (1968) Early fertility decline in Austria-Hungary: A lesson in demographic transition. Daedalus 97:502-522.

De Tray, D. N. (1977) Age of marriage and fertility: A policy review. The Pakistan Development Review 16:89-100.

Dixon, R. B. (1970) The Social and Demographic Determinants of Marital Postponement and Celibacy: A Comparative Study. Unpublished Ph.D. dissertation. University of California, Berkeley.

Dixon, R. B. (1971) Explaining cross-cultural variations in age at marriage and proportions never marrying. Population Studies 25:215-234.

Dixon, R. B. (1977) Late Marriage, Non-Marriage, and Population Policy. Paper presented at the annual meeting of the Population Association of America, Atlanta.

Dixon, R. B. (1978) Late marriage and non-marriage as demographic response: Are they similar? Population Studies 32:449-466.

Douglas, W. A. (1971) Rural exodus in two Spanish Basque villages: A cultural explanation. American Anthropologist 73:1100-1114.

Drake, M. (1969a) Age at marriage in the pre-industrial west. Pp. 196-208 in F. Bechhofer, ed., Population Growth and the Brain Drain. Edinburgh: Edinburgh University Press.

Drake, M. (1969b) Population and Society in Norway, 1735-1865. Cambridge, Eng.: Cambridge University Press.

D'Souza, S. (1979) Nuptiality Patterns and Fertility Implications in South Asia. Paper prepared for the International Union for the Scientific Study of Population Seminar on Nuptiality and Fertility, Bruges.

Durand, J. (1975) The Labor Force in Economic Development. Princeton, N.J.: Princeton University Press.

Durch, J. S. (1980) Nuptiality Patterns in Developing Countries: Implications for Fertility. Reports on the World Fertility Survey, No. 1. Washington, D.C.: Population Reference Bureau.

Duza, B., and C. S. Baldwin (1977) Nuptiality and Population Policy: An Investigation in Tunisia, Sri Lanka, and Malaysia. New York: Population Council.

Easterlin, R. A. (1971) Population change and farm settlements in the northern United States. Journal of Economic History 36:45-75.

Easterlin, R. A. (1978) The economics and sociology of fertility: A synthesis. In C. Tilly, ed., Historical Studies of Changing Fertility. Princeton, N.J.: Princeton University Press.

Elder, G. H., and R. C. Rockwell (1976) Marital timing in women's life patterns. Journal of Family History 1:34-53.

Ermisch, J. S. (1981) Economic opportunities, marriage squeezes and the propensity to marry: An economic analysis of period marriage rates in England and Wales. Population Studies 35:347-356.

Fernando, D. F. S. (1975) Changing nuptiality patterns in Sri Lanka 1901-1971. Population Studies 29:179-190.

Flinn, M. W. (1980) The European Demographic System, 1500-1620. Baltimore, Md.: The Johns Hopkins University Press.

Foster, B. L. (1977) Adaptation to changing economic conditions in four Thai villages. Pp. 113-129 in W. Wood, ed., Cultural-Recognition Perspectives on Southeast Asia. Athens, Ohio: Southeast Asia Program, Ohio University Center for International Studies.

Freedman, R. (1979) Theories of fertility decline: A reappraisal. Pp. 63-79 in P. M. Hauser, ed., World Population and Development. Syracuse, N.Y.: Syracuse University Press.

Freedman, R., and J. Casterline (1979) Nuptiality and Fertility in Taiwan. Paper presented at the International Union for the Scientific Study of Population Seminar on Nuptiality and Fertility, Bruges.

Freiden, A. N. (1972) A Model of Marriage and Fertility. Unpublished. Ph.D. dissertation. University of Chicago.

Friedlander, D. (1973) Demographic patterns and socioeconomic characteristics of the coal-mining population in England and Wales in the nineteenth century. Economic Development and Cultural Change 22:39-51.

Gamble, S. D. (1954) Ting Hsien. New York: Institute of Pacific Relations.

Gaskin, K. (1978) Age at first marriage in Europe before 1850: A summary of family reconstitution data. Journal of Family History 3:23-76.

Goldschmidt, W., and E. J. Kunkel (1971) The structure of the peasant family. American Anthropologist 73:1058-1076.

Goode, W. (1963) World Revolution and Family Patterns. Glencoe, Ill.: The Free Press.

Goode, W. J., E. Hopkins, and H. M. McClure (1971) Social Systems and Family Patterns: A Propositional Inventory. Indianapolis, Ind.: The Bobbs-Merrill Company, Inc.

Goody, J. (1976) Production and Reproduction. Cambridge, Eng.: Cambridge University Press.

Gronau, R. (1970) An Economic Approach to Marriage: The Intrafamily Allocation of Time. Paper presented at the Second World Congress of the Econometric Society, Cambridge, England.

Grossbard, A. (1978) Towards a marriage between economics and anthropology and a general theory of marriage. American Economic Review 68:33-37.

Grossbard-Shectman, A. (1981) A Market Theory of Marriage and Spouse Selection. Paper presented at the annual meeting of the Population Association of America, Washington, D.C.

Gutman, M. P., and R. Laboutte (1980) Early Industrialization and Population Change: Rethinking Protoindustrialization and the Family. Paper presented at the annual meeting of the Population Association of America, Denver, Colo.

Habakkuk, H. J. (1955) Family structure and economic change in nineteenth century Europe. Journal of Economic History 15:1-12.

Habakkuk, H. J. (1971) Population Growth and Economic Development Since 1750. Leicester, Eng.: Leicester University Press.

Haines, M. R. (1977) Fertility, marriage and occupation in the Pennsylvania anthracite region, 1850-1880. Journal of Family History 2:28-55.

Haines, M. R. (1979) Fertility and Occupation: Population Patterns in Industrialization. New York: Academic Press.

Hajnal, J. (1965) European marriage patterns in perspective. Pp. 101-143 in D. V. Glass and D. E. C. Eversley, eds., Population in History. Chicago: Aldine Publishing Co.

Hammel, E. A., and K. W. Wachter (1977) Primonuptiality and ultimonuptiality: Their effects on stem-family-household frequencies. Pp. 113-134 in R. D. Lee, ed., Population Patterns in the Past. New York: Academic Press.

Hanley, S. B. (1977) The influence of economic and social variables on marriage and fertility in eighteenth and nineteenth century Japanese villages. Pp. 165-200 in R. D. Lee et al., eds., Population Patterns in the Past. New York: Academic Press.

Hayami, A. (1980) Class differences in marriage and fertility among Tokugawa villagers in Mino Province. Keio Economic Studies 7:1-16.

Henriques, M. H. F. da T. (1979) Legal and Consensual Unions: Their Fertility Implications in Latin America. Paper presented at the International Union for the Scientific Study of Population Seminar on Nuptiality and Fertility, Bruges.

Henry, A., and P. T. Piotrow (1979) Age at marriage and fertility. Population Reports Series M, No. 4.

Henry, L. (1961) Some data on natural fertility. Eugenics Quarterly 8:81-91.

Henry, L. (1972) Nuptiality. Theoretical Population Biology 3:135-152.

Henry, L. (1975) A model for studying fluctuations in nuptiality after large fluctuations in the number of births. Population 30:759-780.

Herlihy, D. (1977) Deaths, marriages, births, and the Tuscan economy (ca. 1300-1550). In R. D. Lee et al., eds., Population Patterns in the Past. New York: Academic Press.

Hermalin, A. I., and E. van de Walle (1977) The civil code and nuptiality: Empirical investigation of a hypothesis. Pp. 71-111 in R. D. Lee et al., eds., Population Patterns in the Past. New York: Academic Press.

Hirsch, F. (1978) The commercialization effect: The sexual illustration. Pp. 95-101 in F. Hirsch, Social Limits to Growth. Cambridge, Mass: Harvard University Press.

Hirschman, C., and J. Matras (1971) A new look at the marriage market and nuptiality rates, 1915-1958. Demography 8:549-560.

Hogan, D. P. (1978a) The effects of demographic factors, family background, and early job achievement on age at marriage. Demography 15:161-175.

Hogan, D. P. (1978b) The variable order of events in the life course. American Sociological Review 43:573-586.

Holsinger, D. B., and J. D. Kasarda (1976) Education and human fertility: Sociological perspectives. In R. Ridker, ed., Population and Development: The Search for Selective Interventions. Baltimore, Md.: The Johns Hopkins University Press.

Hugo, G. J. (1978) Population Mobility in West Java. Yogyakarta: Gadjah Mada University Press.

Hull, T. H., and V. J. Hull (1977) The relations of economic class and fertility: An analysis of some Indonesian data. Population Studies 31:43-57.

International Center for Research on Women (ICRW) (1979a) Variations in Nuptiality Age: An Inquiry into its Trends and Determinants. Washington, D.C.: International Center for Research on Women.

International Center for Research on Women (ICRW) (1979b) Women in Migration: A Third World Focus. Washington, D.C.: International Center for Research on Women.

Iszaevich, A. (1975) Emigrants, spinsters and priests: The dynamics of demography in Spanish peasant societies. Journal of Peasant Studies 2:292-312.

Jain, A. K. (1981) The effect of female education on fertility: A simple explanation. Demography 18:577-595.

Kasarda, J. D. (1979) How female education reduces fertility: Models and needed research. Midamerican Review of Sociology 4:1-22.

Katz, J. S., and R. S. Katz (1978) Legislating social change in a developing country: The new Indonesian marriage law revisited. American Journal of Comparative Law 26:309-320.

Keeley, M. C. (1977) The economics of family formation: An investigation of the age at first marriage. Economic Inquiry (April):238-250.

Keeley, M. C. (1979) An analysis of the age pattern of first marriage. International Economic Review 20:527-544.

Kennedy, R. E., Jr. (1973) The Irish: Immigration, Marriage, and Fertility. Berkeley, Calif.: University of California Press.

Kiernan, K. E. (1977) Age at puberty in relation to age at marriage and parenthood: A national longitudinal study. Annals of Human Biology 4:301-308.

Knodel, J. (1967) Law, marriage and illegitimacy in nineteenth century Germany. Population Studies 20:279-294.

Knodel, J. (1972) Malthus amiss: Marriage relations in 19th century Germany. Social Science 47:40-45.

Knodel, J. E. (1974) The Decline of Fertility in Germany, 1871-1939. Princeton, N.J.: Princeton University Press.

Knodel, J., and M. J. Maynes (1976) Urban and rural marriage patterns in Imperial Germany. Journal of Family History 1:129-168.

Kobayashi, K., and Y. Tsubouchi (1979) Fertility Implications of Nuptiality Trends in Japan. Paper presented at the International Union for the Scientific Study of Population Seminar on Nuptiality and Fertility, Bruges.

Krause, J. T. (1958) Changes in English fertility and mortality, 1781-1850. Economical History Review 9:52-70.

Lasch, C. (1977) Haven in a Heartless World. New York: Basic Books.

Laslett, P. (1977) Characteristics of the Western family considered over time. Journal of Family History 2:89-116.

Lee, C.-F., and J. C. Chao (1973) A Comparative Investigation of Asian Fertility Transition: Varying Patterns of Nuptiality and Marital Fertility. Paper distributed at the International Union for the Scientific Study of Population General Conference, Liege.

Lee, R. D., ed. (1977) Introduction. In Population Patterns in the Past. New York: Academic Press.

Lee, R. D. (1978) Models of preindustrial population dynamics with application to England. Pp. 155-207 in C. Tilly, ed., Historical Studies of Changing Fertility. Princeton, N.J.: Princeton University Press.

Leibenstein, H. (1981) Economic decision theory and human fertility behavior: A speculative essay. Population and Development Review 7:381-400.

Lesthaeghe, R. (1971) Nuptiality and population growth. Population Studies 25:415-432.

Lesthaeghe, R. (1973) The feasibility of controlling population growth through nuptiality and nuptiality policies. In International Population Conference, Vol. 3. Liege: International Union for the Scientific Study of Population.

Lesthaeghe, R. (1977) The Decline of Belgian Fertility, 1800-1970. Princeton, N.J.: Princeton University Press.

Lesthaeghe, R. (1980) On the social control of human reproduction. Population and Development Review 6:527-548.

Levine, D. (1977) Family Formation in the Age of Nascent Capitalism. New York: Academic Press.

Libbee, M. J., and D. E. Sopher (1975) Marriage migration in rural India. Pp. 347-359 in L. A. Koskinski and R. M. Prothero, eds., People on the Move. London: Methuen and Co.

Lindenbaum, S. (1981) Implications for women of changing marriage transactions in Bangladesh. Studies in Family Planning 12:394-401.

Livi-Bacci, M. (1971) A Century of Portuguese Fertility. Princeton, N.J.: Princeton University Press.

Livi-Bacci, M. (1977) A History of Italian Fertility During the Last Two Centuries. Princeton, N.J.: Princeton University Press.

Lowrie, S. H. (1965) Early marriage: Premarital pregnancy and associated factors. Journal of Marriage and the Family 27:48-56.

MacDonald, M. M., and R. R. Rindfuss (1980) Earnings, Relative Income and Family Formation, Part I: Marriage. CDE Working Paper No. 80-7. Center for Demography and Ecology, University of Wisconsin, Madison.

Manser, M., and M. Brown (1980) Marriage and household decision making: A bargaining analysis. International Economic Review 21:31-44.

Marini, M. M. (1978) The transition to adulthood: Sex differences in educational attainment and age at marriage. American Sociological Review 43:483-507.

Matras, J. (1965) The social strategy of family formation: Some variations in time and space. Demography 2:349-362.

Mauldin, P., and B. Berelson (1978) Conditions of fertility decline in developing countries, 1965-75. Studies in Family Planning 9:90-147.

McArthur, N. (1961) Marriage in the Central South Pacific. International Population Conference, Vol. 2. Liege: International Union for the Scientific Study of Population.

McDonald, P. F. (1981) On Measuring the Onset of Fertility Decline When Age at Marriage is Increasing. Unpublished seminar paper. Department of Demography, Australian National University.

McDonald, P. F., and Katso (1978) The new Indonesian marriage law: Some impressions from village level research. The American Journal of Comparative Law 26.

McDonald, P. F., L. T. Ruzicka, and J. C. Caldwell (1980) Interrelations between nuptiality and fertility: The evidence from the World Fertility Survey. Pp. 77-146 in World Fertility Survey Conference, London, Vol 2. London: World Fertility Survey.

McFarland, D. C. (1970) Effects of group size on the availability of marriage. Demography 7:411-415.

McFarland, D. C. (1972) Comparison of alternative marriage models. Pp. 89-106 in T. N. E. Grenville, ed., Population Dynamics. New York: Academic Press.

McFarland, D. C. (1975) Models of marriage formation and fertility. Social Forces 54:66-83.

McKeown, T., R. G. Brown, and R. G. Record (1972) An interpretation of the modern rise of population in Europe. Population Studies 26:345-382.

McNicoll, G. (1980) Institutional Determinants of Fertility Change. Center for Policy Studies Working Papers No. 59. Population Council, New York.

Medick, H. (1976) The proto-industrial family economy: The structure and function of household and family during the transition from peasant to industrial capitalism. Social History 3:291-315.

Mendels, F. F. (1968) Industry and marriages before the Industrial Revolution. Pp 81-93 in P. Deprez, ed., Population and Economics. Winnipeg: University of Manitoba Press.

Mendels, F. F. (1978) Notes on the age of maternity, population growth and family structure in the past. Journal of Family History 3:236-250.

Mertens, W. (1965) A comparative study of world nuptiality patterns. Unpublished Ph.D. dissertation. University of Chicago.

Mitchell, R. E. (1971) Changes in fertility rates and family size in response to changes in age at marriage, the trend from arranged marriages, and increasing urbanization. Population Studies 25:481-489.

Moch, L. P. (1981) Marriage, migration and demographic structure. Journal of Family History 6:70-88.

Modell, J., F. Furstenberg, Jr., and T. Hershberg (1976) Social change and transitions to adulthood in historical perspective. Journal of Family History 1:7-32.

Modell, J., F. Furstenberg, Jr., and D. Strong (1978) The timing of marriage in the transition to adulthood: Continuity and change, 1860-1975. In J. Demos and S. S. Babcock, eds., Turning Points. Supplement to Volume 84, American Journal of Sociology. Chicago, Ill.

Moore, C. A., and L. J. Waite (1981) Marital dissolution, early motherhood and early marriage. Social Forces 60:20-40.

Mosk, C. (1977) Demographic transition in Japan. Journal of Economic History 37:655-674.

Mosk, C. (1980a) The Origins of Fertility Transition in Rural Japan. Working Papers in Economics. Department of Economics, University of California, Berkeley.

Mosk, C. (1980b) Rural urban fertility difference and the fertility transition. Population Studies 34:77-90.

Mosk, C. (1981a) The evolution of the pre-modern demographic regime in Japan. Population Studies 35:28-52.

Mosk, C. (1981b) Fertility and occupation: Mining districts in prewar Japan. Social Science Study 5:293-315.

Nag, M. (1962) Factors Affecting Human Fertility in Nonindustrial Societies: A Cross-Cultural Study. Yale University Publications in Anthropology No. 66. Reprinted by Human Relations Area Files Press.

Najmi, N. A. K. (1980) Sex Role Perceptions and Singlehood Predisposition: A Social Psychological Analysis of Contemporary Marriage Plans in the U.S. Montreal: McGill University.

Nerlove, M. (1974) Household economy: Toward a new theory of population and economic growth. Journal of Political Economy 82(Part 2):S200-S211.

Ogle, W. (1980) On marriage rates and marrige ages, with special reference to the growth of population. Journal of the Royal Statistical Society 53:253-280.

Ohlin, G. (1961) Mortality, marriage and growth in pre-industrial populations. Population Studies 14:190-197.

Otto, L. B. (1979) Antecedents and consequences of marital timing. Chap. 5 in W. R. Burr et al., eds., Contemporary Theories About the Family, Vol 1. Research-Based Theories. New York: The Free Press.

Outhwaite, R. D. (1973) Age at marriage in England from the late seventeenth through the nineteenth century. Transactions of the Royal Historical Society 23:55-73.

Page, H. J. (1977) Patterns underlying fertility schedules: A decomposition by both age and marriage duration. Population Studies 31:85-106.

Parish, W. L., and M. K. Whyte (1978) Village and Family in Contemporary China. Chicago: University of Chicago Press.

Peipmeir, K., and E. Hellyer (1977) Minimum Age at Marriage: 20 Years of Legal Reform. London: International Planned Parenthood Federation.

Potter, J. M. (1981) Marriage, Family and Kinship in Rural Guangdong Province, People's Republic of China: Retrospect and Prospect. Paper presented at the Modern China Seminar, Columbia University.

Presser, H. B. (1975) Age differences between spouses: Trends, patterns and social implications. American Behavioral Scientist 19:190-205.

Preston, S. H., and A. T. Richards (1975) The influence of women's work opportunities on marriage rates. Demography 12:209-222.

Prothero, E. T., and L. N. Diab (1968) Birth order and age at marriage in the Arab Levant. Psychological Reports 23:1236-1238.

Razzell, P. E. (1965) Population change in eighteenth-century England: A re-interpretation. Economic History Review 18:312-332.

Rindfuss, R. R., C. Hirschman, and A. Parnell (1981) The Timing of Entry into Motherhood in Asia: A Comparative Perspective. Paper prepared for the International Union for the Scientific Study of Population General Conference, Manila.

Roberts, G. W. (1979) Family Unions in the West Indies and Some of Their Implications. Paper presented at the International Union for the Scientific Study of Population Seminar on Nuptiality and Fertility, Bruges.

Ryder, N. B. (1960) Nuptiality as a Variable in the Demographic Transition. Paper presented at the annual meeting of the American Sociological Association, New York.

Salaff, J. W. (1976) The status of unmarried Hong Kong women and the social factors contributing to their delayed marriage. Population Studies 30:391-412.

Santos, F. P. (1975) The economics of marital status. Pp. 244-263 in C. B. Lloyd, ed., Sex, Discrimination and the Division of Labor. New York: Columbia University Press.

Schultz, T. P. (1981) Economics of Population. Reading, Mass.: Addison-Wesley Publishing Company.

Shorter, E. (1975) The Making of the Modern Family. New York: Basic Books, Inc.

Sklar, J. L. (1974) The role of marriage behavior in the demographic transition: The case of Eastern Europe around 1800. Population Studies 28:231-247.

Smith, D. P. (1980) Age at first marriage. World Fertility Survey Comparative Studies: Cross National Summaries (London) No. 1:1-18.

Smith, D. S. (1977) A homeostatic demographic regime: Pattern in west European family reconstitution studies. Pp 19-51 in R. D. Lee et al., eds., Population Patterns in the Past. New York: Academic Press.

Smith, P. C. (1980) Asian marriage patterns in transition. Journal of Family History 5:58-96.

Smith, P. C. (1982) Contrasting marriage patterns and fertility in Southeast Asia: Indonesia and the Philippines. Pp. 363-393 in L. Ruzicka, ed., Nuptiality and Fertility. Liege: Ordina Editions.

Smith, P. C., and M. S. Karim (1980) Urbanization, Education, and Marriage Patterns: Four Cases from Asia. Paper No. 70. Honolulu: East-West Population Institute.

Smith, P. C., M. Shahidullah, and A. Alcantara (1982) Cohort Nuptiality in Asia and the Pacific: An Analysis of the World Fertility Surveys. Paper prepared for the annual meeting of the Population Association of America, San Diego, Calif.

Smith, R. M. (1981) Fertility, economy, and household formation in England over three centuries. Population and Development Review 7:595-622.

Smith, T. C. (1977) Nakahara: Family Farming and Population in a Japanese Village: 1717-1830. Stanford, Calif.: Stanford University Press.

Spreitzer, E., and L. F. Riley (1974) Factors associated with singlehood. Journal of Marriage and the Family 36:533-542.

Sundt, E. (1980) On Marriage in Norway. Cambridge, Eng.: Cambridge Unversity Press.

Tella, A. (1960) The economic cycle in marriges. National Industrial Conference Board Business Record 17:20-22.

Thadani, V. N. (1980) Property and Progeny: An Exploration of Intergenerational Relations. Center for Policy Studies Working Paper No. 62. Population Council, New York.

Tilly, C. (1978) The historical study of vital processes. In C. Tilly, ed., Historical Studies of Changing Fertility. Princeton, N.J.: Princeton University Press.

Tilly, L. A., and J. W. Scott (1978) Women, Work, and Family. New York: Holt, Rhinehart and Winston.

Timur, S. (1977) Demographic correlates of woman's education: Fertility, age at marriage and the family. Pp. 463-495 in International Population Conference, Mexico 1977, Vol. 3. Liege: International Union for the Scientific Study of Population.

Trussell, T. J., J. Menken, and A. J. Coale (1979) A General Model for Analyzing the Effects of Nuptiality on Fertility. Background paper for the International Union for the Scientific Study of Population Seminar on Nuptiality and Fertility, Bruges.

Udry, J. R., and R. L. Cliquet (1982) A cross cultural examination of the relationship between ages at menarche, marriage and first birth. Demography 19:53-63.

United Nations (1962) Demographic Aspects of Manpower. Report 1, Sex and Age Patterns of Participation in Economic Activities. New York: United Nations.

United Nations (1973) Urban-Rural Differences in the Marital Status Composition of the Population. ESA/P/WP.51. New York: United Nations.

United Nations (1976a) Population Aspects of Manpower and Employment: A Regional Overview. Asian Population Studies Series No. 35. Bangkok: Economic and Social Commission for Asia and the Pacific.

United Nations (1976b) Updated Study of Urban-Rural Differences in the Marital Status Composition of the Population. Population Division Working Paper No. 59. New York: United Nations.

United Nations (1980) Patterns of Urban and Rural Population Growth. New York: United Nations.

van de Walle, E. (1968) Marriage in African censuses and inquiries. In W. Brass et al., eds., The Demography of Tropical Africa. Princeton, N.J.: Princeton University Press.

van de Walle, E. (1974) Female Population of France in the Nineteenth Century: A Reconstruction of 83 Departments. Princeton, N.J.: Princeton University Press.

Voss, P. (1977) Social Determinants of Age at First Marriage in the United States. Paper presented at the annual meeting of the Population Association of America, St. Louis, Mo.

Waite, L. J., and G. D. Spitze (1981) Young women's transition to marriage. Demography 18:681-694.

Walsh, B. M. (1970) A study of Irish country marriage rates 1961-66. Population Studies 24:205-216.

Walsh, B. M. (1973) Marital status and birth order in a sample of Dublin males. Journal of Biosocial Science 5:187-193.

Watkins, S. C. (1981) Regional patterns of nuptiality in Europe, 1870-1960. Population Studies 35:199-215.

Weber, A. F. (1899) The Growth of Cities in the Nineteenth Century: A Study in Statistics. New York: The Macmillan Company.

Weekes-Vagliani, W. (1979) Women in Development: At the Right Time for the Right Reasons. Paris: Organisation for Economic Cooperation and Development.

Wessels, W. J. (1976) The Theory of Search in Heterogenous Markets: The Case of Marital Search. Unpublished Ph.D. dissertation. University of Chicago.

White, L. K. (1981) A note on racial differences in the effect of female economic opportunity on marriage rates. Demography 18:349-354.

Whiting, J. W. M., V. Burbank, and M. Ratner (1982) The Duration of Maidenhood Across Cultures. Paper presented at the Social Science Research Council Conference on School-Age Pregnancies and Parenthood, Elkridge, Md.

Willis, R. J. (1981) The Direction of Intergenerational Transfers and Demographic Transition: The Caldwell Hypothesis Reexamined. Paper prepared for the International Union for the Scientific Study of Population Seminar on Individual and Families and Income Distribution, Honolulu.

Wolf, A. P. (1974) Marriage and adoption in Northern Thailand. Pp. 128-160 in R. J. Smith, ed., Social Organization and the Applications of Anthropology. Ithaca, N.Y.: Cornell Unversity Press.

Wolf, A. P. (1976) Childhood association, sexual attraction, and fertility in Taiwan. In E. W. P. Zubrow, ed., Demographic Anthropology. Albuquerque, N.M.

Wolf, E. R. (1966) Peasants. Englewood Cliffs, N.J.: Prentice-Hall, Inc.

Wrigley, E. A. (n.d.) Age at Marriage in Early Modern England. Unpublished paper.

Wrigley, E. A. (1961) Industrial Growth and Population Change: A Regional Study of the Coalfield Areas of North-West Europe in the Later Nineteenth Century. Cambridge, Eng.: Cambridge University Press.

Wrigley, E. A. (1966) Family limitation in pre-industrial England. Economic History Review 18:82-109.

Wrigley, E. A. (1978) Fertility strategy for the individual and the group. In C. Tilly, ed., Historical Studies of Changing Fertility. Princeton, N.J.: Princeton University Press.

Wrigley, E. A., and R. S. Schofield (1981) The Population History of England 1541-1871: A Reconstruction. Cambridge, Mass.: Harvard University Press.

Wunsch, G. (1979) Effects of Changes in Nuptiality on Natality in Western Europe. Paper presented at the International Union for the Scientific Study of Population Seminar on Nuptiality and Fertility, Bruges.

Wyon, J. B., and J. E. Gordon (1971) The Khanna Study: Population Problems in the Rural Punjab. Cambridge, Mass.: Harvard University Press.

Yaukey, D. (1973) Marriage Reduction and Fertility. Lexington, Mass.: Lexington Books.

Chapter 32

THE IMPACT OF FORMS OF FAMILIES AND SEXUAL UNIONS AND DISSOLUTION OF UNIONS ON FERTILITY

Thomas K. Burch*

INTRODUCTION

For an individual woman to achieve maximum fertility, the following conditions must be met:

1. She must be in good physical health; that is, she must be without disease or malnutrition that might cause sterility or subfecundity or lessen the survival chances of the fetus.
2. She must engage in regular sexual intercourse throughout the fecund period, starting early, but not so early as to endanger health through untimely pregnancy.
3. She must avoid long periods of sexual abstinence due to physical separation, taboos on intercourse during pregnancy and the postpartum or lactation period, and taboos based on religious or other considerations.
4. She must be able to change her reproductive partner or take supplementary partner(s) in case the male is or becomes sterile or impotent.
5. She must be able to take another partner in the event of widowhood.

However, there is an important distinction between maximum fertility (children ever born alive) and maximum surviving children (Easterlin, 1978). Good infant and child nutrition, for example, may require a prolonged period of lactation extending postpartum

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amenorrhea and perhaps delaying the resumption of intercourse until another conception is deemed acceptable. The taking of multiple or supplementary partners may lead to sterility or subfecundity through the spread of venereal disease; it may also weaken the sense of responsibility for childcare and so lessen the child's survival chances. Thus maximizing surviving children depends on optimum, not necessarily maximum values for a number of independent variables; the functions linking the number of surviving children and these independent variables often are not linear but concave downward.

In this context, marital and familial institutions, particularly those supported by tradition, are perhaps the primary mechanisms used by society to optimize the number of surviving children. Marriage legitimizes cohabitation and regular sexual intercourse between two or more adults to provide for socially approved reproduction, where the offspring enjoy full rights and privileges in relation to their parents, the kinship group, and the larger society. Kinship and family institutions also establish responsibilities for the child, such as labor, payments in money or kind, care in sickness and old age, marriage in accordance with the interests of the kinship group, and further reproduction. Much of the variation in kinship systems can be understood according to the distribution of these responsibilities and rights. In almost all human societies, marriage, sex, and reproduction have traditionally been closely knit. The distinctive feature of modern reproduction is a weakening of these links, through normative changes (e.g., acceptance of sex outside of marriage or of childless marriage) and through the spread of modern fertility control technology.

To study the effects of variations in marital and familial institutions on fertility or surviving children, it would be helpful to characterize heterosexual unions according to a number of abstract dimensions: age of participants; age difference between participants; exclusiveness, or whether either participant is expected or allowed to have other sexual partners; permanence or dissolubility; repeatability, or whether the surviving partner of a broken union is expected or allowed to form another; formality, or the degree to which the union is recognized and controlled by society or the broader kinship group; reproductive orientation, or whether offspring are expected or allowed; and autonomy, or the extent to which the partners are socially and economically independent of larger social groups, especially extended family households or kinship networks. However, theory and empirical research have not progressed sufficiently to permit such a systematic treatment. The present discussion therefore focuses on a number of concrete patterns of behavior that are important in the developing world and have been studied extensively in the empirical literature. These include polygyny, in Africa and the Middle East; consensual and visiting unions, especially in Latin America and the Caribbean, but also in Tropical Africa; marital dissolution and remarriage; and family type.[1]

POLYGYNY AND FERTILITY

Prevalence

Apart from anomalies such as the Mormons in the nineteenth-century United States, the institution of polygyny (a man having two or more wives) is confined to Africa and the Middle East. (Polyandry, the custom of a woman having two or more husbands, is so rare as to have little demographic significance.)

In his survey of preliterate societies, Murdock (1957) found that approximately 75 percent allowed polygyny; however, its extent within any given society was limited by practical considerations, notably the more or less equal numbers of men and women. Chojnacka (1980) reports a range from 37 percent of males with more than one wife in Guinea, to an average of 20 percent in West Africa as a whole, to around 3 percent in North African nations such as Egypt, Libya, and Algeria. In her own data from five separate Yoruba communities in Nigeria, she found polygyny among 20 to 50 percent of households or husbands, with 50 to 72 percent of the women surveyed involved.[2] In her samples, as is typical, a large majority of polygynous husbands have two wives, with only 25 percent having three or more. Polygyny clearly does not have a major demographic impact on the developing world as a whole; however, its extent in Tropical Africa is large enough to make it potentially important in that region.

Determinants and Differentials

Polygyny as an institution can be explained by male domination; by the desire for the sexual, reproductive, and economic services of more than one wife; and by the status and prestige associated with the practice. A number of specific determinants are frequently mentioned.

1. Economic advantages: Chojnacka (1980:92) describes this as the "underlying major determinant." Given a high land-labor ratio, a negligible role for capital, and near-zero population growth, "labor is the critical factor"; where the family is the dominant social institution, the major way to secure additional labor is to increase the size of one's family by marriage and reproduction. In his study of a largely pastoral society in the Negev, Muhsam (1956:16) cites the common practice of splitting one's flock for grazing, and the convenience of having an extra wife to send off with part of the flock. He describes the higher total number of children of the male in polygynous households as "the main raison d'etre of polygamy."

2. Sexual advantages: With two or more wives, the male is less apt to find himself separated from a potential partner or denied access because of illness, pregnancy, or postpartum taboos (Chojnacka, 1980; Radcliffe-Browne and Forde, 1960; Muhsam, 1956).

3. Female infertility: Where a male wants many children, especially sons, the wife's infertility or subfecundity in a monogamous marriage would motivate the husband to take another wife

(Muhsam, 1956; Chojnacka, 1980).

4. The levirate (a custom requiring a man to marry his brother's widow): Muhsam (1956) describes the "economic reason of the levirate" as one of the main incentives for polygyny, noting that second wives are frequently older than first ones, as would be expected when a man marries his older brother's widow. In Nigeria, Chojnacka (1980) finds that wives are "inherited" by a deceased man's brother or even his son. In a male-dominated society, the levirate provides economic support and social standing for a woman who otherwise might have no acceptable social role.

5. Status and prestige for the male: Polygyny and high social status are associated in a complex reciprocal relationship. Polygyny is commonly seen as prestigious, but can also be a source of greater wealth (through labor supply) and resultant status. At the same time, the taking of an additional wife assumes a degree of wealth, and is often seen as the duty of wealthy men.

6. Distorted sex ratio: Other things being equal, polygyny is more likely where there is a chronic shortage of males due to warfare, export of slaves, or sex-selective outmigration. Also, the sex ratio of marriage-eligibles is low where males marry women much younger than themselves.

In contemporary developing nations, as might be expected, polygyny, a practice frowned on in the West and in Asia, is less acceptable to the more educated and less traditional. Chojnacka (1980:100) found the practice more common among farmers, petty traders, and manual workers, and less common among nonagricultural, nonmanual, and professional workers; it was more common among traditional believers and Moslems, and less among Christians. Chojnacka sees the practice declining over time as the motives for it decline: good agricultural land is becoming scarcer; capital and technology are replacing labor; population increases are providing more abundant labor; consumption patterns and tastes are changing; and wives and children are becoming more of an economic disadvantage, especially in urban areas.

Fertility Impacts

The impacts of polygyny on fertility can be studied at the macro or micro level; at the latter level, they can be studied with regard to the male or the female. Only for the individual male can the impact be stated unambiguously and without qualification: polygynous males have more children than monogamous ones. This is not only the clear result of polygyny, but, as was noted earlier, one of its chief motives. It is generally thought that women in polygamous unions, by contrast, will have fewer children than women in monogamous unions, and thus that societies with a large proportion of women in polygamous unions will tend to have lower fertility. However, these conclusions are much less certain than those pertaining to individual males.

Comparative data on the impacts of polygyny at the macro level are

virtually nonexistent. Nag's study (1962) is an exception, but it generally applies only to preliterate societies contained in the Human Relations Area File. Nag found no support for the hypothesis that polygyny is associated with reduced societal fertility. From a broad comparative perspective, it can be noted that there is no special connection between widespread polygyny and either high or low fertility. Societal fertility rates are as high in many Asian or Latin American nations, where polygyny is largely absent, as they are in African nations where it is commmon; similarly, among populations in Africa where polygyny is widespread, fertility is sometimes high, sometimes relatively low.

There are some data at the micro level on the fertility of women by type of union. These data are relatively scarce; moreover, because the studies are not comparable in a number of ways, including sample composition, fertility measures, and control variables, they have yielded conflicting results. Many find no consistent difference between women in polygynous and monogamous unions (Pool, 1968; Chojnacka, 1980; Olusanya, 1971). However, the most common finding is that women in polygynous unions tend to have lower cumulative or current fertility than those in monogamous unions (see, e.g., van de Walle, 1968:230-231). In a pioneering study of Bedouins in the Negev, Muhsam (1956) found 1076.6 living children aged 0 to 4 per 1,000 women in monogamous unions compared to 735.8 for those in polygynous unions; thus the latter had almost one-third fewer children. This difference persisted when age was controlled, when the analysis was confined to mothers (that is, childless women were excluded), and when known response errors were taken into account. Muhsam concludes that there is a real fertility difference ". . . if it is assumed that there is no difference in infant and child mortality" (p. 9). Olusanya (1971:173) has questioned this last assumption, arguing that "the standard of childcare is generally superior in families where there is only one wife." Chojnacka (1980) has presented survey data from Nigeria showing that levels of living tend to be lower and infant and child mortality higher in polygynous households. However, relations among polygyny, levels of living and childcare, and mortality may not be the same in all cultural contexts.

Explanations of why polygynous wives might be expected to have lower fertility than monogamous wives focus on three variables: (1) frequency of coitus, (2) duration of marriage, and (3) childlessness.

1. Frequency of coitus might be lower for polygynous wives for four reasons: (a) the inability of the male to have frequent intercourse with all his wives; (b) favoritism on his part; (c) a greater willingness to observe taboos on intercourse during pregnancy, the postpartum period, and lactation; and (d) physical separation from one or more wives. Muhsam (1956) tends to discount the role of favoritism, at least in a Muslim context where fair treatment of all wives is religiously enjoined, but attributes an important causal role to a lower average frequency of coitus. Olusanya (1971) expresses doubts that male capacity would become an important limiting factor in female fertility so long as the number of wives did not exceed two or three. He also questions the relevance of this factor in a society

where abstinence from intercourse is already so extensive due to taboos on sex during pregnancy and lactation--for periods of up to three or four years around the birth of a child. Pool (1968) suggests that any difficulties with frequency of sex experienced by a woman in a polygyamous union could easily be offset by extramarital liaisons.

2. A frequent explanation for the lower fertility of women in polygynous unions is that they spend a smaller proportion of their reproductive years in marriage. Specifically, it is often suggested that second or higher-order wives have shorter marriage durations and/or later ages at marriage (Muhsam, 1956; Smith and Kunz, 1976). However, the evidence presented for this view involves problems of interpretation that cause its rejection by other authors. Assuming that males marry their several wives over a period of years, it is clear that for a sample of males, duration of marriage at the time of the survey will be lower for higher-order wives; however, it is not at all clear that the durations of different-order and monogamous wives within the same age group vary significantly, unless women in polygynous unions marry appreciably later than those in monogamous unions. The evidence on the latter point is not conclusive. Smith and Kunz (1976) find that second and third wives marry about two years later than first wives, but fail to distinguish first and later marriages of the women involved. If second and later wives are widowed or divorced from earlier unions, they might well have a higher average age at second marriage, thus driving up the overall average of higher-order marriages. Chojnacka (1980:107, Table 12) finds no tendency for later first marriages among second or higher-order wives, and rejects the marriage duration argument, at least for Nigeria. Olusanya (1971:168) reports that, at the time of survey, women in polygynous unions had longer durations since first marriage, having married earlier.

Other arguments suggest that polygyny would have the aggregate effect of increasing the proportion of women of reproductive age married at any given time. For one thing, polygyny can favor the remarriage of women whose previous union was dissolved by death or divorce. Chojnacka (1980:106) notes that ". . . remarriage follows after a very short interval," with wives in Yoruba society inherited by brothers or even sons, so that the proportion of women currently widowed or divorced is quite low in the early reproductive years.

Another, and perhaps more important, argument is that polygyny tends to lower the average age at marriage for all women, including those in monogamous unions (Chojnacka, 1980:103-104). The argument is that polygyny "generates a constant disequilibrium between the demand for and supply of girls of marriageable age" as older men compete with younger ones. One response to this equilibrium is for men to seek wives among still younger female cohorts. Smith and Kunz (1976:465) question the scarcity of females in the marriage market, so long as males tend to marry women younger than themselves and the population is growing rapidly with a sharply sloping age structure; however, their argument also suggests that females will tend to marry young, certainly in relation to males and probably absolutely. On the other hand, the argument that polygyny promotes a general pattern of early

and universal marriage for women must remain only a plausible hypothesis, since the formal demography of the issue has not been worked out adequately (e.g., by modeling or simulation). There is also no direct empirical evidence, since the kind of survey data reviewed above cannot easily be used to test an essentially macrodemographic hypothesis. In addition, many of the demographic, social, and economic factors that might lead to polygyny are also associated with early and universal marriage, and the implicit multivariate model (with indirect and direct effects distinguished) has barely been hinted at in the literature, much less tested empirically.

3. Still another argument for the observed lower fertility of polygynous wives relates to a higher incidence of childlessness (although, as noted above, in studies where there is a differential in fertility, it often persists when childlessness is controlled--see Muhsam, 1956). Two motivational explanations are given: (a) that a man whose first wife turns out to be sterile or subfecund will be motivated to take an additional wife or wives, given his basic desire for numerous children; and (b) that men will be willing to take sterile and subfecund women as second or higher-order wives (quite possibly on favorable terms) since they can still serve such other functions as the provision of labor. Empirically, however, none of these explanations yields clear predictions of the expected pattern of childlessness when wives are classified by type of union or by order in polygynous unions. In fact, the data are highly erratic. Muhsam (1956:5-6), for example, emphasizing the first explanation above, finds that first wives in polygynous marriages have a higher incidence of childlessness than women in monogamous marriages, but that the incidence is even higher among second wives in polygynous marriages. Smith and Kunz (1976:469) find the highest incidence among third wives.

Olusanya (1971) suggests yet another possible link between polygyny and infertility: that polygyny is associated with a higher frequency of divorce, which in turn leads to the spread of venereal infection and a high incidence of secondary sterility. This mechanism is hypothesized for both the individual and the societal levels.[3]

In summary, a review of the literature shows no conclusive evidence that polygyny has a substantial effect on fertility levels at the micro or macro level, one way or the other. Nor are there compelling theoretical arguments why it should. Census and survey data frequently--but far from uniformly--find women in polygynous unions with lower cumulative fertility than those in monogamous unions; however, this cross-sectional finding could also reflect selection of women into unions by fecundity/fertility status. Data on current age-specific fertility are more consistent with the view that polygyny lowers female fertility. However, studies of these issues have seldom included full reproductive histories, so that fertility cannot be apportioned among the woman's reproductive years spent in each type of union. Moreover, these studies have not included full multivariate analyses: although it is known that polygyny varies according to the social and economic characteristics of husbands and wives, these have seldom been adequately controlled; thus it is not

known if observed fertility differentials by type of union can be attributed directly to union type or to other, related variables.

CONSENSUAL AND VISITING UNIONS

The demographic treatment of marital status has been firmly rooted in Western custom and law. In censuses and surveys, the adult population is categorized according to clear legal criteria: a person is single if never legally married; married if currently in a legal marriage and cohabiting with the spouse; separated if still legally married but not cohabiting; divorced if not legally remarried after the dissolution of a previous marriage by legal means; and widowed if not legally remarried after the dissolution of a previous marriage by death. Whatever the merits of this system, it does not accord with the real-world complexity and fluidity of adult heterosexual relationships. Its inadequacies are being recognized increasingly in developed nations as nonlegal cohabitation becomes commonplace; the problem has been apparent much longer in African and Latin American societies, where nonlegal, more or less stable cohabitation has been socially approved. Studies of illegitimacy indicate the extent to which human reproduction is not confined to the legally married. In the West, illegitimate fertility has typically been a small part of a society's overall fertility; in Africa, Latin America, and the Caribbean, by contrast, a large share of fertility occurs to couples in unions that are nonlegal, or at least not fully formalized. Demographic studies of "union type and fertility" have tried to provide more adequate descriptions of these varying patterns of heterosexual unions, to investigate their implications for individual and aggregate fertility, and to identify the causal links involved.

In relation to fertility, the primary distinction among heterosexual unions is the extent to which they expose the female to intercourse and thus to the risk of pregnancy. Exposure to intercourse, however, is a continuous variable; thus rather than discrete types of union, it is necessary to identify a "gradient of situations, ranging from celibacy (in which there may be considerable promiscuity), through free union, consensual union, and customary marriage, to religious and civil marriage" (van de Walle, 1968:186). In practice, the following categorization has become commonplace:

1. Unions involving some element of duration and stability, social recognition, and cohabitation (or at least more or less continual exposure to intercourse). This category may be further broken down as follows:
   a. legal marriage--a union formed as the result of a ceremony having full legal effect in civil law. In Africa, this includes both customary marriage (based on traditional ceremonies), and marriage based on civil or religious (e.g., Christian, Moslem) ceremonies.
   b. consensual union (also de facto union; in French, union de fait)--a socially recognized stable union, but with little

or no legal standing.[4]

2. More casual unions of various types, characterized by the absence of continuous cohabitation; often temporary and unstable. Free union, visiting union, and keeper union are terms frequently encountered.

Prevalence

The extent to which adults participate in various forms of union differs across societies. Although precise country comparisons are difficult because of noncomparability in the typologies used, it is possible to distinguish situations in which nonlegal cohabitation involves a small minority, and those in which it is a majority or modal pattern. In a series for the Congo presented by van de Walle (1968:213, Table 2.12), for example, only 8 percent of females in stable unions were involved in consensual rather than legal unions, with the maximum proportion (18.6 percent) at ages 15-19. For Jamaica, by contrast, Denton (1979:296, Table 1) presents roughly comparable data showing approximately 60 percent of women in stable unions in the "common-law" as opposed to "married" category, with the highest proportion (87 percent) at ages 15-19, and the lowest (31 percent) at ages 40-44. Although such large differences in the prevalence of nonlegal unions could have important implications for aggregate fertility levels, no systematic cross-national research on the topic seems to have been undertaken.

Type of union is closely related to age. The proportion in stable unions tends to rise steadily with age, as does the proportion in legal marriages among those in stable unions. In Jamaica, for example, the proportion of women legally married rises from 1.2 percent at ages 15-19 to 44.5 percent at ages 40-44; among women in stable unions, the proportion married rises from 13 percent to 69 percent (Denton, 1979:296). In van de Walle's (1968:213) series for the Congo, the proportion in legal marriages among women in stable unions rises from about 81 percent at ages 15-19 to 96 percent at ages 55 and over.

The common interpretation of these age patterns is that consensual unions (as well as other forms of nonlegal union) represent "a transitional stage in conjugal status" (van de Walle, 1968:213). Most men and women are seen as moving toward formal and stable unions during their lifetimes, rather than opting permanently for other types. Viewed in this light, marriage becomes a process rather than a status (Page, 1975:47). This fluidity among union types, as will be seen below, considerably complicates the analysis of their fertility implications.

Fertility Impacts

At the descriptive level, there is general agreement in the literature on the relationship between type of union and fertility. When women

are classified according to current union type, those in formal marriages have the highest cumulative (children ever born) and current (age-specific fertility rates) fertility, followed by those in consensual unions and those in free unions, in that order (Henriques, 1980). Ebanks' (1973:53) data for Jamaica are typical: women in formal marriages have 5.5 children ever born, those in common-law unions have 4.6, and those in visiting unions have 3.2. For the Congo, van de Walle (1968:229) shows age-specific fertility rates to be 50 percent higher for women in formal marriages than for those in consensual unions across all age groups.

There are exceptions to this generalization, however, notably in fertility surveys of several Latin American metropolitan areas (Miro, 1966) that show cumulative fertility of women in consensual unions as high as or higher than that of legally married women. In addition, some investigators report differing patterns by age; for example, Denton (1979:300) reports that, in Jamaica in 1960, married women had higher fertility than those in consensual unions at all ages except the youngest (14-19). Chi and Harris (1979), on the other hand, reporting on survey data from four Colombian cities in 1971, find that legal marriage is positively associated with current fertility for zero-parity (and hence mostly young) women, but negatively associated for those of parities 1-3 and 4+.

Even thus qualified, however, the above generalization does not mean that union type determines fertility levels; the empirical evidence is also consistent with the proposition that conception or live birth helps determine union status. Existing studies cannot determine the direction of causation since they typically relate cumulative or current fertility (e.g., births within the twelve months preceding the survey) to union status at the time of the survey. The problem is aptly summarized by van de Walle (1968:230):

> The difference does not imply per se that formal marriage is more conducive to fertility than consensual union. There is normally an attrition of the numbers of women in consensual unions by the formalization of conjugal relations between a first conception and a first birth (or shortly thereafter). Indeed, the consensual union is frequently a transitional stage before marriage, and it is quite reasonable to assume that the transition may be speeded up by pregnancy or childbirth. Such change in conjugal status tends to raise the fertility rates for regular marriages and to lower those for consensual unions.

Resolving some of these complexities would require data on complete fertility and union histories; fertility at various periods of the woman's reproductive life could then be classified according to union type. This type of analysis was undertaken by Roberts and Braithwaite (1960), who related completed fertility to different patterns of unions. Their findings were a little more complex than those from the typical cross-sectional analysis, in that the relative fertility of women in legal and consensual unions varied according to the precise system of classification used (e.g., continuously in one

type of union, in same type at beginning and end of reproductive period, etc.). Consistent with virtually all other studies, women involved in visiting unions had the lowest fertility.

The interpretation of the causal and selective mechanisms underlying the empirical results summarized above is complex, and probably must differ across the cultural areas in which informal unions are common. The statement from van de Walle quoted above, for example, is more pertinent to the traditional African situation, where an informal union is seen as a temporary step on the way to formal marriage, and where conception or birth may hasten that transition. In the Caribbean, by contrast, consensual unions frequently last longer, and visiting unions are more common throughout adult life, rather than being so concentrated in youth. In such a context, conception or birth often leads to the termination of a union instead of its strengthening or regularization. Blake (1961) and Nag (1971) report this phenomenon for Jamaica and Barbados, respectively, although Stycos and Back (1964) report opposite findings and conclude that fertility leads to greater stability in sexual unions.

As with polygyny, a more definitive interpretation of these relationships is hampered by the methodological problems of existing studies. The absence of longitudinal data has already been mentioned; also absent are adequate statistical controls for socioeconomic variables and explicit causal models. In the Caribbean and Latin America, for example, consensual and visiting unions are more common among the lower social strata; in some nations, such unions are more common among rural couples. Often it is not known whether the fertility observed by union type is due to the union type itself or to other socioeconomic variables. A particularly important contextual variable not included in the most commonly cited studies is the availability of modern fertility control methods. Until recently, in many of the societies at issue, the costs of avoiding pregnancy or a birth were quite high; thus women in casual unions may have been more willing to run the risk that a birth would lead to regularization. With modern contraceptives available, it should be less costly and therefore more rational to avoid pregnancy until there is greater promise of a stable union with the male involved.

The generally lower fertility of women in nonlegal unions is most commonly attributed to the instability of these unions, leading to extensive periods without exposure to intercourse. It is presumed further that women in visiting unions have less frequent coitus than those who cohabit. Moreover, both visiting and consensual unions are more apt to be dissolved than legal marriages, with reproduction time lost prior to the establishment of a new union. It has also been suggested that the instability of casual unions may result in a higher incidence of venereal disease, and thus of reduced fertility associated with secondary sterility (Nag, 1975:23).

Within the Easterlin (1978) framework, the lower fertility observed in visiting and consensual unions in the Caribbean can have a motivational explanation. In anticipating the consequences of pregnancy and birth, a woman may foresee a more stable sexual union with her mate, possibly even legal marriage. Failing that, however,

she might foresee the costs and burdens of childcare falling primarily on herself alone, and thus try to avoid pregnancy or birth. This is consistent with Roberts' (1955) suggestion that induced abortion may be a relevant causal factor in the lower fertility rates observed.[5]

MARITAL DISSOLUTION, REMARRIAGE, AND FERTILITY

If conceptualizing and measuring the frequency of various types of sexual unions are difficult cross-culturally and historically, they are doubly so for divorce and other, less formal kinds of union dissolutions. Not only do customs, laws, and statistical practices differ just as widely, but with union dissolutions there is the added complication of social disapproval and stigma. In many cultures, the parties to a divorce are motivated to deny the fact, or to call it by another name, making empirical data especially difficult to gather.

Prevalence

Despite these data problems, it is possible to make some broad statements about the quantitative importance of divorce in the developing world. An old but authoritative study by Goode (1963) indicates the basic national or regional patterns.

In Islamic Arab societies, divorce (especially at the male's initiative) is allowed and carries relatively little stigma. As with polygyny, however, few men have been able to afford divorce, since it usually requires the return of a portion of the dowry. Still, the rate of divorce per 1,000 marriages has typically been much higher than that of the West. In Algeria, for example, the rate in 1905 was 410 divorces per 1,000 marriages, compared to 259 per 1,000 for the United States in 1960, and less than 200 per 1,000 for most other developed, Western societies (Goode, 1963:Tables 11-15). On the other hand, the trend in twentieth-century Islamic societies, contrary to that in the West, has been downward; in Algeria, for example, the rate had dropped to 35 per 1,000 by 1950.

Sub-Saharan Africa has a variety of patterns, although modern statistical data are virtually nonexistent: divorce is fairly frequent in matrilineal societies, where children belong to the wife's lineage and the bride-price is low; it is much less frequent in patrilineal societies, where children belong to the male line and the bride-price is large. Trends in the face of modernization and other social changes differ depending on the starting point.

In India, divorce was not permitted to Orthodox Hindus, but was common among the lower socioeconomic strata. It was made legal in 1955, and has been growing in frequency.

In China and Japan, divorce was traditionally rather infrequent and carried a measure of social stigma. Rates were lower than in the West, although higher than generally assumed. For the male in China, according to Goode, the alternative to divorce was concubinage, a

system he terms "quasi-polygynous" marriage. In Japan, divorce rates were higher than in China despite apparently similar cultural views, but have tended to decline during much of this century.

Even this cursory review of selected evidence makes an important demographic point: unlike many demographic variables, rates of divorce and other forms of union dissolution are not consistently high or low in traditional Third World cultures; thus trends may be upward or downward, depending on the particular context. Patterns of dissolution may therefore have helped raise or lower birth rates in traditional cultures, and changes in these patterns may either accelerate or slow the fertility decline.

Fertility Impacts

Divorce and other forms of union dissolution are generally thought to lower a woman's fertility (Lauriat, 1969; Cohen and Sweet, 1974; Nag, 1980; Reyna, 1975); however, much of the best evidence for this observation relates to developed rather than developing countries. Moreover, union dissolution patterns for a population with high and relatively uncontrolled fertility may differ from those for populations with low and controlled fertility (Downing and Yaukey, 1979). Nevertheless, it may be generally observed that union dissolution leads to periods of little or no sexual activity, and therefore to reduced risk of pregnancy (Downing and Yaukey, 1979). Where venereal diseases are endemic, secondary sterility associated with a larger number of different sexual partners may also be a factor. Reyna (1975), for example, reports for a sample from Chad that the percent sterile increases from 17.4 percent for women with no divorces to 83.3 percent for those with three or more (although there is no control for age).

Of course, there is again a problem with direction of causation in such data. Where fertility is highly valued by the male or by society generally, female sterility has often been grounds for divorce. In addition, the dissolution of a union in any society is presumably simpler if there are no children (questions of inheritance, custody, and so forth do not arise), or a small number. Sterility or low fertility can thus be a causal factor in divorce.

The fertility effects of union dissolution clearly depend on the frequency and speed of the formation of new unions. Where new unions are discouraged or forbidden (e.g., the prohibition on widow remarriage in India), widowhood or divorce will have a strong negative impact on fertility; in other contexts, there will be little or no impact. For example, in some Caribbean and Latin American studies, there is a <u>positive</u> relationship between fertility and the number of unions a woman has experienced. Ebanks et al. (1974) report 2.6 live births for women who have had only one union, 3.2 births for those with two, 3.8 for those with three, and 4.7 for those with four or more; the general relationship persists when age is controlled (see also Chen et al., 1974). The explanation given is that women will

want to have a minimal number of children by each successive mate (Downing and Yaukey, 1979; Blake, 1955; Stycos and Back, 1964; Ebanks et al., 1974; Chen et al., 1974). However, these studies do not show that the dissolution of the union as such causes higher fertility. Downing and Yaukey (1979) suggest that socioeconomic status may be a primary determinant, since lower class women typically have both higher fertility and higher rates of marital dissolution. In addition, a woman's fertility may affect her need and motivation to seek new partners and remarry. These analytic complexities are addressed and partially solved in a recent study by Koo and Suchindran (1980), who report an interaction effect of age at divorce on the remarriage prospects of women with children; however, similar analyses for developing countries do not exist.

FAMILY TYPE AND FERTILITY

It is widely assumed that high fertility is closely associated with and indeed partly caused by certain family types, specifically "corporate kinship groups" (such as clans or lineages) or "extended families." The former include a large number of people who are or consider themselves to be descendants of a common ancestor; who acknowledge a common leader; and who act as a unit for a variety of social, political, and economic purposes. Such a group is typically comprised of residentially separate families. An extended (or "joint" or "group") family is usually defined to include a central person (commonly a male patriarch), along with his wife, his unmarried daughters, his sons and their wives and children, and other relatives, all of whom live together in the same household or in close proximity, and share the daily round of life and a common domestic economy. The term is also used more loosely to refer to any unified group of close kin more complex than the nuclear family (or husband, wife, and their children).

The thesis that such family systems promote high fertility was first developed at length by Lorimer (1954) and by Davis (1955; see also Davis and Blake, 1956). It has drawn recent interest because the variable "family nucleation" plays a central role in Caldwell's (1976, 1978) theoretical statements about the causes of high fertility and fertility decline processes. Despite a fairly large body of literature, however, both the theoretical treatment and empirical support of this thesis remain inadequate. The subsections below review the related literature: the early theoretical work of Lorimer and Davis, the empirical testing of the thesis, and the more recent theoretical studies.[6]

Early Theoretical Work

In his monograph Culture and Human Fertility (1954) Lorimer emphasized the role of the family/kinship system (as well as of religious values)

in promoting high fertility in premodern societies. This emphasis was in keeping with his assignment in writing the monograph, which was to review the role of cultural factors, and does not imply that family or religion were considered the most important variables. Lorimer's study identifies two family systems that tend to promote high fertility: (1) corporate kinship groups such as clans or lineages, especially in tribal societies that have not yet adopted settled agriculture but have been relatively successful in competing for resources; and (2) extended family systems of settled agrarian societies, especially in Asia. He sees the high-fertility effect of the former as stronger than that of the latter. In both cases, such an effect is likely, but not inevitable; the family system can also lead to fertility restriction.

Although Lorimer does not discuss mechanisms of influence in detail, he suggests that the family system provides "motivation and support" for high fertility, including social support (approval, encouragement) and economic support (childcare services, food, housing, employment). He also stresses the role of what he terms ego-group identification: the welfare of the individual (or reproducing couple) is so closely indentified with that of the kinship or family group that (in microeconomic terms) calculating individual and group utility would yield the same fertility choices. In demographic terms, the high fertility effect of family and kinship systems operates both on marriage patterns (promoting early and near-universal marriage) and on marital fertility.

In sharp contrast with such family systems are those emphasizing the individual reproducing couple and their responsibility for their own offspring, that is, systems dominated by the nuclear family. Lorimer associates this form primarily with Western Europe as far back as the Middle Ages, but quotes with approval Irene Taeuber's (1958) similar characterization of the Japanese.

Davis' (1955) classic treatment of this thesis is narrower in scope: it focuses only on contemporary underdeveloped societies that have reached the developmental stage of settled agriculture; preliterate, tribal societies, discussed at length by Lorimer, are glossed over. However, Davis is more explicit about the mechanisms by which the family system promotes high fertility. He defines families according to the degree of "subordination and incorporation of the nuclear family by wider kinship groups" (p. 34). Such subordination is greater among agrarian societies, and often takes the form of shared residence; even when the nuclear family lives separately, however, it tends to be close to and dominated by elder relatives. Such a family system, according to Davis, favors high fertility for a number of reasons: the economic costs and inconveniences of childrearing are more shared; men can marry earlier because the burden on the individual of supporting a wife is not so great; the emphasis on family solidarity encourages marriage, as well as early childbearing by the wife to improve her status among the husband's kin; and men are more likely to demand offspring, partly for similar reasons of family status, and partly to ensure old age security.

Empirical Testing of the Thesis

The early work of Lorimer and of Davis understandably lacked a number of theoretical specifications required for rigorous empirical testing. There is some haziness about (a) the level of aggregation to which their propositions apply; (b) key concepts; (c) the respective roles of marriage variables and marital fertility; and (d) causal mechanisms. Nevertheless, early empirical studies used census or survey data collected for other purposes to compare the cumulative fertility of women living in extended and nuclear households. The results more often than not failed to confirm the Lorimer-Davis thesis: in many cases, women in nuclear families exhibited higher fertility. In retrospect, most of these studies were not methodologically appropriate for testing the thesis, although they contributed greatly to its further clarification.[7] They were limited in three primary ways:

1. The time referent of the key variables was inappropriate: cumulative fertility, which occurred over the woman's entire reproductive span up to the date of the census or survey, was related to current family or residential status. Thus a woman who had spent her early childbearing years, perhaps most of them, in an extended family would be classified as "nuclear" if that were her status at the time. The relationship between current residence and cumulative fertility could therefore as easily reflect the influence of fertility on residential/family status as the other way around, as pointed out by Rele (1963).
2. The family classification was based on the criterion of joint residence within the same household as defined for census or survey purposes, rather than on the broader concepts of "ego-family identification" or "nuclear family subordination and incorporation" used in the original statements of the thesis. Thus a couple living separately only a few yards from parents or in-laws on whom they might be almost totally dependent could be classified as a nuclear family.
3. Analyses often did not introduce adequate controls for other variables that might account for observed relationships between family type and fertility, such as socioeconomic status, education, modernity, attitudes toward fertility, and availability of relatives. Explanations assuming causal influence from fertility to family type or from a third variable to both fertility and family type were not ruled out.

Later empirical studies have tried to address some of these methodological problems. Liu (1967), for example, relating recent fertility (children under 5 years) to women's current residence, found a fairly consistent positive relationship between living in a stem or joint household and fertility, especially in cities; the relationship with cumulative fertility was virtually nonexistent. Vlassoff and Vlassoff (1981) present Indian survey data to show that, when age and life-cycle stage are taken into account, relationships between family type and both actual and expected fertility tend to disappear.

Bebarta (1977) introduced considerations of past as well as current family/household residence; he tended to find, if anything, a negative relationship between fertility and extended family residence.

The best study of these issues is reported in a recent paper by Freedman (1981). Although the analysis is in a preliminary stage, the data avoid most of the problems mentioned above. A probability sample was taken of 3,816 households in Taiwan containing a married woman 18-39 years of age. Questions were asked on the following: current residence, that is, all the persons with whom the respondent shares a housing unit and/or with whom the respondent takes meals; past residence, back to the time immediately after marriage; availability of kin, that is, whether husband's parents and married brothers are alive and how far away they live; financial contributions from respondent/husband to kin or the reverse; visiting patterns with kin; and expectations of assistance from married sons. The resulting data provide some support for the classic thesis on family type and fertility. Women who have always lived in a nuclear family/household show the lowest actual fertility (3.3 live births) and preferred fertility (2.9 children); they also show the highest percentage preferring fewer than three children (28 percent), and having begun contraception for spacing (38 percent). Past and present involvement in extended households, by contrast, is associated with higher fertility. Those currently in a joint-stem household (i.e., with husband's parents and married brothers) show the highest actual and preferred fertility (3.9 and 3.2, respectively); they also show a low (although not the lowest) percentage preferring fewer than three children or having begun contraception for spacing purposes (Freedman, 1981:Table 16).

Freedman also presents data showing that expectations about the functioning of kinship systems in later life may be as important as past or present residential and kinship involvements in determining fertility. Those respondents who thought it very important to have a male heir and those who expected to get financial aid from and co-reside with married sons later in life had the highest actual and preferred fertility (3.8 and 4.0 actual and 3.2 and 3.3 preferred, respectively). The lowest fertility was found among those who did not think a male heir important (3.3 actual and 2.7 preferred) and who did not expect to receive residential or financial assistance from their married sons (3.2 actual and 2.6 preferred).

The implications of these findings for the Lorimer-Davis thesis must await further analysis. Once again, the direction of causation is not entirely clear. For instance, it is possible that respondents with more children (and therefore more sons on average) naturally tend to place more importance on male heirs, and to have greater expectations of support from married sons. It is also interesting to note that none of the fertility differences reviewed above are massive, the largest being 0.8 live births; they do not suggest a powerful influence of family type or kinship expectations on fertility, and could disappear with the introduction of control variables. Finally, there may be some doubt about extrapolating the Taiwanese findings to societies with different cultural traditions or

at much lower levels of development. For the moment, however, Freedman has presented the most convincing data thus far for a structural and attitudinal link running causally from family/kinship system to fertility.

Some Recent Theoretical Developments

The widespread adoption of a microeconomic perspective on fertility behavior has paradoxically highlighted the importance of family structure, a variable traditionally neglected by economists. The family is seen as providing mechanisms for distributing income, wealth, and labor, as well as the costs of childrearing, among kin (see, e.g., Ben-Porath, 1980; Cain, 1977).

The most central role accorded family variables is in the recent theoretical writings of Caldwell (e.g., 1976, 1978, 1981, in these volumes), who argues that family nucleation is a key event in demographic transitions. The flow of wealth, which previously has gone from the younger generation to the older (thereby making high fertility economically rational) shifts direction. Young people begin to dissociate themselves from the traditional kinship system and its associated norms, to focus on themselves and their own nuclear families. The net flow of wealth is now from the older to the younger generation, making high fertility economically nonrational.

Caldwell's argument represents a fairly marked change in the classic thesis linking family structure and fertility. In contrast with Lorimer and with Davis, he sees the structure of the residential family group as almost completely irrelevant (determined largely by the ease of constructing separate housing); what matters for fertility is the kin network, and the economic exchanges that proceed irrespective of residence. Moreover, in contrast with Lorimer at least, Caldwell posits an economically rational and self-centered actor. If there is any "ego-group identification," it runs the opposite way from that described by Lorimer: what is good for the patriarch is defined as good for the group. Finally, Caldwell sees high fertility as motivated by the desire for eventual wealth flows from offspring in one's middle and later years; Lorimer and Davis emphasize the desire for the adult status and prestige within the family that go with marriage and parenthood. Similarly, Caldwell places no emphasis on the interim costs of childbearing and rearing; the reduction of these costs by the wider kinship group looms large in the Lorimer and Davis analyses.

Further empirical research is clearly needed. This research might focus on the following central questions:

1. Do certain family/kinship forms yield peculiarly favorable "economics of childbearing," either by reducing or spreading the costs of childbearing, or by yielding valuable economic benefits from children in the form of labor, income, anticipated old age security, and so forth? Recent work by Cain (1977), McNicoll (1980), and White (1981), among others, represents a start in this direction.

2. If the first question is answered in the affirmative, does this indicate a conscious choice by the individual, or conformity to a social and cultural system? This is part of the broader question of the adequacy of traditional microeconomic explanations of demographic behavior.

A final specific theoretical result bearing on the question deserves mention, viz., that provided by Goodman et al. (1974), who demonstrate analytically the strong effect of fertility level on the average number of close kin a person has. If one can accept as a general hypothesis that sheer number of close relatives may be an important determinant of the importance of kin-based institutions (both for society as a whole and for individuals), then many of the empirical results and theoretical ideas reviewed above have to be reexamined with an eye to the possibility that causation runs from fertility to family/kinship/household structure as well as or instead of the other way around.

PROPOSITIONS

The following propositions summarize the major points made in the foregoing discussion.

1. Polygyny may have little effect on societal or female fertility, or may lower it slightly because of a lower frequency of intercourse for some women or sterility associated with marital instability and disease. The number of surviving children in polygynous unions may be lower to the extent that the levels of childcare are poorer.

2. Participation in free or consensual unions probably lowers a woman's fertility compared to what it would be in a more formal marriage. Much of this effect is due to the greater instability of such unions and the consequent loss of reproductive time.

3. Divorce and other forms of dissolution of heterosexual unions generally lower fertility, although there may be some exceptions when the rapid formation of new unions is common.

4. Systems of extended family/kinship relations probably tend to raise fertility and surviving children, if only because they facilitate early marriage and reproduction and spread the costs and responsibilities of childbearing.

5. In general, the empirical evidence for these propositions is inadequate. Although detailed longitudinal data are required for proper empirical testing, most of the available data are cross-sectional. Direction of causality is always an issue, and other variables that could be determinants are not controlled or inserted into appropriate multivariate causal models.

In general, there is no particular reason to assume that the effects of particular marriage and family forms on fertility would be massive. Reproduction is only one of several ends served by marriage and family institutions, and these institutions are themselves powerfully shaped by ecological, economic, demographic, and

sociocultural factors. The fundamental determinants of fertility in the less developed nations may after all be nonfamilial.

NOTES

1. Particularly valuable reviews of many of the topics covered here are provided by Nag (1975) and by van de Walle (1968).
2. It is customary to report the extent of polygyny as the percent of men with more than one wife, although the proportion of women in polygynous unions is the more relevant statistic for assessing aggregate fertility effects.
3. Other a priori arguments on the effects of polygyny on fertility are encountered. Olusanya (1971) suggests that co-wives in polygynous marriages may compete for the husband's favor by trying to supply him with many children, especially sons, thus tending to drive up the fertility of polygynous women. Chojnacka (1980), on the other hand, suggests that, in contemporary developing nations where polygyny is giving way in the face of modernization and Westernization, monogamous women may try to make up for the potential offspring lost to the husband who refrains from taking additional wives.
4. The term "common-law" union or marriage is ambiguous, and often avoided: in some legal jurisdictions, a common-law union is in fact a legal marriage; in everyday speech, however, the phrase often is used to refer to consensual unions or even more casual relationships.
5. In the aggregate, a pattern of widespread casual unions like those in the Caribbean tradition probably has favored high fertility in the past, and has militated against fertility reduction because the lines of responsibility for both fertility control and the care of offspring are uncertain, diffused, and fluid. Where it is not clear that the reproducing woman or couple will bear the costs of children, the motivation to control fertility (as defined in Easterlin's model) is proportionately reduced.
6. Relevant review articles are by Burch and Gendell (1970), Nag (1975), and Caldwell et al. (1980).
7. For a review of several earlier studies and their methodological inadequacies, see Burch and Gendell (1970).

BIBLIOGRAPHY

Bebarta, P. C. (1977) Family Type and Fertility in India. North Quincy, Mass.: Cristopher Publishing.

Ben-Porath, Y. (1980) The F-connection: Families, friends, and firms and the organization of exchange. Population and Development Review 6:1-30.

Blake, J. (1955) Family instability and reproductive behavior in Jamaica. Pp. 24-41 in Current Research in Human Fertility. New York: Milbank Memorial Fund.

Blake, J. (1961) Family Structure in Jamaica. New York: The Free Press.

Burch, T., and M. Gendell (1970) Extended family structure and fertility: Some conceptual and methodological issues. Journal of Marriage and the Family 32:227-236.

Cain, M. (1977) The economic activities of children in a village in Bangladesh. Population and Development Review 3:201-227.

Caldwell, J. C. (1976) Toward a restatement of demographic transition theory. Population and Development Review 2:321-366.

Caldwell, J. C. (1978) A theory of fertility: From high plateau to destabilization. Population and Development Review 4:553-578.

Caldwell, J. C. (1980) Mass education as a determinant of the timing of fertility decline. Population and Development Review 6:225-255.

Caldwell, J. C. (1981) The mechanisms of demographic change in historical perspective. Population Studies 35:1-27.

Caldwell, J. C., G. Immerwahr, and L. T. Ruzicka (1980) Family structure and fertility. Unpublished manuscript. World Fertility Survey, International Statistical Institute, London.

Chen, K., S. M. Wishik, and S. Scrimshaw (1974) The effects of unstable sexual unions on fertility in Guayaquil, Ecuador. Social Biology 21:352-359.

Chi, P. S. K., and R. J. Harris (1979) An integrated model of fertility: A multivariate analysis of fertility differentials in Colombia. Canadian Studies in Population 6:111-125.

Chojnacka, H. (1980) Polygyny and the rate of population growth. Population Studies 34:91-107.

Cohen, S. B., and J. A. Sweet (1974) The impact of marital disruption and remarriage on fertility. Journal of Marriage and the Family 36:87-96.

Davis, K. (1955) Institutional patterns favoring high fertility in underdeveloped areas. Eugenics Quarterly 2:33-39.

Davis, K., and J. Blake (1956) Social structure and fertility: An analytic framework. Economic Development and Cultural Change 4:211-235.

Denton, E. H. (1979) Economic determinants of fertility in Jamaica. Population Studies 33:295-305.

Downing, D., and D. Yaukey (1979) The effects of marital dissolution and remarriage on fertility in urban Latin America. Population Studies 33:537-547.

Easterlin, R. A. (1978) The economics and sociology of fertility: A synthesis. Pp. 57-133 in C. Tilly, ed., Historical Studies of Changing Fertility. Princeton, N.J.: Princeton University Press.

Ebanks, G. E. (1973) Fertility, union status, and partners. International Journal of Sociology of the Family 3:48-60.

Ebanks, G. E., P. M. George, and C. E. Nobbe (1974) Fertility and number of partnerships in Barbados. Population Studies 28:449-461.

Freedman, R. (1981) Trends in Household Composition and Extended Kinship in Taiwan and Relation to Reproduction: 1973-1980. Paper prepared for International Union for the Scientific Study of Population Seminar on Family Types and Fertility in Less-Developed Countries, Sao Paulo, Brazil.

Goode, W. J. (1963) World Revolution and Family Patterns. New York: The Free Press.

Goodman, L. A., N. Keyfitz, and T. W. Pullum (1974) Family formation and the frequency of various kinship relationships. Theoretical Population Biology 5:1-27. (See also 8:376-381.)

Henriques, M. H. F. T. (1980) Unioes legais e consensuais: Incidencia e fecundidade na America Latina. FIBGE, Rio de Janeiro. Boletin Demografico 10(3).

Koo, H. P., and C. M. Suchindran (1980) Effects of children on women's remarriage prospects. Journal of Family Issues 1:497-515.

Lauriat, P. (1969) The effect of marital dissolution on fertility. Journal of Marriage and the Family 31:484-493.

Lesthaeghe, R. (1980) On the social control of human reproduction. Population and Development Review 6:527-548.

Liu, P. K. C. (1967) Differential fertility in Taiwan. Pp. 363-370 in Contributed Papers, Sydney Conference. Liege: International Union for the Scientific Study of Population.

Lorimer, F. (1954) Culture and Human Fertility. Paris: UNESCO.

McNicoll, G. (1980) Institutional determinants of fertility change. Population and Development Review 6:441-462.

Miro, C. A. (1966) Some misconceptions disproved: A programme of comparative fertility surveys in Latin America. Pp. 615-634 in B. Berelson et al., Family Planning and Population Programs. Chicago: University of Chicago Press.

Muhsam, H. V. (1956) The fertility of polygamous marriages. Population Studies 10:3-16.

Murdock, G. P. (1957) World ethnographic sample. American Anthropologist 59:664-687.

Nag, M. (1962) Factors Affecting Human Fertility in Non-Industrial Societies: A Cross-Cultural Study. New Haven, Conn.: Yale University.

Nag, M. (1971) The influence of conjugal behavior, migration and contraception on natality. Pp. 105-123 in S. Polgar, ed., Culture and Population: A Collection of Current Studies. Cambridge, Mass.: Schenkman.

Nag, M. (1975) Marriage and kinship in relation to human fertility. Pp. 11-54 in M. Nag, ed., Population and Social Organization. The Hague: Mouton.

Nag, M. (1980) How modernization can also increase fertility. Current Anthropology 21:571-587.

Olusanya, P. O. (1971) The problem of multiple causation in population analysis, with particular reference to the polygamy-fertility hypothesis. The Sociological Review 19:165-178.

Page, H. J. (1971) Fertility levels, patterns and trends. Pp. 29-57 in J. C. Caldwell, ed., Population Growth and Socio-Economic Change in West Africa. New York: Columbia University Press.

Pool, D. I. (1968) Conjugal patterns in Ghana. Canadian Review of Sociology and Anthropology 5:241-253.

Radcliffe-Browne, A. R., and D. Forde (1960) African Systems of Kinship and Marriage. London: Oxford University Press.

Rele, J. R. (1963) Fertility differentials in India: Evidence from a rural background. Milbank Memorial Fund Quarterly 41:183-199.

Reyna, S. P. (1975) Age differential, marital instability, and venereal disease: Factors affecting fertility among the Northwest Barma. Pp. 55-73 in M. Nag, ed., Population and Social Organization. The Hague: Mouton.

Roberts, G. W. (1955) Some aspects of mating and fertility in the West Indies. Population Studies 8:199-227.

Roberts, G. W., and W. L. Braithwaite (1960) Fertility differentials by family type in Trinidad. Annals of the New York Academy of Sciences 84:963-980.

Smith, J. E., and P. R. Kunz (1976) Polygyny and fertility in nineteenth century America. Population Studies 30:465-480.

Stycos, J. M., and K. W. Back (1964) The Control of Human Fertility in Jamaica. Ithaca, N.Y.: Cornell University Press.

Taeuber, I. B. (1958) The Population of Japan. Princeton, N.J.: Princeton University Press.

van de Walle, E. (1968) Marriage in African censuses and inquiries. In W. Brass et al., eds., The Demography of Tropical Africa. Princeton, N.J.: copyright 1968 by Princeton University Press.

Vlassoff, C., and M. Vlassoff (1981) Family Type and Fertility in Rural India: A Critical Analysis. Paper presented at the Canadian Population Society Annual Meeting, Halifax, Nova Scotia.

White, B. (1981) Child labor and population growth: Some studies from rural Asia. Workshop on Child Labor. Institute of Development Studies and the Anti-Slavery Society, Sussex University.

Willis, R. J. (1980) The old-age security hypothesis and population growth. Pp. 43-69 in T. K. Burch, ed., Demographic Behavior: Interdisciplinary Perspectives on Decision-Making. Boulder, Colo.: Westview Press.

Chapter 33

MODERNIZATION AND FERTILITY: A CRITICAL ESSAY

Richard A. Easterlin*

The most challenging problem today in the social study of human fertility is the causes of the shift from high to low fertility during the process of modernization. Most of the preceding papers focus on the state of knowledge about only one of the main determinants of fertility--supply, demand, or regulation costs. The purpose of the present paper is to clarify the conceptual links between modernization and fertility as suggested by the overall theoretical framework of these volumes, and to note some theoretical and empirical implications of the approach. This is, therefore, a conceptual essay rather than a state-of-the-art survey. The central point made is that supply, demand, and regulation costs can be thought of as a new set of "intervening variables" through which modernization influences fertility, and that this perspective offers a number of benefits. First, the transition from high to low fertility has taken place under a wide variety of socioeconomic, institutional, and cultural conditions (Knodel and van de Walle, 1979), and the use of these intervening variables provides possible explanations for that diversity. These variables also indicate important gaps in empirical knowledge and thus new research needs. In addition, they provide a way of comparing and testing different theories about the effects of modernization on fertility.

Although this paper is based on a particular view of the mechanisms through which modernization operates, it is not commited to any one of these mechanisms or any specific set of modernization influences; rather, the framework presented here encompasses existing theories of the effect of modernization on fertility to facilitate their empirical testing and evaluation. The first section below discusses briefly the meaning of modernization and associated changes in fertility behavior; the second focuses on the conceptual links between modernization and fertility; and the third presents some theoretical and empirical implications of the analysis.

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THE NATURE OF MODERNIZATION AND ASSOCIATED CHANGES IN FERTILITY BEHAVIOR

Modernization

Modernization may be defined as a transformation in economic, social, and political organization and in human personality observed in a growing number of nations since the mid-eighteenth century (Coleman, 1968; Easterlin, 1968; Kuznets, 1966; Lerner, 1968; United Nations, 1970). On the economic side, this transformation involves a sustained rise in real output per capita. It encompasses wide-ranging changes in techniques of producing, transporting, and distributing goods; in the scale and organization of productive activities; and in types of outputs and inputs. It embraces major shifts in the industrial, occupational, and spatial distribution of productive resources and in the degree of exchange and monetization of the economy. On the social and demographic side, modernization involves significant alterations in fertility, mortality, and migration; in place of residence; in family size and structure; in the educational system; and in public health services. Its influence extends into the areas of income distribution, class structure, government organization, and political structure. For the human personality, modernization means an increased openness to new experience, increased independence from parental authority, belief in the efficacy of science, and greater ambition for oneself and one's children (Inkeles, 1969).

The international spread of modernization has so far been limited, although few parts of the world have remained untouched. The pattern of its diffusion in time and space cannot be established with quantitative precision, but the picture in broad outline is as follows. Elements of the transformation were increasingly apparent in parts of northwestern Europe in the seventeenth and eighteenth centuries. In the course of the nineteenth century, as the process made increasing progress in these areas of origin, it gradually diffused southward and eastward thoughout Europe. By the end of the century, its beginnings could be identified in easternmost Europe, including Russia, and also in Japan. A somewhat similar development was taking place concurrently in overseas areas settled by Europeans, mirroring to some extent the diffusion pattern within Europe. The process was first apparent in areas initially settled chiefly by migrants from northwestern Europe--the United States in the first part of the nineteenth century, followed by Canada, Australia, and New Zealand. Subsequently, it could be discerned in parts of Latin America, where migration from southern and eastern Europe was especially important. In the twentieth century, and increasingly since World War II, its early signs have become more widely apparent in parts of Asia and, to a lesser extent, Africa.

Fertility Behavior

The principal changes in reproductive behavior associated with the process of modernization relate to nuptuality, fertility, and fertility control. Since the concern here is with the reproductive behavior of the family or similar conjugal unit, the present discussion is confined to married women, and thus to marital fertility and fertility control.

The most widely recognized change in reproductive behavior associated with modernization is the shift from high to low fertility. This shift, together with a similar (and usually prior) decrease in mortality levels, is termed "the demographic transition." For the crude birth rate, this means a shift from magnitudes often of 40 or more per thousand to under 20. This fertility decline has been chiefly accomplished by conscious family-size limitation on the part of individual couples. In the last few decades, this development has been formalized conceptually as a shift from a "natural-fertility regime" to one of deliberate fertility control. There are two types of evidence for this shift: survey data in which households report explicitly on their knowledge and use of fertility control, and analyses of census or other data on observed age-specific fertility rates, using a technique developed by Coale and Trussell (1974) based on Henry's work. Although these data sets embody somewhat different concepts of natural fertility, both yield similar results (Easterlin et al., 1980:104-110; Knodel and van de Walle, 1979:223; Robinson, 1981).

The combined process of fertility decline and this shift to deliberate fertility control is hereafter called the "fertility transition." Although this transition has accompanied the process of modernization in all societies, capitalist and communist alike, the specific links between the two are not clear. As noted above, the transition has occurred under a wide variety of conditions. Also, in comparison with the time required for modernization of a country, the fertility transition is usually comparatively rapid (Knodel and van de Walle, 1979:235-236).

CONCEPTUAL LINKS BETWEEN MODERNIZATION AND FERTILITY BEHAVIOR

In seeking to identify specific links between the processes of modernization and fertility transition just described, a frequent approach is to regress fertility (as measured, say, by children ever born) on measures that reflect various aspects of social, economic, and political modernization, along with other possible determinants such as cultural conditions (see, e.g., Richards, in these volumes). The recent development of the "intermediate variables" approach (Davis and Blake, 1956; Bongaarts, 1978) has introduced an intervening stage into this analysis: fertility is now seen as being directly influenced by a set of "proximate determinants"; modernization, in turn, operates only indirectly on fertility through these determinants

(see Bongaarts, 1978:106).

Panels I and II of Figure 1 present these two approaches schematically. The approach adopted in the present discussion can be thought of as a further evolution. It singles out one subset of the proximate determinants--that relating to deliberate fertility control. It then inserts still another set of what will hereafter be called "intervening variables"--supply, demand, and regulation costs--between deliberate control and modernization (see Panel III, which is a very abbreviated version of Figure 1 in Chapter 1). As applied to the fertility transition, this appoach thus sees the various modernization variables as directly influencing supply, demand, and regulation costs. These three factors, in turn, shape the

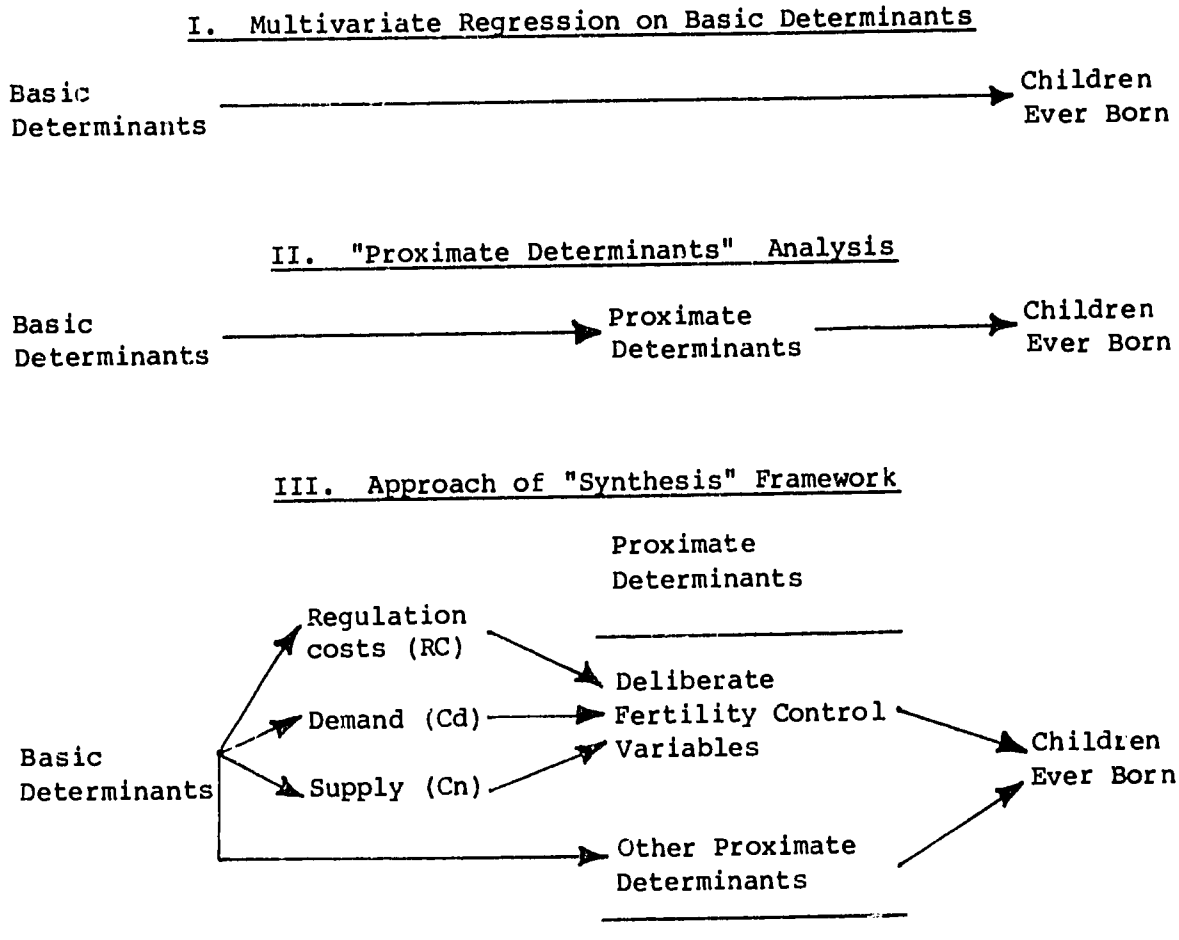

FIGURE 1 Modernization and Fertility: Evolving Approaches

Note: The basic determinants comprise modernization variables (education, urbanization, etc.), cultural factors (ethnicity, religion, etc.), and other determinants.

trends in use of deliberate control. Finally, the latter, in conjunction with the other proximate determinants, determine observed fertility. The other proximate determinants--postpartum infecundability, waiting time to conception, and so on--are, of course, also affected by modernization; the justification for focusing primarily on deliberate control is that changes in this variable have been the source of the observed fertility decline.

The present approach can thus be thought of as a continuation of the theoretical trend started by proximate determinants analysis, designed to establish new links between modernization and fertility. Like that earlier approach, it draws considerably on extant data in its empirical implementation, especially in this case on data from family planning knowledge, attitude, and practice (KAP) surveys. Also, as in the case of proximate determinants analysis, its justification is the promise of useful insights and guidance for further empirical study, rather than final, definitive answers on basic causalities. To illustrate the approach more fully, the next section singles out a few aspects of modernization and traces their possible impact on fertility via supply, demand, and regulation costs. The analysis proceeds in two stages: first, from the modernization factors to supply, demand, and regulation costs; second, from the latter to deliberate fertility control and fertility decline.

Links from Modernization to Potential Supply, Demand, and Regulation Costs

Four widely recognized, empirically identifiable aspects of modernization are selected here for purposes of illustration:

1. innovations in public health and medical care,
2. innovations in formal schooling,
3. urbanization, and
4. the introduction of new goods.

As is clear from the earlier discussion, these aspects are far from exhaustive. There are many other obvious candidates for inclusion, such as per capita income growth, female employment in the modern sector, mass media developments, modernization of government administration, and the introduction of private or public family planning programs. Moreover, none of these aspects adequately captures what some might consider more fundamental aspects of modernization, such as subtle changes in human attitudes and personality. However, the logic of the relationships will remain the same regardless of the measures used.

Table 1 presents a summary view of the channels through which conscious family-size limitation may be influenced by each of the four selected aspects of modernization. In the table, the modernization variables are listed on the left hand side, and the intervening variables immediately relevant to deliberate fertility

TABLE 1 Direction of Effect of Various Aspects of Modernization on Indicated Determinants of Deliberate Fertility Control

	Factors Through Which Fertility Control is Influenced						
	Demand (Cd)			Supply (Cn)		Regulation Costs (RC)	
Aspect of Modernization	Tastes	Income[a]	Prices	Natural fertility	Survival prospects	Subjective costs	Market costs
Better public health and medical care				+	+		
Growth in formal education	-		-	+	+	-	-
Urbanization	-		-			-	-
New consumer goods	-						
New fertility control methods						-	-

[a]See text for treatment of this factor.

control--demand, supply, and regulation costs--run across the top as column headings. An entry in a cell indicates that the item on the left influences the intervening variable at the top in the direction shown. For example, the negative sign at the bottom of the first column indicates that, other things being equal, the introduction of new consumer goods during modernization tends to reduce the strength of preferences for children relative to goods, and thus the demand for children. It should be noted that the effects shown in Table 1 are illustrative; no attempt is made to be exhaustive. A brief sketch of the reasoning underlying the specific cell entries is given below; more comprehensive discussion of the points made here can be found in the preceding papers in these volumes.

Public Health and Medical Care

Improved public health and medical care affects the family's reproductive situation by tending to increase potential supply in two principal ways. First, they may increase the natural fertility of women within marriage, though there are conflicting views on this (on the pro side, see Bourgeois-Pichat, 1967a, and Poston and Trent, 1984; on the con side, see Gray, in these volumes). Second, even if natural fertility remains unchanged, infants are more likely to survive to adulthood, and potential supply is correspondingly increased. These relationships are indicated in Table 1 by the positive signs in the top row.

Better public health and medical care may also raise per capita income since a healthier, more energetic population is likely to be more productive (Malenbaum, 1970); increased per capita income, in turn, may have effects on demand and potential supply beyond those of better health mentioned above. However, to simplify the table, only those effects directly attributable to public health and medical care improvements are shown, not those that might be induced indirectly through the effect of better health on per capita income. The same treatment has been followed in Table 1 with regard to the other aspects of modernization, each of which may raise per capita income in addition to influencing the adoption of deliberate control directly.

Education and the Mass Media

One of the most pervasive influences on fertility control behavior is the growth of formal education (Cochrane, 1979; in these volumes). As shown in Table 1, education operates on all three of the intervening variables--demand, potential supply, and regulation costs.

The impact on potential supply is much like that of public health and medical care improvements. Formal education improves health conditions by diffusing improved knowledge about personal hygiene, food care, environmental dangers, and so on. It may also break down traditional beliefs and customs and thus undermine such cultural practices as an intercourse taboo or prolonged lactation that have had

the latent function of limiting reproduction. In these ways, it tends to enhance potential supply by raising natural fertility and/or increasing the survival prospects of babies; hence the positive signs in the second row.

Education also tends to lower the costs of fertility regulation, as shown by the negative signs in the second row under regulation costs. It may provide information not formerly available on various means of fertility control, reducing time costs. It may also alter cultural norms opposed to the use of fertility control and thus lower subjective costs, challenging traditional beliefs and encouraging a problem-solving approach to life.

Finally, formal education tends to reduce the demand for children by shifting tastes in a way unfavorable to children and decreasing the price of goods relative to children (see Lindert, in these volumes). With regard to the relative price of children (row 2, column 3), if better education improves the income-earning possibilities of women, then the opportunity cost of the mother's childrearing time is increased. Although this cost may be somehow offset, for example, through the help of other family members or domestic workers, there is still probably some net positive effect on the cost of children and thus a tendency toward a reduction in demand. In addition, compulsory education may increase the relative cost of children by reducing the possible contribution of child labor to family income. Tastes for children, or the intensity of the desire for children relative to goods (row 2, column 1), are affected negatively by education because children, and the life style associated with them, are essentially an "old" good, whereas education presents images of new life styles that compete with children. Also, education may lead to higher standards of childcare, creating greater emphasis on quality rather than quantity of children. In these ways, education increases the subjective attractiveness of expenditures that compete with having more children, and thus tends to lower demand.

Urbanization

The process of modernization requires a population density in urban areas that is accomplished in part by a vast increase in rural-urban migration. Urbanization in turn decreases the demand for children by reducing tastes for children and lowering the price of goods relative to them (row 3, columns 1 and 3). The mechanism of the effect via tastes is like that for education--the promotion of antinatal life styles. With regard to costs, the relative price of children of a given "quality" is usually higher in urban than in rural areas (Lindert, 1980; in these volumes; Cochrane, in these volumes). A variety of factors are responsible for this. The price of food is higher in urban than in rural areas; moreover, farm children take less time away from a mother's paid work and contribute more time toward family work than do urban children. Thus, the effect of urbanization is to place the population in an environment where goods become relatively less expensive than children, and, other things being

equal, correspondingly more attractive.

With regard to potential supply, urbanization probably had a significant negative influence in the past, tending to lower the survival prospects of children since concentration in densely populated areas increased exposure to disease. However, this effect is less applicable today given the more modern public health and medical conditions of urban areas in many of the less developed nations; for this reason, no entry appears in the table linking urbanization to potential supply. Another mechanism through which urbanization might influence potential supply is by reducing lactation.

Finally, urbanization tends to reduce both the subjective and market costs of fertility regulation, via mechanisms much like those for formal education (row 3, columns 6 and 7). In higher-density urban situations, access to fertility control knowledge is likely to be greater, and market costs consequently reduced. Subjective costs are also likely to be lower because of the tendency of the urban environment to break down traditional attitudes, including the reluctance to try new ways of doing things.

New Goods

Another facet of modernization is the continuing introduction of new goods (Rosovsky and Ohkawa, 1961). Within the present framework, this tends to lower the demand for children by shifting tastes in a way adverse to children, as shown by the negative sign in row 4, column 1. The enjoyment of new goods tends to require life styles that do not center on children, since new goods are typically substitutes for, rather than complements to, children (see Potter, in these volumes). At any given level of income, households tend to shift expenditure toward new purposes and away from old goods, with the latter including having and raising children.

Among the new goods associated with modernization are some that relate specifically to fertility control. Historical examples are the modern condom and improved methods of induced abortion; more recent examples are the oral contraceptive pill and the IUD. Such developments typically reduce the costs of fertility regulation by expanding alternatives. They may also lower the subjective drawbacks of fertility regulation by providing less objectionable options; for example, an advantage claimed for both the pill and the IUD compared with most other methods is that they separate the contraceptive act from that of intercourse. Allowance for the effects of new methods of fertility control is made in Table 1 by the negative signs in columns 6 and 7 of the bottom row.

Links from Potential Supply, Demand, and Regulation Costs to Fertility Control and Fertility

The preceding section suggests some specific ways that several aspects of modernization affect the demand for children, potential supply, and

costs of fertility regulation. This section extends that analysis by indicating how the latter three factors may in turn shape the trend in use of deliberate fertility control as modernization progresses. As in the foregoing section, the discussion is hypothetical, for lack of the requisite empirical studies.

Assume, to start with, that in a premodern society the typical couple cannot produce as many children as they want, that is, that demand exceeds supply. This might be because of an agricultural environment that generates a high demand for children, adverse mortality conditions and extended lactation practices that make for a low supply, or a combination of the two. Under these circumstances, a couple would have as many children as possible; that is, natural fertility would prevail.

Though the analysis of the preceding section is confined to only a few aspects of modernization, it suggests that modernization tends on balance to lower the demand for children, raise potential supply, and reduce regulation costs, a pattern that is consistent with the general trend of the more detailed papers elsewhere in these volumes (see, for example, the summary essays by Lee and Bulatao, Bongaarts and Menken, and Hermalin). A couple tends to be pushed from an initial excess demand situation into one of excess supply; that is, in the absence of deliberate attempts to limit family size, the typical couple will have more children than are wanted. The prospect of unwanted children provides a motivation for family-size limitation, say, via contraception; however, such action is costly, both psychologically and economically, and the disadvantage of unwanted children must be weighed against these costs. Early in the modernization process, the excess of supply over demand and, consequently, the motivation for fertility regulation are likely to be low, while regulation costs are likely to be high. As a result, the typical couple is likely to forego deliberate family-size limitation, and natural fertility will continue to prevail. Because modernization may be raising natural fertility, an increase in fertility may consequently be observed during this early phase of modernization (Nag, 1980). However, as modernization progresses and the excess of supply over demand grows, the prospective number of unwanted children increases, generating a corresponding growth in the motivation to limit family size. Moreover, regulation costs and thus the obstacles to family-size limitation are declining. At some point, the balance between the motivation for and cost of regulation tips in favor of the former, and deliberate actions to limit family size are taken. At this point, actual family size starts to fall below potential supply, though it still exceeds demand. As modernization continues, motivation rises farther, and regulation costs fall still more--perhaps approximating a "perfect contraceptive society" (Bumpass and Westoff, 1970); a point is eventually reached at which actual family size corresponds to demand.

The above analysis is represented schematically in Figure 2. For simplicity of exposition, modernization is represented as a one-dimensional process, corresponding to a rightward movement along the horizontal axis. Supply and demand, measured according to

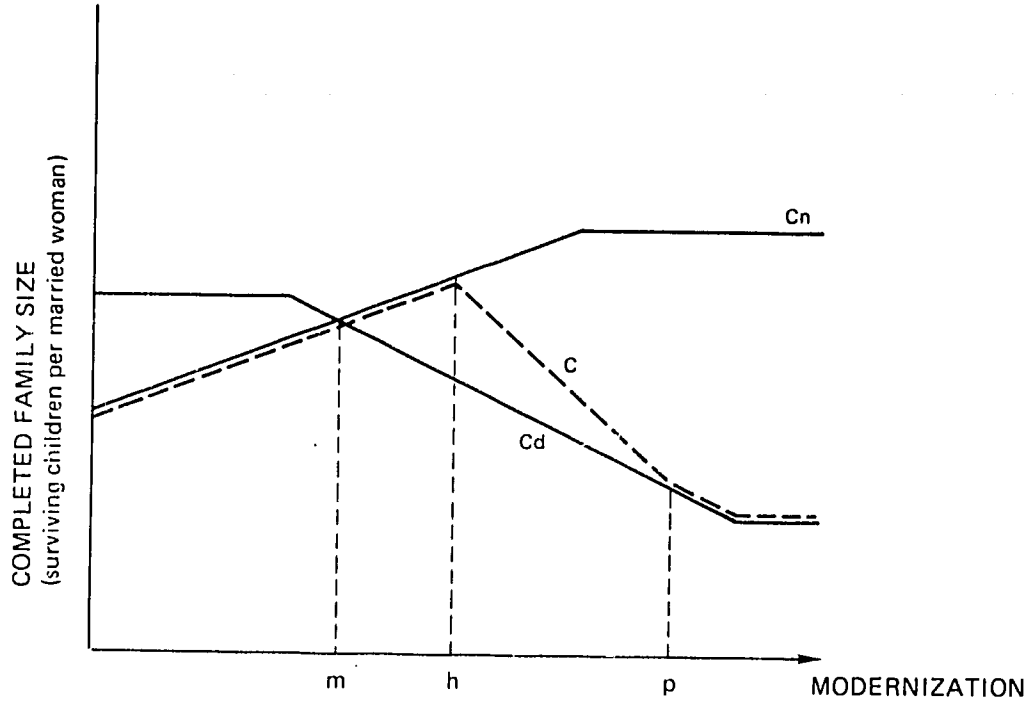

FIGURE 2 Hypothetical Trends in Supply (Cn), Demand (Cd), and Actual Family Size (C) Associated with Modernization

surviving children per married woman, are shown on the vertical axis. Initially, demand (Cd) exceeds supply (Cn), and actual family size (C) corresponds to supply. As modernization occurs, an excess supply condition emerges (point m), generating a motivation for fertility control. Initially, this motivation is low and does not offset regulation costs sufficiently to result in deliberate family-size limitation; hence actual family size continues to correspond to supply. However, as modernization progresses, with motivation growing and regulation costs falling, at some point deliberate restriction sets in (point h). Eventually, family size falls to a level corresponding to demand (point p).

The precise nature of the trends in demand, supply, and regulation costs is, of course, a matter for empirical inquiry. For example, the transition as depicted here starts from a premodern situation in which supply is less than demand and a motivation for regulating family size is therefore absent. However, there is nothing in the framework that requires this view. The premodern situation might be one in which motivation exists, but the practice of fertility control is absent because regulation costs are very high (that is, the premodern position would be between points m and h in Figure 2). Clearly, the

true nature of the premodern situation is an empirical issue.

Point h might be thought of as the dividing line or "threshold" (Kirk, 1971; United Nations, 1965) between two modes of fertility regulation. To the left of point h, fertility is "regulated" by a variety of social and biological mechanisms working though natural fertility (see LeVine and Scrimshaw, in these volumes; Bourgeois-Pichat, 1967b). The modernization process, which shifts the typical household to a position to the right of point h, creates a fundamental change in the circumstances of family reproduction, moving parents from a situation where childbearing is a matter "taken for granted" to one that poses difficult problems of individual choice regarding the limitation of family size. To the left of point h, although there is a demand for children, parents may be quite imprecise about the number desired (stating, e.g., it is "up to God"); the usual demand mechanisms emphasized in the economic theory of fertility do not influence observed fertility, though fertility may be affected by economic variables via natural-fertility mechanisms. The explanation of fertility in such a situation calls for inquiry into the determinants of natural fertility. To the right of point h, the household decision-making approach of economics comes more into its own.

Of course, such sweeping distinctions are never fully satisfactory. Social sanctions are operative in both premodern and modern circumstances, while the idea that there is no individual choice whatsoever in a premodern society is too strong. Moreover, no society shifts en masse at a single point of time from "social" to "individual" control situations, as suggested in this highly simplified sketch. Rather, at any given time, individual couples are distributed about the mean with regard both to motivation and regulation costs, and the modernization process pushes some couples across the threshold earlier than others; indeed, even under premodern conditions there may be some couples actually practicing deliberate family-size limitation. Hence, at the societal level, there may be no "threshold" clearly identifiable in time; however, if there are rapid and sizable changes in supply, demand, or regulation costs that occur in common among many families (see, e.g., Retherford and Palmore, in these volumes, on diffusion processes; Retherford, 1980), a societal threshold may be observable.

SOME THEORETICAL AND EMPIRICAL IMPLICATIONS

Introducing supply, demand, and regulation costs as intervening variables between modernization and deliberate fertility control helps clarify a number of theories and empirical findings on the relationship between modernization and the fertility transition; as has already been seen, it also suggests new empirical research needs. This section first analyzes certain empirical findings and then examines some theoretical views.

Empirical Findings

Variability in the Time Series Relationship Between Modernization and Fertility

As noted earlier, perhaps the most striking finding about the fertility transition in Europe is that "it occurred under remarkably diverse socioeconomic and demographic conditions," in particular, that "there was no clear threshold of social and economic development required for the fertility transition to begin (Knodel and van de Walle, 1979:220, 225). This diversity can be readily understood in light of the present analysis. Assume that two countries have identical trends in potential supply (reflecting, say, identical improvements in infant and child mortality as public health programs are introduced); different levels of demand due to differing child cost environments; and, for simplicity, zero regulation costs. Graphically, this situation may be depicted as in Figure 3 (the superscripts refer to countries A and B, respectively, and the passage of time is represented by movement from left to right).

Note that, despite identical trends in mortality and hence in potential supply, the onset of fertility decline occurs earlier in Country A. This is because of its lower level of demand at each point in time, which, coupled with growing supply, results in earlier motivation for fertility control. Similarly, even if the trends in demand and supply were identical in the two countries, but regulation costs were different, there would be a difference in the onset of fertility decline.

Knodel and van de Walle (1979:235) also make the point that cultural setting "influenced the onset and spread of fertility decline independently of socioeconomic conditions". To see why this might be true, one need merely assume that the differing levels of demand in the preceding diagram reflect differences in cultural conditions operating through tastes--perhaps because of differences in son

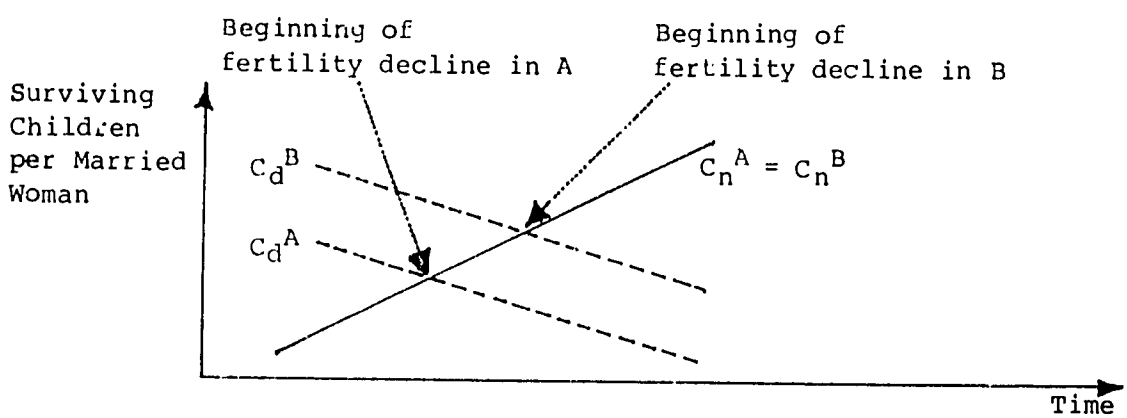

FIGURE 3 Hypothetical Trends in Supply (Cn) and Demand (Cd) in Two Countries and the Timing of Fertility Decline

preference or the status of women. As a result of these cultural differences, the same socioeconomic trend (declining mortality) would be accompanied by a difference in the timing of the onset of fertility decline. Clearly, cultural conditions could also operate via potential supply (e.g., by influencing lactation practices) or regulation costs (e.g., through attitudes toward the acceptability of induced abortion).

These illustrations show that the effect of any given modernization factor, such as public health, varies depending on the initial conditions of (and, implicitly, changes in) other modernizing and cultural variables; thus no one aspect of modernization, nor any selected set of modernization variables, need exhibit an invariant pattern in relation to observed fertility and the adoption of fertility control. Indeed, it is surprising that mortality and fertility change were ever closely enough related in historical experience to suggest the well-known model of the demographic transition. Although in all countries that have modernized or are modernizing there are a number of similar changes in social, economic, and political conditions, the relative timing of these changes has by no means been uniform. Moreover, economic changes, such as shifts in industrial structure, are often protracted, whereas social changes, such as those in public health or compulsory elementary education, may be more temporally concentrated. In addition, in today's developing countries, advances in public health and compulsory education often occur at an earlier time relative to economic modernization than was true of the now-developed countries; in these countries, new modernizing influences are also at work, such as mass media in the form of radios, television, and movies, new modes of fertility regulation such as the pill and the IUD, and government population programs that are sometimes highly coercive in nature. Cultural conditions also vary widely, both within and between the more and less developed blocs. Hence it should not be expected that the ways in which various modernizing and cultural influences come together to shape the fertility transition will be identical from one place to another. However, the present effort to identify how these influences shape supply, demand, and regulation costs, and thus the adoption of fertility control during modernization, as well as how they affect the noncontrol proximate determinants, should help to explain differences among countries in the timing and pace of the fertility transition more coherently.

The Trend in Fertility Differentials by Socioeconomic Status (SES)

The present approach also has implications for findings on trends in fertility differentials during modernization. Cross-sectional empirical studies linking fertility to a given modernization variable often yield mixed results, even after a variety of controls have been introduced. For example, the review of evidence by Mueller and Short (in these volumes) finds that fertility is related to income

positively in rural and negatively in urban areas. Cochrane (in these volumes) reports a frequent finding of a positive relationship between fertility and education over part of the educational range in low-income countries and, consistent with this, that the "cross-section effect on fertility is more negative at later than at earlier points of time." Such results should not be surprising since there is reason to expect that the cross-section pattern of fertility differentials by socioeconomic status may change during modernization. As is evident from Table 1, any given modernization factor may influence fertility through more than one intervening variable, and the net effect on fertility may differ according to which intervening variables dominate. Therefore, the observed relationship between fertility and a given modernization variable may vary in time and space if the dominant intervening variables change. In particular, if the prevailing variables yield a natural-fertility regime at one time and a situation of partially or wholly deliberately controlled fertility at another, a change in the nature of the observed relationship is quite possible.

As an illustration, consider the relation of fertility to education. Suppose that, at a given time within a country, potential supply (Cn) varies positively with education (say, because of higher natural fertility among the more educated due to shorter lactation), while demand (Cd) varies negatively, reflecting the antinatal effect of education via the taste and cost mechanisms described earlier. Suppose further that the cross-sectional schedules relating supply and demand to education are positioned as shown in panels a and b of Figure 4 in two succesive periods. Figure 4a is the premodern case, and Figure 4b the early modern one. In Figure 4a, neither those at low nor at high education levels can have as many children as they would like (supply, Cn, is less than demand, Cd); hence, those at both levels have as many as they can. In this situation, one would expect observed fertility to vary positively with education, as a result of the lactation mechanism just mentioned. In Figure 4b, the early modern case, the supply schedule is shifted upward and the demand schedule downward at all levels of education, as modernization exerts its expected effects. As a result, there is a motivation to control fertility among those of higher education. Assuming that no obstacle arises from regulation costs, natural fertility will prevail among less-educated parents and controlled fertility among more-educated parents. In this situation, fertility differentials by education might shift from a positive to a negative slope, as antinatal taste and cost mechanisms working through demand and lower regulation costs come to prevail at higher educational levels.

This example suggests that, for developing countries, estimates of the elasticity of fertility with regard to a given modernization variable such as education based on cross-sectional data may yield results differing in magnitude and/or sign, depending on the mechanisms governing the determination of fertility. It also implies that time series observations on national averages of, say, education and fertility in a given country will not necessarily show the same relationship in different phases of modernization. If, for example,

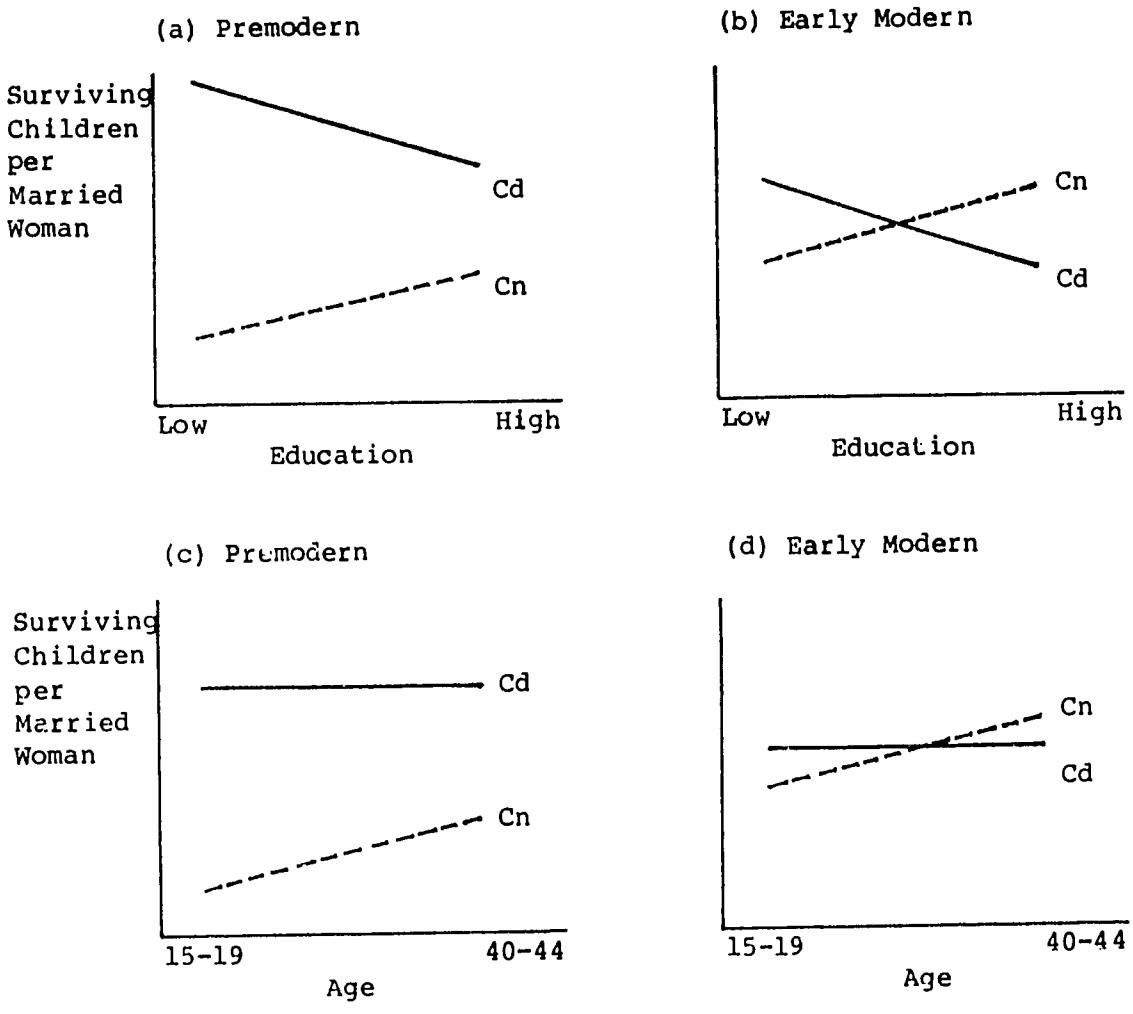

FIGURE 4 Hypothetical Relationship Between Supply (Cn) and Demand (Cd) and Education and Age in Premodern and Early Modern Settings

potential supply were rising over time as a result of decreased lactation associated with growing education, but remained below demand so that natural fertility conditions persisted, then education and observed fertility would be positively associated in time; in some later period, education and fertility might be negatively associated in time as deliberate control came increasingly to prevail.

The Trend in Fertility Differentials by Age

Several studies reported on by Knodel (in these volumes) show a "tilt" in the age-specific marital fertility schedule with the onset of modernization--an increase at younger and a decrease at older ages. Knodel links this development to the effect of natural fertility at

younger ages and of deliberate family-size limitation at older ages. Reference to the intervening variables suggested by the present analysis indicates the underlying mechanisms involved.

Assume that for any given couple, potential supply varies with duration of marriage--the longer the marriage, the greater the potential supply; for simplicity, also assume that demand and regulation costs are independent of duration of marriage. If duration of marriage and age are positively correlated, the hypothetical cross-sectional patterns of supply and demand by age in successive periods shown in panels c and d of Figure 4 will obtain. Figure 4c is a hypothetical sketch of how demand (Cd) and supply (Cn) might vary as the typical woman in a premodern society goes through her reproductive career. As shown, even by the end of her reproductive career, the typical woman has fewer surviving children than are desired. If for simplicity of exposition one disregards variations around the mean at each age, no motivation for or adoption of fertility control exists at any reproductive age. This means that, in such a society, the observed age-specific marital fertility schedule and a natural fertility schedule would correspond.

Figure 4d is a hypothetical sketch of the same two curves later in the process of modernization; it assumes that the supply curve shifts upward and the demand curve downward, in keeping with the effects of modernization discussed earlier. As a result of this, a motivation to control fertility emerges at the later reproductive ages, and, assuming no obstacle from regulation costs, deliberate family-size limitation occurs. With regard to the schedule of age-specific marital fertility, this implies that the trend in age-specific marital fertility rates at the younger reproductive ages between situations 4c and 4d will reflect developments in natural fertility alone, and hence will be upward; however, the trend at older ages will be influenced, in addition, by a shift from uncontrolled to controlled fertility, and hence may be downward. The overall result may be a tilt in the marital fertility schedule like that observed. Also, as Knodel points out, the net balance of these contrasting fertility changes at younger and older ages may yield a stable or even upward movement in the total fertility rate at an early stage in the shift to deliberate fertility control.

Theories of the Fertility Transition

Although the present approach views modernization as influencing fertility through the intervening variables of supply, demand, and regulation costs, it does not adopt a particular theory of the dominant mechanisms at work. However, by providing a framework that encompasses different views, it facilitates their comparison and empirical testing. To illustrate this, the following discussion touches briefly on several theories.

To start with, there are those whose theories either explicitly or implicitly stress influences working through the demand for children. Lindert (in these volumes; see also Schultz, 1976) provides an

excellent and succinct statement:

> In all countries and all eras, fertility follows changes in the demand for children, driven by considerations of both economics and taste. Fertility fails to fall in the early phases of most countries' development, and falls thereafter, for a straightforward reason: the relative costliness of extra children fails to rise until a fairly advanced stage in development. . . . It appears, therefore, that the fertility transition parallels the long-term pattern of child costs and benefits.

Caldwell's "wealth flows" theory (see Caldwell, in these volumes) also stresses factors working wholly through the demand for children, though the underlying mechanisms shaping demand differ in important respects from Lindert's.

In contrast, other analysts focus on supply. Consider, for example, Carlsson's (1966) well-known article on the historical experience of Sweden, "The Decline of Fertility: Innovation or Adjustment Process?" In the terminology of the present analysis, the adjustment process Carlsson has in mind is the response that occurs when rising supply due to declining infant and child mortality pushes households across (or further to the right of) the fertility control threshold (point h in Figure 2). He contrasts this with an explanation of the fertility decline according to "innovation," for example, in methods of fertility regulation that would, in the present terminology, reduce regulation costs. Carlsson argues that the Swedish evidence favors an interpretation of that country's fertility decline as an adjustment to increasing supply caused by lower infant and child mortality, rather than a response to an innovation that lowers costs of regulation.

Still other scholars place primary emphasis on regulation costs. Knodel and van de Walle (1979), for example, argue that the motivation for fertility control (an excess supply situation) already existed in many parts of Europe prior to the fertility transition: "[T]here was latent motivation for reduced fertility among substantial portions of the population before fertility began to fall," and "births were frequently unwanted, especially among women . . ." (pp. 226, 227). As regards the availability of or access to fertilty control, they argue that "family limitation was not widely available or acceptable . . . [and] its use . . . [was] extremely limited because it was either unknown or objectionable" (p. 231). They therefore identify a decline in regulation costs as the key development behind the fertility transition:

> [W]e believe that what is understood by the "cost of fertility regulation," a term that covers a variety of factors including sheer familiarity with the concept and means of family limitation, is an extremely important component of an explanation of the secular fertility decline, as it occurred in Europe. . . (p. 239).

Others propose some combination of the intervening variables

stressed here. Freedman (1975), for example, places particular emphasis on two sets of social norms--those about family size and those about each of the "intermediate variables" of the Davis-Blake (1956) framework. The former would work through the demand for children. As for the latter, norms regarding those intermediate variables that are under voluntary control relate to regulation costs; others relate to supply. As another example, Potter's discussion (in these volumes) of institutional influences primarily stresses those shaping the demand for children, either through cost or taste factors. However, in considering institutional influences on social values relating to appropriate fertility behavior, such as religious opposition to birth control, he also touches on influences of regulation costs.

Clearly, resolution of these differing views would be helped by empirical studies of the trends in supply, demand, and regulation costs. Time series and cross-sectional data for different countries could be mobilized to answer questions such as the following (Crimmins et al., 1983; Easterlin and Crimmins, 1982): Is the prevalence of natural fertility in premodern societies due to an inability on the part of the typical household to have as many children as are wanted, and therefore to an absence of motivation for fertility control (i.e., is demand [Cd] greater than supply [Cn])? Or does the motivation for fertility control exist (demand is less than supply), but regulation costs (RC) are perceived to be so high that fertility control is not adopted? As modernization occurs and growth in deliberate fertility control eventually sets in, what is the proximate source of this increase in fertility control--increasing motivation (an excess of supply over demand), declining regulation costs, or both? If it is increasing motivation, to what extent is this due to a growth in supply (Cn) rather than a reduction in demand (Cd)? If supply grows, what is the relative role in this growth of changes in natural fertility compared with infant and child survival? The answers to these questions would help sort out the relative roles of supply, demand, and regulation costs at different stages of the fertility transition. This would help assess the relative plausibility of different theories of the moving forces behind the transition, and identify which lines of further research are likely to be most fruitful.

BIBLIOGRAPHY

Bongaarts, J. (1978) A framework for analyzing the proximate determinants of fertility. Population and Development Review 4:105-132.

Bourgeois-Pichat, J. (1967a) Relation between foetal-infant mortality and fertility. Pp. 68-72 in Proceedings of the World Population Conference, 1965, Vol. 2. New York: United Nations.

Bourgeois-Pichat, J. (1967b) Social and biological determinants of human fertility in non-industrial societies. In Proceedings of the American Philosophical Society 3:160-163.

Bumpass, L., and C. F. Westoff (1970) The perfect contraceptive population. Science 169:1177-1182.

Carlsson, G. (1966) The decline of fertility: Innovation or adjustment process? Population Studies 20:149-174.

Coale, A. J., and T. J. Trussell (1974) Model fertility schedules: Variations in the age structure of childbearing in human populations. Population Index 40:185-258.

Cochrane, S. H. (1979) Fertility and Education: What Do We Really Know? World Bank Staff Occasional Papers No. 26. Baltimore, Md.: The Johns Hopkins University Press.

Coleman, J. S. (1968) Modernization: Political aspects. Pp. 395-402 in International Encyclopedia of the Social Sciences. New York: Macmillian.

Crimmins, E. M., R. A. Easterlin, S. J. Jejeebhoy, and K. Srinivasan (1983) New perspectives on the demographic transition: A theoretical and empirical analysis of an Indian state, 1951-1975. Economic Development and Cultural Change, forthcoming.

Davis, K., and J. Blake (1956) Social structure and fertility: An analytical framework. Economic Development and Cultural Change 4:211-235.

Easterlin, R. A. (1968) Economic growth: An overview. Pp. 395-408 in International Encyclopedia of the Social Sciences. New York: Macmillan.

Easterlin, R. A., and E. M. Crimmins (1982) An Exploratory Study of the 'Synthesis Framework' of Fertility Determination with World Fertility Survey Data. WFS Scientific Reports, No. 40. London: World Fertility Survey..

Easterlin, R. A., R. A. Pollak, and M. L. Wachter (1980) Toward a more general economic model of fertility determination: Endogenous preferences and natural fertility. Pp. 81-135 in R. A. Easterlin, ed., Population and Economic Change in Developing Countries. Chicago: Chicago University Press.

Freedman, R. (1975) The Sociology of Human Fertility. New York: John Wiley.

Inkeles, A. (1969) Making men modern: On the causes and consequences of individual change in six developing countries. American Journal of Sociology 75:208-225.

Kirk, D. (1971) A new demographic transition. Pp. 123-147 in Rapid Population Growth. Baltimore, Md.: The Johns Hopkins University Press.

Knodel, J., and E. van de Walle (1979) Lessons from the past: Policy implications of historical fertility studies. Population and Development Review 5:217-245.

Kuznets, S. (1966) Modern Economic Growth: Rate, Structure and Spread. New Haven, Conn.: Yale University Press.

Lerner, D. (1968) Modernization: Social aspects. Pp. 386-395 in International Encyclopedia of the Social Sciences. New York: Macmillan.

Lindert, P. H. (1980) Child costs and economic development. Pp. 5-69 in R. A. Easterlin, ed., Population and Economic Change in Developing Countries. Chicago: University of Chicago Press.

Malenbaum, W. (1970) Health and productivity in poor areas. Pp. 31-54 in H. E. Klarman, ed., Empirical Studies in Health Economics. Baltimore, Md.: The Johns Hopkins University Press.

Nag, M. (1980) How modernization can also increase fertility. Current Anthropology 21:27-36.

Poston, D. L., and K. Trent (1984) Modernization and childlessness in the developing world. Comparative Social Research 7, forthcoming.

Retherford, R. D. (1980) Modeling Sudden and Rapid Fertility Decline. Working Paper No. 1. East-West Population Institute, Honolulu.

Robinson, W. C. (1981) Demand Versus Supply Factors in the Fertility Transition. Unpublished paper. Pennsylvania State University, University Park, Pa.

Rosovsky, H., and K. Ohkawa (1961) The indigenous components in the modern Japanese economy. Economic Development and Cultural Change 9:476-501.

Schultz, T. P. (1976) Determinants of fertility: A micro-economic model of choice. Pp. 89-124 in A. J. Coale, ed., Economic Factors in Population Growth. New York: Halsted Press.

United Nations Department of Economic and Social Affairs (1965) Population Bulletin of the United Nations, No. 7. New York: United Nations.

United Nations, Research Institute for Social Development (1970) Contents and Measurement of Socio-Economic Development: An Empirical Inquiry, Report No. 70.10. Geneva: United Nations.

Chapter 34

EFFECTS OF EDUCATION AND URBANIZATION ON FERTILITY

Susan H. Cochrane*

The purpose of this paper is to document the effects of education and residence on fertility. The effect of education has been much more carefully documented (Cochrane, 1979) than that of residence; however, both raise similar methodological issues.

First, neither education nor residence can affect fertility directly in the same way as age at marriage, lactation, and contraceptive use, but must operate through such variables. Although these intervening channels are not the focus of this paper, they must be recognized if the "true" effects of education and residence are to be assessed. If all these channels were included in the analysis, the measured effect of education would be reduced to zero.

In addition to these problems of causal modeling, there is a second problem--linearity. If the relationship between two variables is linear, one can aggregate with impunity. Unfortunately, the evidence indicates that the relationship between education and fertility is nonlinear, and is in fact not even monotonic. In a previous literature review, uniformly inverse relationships were found in only 49 percent of the cross-tabular studies; significant negative coefficients were found in only 31 percent of the regression studies in which income and wealth were controlled along with age and residence (Cochrane, 1979). In most cases, if the relationship was not monotonically inverse, fertility first rose with education and then fell. In these cases, peak fertility was generally found at lower primary education. The new data reviewed in this paper confirm the existence of two different patterns--the inverse pattern and an inverted "U." Similarly, it is unlikely that the relationship between residence and fertility is linear, although this has not been documented. Therefore, studies should probably be restricted to the individual rather than the aggregate level.

The methodological issues involved in assessing the effects of education and residence on fertility are discussed in detail below.

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Following this discussion is a summary review of the literature on these effects.

MEASURING THE EFFECTS OF EDUCATION AND RESIDENCE ON FERTILITY: METHODOLOGICAL ISSUES

Measuring Education's Effect

To measure the effect of education on fertility, one must first eliminate spurious correlations between education and other fertility determinants, most obviously age and residence. In developed countries, younger women are generally more educated than older women, and of course age is highly correlated with number of children ever born. Therefore, if age is not controlled, the effect of education on fertility will be overestimated. Likewise, education tends to be higher in urban than in rural areas, and fertility is generally higher in rural than urban areas. Thus if residence has effects other than those through education and if it is not controlled, education's effect will be overestimated. Beyond these generalizations, however, there is not even agreement on how to control appropriately for residence or exposure to childbearing. Moreover, although other background variables such as caste probably determine both education and fertility and therefore need to be controlled, these factors vary among countries so that generalizations cannot can be made.

There is also considerable disagreement about which effect of education one wishes to estimate, depending on the objective of the research. This paper focuses on the total effect of education. As noted above, education acts through many other variables, such as age at marriage, lactation, and contraceptive use. If these intervening variables (IV) are included in the analysis, then education's total effect on fertility will be biased. Therefore, education's effect on fertility through these variables must be added to its "direct" effect. Table 1 lists a number of these variables; the effect of education on each; the effect of the IV on fertility; and the resultant bias in estimating education's total effect if the IV is controlled but the effect of education on that IV is not added.[1] These variables have been arranged under the three broad determinants of fertility: the supply of children, the demand for children, and fertility regulation.

In most cases (14 of 15), the inclusion of an intervening variable will bias the education variable positively (i.e., toward zero if the effect is negative). On the other hand, while the direction of the bias can be determined in most instances, the magnitude can not, since it depends on how strong an effect education has on the intervening variable. For example, if mass media exposure includes mainly written communication, education will have a strong effect on exposure; inclusion of exposure in the analysis will then lead to a serious underestimate of education's effect (assuming that mass media exposure has a strong effect on fertility). On the other hand, if mass media

TABLE 1 Education--the Intervening Variables Through Which It Affects Fertility, and the Biases Introduced by Including these Variables with Education in Regression Models

Intervening Variable (IV)	Effect of Education on IV	Effect of IV on Fertility	Bias in Estimating Education's Effect if Controlling for IV Without Adding Indirect Effects
Supply of Births			
Age of marriage	+	-	+
Breastfeeding	-	-	-
Abstinence (noncontraceptive)	-	-	-
Demand for Children			
Income[a]	+	?	?
Wealth	+	?	?
Female wage	+	-	+
Mass media	+	-	+
Female labor participation[a]	+	?	?
Child labor participation[a]	-	+	+
Child schooling[a]	+	-	+
Child survival[a]	+	-	+
Perceived cost of children	+	-	+
Perceived benefits of children	-	+	+
Migration[b]	+	-	+
Fertility Regulation			
Contraceptive use	+	-	+
Knowledge of birth control	+	-	+
Access to birth control	+	-	+

[a] Variables affected by as well as affecting fertility. Income is included in the list since it depends on labor participation, which in turn is affected by fertility; income is also affected by education independently of labor participation as a result of assortive mating.

[b] Education may affect migration, but migration's effect on fertility is uncertain. Most of its effect is probably captured by residence.

exposure represents primarily radio, the bias resulting from inclusion of this variable will be less serious.

These points can be illustrated by Mason and Palan's (1980) Malaysian study. Starting with the basic controls of age and marital duration,[2] they estimate the coefficient of education for six racial-residence groups and then successively show the effect on these estimates of the following variables: occupation prior to marriage, residence when growing up, husband's education, a sanitary and amenities scale, family income, and the minimum education for sons. When these variables are added, significant inverse (linear or nonlinear) relationships are eliminated in four out of five groups; in the fifth group--rural Malays--for whom the positive effects of education were initially strongest, the negative effect of education is increased. (In the sixth group, the coefficient was not significant initially.) The neutralizing effect of the variables differs from group to group. This variation among groups in the channels through which education operates makes it impossible to formulate a priori statements about the size of the biases introduced (or eliminated) by introducing variables.[3]

The indirect effects of education can be easily adjusted for if sufficient information is available and causation is unidirectional. However, if causation runs in two directions, it is much more difficult both conceptually and empirically to determine the effect of education on fertility. Two kinds of problems may arise here. First, education and some other variable may be simultaneously determined. The most important example is the education of husband and wife. Assortive mating will result in more educated women being married to more educated men. To the extent that the husband's education also affects fertility, it would be a mistake to attribute all of education's effect to either the wife or the husband. If the wife's education is used alone, its effect will be biased away from zero; if both the husband's and the wife's education are included, then the effect of each education measure will be biased toward zero. Although there is no clear-cut solution[4] to this problem, it helps to be aware of the upper and lower limits on "education's" effect (see Hermalin and Mason, 1980).

A second kind of problem arises if fertility, rather than education, is jointly determined with some other variable. For example, if fertility and female labor participation are interdependent, then the inclusion of the latter causes the coefficients of other explanatory variables such as education to be biased. Since the importance of this bias is a matter of degree, there is considerable disagreement over which variables should be treated as simultaneous with fertility.[5]

In Table 1, those variables most commonly considered to be simultaneous with respect to fertility have been marked. There are no variables on this list which might be considered to have feedback effects on education, primarily because these variables are measured in adulthood, generally long after education has already been completed. The one important exception might be age at marriage if there is overlap between marriage ages and levels of education.

To summarize, residence and age are necessary controls if one is to avoid overestimating the negative effect of education.[6] Inclusion of other variables determined by education may bias the effect of education (usually toward zero). Inclusion of husband's and wife's education together will reduce the measured effect of each individual measure, while exclusion will lead to an overestimate (unless they differ in the sign of their effect); the "proper" specification will depend on the use to be made of the model. Finally, inclusion of simultaneous variables will cause biases of unknown direction and magnitude.

Measuring Residence's Effect

The effect of education on fertility cannot be studied separately from that of residence. The reason for this is that many of the factors affecting individual decision making are determined at least in part by the community of residence. These factors include presence in the community of contraceptive services; schooling opportunities and health facilities; economic opportunities and costs, such as the demand for labor of men, women, and children; the costs of food and housing; and the less easily defined factors of social milieu, climate, and exposure to disease. All of these factors vary between urban and rural areas. Ideally, one would control for these factors individually; however, sufficient data are rarely available. Therefore, residence is used as a control to approximate these factors. This is at best a very gross control, especially if a dichotomous variable is used for residence.

The effect of residence on fertility operates through all these intervening factors. As in the case of education, if these factors are included with residence in a model of fertility determination, a bias will be introduced in estimating residence's effect. Table 2 shows the direction of such biases. It should be recognized that because the intervening community variables (ICV) will in turn affect intervening family variables (IFV), the inclusion of the latter will affect estimates of the effect of residence. One major advantage of ICVs over IFVs in an analysis is that, unlike the ICVs, the IFVs may be simultaneously determined with family fertility. Thus although both introduce biases, the ICVs are exogenous to the family, and the biases are of known direction.

Interactions, Nonlinearities, and Measurement Problems

To this point, residence and education have been discussed separately. However, it is important to recognize that interactions may exist. These interactions can arise from (1) the effects of one variable on the other; (2) the fact that education operates differently in various environments; and (3) a combination of nonlinear effects and different levels of education in different areas.

The first of these possibilities depends on whether place of birth

TABLE 2 Urbanization--the Intervening Variables Through Which It Affects Fertility, and the Biases Introduced by Including these Variables with Urbanization in Regression Models

Intervening Variable	Effect of Urbanization on ICV or IFV	Effect of ICV or IFV on Fertility	Bias in Estimating Residence's Effect if Controlling for ICV or IFV Without Adding Indirect Effects
Intervening Community Variables (ICV)			
Presence of family planning facilities	+	-	+
Presence of schools	+	-	+
Presence of health facilities	?	-	+
Demand for labor of			
Men	+	+	-
Women	+	-	+
Children	-	+	+
Housing costs	+	-	+
Food costs	+	-	+
Sociocultural milieu	+	-	+
Disease exposure	?	-	?
Intervening Family Variables (IFV)			
Income[a]	+	?	?
Female wage	+	-	+
Mass media	+	-	+
Knowledge of birth control	+	-	+
Access to birth control	+	-	+
Female labor participation[a]	+	?	?
Child labor participation[a]	-	+	+
Child schooling[a]	+	-	+
Child survival[a]	+	-	+
Cost of children	+	-	+
Benefits of children	-	+	+
Modernism	+	-	+

[a]Endogenous variable.

or place of current residence is used as the residence variable. In the former case, the places of birth, childhood, and adolescence can affect educational opportunities and thus determine educational achievement; thus the total effect of place of birth on fertility would have to include its effect through educational achievement. If current residence is used, education may affect residence through migration; thus education's effect would have to include its effect through migration. (Migration is included in Table 1. However, there is little evidence on whether migration per se or residence before and after migration affects fertility, although those who migrate from rural to urban areas generally have lower fertility.)

The second of these possible interactions, the fact that education operates differently in urban and rural areas, has frequently been discussed, but with little certainty. One possible interaction is through labor markets. Increased education opens modern-sector employment opportunities for women in urban areas; it does not generally have this effect in rural areas. Of course, migration would allow rural women to avail themselves of urban opportunities, but at higher cost than that incurred by urban women.

Although such behavioral interactions between education and residence are not precisely defined, a statistical interaction clearly exists. The evidence that urban areas have a different educational distribution from rural areas is very convincing. In addition, it is fairly clear that education's effect on fertility is nonlinear in some environments. Therefore, if linear estimates of education's effect are made, that effect will appear different in urban and rural areas; if the correct nonlinear specification is used and no other interactions exist, that effect will not differ between urban and rural areas.

In addition to these considerations of interaction and nonlinearity, there are problems of measurement. Both education and residence can be measured as either dichotomous or continuous variables. It is much more common, however, to use an urban/rural dichotomy for residence than to use a literate/nonliterate dichotomy for education. Therefore, the measurement of education is usually more detailed than that of residence. This point will be raised in the following review of the literature on the effects of education and residence on fertility.

LITERATURE REVIEW

As noted earlier, only studies having a direct or indirect age control will be included in the present review. This review is also limited to studies having a minimum sample size or degrees of freedom of over 150 in the relevant age-residence group. Moreover, because of the nonlinearities noted above, studies based on regional aggregates of data will not be included. Finally, if the same methodology were used in all studies, the results would be easy to summarize; however, studies differ substantially in how they analyze fertility determinants. Therefore, this review will be restricted to studies in

which the dependent variable is a measure of completed fertility, either children ever born or the total fertility rate, and in which age or marital duration is implicitly or explicitly used as a control.

The subsections below first review a study that uses a common methodology to estimate the effects of education and residence on fertility for several countries. This study, prepared by Rodriguez and Cleland for the 1980 World Fertility Survey (WFS) Conference in London, addresses the separate effects of education and residence, as well as their interaction. Next, two other types of studies of education's effect on fertility are examined: Hermalin and Mason's meta analysis, and a number of multivariate studies within countries. Finally, two important considerations in studying the effects of education and residence on fertility are examined: the issue of the stability of educational differentials over time, and evidence on urban-rural differences in fertility.

Comparative Analysis of WFS Data

The Rodriguez and Cleland paper (1980) is a comprehensive report on the effects of education, residence and a number of other explanatory variables on fertility for 22 countries in which WFS surveys have been conducted. This paper is extremely useful in illustrating the points discussed above, as well as in quantifying the relationships between education and residence and fertility.

Rodriguez and Cleland use regression analysis both to create their primary dependent variable--marital fertility--and to estimate the effects of education and residence on fertility. The dependent variable is constructed by estimating the effect of marital duration and duration squared on fertility in the last 5 years (weighted by exposure), and then predicting total fertility over 25 years of marriage using the estimated effects of duration. Thus the dependent variable, an approximation of completed fertility based on recent fertility, resembles the total fertility rate in its characteristics.[7]

Education

Rodriguez and Cleland estimate the effects of education and other variables on fertility using dummy variables and regression. Average marital fertility can be determined for every category of education (see Table 3). Other variables can also be introduced, and average marital fertility determined controlling for these factors.

Table 3 shows the relationship between fertility and the education of the wife (or woman) and that of the husband. In Panel A, fertility is estimated, using total fertility rates, for all women in the household; in Panel B, only ever-married women are included, and fertility is estimated at marital durations of 25 years. Before reviewing the data in Panel B, it is important to determine if restricting the sample to ever-married women causes any bias. If

TABLE 3 Effect of Education on Predicted Completed Fertility

Country	Panel A. Total Fertility Rate (all women)				Panel B. Adjusted for Marital Duration (ever-married women)							
	Woman's Education				Wife's Education				Husband's Education			
	No School	Lower Primary	Upper Primary	Secondary	No School	Lower Primary	Upper Primary	Secondary	No School	Lower Primary	Upper Primary	Secondary
Bangladesh	6.2	6.5	6.9	5.0	6.2	6.6	7.1	6.1	6.0	6.9	6.6	6.8
Fiji	--	--	--	--	4.8	5.2	4.8	4.1	4.9	5.3	4.7	4.3
Indonesia	--	--	--	--	4.9	5.5	5.6	5.4	4.5	5.4	5.3	5.7
Korea	5.8	5.2	4.5	3.3	6.2	5.5	5.0	4.0	6.1	6.1	5.5	4.5
Malaysia	5.2	5.1	4.6	3.2	6.3	6.0	5.4	4.6	5.9	6.3	5.8	5.1
Nepal	--	--	--	--	6.1	6.5	6.1	2.8	6.1	5.4	6.2	5.4
Pakistan	6.6	(5.9)	(5.7)	3.6	7.0	6.7	7.1	5.8	7.0	6.6	7.3	6.8
Philippines	5.2	6.9	6.0	3.8	6.4	7.1	6.6	5.3	6.5	7.2	6.6	5.5
Sri Lanka	--	--	--	--	5.3	5.1	5.3	4.8	5.4	5.3	5.2	5.0
Thailand	--	--	--	--	5.5	5.7	5.3	3.6	5.1	6.8	5.5	4.0
Colombia	6.4	5.5	3.5	2.5	6.7	5.9	4.1	3.3	6.7	6.1	4.3	3.3
Costa Rica	(4.9)	4.5	3.3	2.7	5.2	4.5	3.4	3.3	4.7	4.5	3.6	3.3
Dominican Republic	(6.6)	6.4	4.1	(2.3)	6.9	6.7	4.9	3.7	6.6	7.1	5.1	3.5
Guyana	--	5.4	5.3	4.0	6.0	5.1	4.8	4.4	4.6	5.3	5.0	3.9
Jamaica	--	5.4	5.1	3.2	6.6	5.3	5.0	3.4	6.0	5.4	4.9	3.4
Mexico	7.6	6.6	4.7	3.3	7.4	7.2	5.5	4.6	7.6	7.2	5.9	4.7
Panama	--	6.1	4.3	2.9	6.7	6.2	4.5	3.6	6.6	6.2	4.5	3.7
Peru	7.0	6.4	3.7	3.4	7.7	6.9	5.4	4.5	7.2	7.4	6.3	5.1
Jordan	9.2	6.8	5.4	(3.6)	9.3	7.7	6.7	5.6	9.3	9.1	7.9	6.8
Kenya	8.4	8.9	8.0	5.5	7.4	8.1	7.7	7.8	7.2	8.2	7.9	7.8
Average of all available countries	6.6	6.1	5.0	3.5	6.4	6.2	5.5	4.5	6.2	6.4	5.7	4.9
Average for countries with data in Panel A only	6.6	6.1	5.0	3.5	6.8	6.4	5.6	4.7	6.5	6.6	5.8	5.0

Note: Dash indicates not available or n less than 250; parentheses denote n less than 500.

Source: Rodriguez and Cleland (1980:Tables 4, 7, A-2).

education has an effect on age at marriage, as many studies have shown, then this restriction, used in most fertility surveys, will result in an underestimation of the effect of education on fertility. Panel A offers some guidance in making this determination because it includes education and total fertility data for married and unmarried women combined. On average, the difference between the effects of education shown for all women and only married women are substantial (compare Panel A with the effects of wife's education in Panel B). Over the entire education range, the difference in fertility is 3.1 when all women are included, but only 2.1 if only married women are included.[8] Thus, a priori, surveys of married women will tend to underestimate the effect of education on fertility substantially, depending on the importance of education in determining age at marriage. This point needs to be considered in reviewing any comparative analysis of data drawn from surveys of ever-married women.

These data for ever-married women show that the relationship between education and fertility is monotonically inverse for women in Latin America; outside Latin America, female education is monotonically related to fertility only in Jordan, Korea, and Malaysia. (Sri Lanka is a marginal case.) For males, the relationship is monotonic only in five of the eight Latin American countries, Jordan, and Sri Lanka.

This irregular relationship between female education and fertility outside Latin America is not inconsistent with the pattern found in Cochrane (1979). The nonlinearities differ according to the education level at which the highest fertility is observed, the regularity of the increases and decreases in fertility on either side of the peak, and the magnitude of the differences in fertility among those with no education and those with maximum education. In Sri Lanka and Pakistan, the overall pattern is irregular, showing two peaks; in the other countries, only one peak is evident, and the fertility differences between the extreme education categories are typically at least one-half a child. Although these irregularities defy simple description, they are sufficiently persistent and based on adequately large samples that they cannot be dismissed as mere flukes.

In an attempt to determine if such nonlinearities are regionally determined or a function of development, some additional analysis was done for this paper: literacy, urbanization, caloric intake, income, and total fertility rates were compared for countries with and without monotonic fertility-education relationships. Simple comparisons show that only for per capita income is there a clear separation between the two groups of countries: all countries with 1978 per capita income at or below $510 have a pattern of increased fertility with education prior to a decline; all countries with an income of $740 or above have monotonic inverse relationships.

However, income is not the only important variable for some very low-income countries, such as Sri Lanka, that have small increases in fertility, or for richer low-income countries, like the Philippines, that have large increases in fertility before a decline is observed. A test of the relative importance of variables in explaining the shape of the education-fertility relationship is shown in Table 4. The

TABLE 4 Relationship Between Fertility at Different Education Levels and Aggregate Characteristics

	$F_{LP}-F_{NO}$	$F_{UP}-F_{NO}$	F_S-F_{NO}	$F_{UP}-F_{LP}$	F_S-F_{LP}	F_S-F_{UP}
Wife's Education						
GNP	--	-.002 (3.99)	--	-.001 (2.60)	--	--
TFR	--	--	--	--	--	--
Urbanization	-.020 (1.98)	-.044 (5.53)	-.047 (2.31)	-.025 (2.95)	--	--
Literacy	--	--	--	--	--	--
Daily calories	--	-.002 (2.83)	--	-.002 (2.34)	--	--
Constant	-.0495	-3.43	-6.82	-2.94	--	--
R^2	.39	.88	.38	.67	--	--
d.f.	12	12	12	12	--	--
Husband's Education						
GNP	--	-.001 (2.92)	--	-.001 (3.24)	--	--
TFR	--	.254 (2.03)	--	--	--	--
Urbanization	-.023 (2.39)	-.043 (5.57)	-.054 (3.77)	-.020 (2.95)	-.031 (2.35)	--
Literary	.022 (2.25)	.017 (2.08)	--	--	--	--
Daily Calories	--	.002 (2.90)	--	.003 (4.63)	.003 (2.77)	--
Constant	.555	-4.49	-4.62	-4.99	--	--
R^2	.38	.83	.71	.77	.66	
d.f.	13	12	12	12	12	--

Note: The dependent variable is the difference in fertility between education groups: those with lower primary school and no education ($F_{LP}-F_{NO}$), upper primary and no education ($F_{UP}-F_{NO}$), etc. Only significant coefficients are shown; t values are in parentheses.

Source: Regressions based on data in Table 3 and World Bank (1980).

differences in fertility between particular levels of education were regressed on per capita income, the total fertility rate, urbanization (proportion urban), the literacy rate, and per capita calories. Urbanization is the most consistent variable explaining the differences in fertility between education groups. For the first four steps of education given in Table 4, the greater the degree of urbanization, the more likely it is that fertility will fall with each increment in education, and the larger these decreases will be. GNP behaves similarly for the differences between no schooling and upper primary, and between lower primary and upper primary. Caloric intake is also significant at these steps in education. Rather surprisingly, neither aggregate education (literacy) nor total fertility rate is significant in explaining the changes in fertility between particular levels of education. This suggests an important interaction between poverty (GNP and caloric intake) and urbanization and the effect of education on fertility. It is interesting to note that, for husband's education, urbanization and GNP have the same relationship as for wife's education; however, caloric intake, literacy, and total fertility rate have perverse signs. Of these, caloric intake is the most interesting in that it is significant in three equations.

In Cochrane (1979), it was shown that female education was much more likely than male education to be inversely related to fertility. This is confirmed in the WFS data by the unweighted average fertility for males and females in each education group. These average values, given at the bottom of Table 3, show that there is a difference of 1.9 children over the education spectrum from no education to secondary schooling for females, and a difference of only 1.3 for males. In addition, males with some education have higher fertility on average than those with no schooling--6.4 versus 6.2 (these values are reversed for females). In considering the extent to which these differences accurately reflect the effect of education, several adjustments need to be considered. Adjustments for residence and for spouse's characteristics are addressed by Rodriguez and Cleland, and are discussed in the subsections below.

Residence

Table 5 summarizes Rodriguez and Cleland's urban-rural fertility estimates. The difference between urban and rural areas is greater for the data on all women (1.6 children) than for those on married women only (1.2). This is similar to the finding for education. However, the residential differential using either group of women is smaller than the educational differential, perhaps because residence is measured dichotomously, whereas education is classified into four groups.

A particularly interesting finding is that urban fertility is always lower than rural fertility when all women are included, but not when only married women are sampled. In Bangladesh, Indonesia, and Pakistan, the marital fertility of urban women is higher than that of rural women. In Indonesia and Pakistan, this difference is large,

TABLE 5 Effect of Residence on Predicted Completed Fertility

Country	Total Fertility (all women)		Marital Duration Adjusted (ever-married women)	
	Rural	Urban	Rural	Urban
Bangladesh	6.2	6.0	6.3	6.5
Fiji	4.6	3.6	5.2	4.3
Indonesia	4.8	4.6	5.1	5.6
Korea	5.1	3.7	5.9	4.5
Malaysia	--	--	6.1	5.5
Nepal	6.2	--	--	--
Pakistan	6.4	6.2	6.8	7.3
Philippines	6.0	3.9	6.8	5.4
Sri Lanka	3.8	3.2	5.3	4.8
Thailand	4.9	2.9	5.5	4.3
Colombia	6.6	3.5	7.2	4.2
Costa Rica	4.7	2.9	4.8	3.3
Dominican Republic	7.1	4.1	7.6	5.0
Guyana	5.1	4.3	5.1	4.1
Jamaica	5.3	3.9	5.4	4.1
Mexico	7.3	4.8	7.7	5.7
Panama	5.7	3.3	5.9	3.9
Peru	7.0	4.6	7.6	5.8
Jordan	9.8	7.1	9.7	8.5
Kenya	8.4	6.1	8.0	6.5
Total	6.0	4.4	6.4	5.2

Note: Dash indicates not available.

Source: Rodriguez and Cleland (1980).

one-half a child. This implies that, particularly in these two countries, age at marriage is very important in explaining residential differentials.

Multivariate comparisons of urban-rural differences in fertility, similar to those in Table 4 and using the same variables, show that only the degree of urbanization is significant. The higher the level of urbanization in a country, the greater the difference between rural and urban fertility. Findley and Orr (1978) also found the percentage of the population urban significant in explaining urban-rural differentials in fertility.[9] These findings suggest that in

countries with greater degrees of urbanization, those classified as urban are more likely to be from large cities where fertility is in fact lower than in rural areas.

Interaction of Residence and Education

The question of interaction between residence and education was also addressed by Rodriguez and Cleland. Although they found that such interactions were not statistically significant in most instances, their test of interaction was not symmetrical for husband's and wife's education.

Husband's education was adjusted for residence by the inclusion in the regression of a dummy variable for residence. In many cases, there was no perceptible difference in education's effect before and after this adjustment. In those cases where the interaction term was significant, the residential adjustment reduced the impact of husband's education in all cases except Kenya, where education's effect became more positive, and in Guyana, where there was no change. Overall, the average (unweighted differential) before adjustment was -1.9; after adjustment the average was -0.85.

On the other hand, wife's education was adjusted not only for residence, but also for husband's characteristics (education, occupation, and work status).[10] These adjustments reduced female education's average effect from -1.9 to -0.955, making it less negative in most cases, although in one case (Indonesia), it made that effect negative rather than positive. Adjustment for residence seems desirable to estimate the "true effect" of education; however, adjustment for husband's work status and occupation is not desirable since these are at least partially the effect of the wife's education through assortive mating.

Residence's effect was also measured by Rodriguez and Cleland, adjusting for all other variables (husband's education, occupation, and work status, and wife's education and work status). Again, such adjustments generally reduced the effect of residence from an average of -1.2 to -0.66.

The effects of these various adjustments are summarized in Table 6. After controlling for other variables (some of which are endogenous to education, residence, or both), the effect of female education is still to reduce fertility by almost one child; the effect of male education is one-third as large; and the effect of urban residence is about two-thirds of a child. Although these figures support a strong negative effect of female education, this effect is not linear, as was noted above. After all other variables have been controlled, the difference in fertility for married women is only a tenth of a child between no and some primary education, and the negative effect increases thereafter. In contrast, the fertility of husbands with some primary education is one-third of a child <u>larger</u> than that of husbands with no education after controlling for all other factors, including residence, wife's education, and work

TABLE 6 Differences in Predicted Completed Fertility Between Specific Education-Residence Groups

	Wife's Education			Husband's Education			Residence
	$F_{LP}-F_{NO}$	$F_{UP}-F_{NO}$	F_S-F_{NO}	$F_{LP}-F_{NO}$	$F_{UP}-F_{NO}$	F_S-F_{NO}	F_U-F_R
All women	-0.5	-1.6	-3.1	--	--	--	-1.6
Married women	-0.2	-0.9	-1.9	0.0	-0.5	-1.3	-1.2
Controlling for residence	--	--	--	0.6	-0.3	-0.9	--
Plus husband's characteristics	-0.9	-0.4	-1.0	--	--	--	--
Plus all other variables	-0.1	-0.4	-0.9	0.3	0.0	-0.3	-0.7

Source: Summarized from Rodriguez and Cleland (1980) using unweighted averaging of results.

status. Thus adjustment for other variables does not eliminate the nonlinear relationship between education and fertility.

Other Studies of Education's Relationship to Fertility

Meta Analysis

Another study using WFS data from several countries was done by Hermalin and Mason (1980). This paper, which addressed strategies for comparative analysis of WFS data, used an approach falling between micro and macro analysis. Instead of using individual or countrywide data to estimate regressions between education and fertility, it used as the dependent variable the average fertility of women of various education and marital duration groups from WFS tabulations. The independent variables were education and marital duration, and their values were estimated by the approximate midpoints for each group.

Using these data points from WFS tabulations in each of 10 countries, Hermalin and Mason fitted a nonlinear model to the data. The model used was $\ln (P + .5) = a + bE + c \ln D$, where P is parity, D is duration, and E is education.[11] This formulation implies that the higher the level of education, the stronger its effect. In all cases except Nepal, the coefficients for education were negative, although they varied in size from -0.0077 in Sri Lanka to -0.04085 in Panama and +0.02531 in Nepal. These variations in the effect of education were then studied at the national level to determine what macro characteristics affect the relationship between education and fertility.

The analysis most relevant to this review is that which relates the effect of education on fertility in a country, B_1, to that country's level of development and to characteristics of the education system. Generally, the more "modern" the country, the more negative was education's effect. Five correlations were significant at the 5

percent level for a two-tailed test: (1) 1957/58 per capita expenditures on education, in U.S. dollars; (2) percentage rural; (3) females in teacher training as a percentage of all students in teacher training, secondary and higher, 1960; (4) percentage of economically active females aged 14 to 65 in occupations other than agriculture in the early 1960s; and (5) females as a percentage of total school enrollment at first, second, and third levels. The most interesting finding is the robustness of the effect of the percentage rural:

> We would conclude on the basis of the analysis thus far that the effect of education on fertility is weaker in more rural settings. Whether this is due to the content of education or to the opportunity of individuals to use education remains to be studied and the general hypothesis needs to be further tested with more observations (Hermalin and Mason, 1980:116).

The summary of Hermalin and Mason's work presented here is very abbreviated. However, it does illustrate the pattern of nonlinearity in the education-fertility relationship, as well as the interaction of education and residence.

Multivariate Studies Within Countries

A great number of multivariate studies of fertility determinants have been done on micro data within countries. For this reason, the present discussion must be selective. For comparability, only studies using children ever born as the dependent variable and a sample size of over 150 will be included. Estimates of both linear and nonlinear relationships between education and fertility will be examined.

The Appendix Table summarizes the results of 30 multivariate studies of the effect of education on fertility. These studies vary substantially in their methodology. However, in all cases but five, both husband's and wife's education are included, and most use linear estimation of the relationship between education and fertility. Of these, 19 include husband's education. In six cases, the relationship is negative and significant, whereas in two cases it is positive and significant; in the rest it is insignificant. The two perverse cases are for a group of urban men in Brazil in 1960 and for 717 heads of household in Sierra Leone in 1966-67.

For women's education, 13 of the 26 estimates are negative and significant, and two cases are positive and significant. The two atypical cases are the rural Laguna survey, in which a matching analysis of the same data revealed a negative significant value, and a rural Bangladesh sample of 265 women in 1968-69. In the latter case, the positive relationship would be reduced from +0.13 to +0.03 if the effect of female education on child mortality and of child mortality on fertility were considered in the ordinary least squares estimates; it would be reduced from +0.42 to +0.26 if the mortality effect were adjusted for in the two-stage least squares estimates.[12]

These linear estimates can also be used for other analyses. For

example, Table 7 (Panel A) shows a very clear relationship between sample size and significance: for small samples (under 300) only 13 percent of the results are negative and significant; for samples 300 to 1,000, 36 percent; and for samples over 1,000, 54 percent.

Another conclusion to be drawn relates to the effect of controlling for age at marriage.[13] Table 7 (Panel B) shows that, if age at marriage is included, 45 percent of the cases are inverse for males and females; if age at marriage is not included, none of the

TABLE 7 Significance of Linear Estimates of the Effect of Education on Fertility, by Methodology Used

Panel A. Results by Sample Size

Statistical Significance	Sample Size: Under 300		300-1,000		Over 1,000		
	Male	Female	Male	Female	Male	Female	Total
Negative significant	0	2	0	5	6	9	22
Not significant	5	5	6	2	5	7	30
Positive significant	1	2	0	1	1	0	5
Percent negative significant	0	29	0	63	50	56	39

Panel B. Results by Inclusion of Age at Marriage in Regression

Statistical Significance	Age at Marriage Included			Age at Marriage not Included		
	Male	Female	Total	Male	Female	Total
Negative significant	6	11	17	0	6	6
Not significant	9	10	19	7	4	11
Positive significant	1	1	2	1	1	2
Percent negative significant	38	50	45	0	55	32

male and 55 percent of the female results are negative and significant. Thus inclusion of age at marriage has a different effect on the sign and significance for males and females.

To summarize, with the best methodology and the largest sample sizes, most studies show inverse results. However, even with the best methodology, the proportion of inverse results does not rise above 60 percent. This confirms what was suggested earlier: in an important number of cases, education is not monotonically, much less linearly, related to fertility.

In 11 studies, the authors explore the nonlinearity in the relationship between education and fertility. Anderson (1979) uses a semilog specification, four authors use a quadratic term, and six authors use dummy variables for various levels of education. To briefly summarize these results, Anderson's formulation showed that the negative impact of female but not male education increased as education rose. Studies using a quadratic specification find that fertility first increases with education and then decreases. The level of education with maximum fertility (obtained by solving for the maximum point on the quadratic curve) varies from 2.8 years in the Philippines to 10 in Sierra Leone. In studies using dummy variables for the different levels of education, the patterns observed vary among age groups and regions within countries. In general, the impact on fertility is more negative at higher education levels. In some cases, no level of female education has a significantly negative impact (women over 45 in Korea, landless households in India, urban households in Kenya, rural households in Egypt); in one case, education has a significantly positive effect (male primary education in rural Egypt). Part of this uneven pattern of significance may be due to small sample sizes in particular age and education groups.

It is not easy to get an overall picture of the education-fertility relationship from these studies. Averaging the coefficients is inappropriate because of the nonlinearity of the relationship. In addition, given the variety of methodologies used, most estimates are "biased" in one direction or another from some ideal effect. To explore the true relationship further in a multivariate context would require some explicit causal modeling of the channels through which education acts. Mason and Palan (1980) have done this for Malaysia, and Smock (1980:87) for Kenya. Both studies show that, as more channels are included, the direct effect of education diminishes to zero; however, neither goes through the final step of adding up the effect of education through various channels.

Several papers have carried out rather complete path analyses of fertility. Loebner and Driver (1973) have done such a study with data from Central India. In this study, although neither husband's nor wife's education was directly related to children ever born, both affect fertility indirectly. Husband's education operates through occupation (0.267), husband's income (0.275), wife's age at marriage (0.130), family structure (0.131), and absence of husband and wife (-0.12 and 0.08). Among these, only age at marriage affects fertility (0.052); therefore, husband's education has a small indirect positive

path of 0.130 x 0.052 = 0.0068. The path between wife's education and fertility is more tortuous: direct through age at marriage 0.191 x 0.052 = 0.0099, and more indirect through marriage duration 0.191 x -0.272 x 1.032 x 0.721 = -0.0387. Thus the net effect of female education through these indirect paths is -0.0288.

Another study traces the effects of education on current fertility (rather than children ever born) for a sample of Colombian women (Chi and Harris, 1979). The analysis is done separately for women of zero parity, parities one to three, and parities of four or more. The direct effects of education are not significant for those of zero parity, -0.109 for those of parities one to three, and -0.099 for those of higher parities; the indirect effects are +0.025, -0.001, and -0.062 for the three groups. Thus the total effects are +0.025, -0.110, and -0.161, respectively. The principle channels through which education acts indirectly are spouses' discussion about family size; contraceptive attitudes, knowledge, and use; and infant mortality experiences. This study illustrates the shift in education's effects as family size increases, as well as the importance of indirect effects.

Other Considerations

Stability of Educational Differentials Over Time

It is important to determine the stability of educational differentials in fertility across time. Unfortunately, in very few countries is this possible. Many censuses do not report fertility differentials by education controlling for age; even more rarely are there two such censuses for one country. Since most WFS data are standardized by marital duration rather than age, the educational differentials cannot be directly compared with census data.

Three countries do provide data of this kind: the Philippines, 1968 and 1973; Jordan, 1972 and 1976; and Egypt, 1960 and 1976. The results of these comparisons are given in Table 8, showing that education has a more negative effect on fertility at the later point in all three cases. Although this is a very small amount of evidence, it does seem to be confirmed by much more tenuous comparisons of census (age) data with duration data from comparable WFS surveys.[14] Comparisons of CELADE data with WFS data for urban areas (or specifically for city or metropolitan areas where available) also confirm this pattern if women 25-44 are compared with women of all marital durations in the WFS. Any attempt at a finer breakdown (women 35-44 and durations 10-19 and 20-29), yields confirmation for the longer durations only.[15]

Although these data are suggestive, retabulation of WFS data by age would considerably increase our ability to make these comparisons across time. This would permit testing of the hypothesis that education's impact increases over time until fertility is relatively low, at which point the absolute but not the relative differentials decrease.

TABLE 8 Relationship Between Education and Fertility at Two Points in Time: The Philippines, Egypt, and Jordan

Panel A. Philippines, Children Ever Born to Women 40-44 (ESCAP, 1978)

Education	CEB 1968	Percentage Difference from CEB of Uneducated	CEB 1973	Percentage Difference from CEB of Uneducated
No school	6.11		6.85	
1-4 years	6.49	+6.0	7.04	+2.8
5-7 years	6.77	+10.8	6.75	-1.5
High school	5.93	-2.9	6.09	-11.1
College	4.27	-30.1	4.57	-33.0

Panel B. Egypt, Standardized Average Parity (World Bank, 1981)

Education	Parity 1960	Percentage Difference from Parity of Uneducated	Parity 1976	Percentage Difference from Parity of Uneducated
Illiterate	4.21		4.21	
Read and write	4.53	+7.6	4.37	+4.2
Elementary	4.26	+1.2	3.66	-13.1
Secondary	3.59	-14.7	2.80	-33.5

Panel C. Jordan, Children Ever Born Among Women Married over 20 Years (Rizk, 1977; Jordan WFS, 1979)

Education	CEB 1972	Percentage Difference from CEB of Uneducated	CEB 1976	Percentage Difference from CEB of Uneducated
Illiterate	8.79		9.00	
Primary and secondary	7.86	-10.6	7.23	-19.7
Secondary+	4.70	-46.5	4.50	-50.0

Other Evidence on Urban-Rural Differences in Fertility

A number of country-specific studies specifically address or indirectly control for residence in the analysis of fertility. In addition to these studies and the WFS data used by Rodriguez and Cleland, there have been a number of other fairly comprehensive studies of urban and rural differences in fertility.

Kuznets (1974) reviewed data on urban-rural variations in fertility for the late 1950s and early 1960s, and Findley and Orr (1978) reviewed data from the period around 1970. These two studies use different methodologies, though they do share two similarities: (1) they examine the fertility of all, not just married, women; and (2) they introduce no controls except for age. Although differences in methodology prevent close comparison, these studies agree on some points that give considerable insight into urban-rural variations.

Findley and Orr found that the average total fertility rate was 4.95 for urban areas and 6.35 for rural areas, yielding a difference of 1.4 and a ratio of 1.28. This absolute difference falls between the two estimates found using data from Rodriguez and Cleland,[16] but the ratio of fertility rates indicates much larger differences than those found by Kuznets. Kuznets found a ratio of 1.09 for developing countries as a whole, this ratio varying from 1.03 for sub-Saharan Africa to 1.12 for Asia and 1.15 for Latin America. At least some of the contrast with Findley and Orr is due to differences in methodology. Kuznets used children under 5 per 1,000 women of reproductive age as his measure of fertility. Using this measure, differences between urban and rural areas would result from differences not only in fertility, but also in age structure and child mortality, although it is possible that these latter two factors cancel each other out somewhat. To the extent that Kuznets' results are accurate for the period around 1960, it is also quite possible that urban and rural differences in fertility widened over the decade. Further support for a widening gap is found in the fact that, in Western Europe, residential differences widened during the period of fertility decline and then began to narrow in the post-World War II period (United Nations, 1973:97).

Additional findings of interest from these two studies concern regional differences. Findley and Orr found that the larger the city, the lower the level of fertility in Asia and Latin America; however, this relationship did not hold for Africa. Kuznets found greater urban-rural differences in Latin America than elsewhere in the developing world, whereas in Africa urban fertility was in some cases higher than rural. This pattern can be checked against the Findley and Orr data from the 1970s, showing that African differentials (1.29-1.39) are midway between those of Latin America (1.56-1.43) and Asia (1.20-1.12). This change in pattern may arise from differences in measurement, actual changes in differentials, or the effect of selecting particular countries for study. Unfortunately, the latter point can not be checked on a country-by-country basis since Kuznets did not report country-specific data. These varying results may also arise not from regional factors per se, but from differences in the

degree or pattern of urbanization in different regions. Thus one must interpret these regional patterns cautiously.

Relatively little insight into the effect of urbanization on fertility is gained from the multiple regression studies reviewed above (see the Appendix Table) since they were not designed for that purpose. Only 11 of the 26 studies include residence or a proxy in their analysis.[17] In these studies, significant negative effects of urbanization are shown in five cases and positive significant effects in one; the rest are insignificant. Given the relatively small number of cases, it is impossible to derive patterns of significance and nonsignificance from these data.

On the other hand, three multivariate studies yield some insight into the channels through which residence operates. A study of Costa Rica by Michielutte et al. (1975) shows that adding other variables (education, income, age at first conception, and church attendance) significantly reduces the effect of residence. Of these variables, the addition of income has the greatest effect on the association, reducing the correlation coefficient from -0.32 to -0.24; no other variable had an effect even a third this size. Ketkar's (1979) study also shows that fairly large urban-rural differentials in fertility (0.85) are reduced to statistical insignificance when income, education, infant mortality, size of extended family, religion, and occupation are added to a regression. The Loebner and Driver (1973) path analysis of fertility in India examines residence as well as education and shows no direct effect of residence. Although residence affects husband's income, family structure, and education, its only indirect effects on fertility are those through education, which is itself an indirect effect. Residence's effect is thus much smaller than education's. It is somewhat surprising that residence does not have an effect more directly through age at marriage; however, for this particular sample, no significant effect of this kind exists. On the other hand, this sample is perhaps atypical in that even the zero-order correlations between residence and children ever born are very small (0.039).

There are other studies giving some fragmentary evidence on the channels through which urbanization may operate. However, it seems more efficient to examine broader issues in addressing the effects of changing socioeconomic circumstances on fertility. The propositions below summarize these issues.

PROPOSITIONS

Education and Fertility

1. The effects of education on fertility vary according to whether male or female education is considered and whether all or only married women are included, and with the degree of urbanization.

2. A major effect of education on fertility is through age at marriage; thus the observed negative effect of education on fertility is smaller in samples including only ever-married women than in those

including both married and unmarried women.

3. Monotonic inverse relationships between education and fertility are much less likely to be observed in countries having low levels of urbanization, per capita income, and daily caloric intake. Of these three factors, urbanization appears to be the most important. This may explain the stronger observed negative relationship between education and fertility in Latin American than in Asia.

4. Female education is more often inversely related to fertility than is male education: the negative effect across the total range of female education is about three times greater than that of male education after adjusting for many other factors, including spouse's education, occupation, and residence. Male education at low levels is more likely to be positively related to fertility than is female education; however, this may well reflect a positive income effect of education since income is more closely related to male than to female education.

5. In multiple regression studies, the observed magnitude of the relationship between education and fertility is highly dependent on whether or not the regression equation includes variables through which education operates. Although several recent studies have illustrated this by including these variables, the relative importance of the different channels is still unclear and probably varies among countries.

6. The cross-section effect of education on fertility is more negative at later than at earlier points in time, at least until fertility levels become very low. This topic needs more research, which would be facilitated by a simple retabulation of WFS data in more comparable form to those of earlier surveys and censuses. In addition to comparing differentials at various points in time, research should attempt to determine what aggregate factors, such as development or income growth, affect the changes in differentials over time.

7. Reanalysis of the Value of Children data could provide insight into the extent to which education's effect operates through differential values.

Residence and Fertility

8. Differences in fertility between urban and rural areas are smaller than those between the least and most educated; however, this may result from the dichotomous classification of residence and may thus be an artifact.

9. The greater the degree of urbanization in a country, the greater the urban-rural differences in fertility. This may arise in part from measurement problems since, as urbanization increases, those classified as urban generally come from larger cities.

10. The mechanisms through which residence operates are less clear than those through which education operates. The former are more difficult to identify because of the need to separate out factors

specific to location (place factors), as well as those specific to individuals and themselves correlated with place factors. The WFS analysis of such community variables as access to markets and average education levels offers some hope of eventually disentangling these channels; reanalysis of Value of Children data could also provide insight into the extent to which residence operates through the perceived costs and benefits of children.

NOTES

1. For example, if education affects age at marriage, then the inclusion of age at marriage (M) in a regression between age-controlled fertility (F) and education (E) will have the following bias. Let $F = a + bE + cM$ and $M = d + eE$. The effect of education on fertility cannot be measured by b alone, but must be measured by $b + ec$. If c is negative and e is positive, then the coefficient of b will be biased upward. This explains the plus in column 3 of Table 1.
2. Including age and marital duration is equivalent to including age at marriage; this will cause a positive bias in the education coefficient.
3. It is interesting to note that in no case was husband's education the most important variable in reducing the negative effect of wife's education, and that, for rural Malays, controlling for husband's education had the most important impact on increasing the negative effect of wife's education.
4. Studies using the total education of husband and wife introduce other problems--such as nonlinearities and the differential effects of husband's and wife's education.
5. Two solutions to the problem of variables determined simultaneously with fertility are two-stage least squares and reduced-form equations.
6. Other background variables, such as religion, caste, and parental status and education, cause less well-defined problems because the direction of bias depends on the effect of the background variable on education and fertility.
7. Therefore, in countries where the timing of fertility is undergoing significant change, these variables will be an inaccurrate reflection of completed fertility.
8. The value obtained for countries in which both estimates are available is 2.1; for all countries, the average difference is 1.9 for married women.
9. Rather surprisingly, Findley and Orr also found that the percentage of the population in small cities (under 20,000) was significantly related to larger urban-rural differentials.
10. Rodriguez and Cleland give no explanation for the asymmetrical treatment of male and female education in this respect.
11. This description glosses over very detailed, careful discussions of the measurement of the variables and the choice of model specification.

APPENDIX TABLE Multivariate Studies of Education and Children Ever Born in Developing Countries, by Region

Region and Study	Sample: Location, Year, Size	Estimation Technique	Education Measure	Education's Effect and Significance (t values in parentheses) [elasticities in brackets]		Other Variables Included (sign if significant)	Comments
LATIN AMERICA							
Iutaka et al., 1971	Brazil (1959-60) 1,280 urban males	OLS	Husband's levels	.077 (2.46)		Age +, age at marriage -, city size +, migratory status +, color -, social status +, father-in-law's status +, father's status.	Major bias due to inclusion of age at marriage and social status.
Kogut, 1974	Brazil (1960 census) 2,083 NE 3,287 S 2,872 E	OLS	Years	HE -.088 (2.93) -.065 (5.66) -.059 (3.85)	WE -.035 (0.87) -.030 (1.84) -.058 (2.68)	Age -, marital duration +, income (varying sign), type of marriage consensual - (NE and S), rural +, suburban.	Major bias due to marital duration, which affects the coefficient of wife's education more than husband's.[a]
Davidson, 1973	Mexico Mexico City (1963-64) 239 women 35-39	Stepwise	Wife's years	-.096 (0.80)		Age at marriage -, desired number of children +.	Age at marriage causes education to be underestimated, as does desired size. Author recognizes former effect in text.
	Venezuela Caracas (1963-64) 192 women 35-39	Stepwise	Wife's years	-.101 (0.76)		Age at marriage -, desired number of children +, wife's work status, husband's occupation.	
Michielutte et al., 1975	Costa Rica (n.d.) 292 women 35-49 (clinic and control)	OLS	Wife's years	-.38[b]		Residence -, income, church attendance -, age at first conception -.	Bias probably introduced by age at first contraceptive use; also perhaps by sample design.

Stycos, 1980	Costa Rica (1978) 966 women over 35	OLS	Wife's years	-.16[b]		Years married +, mass information -, modern psychology.	Since mass information depends on education, education is underestimated. Adjustment not possible with given data.
	Sterilized			HE	WE		
	No (550)			-.05	-.05		
	Yes (267)			.00	-.17[b]	Years since union +, consumer durables -, siblings +, urban church attendance, work history, parent's education, current work.	No residence control.
Anderson, 1979	Guatemala (1974-75) 657 households	OLS (in CEB)	Years	HE -.008 (1.00) [-.021]	WE -.029 (3.22) [-.054]	Wealth, location, wife's age +.	Does not include imputed wage for husband.[c]
EAST ASIA							
Kiranandana, 1977	Thailand (1969-70) 1,546 women 478 rural 1,068 urban	OLS	Levels	HE -.155 (3.05) -.097 (0.95) -.162 (4.09)	WE -.059 (1.31) .049 (0.43) -.073 (1.70)	Age +, marital duration +, ideal family size +, contraceptive use +, proportion dying +, proportion male +, (urban) -.[d]	If husband's education is deleted, wife's is negative and highly significant.
Lee et al., 1978	Korea (1971) 2,334 women 35-49	OLS	Age 35-39	HE	WE	Mortality +, mortality squared -, surviving sons -, wife urban -, modern objects owned, family structure, children in agriculture, children in nonagriculture +, regional mortality, children enrolled, children under 6 +, regional unemployment, demand for female labor, husband's unemployment.	Education underestimated due to the inclusion of mortality, child enrollment, and employment.
			0	0.29(2.17)	0.23(2.27)		
			7-9	-0.08(0.66)	-0.52(3.58)		
			10-12	-0.22(1.79)	-0.64(3.17)		
			12+	-0.26(1.47)	-0.45(0.88)		
			Age 40-44				
			0	0.01(0.07)	0.39(2.51)		
			7-9	-0.20(1.10)	0.08(0.28)		
			10-12	-0.17(0.77)	-1.07(3.00)		
			12+	-0.18(0.56)	-0.95(1.41)		
			Age 45-49				
			0	-0.36(1.59)	0.20(0.84)		
			7-9	-1.15(3.87)	0.05(0.10)		
			10-12	-0.31(0.79)	-0.24(0.45)		
			12+	-0.96(1.99)	-0.85(0.69)		

APPENDIX TABLE (continued)

Region and Study	Sample: Location Year, Size	Estimation Technique	Education Measure	Education's Effect and Significance (t values in parentheses) [elasticities in brackets]		Other Variables Included (sign if significant)	Comments
Mason and Palan, 1980	Malaysia (1974) 6,147	OLS	Years	Urban	Rural	Age, marital duration.	Biased due to marital duration, but see text for expanded discussion.
			Race	E	E		
			Malay	.095	.127		
			Chinese	-.117[b]	-.096[b]		
			Other	-.180[b]	.034		
				E^2	E^2		
			Malay	-.015[b]	-.016[b]		
Chernichovsky and Meesook, 1980	Indonesia (1976) 60,000 households	OLS	Wife	Java-Bali	Outer Islands	Age +, age at marriage -, marital status -, religion, work in home +, work outside +, modern durables -, household expenditure +, expenditure squared -, knows contraception +, rural - (Java-Bali).	Education's effect probably biased positively by age at marriage, but knows contraception has a perverse sign, as does work outside the home. Thus overall direction of bias is unclear.
			Elementary	-.076(1.79) [-2.0]	.083(1.75) [1.9]		
			Jr. Hi. Voc.	.023(0.16)	.061(0.44)		
			Jr. Hi. Gen.	-.133(1.38)	-.313(3.42)		
			Sr. Hi. Voc.	-.479(3.61)	-.663(4.70)		
			Sr. Hi. +	-.960(7.92)	-.888(6.72)		
Encarnacion, 1974	Philippines (1968 NDS) 3,629 women under 50	OLS	Wife's years	WE = .214(3.05)[e] WE^2 = -.040(3.56)		Age at marriage -, duration (nonlinear), family income (nonlinear) +/-.	Biased due to inclusion of age at marriage.
Rosenzweig, 1978	Philippines (1968 NDS) 1,830 women 35-49	OLS	Years	HE = .022(0.65) WE = -.091(3.51)		Age of husband +, age of wife +, child wage +, regional infant mortality +, religion, contraceptive knowledge, predicted husband's wage, farm.	Husband's education may be biased slightly due to predicted wage; wife's education may be biased due to contraceptive knowledge.
Banskota and Evenson, in press	Philippines Laguna (1977) 320 rural households	OLS	Years	HE = -.049(1.43) WE = .172(3.31)		Infant deaths +, 1963 husband's wage, predicted wife's wage -, predicted child wage +, full income, land, home technology -, year married -, father's farm background +, mother's farm background, mother's nonfarm.	Compare results with next study. This specification has far more variables endogenous with respect to education so results are more biased.

Navera, 1978 (in Evenson et al., 1979)	Philippines Laguna (1977) 320 rural households	OLS	Years	HE = -.131(1.58) WE = -.182(2.07)		Wife's age at marriage, duration of marriage +, household income, wealth.	Wife's education underestimated due to age at marriage and duration.
SOUTH ASIA							
Chernichovsky, forthcoming	India (1968-69) 213 rural households (one village)	OLS	Husband's years Wife's literacy	HE = .058(0.85) WE = .341(0.952)		Log mother's age +, age at marriage -, agricultural income +, unskilled income +, skilled income -.	Wife's education biased positively by age at marriage; husband's education biased downward due to effect of his education on income.
Sarma, 1977	India (1970-71) 1,111 landed households 505 landless	OLS	Wife Some primary Above primary Matriculated Husband Primary or above	Landed -.247(0.89) [-.0029] -.599(1.66) [-.0040] -1.44 (2.57) [-.0039] .95 (6.90) [.1401]	Landless -.165(0.48) [-.0038] -.431(0.82) [-.0036] -.464(0.72) [-.0026] 1.19 (5.36) [.1726]	Age of wife +/0, child death rate +/+, value of livestock, cultivated area +, intensive development program, health center in village +/+, school in village, factory in village, household electricity -/0, distance to town 0/-, value of farm instruments	Careful effort to exclude endogenous variables. However, if education affects landownership, some selectivity bias may exist.
Chaudhury, 1977	Bangladesh Dacca (n.d.) 1,130 women	OLS	Years 1-5 6-9 Secondary BA MA	HE -1.03 (2.60) -0.64 (1.22) -0.548(1.00) -0.446(0.78) -0.39 (0.67)	WE -0.675(2.05) -0.953(3.32) -1.25 (5.04) -1.50 (5.56) -1.83 (6.67)	Duration of marriage, age at marriage, labor force status, income, exposure to mass media.[f]	Husband's, wife's education entered separately. Underestimates wife's education due to inclusion of age at at marriage.
Khan, 1979	Bangladesh (1968-69) 265 rural women 35-49 who want no more children	OLS	Years	HE = -.06 (1.00) WE = .13 (2.17)		(Dead children) +/+, (monthly income) +/+, (wife worked), land owned -/0, income adequacy -/-, age of wife, aware of family planning, nuclear family, age of wife at marriage 0/+, education of children +/0.[d]	See comments on next study.

APPENDIX TABLE (continued)

Region and Study	Sample: Location, Year, Size	Estimation Technique	Education Measure	Education's Effect and Significance (t values in parentheses) [elasticities in brackets]	Other Variables Included (sign if significant)	Comments
Khan and Sirageldin, 1979	Pakistan (1968-69) 269 women 35-49 who want no more children	TSLS	Husband's years Wife's literacy	HE = .04(0.10) WE = -.48(0.68)	(Number of dead children) -, (income), (wife worked) -, urban +, nuclear +, land owned -, house owned +, wife's age +, age at marriage -, know of family planning -, income adequacy -, education of children -.[d]	Wife's education underestimated due to other variables. Also possible bias due to selection of those who want no more children. See text.
De Tray, 1979	Pakistan (1968-69) 861 women 35-49	OLS	Years	HE = .38(2.00) HE^2 = -.09(2.10) WE = -.33(3.30)	Electricity +, house type +, rural, wife born urban, current age +, mortality +.	Only child mortality is likely to bias results.
Afzal et al., 1976	Pakistan Lahore (1973) 674 women	OLS	Levels	HE = -.037 (0.87) WE = -.234 (3.68)	Mortality rate, age of mother, marital duration +.	Age and marital duration are implicit control for age at marriage and bias may exist.
Sathar, 1979	Pakistan (1975) 4,949 women 15-49	OLS	Years Total Urban Rural	HE -.017(2.10) -.022(1.83) -.012(0.99) WE -.058(3.85) -.052(2.83) -.070(2.07)	Age +, age squared -, age at marriage -, mortality +, use of contraception +.	Wife's education probably underestimated due to age at marriage, mortality, and use of contraception.
MIDDLE EAST						
Zurayk, 1977	Lebanon (1976) 16 villages 1,050 women 15-44	OLS	Levels	HE = -.08(1.82) WE = -.06(2.73)	Duration of marriage +, number of child deaths +, religion -.	Education's effect probably underestimated due to mortality.
Kelley et al., 1980	Egypt (n.d.) 3,812 rural households	OLS	Wife Some primary (19%) Primary + (4%) Husband Some primary (23%) Comp. primary (6%) Above primary (8%)	.05(0.71) .02(0.15) .16(2.48) .15(1.35) .17(1.52)	Wife's age +, age squared -, age at marriage -, electricity +, child death +, personal assets, real assets +.	Age at first marriage and child deaths cause education coefficient to be biased.

Snyder, 1974	Sierra Leone (1966-68) 228 women 35-49	OLS	Levels	HE = .21(3.71) WE = -.19(2.17) HE = .19(1.56) WE = -.19(1.40)	Wife's working age, child survival -, age +. Wife's wage if working, labor participation, survival of children -, age, age squared -, child education.	Probable bias upward by child survival.
Ketkar, 1978 1979	Sierra Leone (1966-68) 1,999 women	OLS	Years	HE = .016(1.11) WE = -.011(0.61) WE_2 = .06 (1.03) WE^2 = -.006(1.17)	Wife's age +, number of adult females +, community infant mortality +, religion, residence, occupation, migration.	Careful use of reduced form.
Knowles and Anker, 1975	Kenya (1974) 1,073 women	OLS	Years	WE = .0256(0.697)	Years married +, urban -, nonfarm employment +, breastfeeding, household income, land owned +, other wife, community family planning.	None of the independent variables that are dependent on education are significant.
Kelley et al., 1980	Kenya (n.d.) 401 urban nuclear households	OLS	Husband Comp. primary Secondary Wife Comp. primary Secondary	 -0.32(-0.67) -2.82(1.83) -0.29(0.70) -3.88(2.72)	Child death +, income +, age +.	Probable bias due to child deaths, but female education is not significant in child death equation.

[a]Age at marriage is highly dependent on education, but more dependent on wife's education. The coefficients of husband's and wife's education on age at marriage in each region are shown below:

	NE	S	E
Husband's	.144	.214	.244
Wife's	.325	.322	.305

All values are highly significant, but adjustment of education coefficients is not possible given the specification.

[b]t values not reported, but result is significant at 5 percent level.

[c]This is the third specification. With an imputed wage added, husband's education has a positive coefficient and is marginally significant if the imputed wage is a reservation wage. In another paper, the author also used an imputed wage for the wife. In that case, wife's education had a value of -0.956, but a t value of only 1.55 (Anderson, 1978:146).

[d]Variables in parentheses are endogenous.

[e]This is not the regression equation focused on by Encarnacion. His focus was on a more complex equation (p. 125) which uses a threshold treatment. That treatment confirms the above: at low levels of education, there is a positive effect of education; at high levels, there is a negative effect. The threshold value is 2.75 years.

[f]Significance not reported for any of these variables.

12. If income or wealth is controlled, female education is significantly inverse to fertility in 46 percent of the cases, and male education in 29 percent. If there is no control for income or wealth, female education is inversely related 58 percent of the time and male education 20 percent. If wealth, income, or husband's education is controlled, wife's education is inversely related in 49 percent of the cases.
13. If age and marital duration are both in the equation, this is equivalent to including age at marriage.
14. The approximate comparisons are as follows: for Kenya, women 45-49 in 1962 and over 45 in 1977-78; for Indonesia, women 45-49 in 1971 and marital duration over 20 in 1976; and for Malaysia, women 35-44 in 1966-67 and duration over 20 in 1974.
15. This is not surprising since in most cases, the negative impact of education increases over the life cycle.
16. For all women, the average difference was 1.6 and for ever-married women 1.2.
17. Many control for residence by having samples restricted to urban or rural areas.

BIBLIOGRAPHY

Afzal, M., Z. Khan, and N. A. Chaudhry (1976) Age at marriage, fertility and infant-child mortality in a Lahore suburb. Part I, Pakistan Development Review 15(1):90-109. Part II, Pakistan Development Review 15(2):195-210.

Aghajanian, A. (1979) The relationship of income and consumption of modern goods to fertility: A study of working class families in Iran. Journal of Biosocial Science 11:219-226.

Anderson, K. H. (1978) The Effect of Child Mortality on the Quantity and Quality of Children in Guatemala. Unpublished Ph.D dissertation. North Carolina State University, Raleigh, N.C.

Anderson, K. H. (1979) Determination of Fertility, Child Quality, and Child Survival in Guatemala. Economic Growth Center Discussion Paper No. 332. Yale University, New Haven, Conn.

Banskota, K., and R. E. Evenson (in press) Fertility, schooling and home technology in rural Philippines households. Philippine Economic Journal.

Bulatao, R. A. (1975) The Value of Children: Philippines, Vol. 2. Honolulu: East-West Population Institute.

Buripakdi, C. (1977) The Value of Children: Thailand, Vol. 4. Honolulu: East-West Population Institute.

CELADE and CFSC (1972) Fertility and Family Planning in Metropolitan Latin American. Community and Family Study Center, University of Chicago.

Chaudhury, R. H. (1977) Education and fertility in Bangladesh. Bangladesh Development Studies 5:81-110.

Chernichovsky, D. (forthcoming) Fertility behavior in developing economies: An investment approach. In J. L. Simon and P. Lindert, eds., Research in Population Economics. Greenwich, Conn.: JAI Press.

Chernichovsky, D., and O. A. Meesook (1980) Regional Aspects of Family Planning and Fertility Behavior in Indonesia. World Bank Mimeo. World Bank, Washington, D.C.

Chi, P. S. K., and R. J. Harris (1979) An integrated model of fertility: A multivariate analysis of fertility differentials in Colombia. Canadian Studies in Population 6:111-125.

Cochrane, S. H. (1979) Fertility and Education: What do we Really Know? Baltimore, Md.: The Johns Hopkins University Press.

Davidson, M. (1973) A comparative study of fertility in Mexico City and Caracas. Social Biology 20:460-472.

De Tray, D. (1979) The demand for children in a "natural fertility" population. Pakistan Development Review 18:55-67.

Encarnacion, J., Jr. (1974) Fertility and labor force participation: Philippines 1968. Philippine Review of Business and Economics 11:113-144.

ESCAP (Economic and Social Commission for Asia and the Pacific) (1978) Population of the Philippines. ESCAP Country Monograph Series No. 5. Bangkok: United Nations.

Evenson, R. E., B. M. Popkin, and E. King-Quizon (1979) Nutrition, Work, and Demographic Behavior in Rural Philippine Households: A Synopsis of Several Laguna Household Studies. Economic Growth Center Discussion Paper No. 308. Yale University.

Findley, S. E., and A. C. Orr (1978) Patterns of Urban-Rural Fertility Differentials in Developing Countries: A Suggested Framework. Washington, D.C.: Office of Urban Development, Development Support Bureau, Agency for International Development.

Goldberg, D. (1976) Residential location and fertility. In R. G. Ridker, ed., Population and Development. Baltimore, Md.: The Johns Hopkins University Press.

Hermalin, A. I., and W. M. Mason (1980) A strategy for the comparative analysis of WFS data, with illustrative examples. In The United Nations Programme for Comparative Analysis of World Fertility Survey Data. New York: United Nations Fund for Population Activities.

Hull, T. H., and V. J. Hull (1977) The relation of economic class and fertility: An analysis of some Indonesian data. Population Studies 31:43-57.

Indonesia, Central Bureau of Statistics (1978a) Indonesia Fertility Survey 1976. Principal Report, Vol. I. Jakarta: Central Bureau of Statistics.

Indonesia, Central Bureau of Statistics (1978b) Indonesia Fertility Survey 1976. Principal Report: Statistical Tables, Vol. II. Jakarta: Central Bureau of Statistics.

Iutaka, S., E. W. Bock, and W. G. Varnes (1971) Factors affecting fertility of natives and migrants in urban Brazil. Population Studies 25:55-62.

Jordan, World Fertility Survey (1979) Jordan Fertility Survey, 1976 Principal Report, Vol. I. Amman: Department of Statistics.

Kelley, A. C. (1980) Interactions of economic and demographic household behavior. Pp. 403-470 in R. A. Easterlin, ed., Population and Economic Change in Developing Countries. Chicago: University of Chicago Press.

Kelley, A. C., A. M. Khalifa, and M. N. El-Khorazaty (1980) Demographic Change and Development in Rural Egypt. Paper presented at the Institute of Statistical Studies Seminar on the Demographic Situation in Egypt, Cairo.

Kenya (1966) Kenya Population Census, 1962. African Population, Vol. III. Nairobi: Statistics Division, Ministry of Economic Planning and Development.

Ketkar, S. L. (1978) Female education and fertility: Some evidence from Sierra Leone. Journal of Developing Areas 13:23-33.

Ketkar, S. L. (1979) Determinants of fertility in a developing society: The case of Sierra Leone. Population Studies 33:479-488.

Khan, M. A. (1979) Relevance of human capital theory to fertility research: Comparative findings for Bangladesh and Pakistan. Research in Human Capital and Development 1:3-43.

Khan, M. A., and I. Sirageldin (1979) Education, income, and fertility in Pakistan. Economic Development and Cultural Change 27:519-547.

Kiranandana, T. (1977) An Economic Analysis of Fertility Determination Among Rural and Urban Thai Women. Institute of Population Studies Paper No. 20. Bangkok: Chulalongkorn University.

Knowles, J. C., and R. Anker (1975) Economic Determinants of Demographic Behavior in Kenya. Population Employment Working Paper No. 28. International Labour Organization, Geneva.

Kogut, E. L. (1974) The Economic Analysis of Fertility: A Study for Brazil. Population and Employment Working Paper No. 7. International Labour Organization, Geneva.

Kuznets, S. (1974) Rural-urban differences in fertility: An international comparison. Proceedings of the American Philosophical Society 118:1-29.

Lee, B. S., R. E. Padcock, and B. F. Jones (1978) Development of an Econometric Fertility Model for Less Developed Countries: The New Home Economics Approach to Female Status and Age at Marriage and Fertility. First Draft. Interim Report prepared for the Office of Population Policy Development Division, Department of State, Agency for International Development.

Loebner, H., and E. D. Driver (1973) Differential fertility in central India: A path analysis. Demography 10:329-350.

Malaysia, World Fertility Survey (1977) Malaysian Fertility and Family Survey--1974. First Country Report. Kuala Lumpur: Department of Statistics.

Mason, K. O., and V. T. Palan (1980) Female Education, Fertility and Family Planning Behavior in Peninsular Malaysia. Unpublished manuscript. University of Michigan, Ann Arbor, Mich.

Michielutte, R., C. A. Haney, C. M. Cochrane, and C. E. Vincent (1975) Residence and fertility in Costa Rica. Rural Sociology 40:319-331.

Navera, E. (1978) Home Investment in Children in Rural Philippines. Paper presented at the International Center for Research on Women Workshop, "Women in Poverty, What Do We Know?", Elkridge, Md.

Rizk, H. (1977) Trends in fertility and family planning in Jordan. Studies in Family Planning 8:91-99.

Rodriguez, G., and J. Cleland (1980) Socio-Economic Determinants of Marital Fertility in Twenty Countries: A Multivariate Analysis. World Fertility Survey Conference, Substantive Findings Session No. 5, London.

Rosenzweig, M. R. (1978) The value of children's time, family size and non-household child activities in a developing country: Evidence from household data. Pp. 331-347 in J. L. Simon, ed., Research in Population Economics, Vol. 1. Greenwich, Conn.: JAI Press.

Sarma, M. T. R. (1977) The Economic Value of Children in Rural India. Economic Growth Center Discussion Paper No. 272. Yale University, New Haven, Conn.

Sathar, Z. A. (1979) Rural-urban fertility differentials: 1975. Pakistan Development Review 18:231-251.

Smock, A. C. (1980) The Relationship Between Education and Fertility in Kenya. Nairobi: Central Bureau of Statistics, Ministry of Economic Planning and Development.

Snyder, D. W. (1974) Economic determinants of family size in West Africa. Demography 11:613-627.

Stycos, J. M. (1980) Education, Modernity, and Fertility in Costa Rica. Unpublished manuscript. International Population Program, Department of Sociology and Center for International Studies, Cornell University, Ithica, N.Y.

Thailand, World Fertility Survey (1977) The Survey of Fertility in Thailand: Country Report, Vol. II, Report No. 1. Institute of Population Studies. Bangkok: Chulalongkorn University.

United Nations (1973) The Determinants and Consequences of Population Trends, Vol. I. Department of Economic and Social Affairs. Population Studies, No. 50. New York: United Nations.

UN/WHO Advisory Mission (1969) Pakistan: Report on the family planning program. Studies in Family Planning 40.

U.S. Agency for International Development (1978) Patterns of Urban-Rural Fertility Differentials in Developing Countries: A Suggested Framework. Washington, D.C.: Office of Urban Development, Development Support Bureau, Agency for International Development.

World Bank (1980) World Development Report, 1980. Washington, D.C.: World Bank.

World Bank (1981) Some Issues in Population and Human Resource Development in Egypt. World Bank Mimeo. Population and Human Resources Division, Development Economics Department, World Bank, Washington, D.C.

Wu, T.-S. (1977) The Value of Children: Taiwan, Vol. 5. Honolulu: East-West Population Institute.

Zurayk, H. C. (1977) The effect of education of women and urbanization on actual and desired fertility and on fertility control in Lebanon. Population Bulletin of the United Nations Economic Commision for Western Asia 13:32-41.

Chapter 35

EFFECTS OF SOCIETAL AND COMMUNITY INSTITUTIONS ON FERTILITY

Joseph E. Potter*

INTRODUCTION

In studies of the determinants of fertility, much more attention has traditionally been given to the characteristics of individuals, households, and families than to the characteristics of the environments in which they are found. This review attempts to delineate some of the questions that arise when the emphasis is reversed, and attention is focused on social and economic contexts and the institutions of which they are comprised. Such a perspective brings to the fore a vast and diverse subject matter with only a slight correspondence to identifiable niches in the literature on fertility, on the demographic transition, or even on population and development. The institutions in question range from such concrete entities as schools, churches, and local welfare systems to less tangible aspects of economic, social, and administrative organization. Their existence may be rooted in the local community, or stem from the national capital city; their influence on behavior is apt to work through a loose articulation that comprehends large portions of the more familiar socioeconomic determinants of fertility.

The discussion that follows is organized according to three distinct primary routes by which alterations in an institutional setting can be seen to elicit corresponding shifts in fertility:

1. by changing the economic costs and benefits of children;
2. by changing internalized values concerning the family, marriage and fertility; and

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3. by changing the social and administrative pressures bearing on the reproductive behavior of individuals and couples.

The approach is a crude one. The primary concern is with the objective reality of the incentives created by institutional arrangements and the messages transmitted by institutions and their agents. The complexities of decision making and behavioral response are beyond the scope of this review, as are important issues regarding the sources and functions of institutions.

In the discussion, considerable place will be given to illustrative examples of the sorts of questions that can and should be addressed by research on the institutional determinants of fertility. Given the limited amount of work that has been done on most of these, and the sorts of data that available studies have been able to marshal, only occasionally will it be possible to respond to the editors' injunction to indicate conclusions that can be safely drawn from the evidence. This might not have been the case if mainstream research on fertility in the past two decades--whether focused on the historical populations of Western Europe or contemporary societies of the South--had not been so singlemindedly preoccupied with the analysis of data collected from censuses and individual or household surveys. To make further progress in understanding the effects of societal and community institutions, a major effort will be required to collect the appropriate data; a recommendation along these lines is offered in the concluding section of the paper.

INSTITUTIONAL INFLUENCES ON THE ECONOMIC COSTS AND BENEFITS OF CHILDREN

Although it is altogether reasonable to suppose that institutions and institutional change play an important role in shaping the economics of fertility, the subject is inevitably complex and open to a wide variety of interpretations. The approach taken here is to consider the problem by separating the economic value of children into several components. On the benefit side, there is a distinction between the everyday labor that children contribute (both as children and as adults) towards production and household maintenance, and the value of children as sources of risk insurance and old age support. Costs of children, the third component, are seen as the opportunity costs attached to time spent by parents or others in childrearing and direct costs arising from expenditures on food, clothing, shelter, and education. Component by component, an attempt is made to delineate some of the more frequently mentioned ways in which institutional factors and arrangements influence the economic value of children, and what changes may be expected to take place in the course of development.[1]

The Labor Value of Children

The belief that the labor contributions of children are both needed and desired in pretransition settings is shared by almost everyone who has written on the economics of fertility. However, what determines differentials in the labor value of children between different contexts, and what determines change over time, are not so well established. The discussion below focuses on influences that derive from the social organization of production.

Familial or Household Production

In conditions characterized by relatively primitive technology, there is apt to be ample scope for the productive employment of child and family labor when production takes place within the household, or on land or in enterprises controlled by networks of relatives. This is a familiar and almost tautological thesis, but it is one that has important implications for the economics of fertility. In the past, familial or household production characterized a very large proportion of all economic activity in the Western world, and it probably still characterizes a substantial proportion of economic activity in the contemporary countries of the South.

A wide variety of institutional arrangements for economic production fall into the loosely defined category of familial or household production. In agriculture, smallholders, sharecroppers, tenant farmers, squatters, and those who farm communal or lineage lands would all qualify, with (temporary) wage labor providing the major exception. Elsewhere, one would think first of artisans and those engaged in cottage industry, but family-owned and (at least to some extent) family-operated enterprises clearly extend into industry, commerce, and various kinds of services.

Recognizing that definitional issues command a lot of attention in this realm, it may be worth noting that most delimitations of the "peasant economy" or "domestic mode of production" would constitute a distinct subset of the activities and arrangements listed in the preceding paragraph. Thadani (1980:19), for example, recently characterized the salient features of peasant social organization as "the dependence of the household on family labor, production largely for self consumption, for use rather than for exchange, and the combination of production, consumption, and reproduction within the household." In contrast, the present discussion will not exclude from consideration units that market a significant fraction of the goods they produce: peasant societies often have numerous forms of highly institutionalized exchange, and production for markets has been common in villages where modern or capitalist relations of production have made few inroads.

The peasant or household economy is generally seen as fundamentally different from the capitalist or commercial economy. Some of these distinctions are relevant to the way child labor and, thereby, fertility are evaluated by parents (and other relatives).

First, household production units do not maximize profits. Since labor is provided by the family, and family income is not divisible into wages and rents, the eventual tradeoff that determines the intensity of the use of the factors of production at the disposition of the household is between the "disutility" of additional work and the utility of additional consumption. Apart from differences in preferences, just how intensely factors will be used depends, of course, on the amounts of land, labor, and capital available to the household; the number of consumers it must support; and the amount of surplus that is extracted from the household by way of taxes, payments in kind to a landlord, or the like. It may also be said of the peasant economy that "assymetrical relationships to other segments in both rural and urban society" (Thadani, 1980:19) will ensure unfavorable terms of trade for peasant products in the overall or local market; thus peasants will tend to reduce the purchase of inputs and means of production to the lowest possible level, and take maximum advantage of their (abundant) labor resources (Schejtman, 1980:124).

Most economic and anthropological work on the peasant economy has emphasized the removal of surplus production by the politically powerful; whatever coercion and exploitation may exist in the internal relations of production of the peasant family has received relatively little attention. It is this apparent vacuum that provided Caldwell with the opportunity to make a host of far-reaching generalizations about the control of familial labor and consumption in peasant households. Caldwell's (1978:560) thesis is that, in the "familial mode of production," the powerful or the decision makers (usually elder males) use their authority to secure a host of advantages:

> They include consumption: the kind and amount of food eaten, precedence in feeding, the clothing customarily worn, use of house space and facilities, and access to transport. They include power and access to services: who can tell whom to do what; the right to be pampered and have the little services performed that make life graceful; the guarantee of support in argument, danger, or a bid for social or political power, and the right to make unchallenged decisions. They include labor: the amount of work done, the kind of work done, the right to control one's own working time, and access to leisure or to activities (such as bargaining) that give real pleasure.

If Caldwell is right, the economic calculus of peasant production units begins to look like that of a miniature capitalist firm, and is by no means as "antisurplus" as has often been maintained.

A final aspect of the logic of the peasant economy has to do with its reproduction. The length of time that children will work for their parents is influenced by the requirements for establishing a new productive unit (household). When the nuclear family is an independent unit of production and the inheritance of land is a critical factor, parents may benefit directly from their children's labor for their entire lives. In the gerontocratically controlled kinship groups prevalent in African societies, since the lineage

elders retain their prerogatives until death, a similar result may obtain, but without the nuptiality check implicit in the previous case (Lesthaeghe, 1980). In the case of the protoindustrial households of historical Europe, however, the requirements for forming a new productive unit were slight, and children tended to leave the household at a relatively early age. "Employment in proto-industry provided the means to a livelihood not contingent upon customary practices of retirement and inheritance" (Thadani, 1980:45); thus the period during which parents could benefit from the labor contributions of their children was cut short. Considering the range of land tenancy arrangements to be found in developing countries, the variations here would seem to be endless.

In synthesis, the expected economic value of the labor contributions of a child in a peasant economy will vary with the economic and demographic circumstances of the particular household or family, and with the characteristics of the relations of production in the setting under consideration. The implications of this conclusion for fertility, however, are not as straightforward.

At one extreme is Caldwell (1978:554), who writes that "as long as the internal relations of the familial mode of production remain intact, marital fertility will not be restricted for the purposes of limiting family size." His basis for this statement seems to be a belief that, as long as children can be exploited, there is no danger of their consumption requirements exceeding their marginal productivity. In short, children are either exploitable and economically worthwhile, or they are not; if they are, it makes economic sense to have as many as possible. Needless to say, this sort of theorizing raises the hackles of those who are convinced of "the intrinsically 'antisurplus', 'non-maximizing' basis of household enterprise" (Thadani, 1980:20).

The notion that child labor represents an argument for limitless high fertility in the domestic mode of production has recently been challenged. Both Thadani (1980) and Smith (1981) have made use of the example of a sizeable proportion of peasant households in historical England sending their adolescent children away to work as agrarian servants in the households of others, who for the most part were not their kin. The apparent motivation was to restore balance between the consumption requirements of the household and its productive capacity, rather than to secure additional income by way of obliging the children to return their earnings to their parents (Smith, 1981:605).[2] Cain (1981a:7) has made a similar point about the market for servants in the rural societies of South Asia. In particular, he has emphasized that "one can purchase labor, including child labor, for practically any service or activity," and that this alternative is often an inexpensive way to meet seasonable labor demands.

Modern Organizational Forms

Although the number of children that provides a peasant household with an optimal balance between its productive capacity and its consumption requirements may vary between contexts, it seems clear that household or familial production generally offers greater opportunities for parents to benefit from the labor of their children than do other forms of production.

The polar opposite of familial or household production would seem to be "modern" organizational forms in which the means of production are owned and controlled either by private entrepreneurs or by the state, and labor is supplied by individuals in exchange for monetary compensation. The characteristic of these forms of production which most decreases opportunities for the productive employment of children is the fundamental separation between family and economy that they entail: labor contracts are with individuals rather than families; moreover, the place of work is no longer the place of residence, so that there is a differentiation between childcare and the supervision of child labor. Of course, in reality, the purely institutional effects of new forms on child labor will be complemented by the effects of the shifts in technology, mechanization, specialization, and required skill levels that are associated, in the first place, with the shift in organizational forms.[3]

On the other hand, although one can be reasonably sure that the labor contributions of children will be considerably diminished when virtually all production is organized along moderns lines of one type or another, and although this is in effect what eventually came to pass in the now developed countries of the North, it is by no means certain that the changes in the relations of production that are currently taking place in many countries of the South have similar implications. For one thing, as Caldwell (1978:568) has pointed out, "the transformation from familial to capitalist production is a process rather than a sudden change. What is formed first and is sustained for long periods of time is a two-tiered system in which the two forms of economies coexist." With respect to the historical experience of Western Europe, he goes on to note that "at the early stages only the husband participated in the capitalist mode of production; services within the house were provided on a subsistence basis by a familial mode of production not very different from that found in the peasant household." This sketch bears an obvious similarity to descriptions of what is taking place today in many countries of the South, especially where wage labor is combined with subsistence farming on "private plots" of one sort or another.

Moreover, not all of the changes in the relations of production taking place in the Southern countries involve an increase in wage labor. McNicoll (1978a:137) has written that "forced occupational diversification out of agriculture into micro-scale trading, fodder or fire-wood gathering, and the like, creates a self-employed class without capital--in status even below the proletariat--competing both within itself and with increasingly favored townbased enterprise." In both rural and urban settings, a wide range of intermediate or

peripheral organizational forms have emerged that are neither classic cases of familial production nor reasonable facsimiles of modern capitalist or socialist modes of production. Although the economic activities of children in such settings have not been thoroughly studied, there is evidence, at least for Latin America, that children make significant contributions to the family economy of the marginal self-employed (e.g., Garcia et al., 1982).

Despite the fact that the changes in the relations of production taking place in the South are complex and unstudied, there are important cases to be found where these changes are having a significant impact on opportunities for exploiting child labor. This discussion concludes with two agricultural examples where major changes in the social organization of production seem to be having just such an impact.

Over the past two decades, the structure of Brazil's agricultural economy changed dramatically as the country became one of the world's greatest agricultural exporters. This metamorphosis--achieved at the cost of increased resource concentration, shortfalls in domestic food supply, and ecological deterioration--led to new patterns in the organization of agricultural work and a dramatic increase in temporary wage labor, known commonly as "boia fria" (Saint, 1981).

In Brazil, the system replaced by a capitalist agriculture based on mechanization, modern inputs, and temporary wage labor was that of fazendas, large landholdings cultivated by resident tenant farmers under arrangements that permitted landowners full access to family labor, and provided tenants (parceiros and moradores) with income from the commercial harvest that varied directly with the number of workers in the family. Presumably, larger families also had the advantage of economies of scale in domestic food production and suffered no disadvantage in terms of housing, which did not represent a financial cost (Carvalho et al., 1981; Paiva, 1982).

Somewhat surprisingly, there is some debate about whether the advent of boia fria has led to more or less exploitation of child labor than existed on traditional fazendas. The idea that child labor has increased may stem from a misguided tendency to compare the Brazilian example of proletarianization to that which took place in historical Europe with the development of protoindustry. It may also be inspired by census and survey data showing increased participation of children in the agricultural labor force (Saint, 1981); however, this probably just reflects the fact that children who work for wages are more likely to appear in such statistics than those who participate in family production. In fact, it seems probable that the boia fria has led to a rather drastic reduction in opportunities for child labor for several reasons: the labor contracts are made on a short-term, individual rather than a long-term, collective basis; the distance between place of work and place of residence has greatly increased; and greater speed and skill are demanded of workers. This shift in labor relations has been identified as one of the important determinants of the rapid fertility decline now taking place among the poorer segments of the Brazilian rural population (Carvalho et al., 1981; Paiva, 1982).

Another example of a diminished role for child labor is provided by a study of village and family life in contemporary Kwangtung province recently conducted by Parish and Whyte (1978). In the years following their military triumph, the Chinese Communists carried out land reform, the collectivization of agriculture, and then the formation of people's communes. The economic and political organizations that emerged are radically different from the systems that existed prior to 1949. The new organizational unit is the production team, a group of about 20 to 40 households that corresponds in most cases to a village. Landholdings are of two types: the bulk of the best land is collectively held and controlled by the production team, and the rest is allocated as private plots to individual households. Individuals are given points for work in the collective fields; these amount to income credits that are eventually paid in cash if a positive balance remains after deductions for payments in kind (grain allowances) and cash advances. Although points are awarded on an individual basis, accounting is by household, and it is usually the household head who receives the lump sum payment at the end of the year. One of the most important changes in the lives of children has been the advent of compulsory primary education. As Parish and Whyte (1978:228) point out, "the major economic consequence of children attending school is not the cost of tuition but the lost labor the children could provide." Even so, children provide a considerable amount of labor to the household: before they begin to attend school by aiding with childcare and other duties, while attending school by dedicating their spare time to household chores and/or work on the private plot, and after completing school by contributing work points earned in regular fulltime labor in the collective fields.

Although the structure of production in Kwangtung province clearly includes both traditional and modern elements, there are some parallels with the Brazilian case. There is at least limited separation between place of work and place of residence; moreover, since both parents are apt to be actively engaged in field work for the production team, the possibilities for supervising the work of children in domestic endeavors are greatly limited. Perhaps the other major change is in the length of time that a son or daughter will remain economically active in the parents' household. In the pre-1949 scheme, a son labored on the family farm after marrying and until it became his through inheritance or the father's retirement; similarly, after marriage, a daughter worked for her mother-in-law in the household of her husband's family. As Parish and Whyte (1978:133) note, "land reform and collectivization have curtailed the economic authority of the father and his power and desire to keep sons together under his rule." Finally, it may be speculated that specialization and increased skill levels not only made possible the impressive increases in rice yields documented by the authors, but also reduced opportunities for the productive employment of children, at least on collective lands.

Children as a Source of Risk Insurance and Old Age Support

The value of children to their parents as a source of economic support in old age is a familiar theme in fertility theory (e.g., Caldwell, in these volumes); somewhat less familiar is the value of children as a source of insurance against various risks. In both cases, children are a source of income when the regular earnings of the parent(s) are reduced or eliminated. The drop in income with old age is foreseeable, although there may be considerable uncertainty about the timing and duration of the required support; risk insurance relates to any unforeseeable drop in income that might result from, say, a natural disaster like a drought, from an illness, or from the closing of a factory.

The value of children as a source of economic security clearly depends on what alternative forms of insurance are available, as well as on the gravity of the risks parents face. In the course of development, there are likely to be important changes in both of these variables, with institutional factors playing a major role. For example, the development of capital markets would have a clear effect on the value of children as a source of both old age support and insurance against natural disasters.[4] Given efficient credit institutions, parents are able to accumulate financial assets through savings and interest during good (productive) years, and to borrow at similar rates of interest or draw down savings during bad years (in their retirement). Institutional change can also directly affect the risks to which families are exposed. For example, development of effective law enforcement and adjudication within an effective system of economic administration would help to protect against the violation of property rights, the risk of depredation, and the threat of physical violence.[5]

In a recent paper, Cain (1981b) analyzed the insurance value of children in four poor agricultural villages in South Asia, three in India, and one, Char Gopalpur, in Bangladesh. One of his principal conclusions is that children, particularly adult males, are a vital source of risk insurance in Char Gopalpur, but they have little or no such value in the Indian villages. According to Cain's analysis, this difference can be attributed almost totally to institutional factors.

To begin with, two critical aspects of the Bangladesh social setting make Char Gopalpur a much higher-risk environment than the Indian villages. First, Char Gopalpur's system of patriarchy and division of labor by sex effectively excludes women from most wage employment and from cultivation of their own land; thus the consequences of the illness or death of the principal male provider are greatly intensified. Second, because there is no credible system of justice and law enforcement in rural Bangladesh, there is more lawlessness and a greater likelihood of property loss through either outright expropriation or fraud.

The second important difference between the Indian and Bangladesh villages is that the former offer several possible sources of risk insurance, whereas in Char Gopalpur parents apparently have almost no alternative to children (especially adult male children) as a means of

reducing economic vulnerability in times of stress. The Indian villages have well-functioning credit cooperatives, and villagers have been able to obtain public relief employment in periods of prolonged drought. In Char Gopalpur, the major way of adjusting to severe economic stress due to either bad weather or widowhood is the sale of land. Cain argues that this can only be interpreted as the worst outcome next to loss of life. As the last step in his analysis, he observes that fertility is now low and declining in the Indian states of Maharashtra and Andhra Pradesh. He notes that Bangladesh, in contrast, "has one of the highest and most unyielding fertility rates in all of South Asia" (Cain, 1981b:467).

In contrast to the Cain study, two examples may be cited in which a relationship between fertility decline and the availability of alternate, institutional forms of security was not observed. First, the Parish and Whyte (1978) Kwangtung study provides a vivid example of planned institutional change producing, albeit somewhat inadvertently, a major decline in fertility; however, this institutional change did not result in a significant curtailment of the role of children as providers of old age support. Parish and Whyte state categorically: "For the vast majority of old people in rural Kwangtung, support is the obligation of the family, not of the collective or the state" (p. 76). The responsiblity lies almost entirely with sons, and may or may not involve living in a stem family arrangement with the aged parents. The authors also note that the relationship between sons and economically dependent parents who have retired from field labor is, in most cases, seen as mutually beneficial, since older relatives can assist in childcare, domestic chores, private-plot work, and other activities. This is in marked contrast to many higher-income developing countries such as Singapore, where most parents do not expect to rely on their children for old age support, but rather on their personal savings (Fawcett and Khoo, 1980:569). In this respect, there is also a big difference between Kwangtung and Char Gopalpur. In China, all is not lost for parents with no surviving sons since they are eligible for "five guarantee support" in their old age. This is seen not as a substitute for family support, but as something to fall back on together with private endeavors such as raising chickens and tending a private plot. The communist revolution in China has produced some institutions that have done away with many of the traditional dangers to family incomes, and others that constitute effective insurance mechanisms. However, in an environment that is still very poor and harsh, many risks remain, and children in Kwangtung continue to help out their parents, for example, when they have run short of grain or become ill or lame. Thus although the Chinese revolution clearly reduced the "indispensability" of children as a source of risk insurance and old age support, it did so without losing the benefits of the traditional system and without going to the expense of replacing it.

Another somewhat anomalous illustration of institutional influence on the value of children as sources of risk insurance and old age support is offered by Smith's (1981) study of historical England. Smith argues that the welfare institutions operating from the late

sixteenth through the first half of the nineteenth century did much to make children redundant as a means of dealing with "nuclear family hardship." Furthermore, in marked contrast to contemporary China, a large proportion of the poor seem to have spent their old age as dependents of the parish whether they had adult children or not. The striking fact about this case, however, is that marital fertility remained high in England until the late nineteenth century. The onset of controlled marital fertility came much later than in other European societies where the role of children as a source of economic security was presumably greater.

Costs of Children

Before evaluating how institutions may influence the economic costs of children, it is important to define what is meant by costs. First of all, in the framework of this paper, benefits and costs are considered separately; no attempt is made to balance the two in some net measure. Second, following the logic of the microeconomists, the concern here is with price influences rather than with changes in the amount of time and resources parents invest in their children as a result of changes in their tastes or incomes. This distinction is important in that it excludes from the present discussion "Caldwell effects," whereby parents gradually decide to grant their children a larger share of family consumption as a result of changes in the cultural environment.

Although the composition of child costs will vary greatly from setting to setting, it will usually include a mix of the following:

a. food and other material goods such as clothing, shelter, and toys;
b. services--principally formal education and health; and
c. time, such as that spent on general childcare (including breastfeeding) and at-home training and instruction.

Food Costs

Among the material inputs to childrearing, food seems to merit special attention. Household budget studies in many parts of the world have confirmed the "food intensity" of children (Lindert, 1980:29), and in very poor settings the cost of food may dominate that of all other inputs together. It is therefore at least possible that institutional arrangements affecting the cost of food could in turn affect fertility.

An interesting attempt to develop and explore this hypothesis in the context of the Brazilian Northeast has recently been made by Almeida (n.d.). Her analysis focuses on the cost of two alternative "investments in the future"--land, on the one hand, and children, on the other--and on how the relative prices of these two assets depend upon the terms under which a family has obtained access to the means of production. There are four predominant land-tenure arrangements in

this part of Brazil, and over 60 percent of agricultural laborers are either posseiros (squatters), minifundistas (small landowners), parceiros (sharetenants), or moradores (sharecroppers). The data used for the study were collected in several municipios of a hot, semi-arid region called the sertao, where cotton and cattle are the main cash-earning economic activities, and in a township characterized by heavier rainfall, shallow topsoil, and slash-and-burn agriculture in the state of Maranhao. Farming is a very risky proposition throughout these areas, with droughts a perennial threat in the sertao, and with soil erosion and the onrush of weeds making it imperative to change locations frequently in the pre-Amazonic Maranhao region.

In the event of a bad year, tenant farmers, squatters, and small landowners employ quite different strategies. Almeida's argument takes special account of the credit systems operating in the region. Tenants on large farms may obtain food on credit throughout the course of the year, and repay their debts in kind at harvest time. Small landowners and squatters, on the other hand, have only local usurers to finance their consumption. Thus the interest cost of food is considerably lower for tenants than for other agricultural laborers. Almeida goes on to argue that tenants are also at an advantage in the subsistence production of beans and corn since landlords provide them with an elastic supply of land that increases with household size; thus they never encounter the diminishing returns that small landowners and squatters must contend with as their families grow. Tenants, however, are not in a good position to acquire their own land. The cost of land is money, and tenants have no special advantage in acquiring financial credit. Indeed, their lack of any collateral places them at a disadvantage with respect to those who already own some land. These considerations lead Almeida to predict that sharetenants would want and have more children than other rural residents in the study areas.

The empirical analysis supports this prediction, and also indicates that tenants are somewhat less conscious of the cost of children than are small landholders or squatters. Since the available data are from a pilot survey of a small population, these conclusions are only tentative. However, perhaps the most attractive contribution of the study is its careful delineation of one of the ways the Brazilian sharetenancy system promotes high fertility. With respect to landlord-tenant relations, Almeida's argument clearly complements the child-labor thesis discussed above.

Education and Health Services

Demographic considerations may play a limited or negligible role in discussions of the important issues of equity, efficiency, and administrative feasibility involved in providing basic services such as education or health care. However, by way of the fees that they do or do not charge for their services, schools, hospitals, and health clinics may have an important impact on the cost of children. When demographic incentives are purposely built into a price structure, as

for example in the case of delivery fees in Singapore, a certain amount of research attention is likely to focus on the fertility impacts of those incentives (e.g., Fawcett and Khoo, 1980). Less attention, however, has been given to the finding that "some important (but unknown) proportion of the cost of rural schools is borne by the parents of students" in contemporary China (Parish and Whyte, 1978:80). Indeed, in most of the voluminous literature on the links between education and fertility, there is very little to be found on the elementary question of what schooling costs parents (e.g., Cochrane, 1979).

Time Costs

A consistent finding of time-use surveys the world over is that "the mother's childcare time far outweighs that of the father and accounts for most of the total care time, regardless of socioeconomic class or nation of residence" (Lindert, 1980:38). Since the opportunity cost of a mother's time depends on the economic activities that she would be able to engage in were she not rearing children, it seems likely that patriarchy--defined as a set of social relations with a material base that enables men to dominate women--suppresses the cost of children in societies such as Bangladesh. Here again Cain's work on Char Gopalpur is particularly illuminating. There he and his colleagues find that the "same patriarchal structures that force (women) into relative seclusion in the household compound also deny them access to most forms of market work" (1979:411). Although Cain is careful to point out that the pronounced labor market segregration found in this setting is "not simply a neutral accommodation of women's childrearing role," it seems clear that the opportunity costs of childcare would rise considerably if this segregation were removed (see Standing, in these volumes).

In addition to discrimination against women in various forms, other institutional developments that might have an important influence on the opportunity costs of children are those that affect the sharing of childcare in large family-based groupings or the availability of domestic help (Oppong, in these volumes).

INSTITUTIONAL INFLUENCES ON FERTILITY-RELATED VALUES

Beliefs, attitudes, and motivations are prominent among the recognized determinants of fertility (see Mason, in these volumes; Fawcett, in these volumes). They clearly affect the way people react to changes in institutional settings such as those discussed above and are sometimes said to have an important independent influence on fertility.

Many survey questionnaires have been designed to collect information on fertility-related values. The crude attempts of the first KAP surveys have recently given way to more sophisticated efforts such as the Value of Children surveys. In these analyses, much attention has been focused on the associations between particular

value orientations and such variables as educational achievement, urbanization, and industrial employment. Although the reasons for such associations are not always made explicit, the rationale often has to do with the influence of the individual's institutional context. This is, to be sure, a very indirect way of testing hypotheses about the influence of certain institutions on fertility-related values; a more direct approach would involve studying the institutions and their agents to find out what sort of messages they actually transmit.

Of course, there is debate over the sorts of ideological influences that are eventually related to fertility. Attention is restricted here to influences related to two areas of clear importance: family life and appropriate reproductive behavior. The discussion examines the role of institutions as agents of ideological change in each of these areas, albeit in a highly simplified manner. The focus is on the content of the images or messages transmitted, with no attempt made to explore how these are incorporated into norms or decision-making processes. Similarly, the difficult background questions of how different institutions relate to each other and why they "say" what they do are largely ignored.

Images of Family Life

Caldwell takes values very seriously, and has not limited his attention to survey data. In advancing the thesis that mass education has done a great deal to destroy traditional family morality, and thereby to generate new patterns of fertility behavior, he has focused his analysis directly on the institution of education itself. The framework of family morality that he believes is under attack is one "which enjoins children to work hard, demand little, and respect the authority of the old. Under this system, the patriarch, as head of the family, exercises authority. Children are employed from an early age and are valued as an addition to the work force" (Caldwell, 1980:226). As long as domestic production of goods and services remains important, this system makes high fertility beneficial to parents.

Caldwell is quick to recognize two economic mechanisms through which education has an impact on fertility--by reducing "the child's potential for work inside and outside the home" (p. 227), and by increasing the cost of children. However, he rests the bulk of his case on three ideological effects. First, schooling creates dependency: it is responsible for the social construction of children as dependents, where they were previously regarded primarily as producers. Second, "schooling speeds up cultural change and creates new cultures" (p. 228); these cultures, oriented towards a capitalist economy, are in conflict with the morality of the domestic mode of production. Third, the school is the major instrument "for propagating the values . . . of the Western middle class" (p. 228). Caldwell also identifies a particularly devastating idea conveyed by national education systems: the ethic that one has to do things for

the good of the country rather than for the good of one's father or parents.

In his analysis, Caldwell focuses on school books, curricula, and the impressions of teachers and school administrators. He notes that there are exceptions to the general rule, such as Catholic schools that "taught and implied the need for more traditional (and more authoritarian) family relationships" (p. 234); however, he does not take up the question of why these schools teach a different family morality.[6]

Parish and Whyte's (1978) Kwangtung study can be used to "test" several of Caldwell's hypotheses. Most of the prerequisites for a powerful "Caldwell effect" would seem to be present. First, there was an impressive increase in school enrollment: before 1949, a minority of rural males and a few rural females received schooling; currently, almost all youths of both sexes receive some education. Moreover, in China, schools are considered a major source of moral and ideological training, and official Chinese policy on intrafamily relations would seem to be very much at odds with the traditional family morality that prevailed before the communists came to power: there is an emphasis on more egalitarian marital relationships, and parents are expected to encourage children's awareness of their extrafamilial obligations. However, education in Kwangtung province does not seem to have produced the dramatic conflict between the generations that Caldwell posits. Parents do not view their children's schooling as a threat, and new ideas can apparently be accepted without a weakening of family ties and roles.

On the other hand, the educational system seems to have adapted in important ways to the local environment; moreover, "school authorities take pains not only to avoid conflict with familial authority but to stress values that parents strongly approve of: hard work, discipline, harmonious relationships with others, and helpfulness around the home" (Parish and Whyte, 1978:232). On the other hand, those changes in intrafamily relations that have occurred seem to accord well with the new institutional realities. For example, new wives, who now have the opportunity and obligation to earn income laboring on the team's fields, no longer serve their mothers-in-law like domestic slaves until they demonstrate their son-bearing abilities. Sons may be somewhat less fearful of their fathers than in earlier times, but no longer will they spend an important fraction of their adulthood working on the family farm under their father's supervision.

A reasonable conclusion might be that, although family life has undergone some change in Kwangtung, the introduction of mass education has been in relative harmony with that change. It does not seem to have had the destructive impact on family morality that Caldwell posits.

Appropriate Reproductive Behavior

While entities such as schools, enterprises, and the media may promote or propagate a wide variety of values that affect fertility indirectly, a smaller number of institutions are likely to attempt to influence the way people think about fertility itself. Organized religion is clearly one of these. In numerous studies of historical Europe, it is argued that the Church has had an important influence on the timing and speed of the fertility transition. In a paper reviewing the results of the European Fertility Project, Coale (1973) identifies the moral acceptability of birth control as one of the three conditions necessary for a major fall in marital fertility. In a similar vein, Lesthaeghe (1980:537) assigns an important role to secularization and to changes such as those that took place in England, where "the Churches gradually accommodated to the altered facts of life without a strong fundamentalist revival, thereby allowing fertility to fall more closely in line with what one might expect on the basis of formal economic reasoning."

Organized religion is undoubtedly an important arbiter with respect to the moral acceptability of birth control in many societies of the contemporary South. Yet perhaps just as frequently, its competence in this realm is being eroded by the increased importance of the medical community. A recent investigation in Brazil provides interesting evidence about the changing prominence of different institutions in propagating and sustaining values regarding appropriate reproductive behavior. This is a valuable case for present purposes since it is not complicated by the influence of a national family planning program.

The Brazilian National Survey of Human Reproduction (PNRH), unlike most fertility surveys, was focused on only nine municipalities.[7] In each of these, a study of different aspects of the community was undertaken before a representative sample of households was drawn and their members interviewed. The community studies included a component that, by way of extended structured interviews with agents and clients of a variety of institutions, attempted to determine whether organizations such as churches, private businesses, the media, schools, and the medical community were attempting to influence reproductive behavior. A few generalizations that seem to apply to most of the municipalities can be summarized here.

In a country where, at least nominally, most of the population is Catholic, the Church could be expected to have an important influence on attitudes toward fertility limitation and modern contraception. That, however, does not seem to be the case in these communities in contemporary Brazil. In addition to the apparent atrophy of the Church itself, there is no uniformity of opinion among priests, and there are indications that attitudes are rapidly changing to a "hands-off" approach to the question of birth control. A common stance is that of "responsible parenthood": each case is taken individually, and couples should try to find the proper balance between economic pressures and their obligation to reproduce. The question of birth control methods, more often than not, is recognized

as a problem outside the province of the priest; Lamounier (1981:19) interprets the trend as a gradual transfer of responsibility for the matter to the broader medical community.

On the other hand, medical institutions and doctors in particular were found by the PNRH researchers to be eager and willing to provide both counseling and services with respect to fertility limitation. In fact, given that Brazil has no official policy to curb population growth and devotes few resources to government health programs, medical institutions in that country seem to do a remarkably effective job of legitimizing modern contraceptive methods and promoting their widespread use.

INSTITUTIONAL PREREQUISITES FOR THE SOCIAL REGULATION OF FERTILITY

The previous two sections have focused on how institutions can have a more or less direct impact on reprodutive behavior, either by contributing to the incentive structures faced by individuals and families, or by influencing the normative values of a community and its members. This section turns to a slightly different set of issues related to the social control of fertility. Here a distinction is drawn betwen local efforts to either restrict or increase natural population growth, and fertility policies designed and implemented at the national level. With respect to the former, the question asked is what sort of insitutional arrangements are likely to foster social regulation of fertility at the community level. With respect to national policies, the focus is on institutional prerequisites for effective implementation.

Local Fertility Policies

In all but the most primitive or otherwise exceptional circumstances, it can be taken for granted that fertility has social consequences. That is, the reproductive behavior of individuals in one way or another affects the welfare of other people. To the extent that the overall fertility level of the population residing within a geographically bounded local community affects the collective welfare of the members of that community, or at least the welfare of established interest groups within the community, there is good reason for establishing some sort of "social regulation" of the phenomenon.

NcNicoll (1975) has argued forcefully that conscious community-level regulation of fertility is important both in explaining historical experience and in designing effective population policies in the countries of the South. He has been particularly concerned with identifying the characteristics of local organizational forms that are likely to elicit social incentives and sanctions that encourage demographic restraint. He suggests that, in addition to having a legitimate internal administrative structure or some less formal means of influencing its members, a community is likely to be successful in this regard if it is small, closed, and autonomous, and

if its members can at least partially identify their own interests with those of other members. The advantage of smallness is that it permits face-to-face contact--a frequently mentioned requirement for effective social control. Communities able to regulate in-migration can benefit from restrained fertility without fear that their success will be offset by an influx of new entrants; similarly, a community that can transfer its unemployment problems to other parts of the society through out-migration will have little incentive to "invest" in local fertility control. A village's self-regulating capacity is likely to be enhanced if its authority is not crippled by "alliances such as large kin groups that extend over village boundaries and compete with village economic functions" or by "government apparatuses that extend down to the village (and interfere) with intra-village relations." Finally, the felt need for cooperative effort in addressing mutual problems is likely to be greatest where "all member households have a stake in the village economy" (p. 16).

McNicoll's policy orientation directs his attention away from communities in which economic advantage and political authority have been concentrated among a few members, and local efforts to regulate fertility have been decidedly pronatalist. The list of prerequisites for the emergence of social control along these lines is notably shorter. Again, however, an open population severely limits the incentive to invest in reproductive policy of any kind.

Several of the papers cited earlier in this discussion make some reference to social controls operating at the local level for the benefit of the ruling group. Lesthaeghe notes (1980:530) that "appropriation of resources takes place . . . at very early stages of social organization. Such an appropriation leads inevitably to inequality with respect to access to resources, and its maintenance (both as a short-term and a long-term goal) implies the imposition of restraints and the emergence of social controls". Caldwell (1978:568) includes this resounding statement: "It is not the factories and the steel mills that count in the reduction of fertility; it is the replacement of a system in which material advantage accruing from production and production flows to people who can control or influence reproduction by a system in which those with economic power either gain no advantage from reproduction or cannot control it." Indeed, the African lineages that Lesthaeghe refers to and the haciendas described by Almeida could both be taken as cases of community level fertility control.[8]

The problem of demonstrating a link between particular characteristics of local-level organization and the emergence of social regulation of fertility clearly does not lend itself to easy empirical tests. As McNicoll (1980:449) himself admits, "persuasive post hoc theorizing is essentially the present state of the art." As examples of communities in which social or administrative pressures have been mobilized to advance the collective demographic interest, he has taken up the cases of Tokugawa Japan (1975), China in the 1950s (1975), contemporary Kwangtung province (1980; based on Parish and Whyte, 1978), and Bali since the late 1960s (1980). He also presents Bangladesh as a case where dysfunctional social organization has

prevented the emergence of community interest in fertility (1980; based on Arthur and McNicoll, 1978).

The late fertility transition in historical England, because of the controversy it has stirred, may serve as a useful basis for further speculation about organizational forms and community-level regulation of fertility. Several elements of the English institutional setting are critical to the interpretation offered here. Foremost is the presence of very marked class differentiations: there was a readily identifiable elite in this society that retained economic and political power as well as social status. Next are the institutions highlighted in Smith's (1981) analysis. The first of these is agrarian service, whereby "so many young people in this society spent many years between the onset of sexual maturity and marriage residing and working in households of others who for the most part were not their kin" (p. 603). The second is parish relief, which served as "a system of social welfare to buttress households and individuals whose self-sufficiency was frequently impaired," and which "required a local revenue-gathering and re-distributional system of considerable sophistication" (p. 608). A third development highlighted by Smith is the growing importance of markets, wage labor, and the monetization of exchange. A prominent feature of the English institutional setting hardly mentioned by Smith is the strict administrative control exercised over such matters as the enforcement of labor, the prohibition of vagrancy, and restrictions on the physical mobility of labor. A last feature, emphasized by Lesthaeghe (1980) if not by Smith, is the existence of a strong, unified church.

The primary unit of social, economic, and political activity was the parish or village. This unit was small, territorially bounded and closed to migration. Within it, economic, administrative, and moral authority was concentrated in the hands of a well-defined few. Moreover, English village society exhibited a remarkable amount of organizational coherence, with a notable absence of conflicting or overlapping alliances or interest groups. Indeed, it seems likely that agrarian service and parish relief did quite a bit to preempt the emergence of kin-based alliances that might compete or interfere with the established village power structure. The institution of service certainly weakened ties between parents and their children, while the ready availability of community support for the casualties of "nuclear family hardship" such as widows, the disabled, and the aged meant that there was no need for kin groups to serve as a welfare agency in this society.

Parish relief and the system of taxes and transfer payments it entailed also seem to have created important incentives with regard to marital fertility: if this institution downgraded the need for children as a source of risk insurance and old age support, it also did much to reduce the cost of childbearing. Smith (1981:608) notes that "it is frequently possible to observe persons excused from rate payments while they contended with the presence of a youthful and expensive family on fixed household resources only to contribute more heavily as their children left home," and that "those with few family

dependents who were economically active gave to those with costly dependents or those who were economically inactive." The effect was clearly to take the weight off the nuclear family and to spread the cost of fertility over the wider community, thus removing or at least diminishing economic incentives for couples to control marital fertility.

The institutions of English village society also seem to have fit together in a remarkable way that yielded late (if variable) age at marriage--what Lesthaeghe (1980) refers to as the nuptiality valve. Age at marriage, on average if not for individuals, was effectively controlled by two rules. The first was the rule that "after marriage a couple was in charge of their own household" (Smith, 1981, drawing on a forthcoming paper by Hajnal); that is, the newly formed nuclear household was economically independent of the families of both the wife and the husband. The second rule, really a supplement to the first, concerned the minimum economic standard that a new family was supposed to meet by having acquired a certain amount of capital (physical or human), and/or a suitable "economic niche."

Controls of these sorts were certainly convenient for the rate payer in a parish. Most immediately, through the influence of nuptiality on the level and age pattern of fertility, they limited the number of child dependence allowances. Equally important, if less direct, was the effect that such controls had in limiting the number of paupers that might burden the parish. Of course, both effects were entirely dependent on the ability of the parish to restrict in-migration. As Smith emphasizes, this household formation regime also meshed well with the institution of agrarian service. So, too, it was part of a social system that gave little place to the extended family, both with respect to residence and to household economy. In this characterization, English village society is seen as coherent, tightly controlled, paternalistic, and thus moderately cohesive. It was exploitative in that the bulk of economic and human resources were appropriated by a small elite; however, appropriation was limited by a quid pro quo that guaranteed all members of the parish a certain minimum economic standard. Social and economic mobility, like physical mobility, were greatly restricted.

The transition from this demographic regime to one of controlled marital fertility would seem to hinge on the breakdown of one or more components of the system. Indeed, by the end of the eighteenth century, many of these components were clearly facing some rather momentous forces for change. Prominent among these were economic factors such as the expansion of markets, urbanization, and factory-based industrialization. The complex of changes known as the industrial revolution, in which England was clearly a pioneer, seemed to demand social changes that would convert the system just described into one much better attuned to the needs of a fast-growing industrial economy. Not by any means the least of the changes "required" was an increase in the physical mobility of labor.

It may well be that it is on this front that one may find important clues to why the demographic transition occurred later in England than one would have expected on the basis of aggregate

economic indicators alone. For a series of idiosyncratic cultural and political reasons, many of which undoubtedly had to do with the "cohesiveness" of the old system, English society put off these social changes until well past the time that they occurred in other European societies less advanced along the path of industrialization. The Speenhamland system, in effect from 1795 to 1834, which prevented the mobilization of labor and promoted new heights in paternalism, may have been the most overt example of the phenomenon referred to (Polanyi, 1944).

In this view, the sine qua non for the transition to controlled marital fertility was the elimination or replacement of locally financed welfare systems, combined with the removal of restrictions on the physical mobility of the population. When this happened, the family rapidly came to bear a much larger share of the costs of fertility, and the village elites no longer had much incentive to invest in local population policies. Moreover, the wide range of risks and opportunities to which the bulk of the population was rather suddenly exposed greatly increased the incentive to invest in the education of one's children. In short, the "new household economics of fertility," which had little place in the old system, had a prominent place in the new one.

The interpretation advanced here may be clarified by comparison with the views of Lesthaeghe and Smith. Lesthaeghe's (1980) study of England is largely confined to the transitional stage. In accordance with the "secularization hypothesis," he suggests that the belated adaptation of an unchallenged moral or ethical code delayed marital fertility decline in the face of rapid changes in the "formal aspects of household economics" (p. 537). The present interpretation also stresses the parson's influence on sexual behavior in the village; however, that influence is seen as part of the efforts of an elite to regulate the demography of the local population, and the formal aspects of household economics are seen as being more responsive to the incentives built into the parish rates than to changes in the level of aggregate (economywide) economic indicators. In Smith's (1981:618) view, in England "the family, demographic, economic, and political systems were linked in a culturally determined moral economy"; however, he strongly objects to the notion that the control system was "imposed by the social and economic elite who have appropriated resources and are intent upon maintaining the prevailing social structure" (p. 616). He bases his objection on two arguments. The first is that "it was in a practical sense not easy for the social and economic elites to control the reproductive activities of those in lower status groups" (p. 615). The second is that the relationship between changes in real income and fertility was not instantaneous enough to suggest that either parental or social elite controls were functioning very well. Since the control exerted was not so much a matter of directly intervening in individual decisions as of setting up a system with the appropriate incentives, the first argument seems somewhat shortsighted; the second seems to be based on the dubious proposition that the welfare of the village elite was directly related to the real wage.

It seems quite clear that, in a small, closed population with a well-defined power structure, the elite is likely to be concerned with the rate and pattern of household formation, and with growth or shrinkage in the amount of labor at its disposal. A great deal of attention has been focused on the operation of preventive checks in such societies; at least recently, however, much less attention has been given to the ways elites may have sought to ensure that fertility never fell to a level that would endanger an adequate future supply of labor. Another broad but tentative conclusion might be that, in village societies of the type posited here for England, theoretical approaches to the analysis of fertility that place great weight on the family and on intrafamilial relations have only limited applicability. In such contexts, class rather than family relations are what are of central importance to social organization. This is not to say that many of the propositions advanced by Caldwell have no relevance to England; however, they should be recast in terms of wealth flows between classes rather than between generations, in a system where those with social and economic power are the elite of the village rather than patriarchs standing at the head of lineages, extended families, or other kin-based associations.

National Population Policies

One way to carry out a national population policy is to alter local environments to ensure that their incentive structures are consistent with the desired fertility outcome; most of the discussion to this point has potential applications in this regard. In practice, however, national policies are not usually so broad in their scope; generally, they are confined to programmatic attempts to increase the availability of contraceptive services, and to convince people that low fertility is in their own, as well as the nation's, best interest. Sometimes, governments may complement such efforts with administrative pressure or the establishment of outright sanctions for those unwilling to cooperate.

Given their mixed success in the past, it is worth asking whether there are certain institutional prerequisites for effective family planning policies of this sort, or how they are limited by various existing institutional arrangements. Two issues may be raised in this regard. First is the existence of local interest groups that are unresponsive or, worse, outwardly hostile to the government policy, whether because they have conflicting demographic interests or because they have their own, nondemographic uses for the family planning resources available. A second issue concerns the sort of "presence" the central government is able to muster at the local level. The government's local agents or representatives might not be responsible in any real sense to higher levels of administration; they might be controlled by local interest groups, or they might simply be their own men--<u>caciques</u> bent on using public office for private gain. In addition, there are issues related to the resources at the government's disposal--financial constraints and the range and quality

of the services provided.

As an example of these issues, Arthur and McNicoll (1978) argue convincingly that the institutional prerequisites (among other sorts of necessary prior conditions) for an effective government-sponsored family planning program are lacking in Bangladesh. There, they note, "the various colonial regimes did not leave behind a strong system of local government capable of responding to national goals and providing a firm institutional setting for rural change" (p. 43); this condition has persisted to the present. The local system is dominated by the rural elite, whose interests take precedence over national concerns.

In contrast, McNicoll's (1980) sketch of the local administrative system on the Indonesian island of Bali indicates a much greater responsiveness of local authorities to initiatives of the central government. According to McNicoll, in the aftermath of the 1965 attempted coup in Indonesia, the local administrative system was greatly strengthened; moreover, its interests were in harmony with those of the prevailing social and political structures. This harmony was in turn favorable to implementation of the national government's fertility control policies, with local authorities given responsibility for meeting target numbers of birth control acceptors, and these targets being compatible with local social interests.

Another example of a context where government initiatives are not undercut by factional interests is provided by Fawcett and Khoo's (1980) recent description of public administration in Singapore. Here, a strong, wide-ranging national population policy is administered by a bureaucracy having two essential qualities. First, it is both powerful and efficient, and perceived as such by the public. Second, it is subject to political direction, particularly the dominance of Prime Minister Lee Kuan Yew and his People's Action Party.

CONCLUSIONS AND RECOMMENDATIONS

The preceding discussion has necessarily been limited in scope. In particular, institutional influences on the process of household formation were mentioned only in passing, and virtually no attention was given to the effect of institutional and cultural environments on decision-making processes, an area in which McNicoll (1980) has suggested that there is fruitful work to be done.

A more fundamental limitation, however, may arise from what might be called the "partial derivative" approach taken here, which effectively divides the problem into many small parts whose relationships may not be specified. This strategy precludes consideration of important "second-order" or "feedback" effects, such as those that demographic change may have on institutional developments. More important, perhaps, it means omitting discussion of what sorts of institutional change are likely to take place in combination, and what their net effect on fertility is likely to be, an issue that may well be at the heart of many Latin American discussions of the relations between development style and population

change.

The avoidance of this and other difficult questions about the forms and dynamics of institutional change may, however, generate some useful insight: just as it is now possible to analyze the influence of the various so-called intermediate fertility variables in "determining" a particular level or trend in fertility without addressing fundamental ideological assumptions about how the world works, it may soon be possible to analyze the fertility-related incentive structures embedded in particular institutional settings in an ideologically neutral manner. The earlier discussion of temporary wage labor in Brazil may illustrate this point. Similar transformations in agricultural labor markets are apparently taking place in a number of countries of the South. There is wide variation in the causes and consequences of this phenomenon being suggested in the literature--from the human capital type of interpretation of the Philippine experience in a recent paper by Roumasset and Smith (1981) to a neo-Marxist interpretation of the boia fria (Gomes da Silva, 1975). Ideology will form an important component of such discussions for a long time. Meanwhile, however, although the forces generating a shift from traditional production relations to temporary wage labor may be difficult to assess empirically, it may be relatively simple to determine whether that shift decreases the opportunity (if not the need) for families to exploit child labor--regardless of whether the new system is viewed as fair and efficient, or exploitative and wasteful.

Finally, a number of thoughtful recommendations have been made for additional work on the institutional determinants of fertility (see, e.g., McNicoll, 1978, 1980); certainly, work could be undertaken on virtually all of the topics that have been addressed in the preceding pages. This being the case, rather than set forth yet another research agenda, it might be more profitable to take the present opportunity to address the strategic question of how to proceed with research in this area.

Much of the research that has been reviewed is of relatively little use when it comes to drawing conclusions about why fertility is behaving the way it is in a particular country. At one extreme are the highly empirical micro or village-level investigations; although these have yielded a wealth of interesting and empirically verified hypotheses, their results can only be taken as suggestive of what might be happening beyond the particular area considered. At the other extreme are the wide-ranging and qualitative arguments about the effects of particular institutions. These studies make skillful use of a kaleidoscope of evidence, often drawn from various parts of the world, but once again there is nothing much that can be said about what happens in a particular country.

If work done by people such as Caldwell and Cain has produced a wealth of interesting hypotheses but few if any nationally representative results, almost the opposite can be said about the mainstream efforts to discover the causal factors underlying fertility change on the basis of data collected in the World Fertility Survey. This is not the place to engage in a thorough critique of this

much-debated research instrument; the point is simply that the WFS made only a very limited attempt in its community survey to collect data on the institutional environment surrounding the household. Indeed, it may well be true that "the community factors most pertinent to the explanation of demographic behavior cannot, by their very nature, be measured in one-visit surveys, in which the content of the instrument must necessarily be restricted to a set of straightforward factual items" (Casterline, 1981:2).

There would seem, however, to be a way out of this dilemma. The use of heavily clustered samples in future surveys would permit a two-pronged investigative effort, collecting detailed community-level data on social and economic organization on the one hand, and individual and family-level data on fertility, economic activity, and the like, on the other. The object would still be to collect nationally representative data, but the tradeoff between sampling efficiency and the collection of satisfactory data on local institutional environments would be heavily weighted towards the latter. An example of this type of investigation is the Brazilian National Survey of Human Reproduction referred to above.

There is, of course, no readily available prescription for drawing a sample and designing research instruments for this kind of a survey, and a large amount of conceptual and experimental effort would be required of any such attempt to break away from the traditional mold. With regard to sample design, there would be important questions about the number, size, and character of the "communities" to be included as primary sampling units; indeed, there would even be the important question of whether the primary sampling units should be defined geographically or according to some other criteria. In any event, the selection of a stratification scheme would raise major theoretical as well as statistical problems.[9]

The design of research instruments for such investigations would be a major challenge. Still lacking, as McNicoll (1980:459) has pointed out, are "well designed empirical measures of the forms and dynamics of fertility-relevant institutions." What is more, the field work involved in this sort of research would make much greater demands on the talented social scientists available in a country than does the normal one-visit fertility survey. However, these difficulties should not be exaggerated. In-depth interviews with both the agents and clients of, say, local government, the church, the school system, the health system, and private enterprise can, as the Brazilian PNRH has shown, reveal much about the ideological influences exercised by such institutions. An examination of institutional products, such as curricula for educational programs, can contribute additional information. Although incentive structures may be more difficult to document, Cain's work on villages in India and Bangladesh, Parish and Whyte's study of Kwangtung Province, and Almeida's analysis of the Brazilian Northeast provide examples of successful empirical attempts to trace the influence of the social relations of production on the economics of reproduction. Of crucial importance is a direct attempt to determine the rules and procedures that govern the operation of, say, markets for temporary agricultural labor, haciendas, factories,

and credit institutions, as well as to form a picture of how such institutions work from the information gathered on individual behavior.

In conclusion, an institutional approach to the analysis of fertility determinants holds considerable promise for the future. Such a focus may well enable researchers to overcome two of the major stumbling blocks they face: the much-discussed divorce between micro and macro levels of analysis, and the less frequently mentioned but equally fundamental contradiction between the Malthusian and transitional perspectives on historical demographic experience.

Arguably, the former problem results from the disparate findings generated by two parallel and somewhat misguided research traditions: the first was comprised of correlation and regression analyses in which individual fertility was arrayed against one or more explanatory variables such as household income, women's labor force participation, and education; the second consisted of attempts to estimate the relationship between national or state-level indicators of fertility and aggregate socioeconomic variables associated with modernization and economic development. Missing was an intermediate level of analysis--"empirical investigation of how social, economic, political, administrative, and cultural structures create fertility incentives or disincentives and otherwise impinge on reproductive behavior" (Population Council, 1981:315). It seems likely that research concentrating on local institutional settings would supply much of the "mediation" needed between global and individual levels of analysis, whatever the theoretical framework adopted by the analyst.

The second stumbling block arises from the positive association hypothesized by demographic transition theory between declining fertility and mortality--and, eventually, decelerating natural increase--and economic growth. In the Malthusian perspective, over the long run, population growth and economic expansion generally accompany each other. "Likewise, economic decline and demographic contraction tend to occur together. In the short run, fertility and nuptiality tend to respond positively, mortality to respond negatively, to upswings in economic well-being" (Tilly, 1978:24). This contradiction, however, is readily explained within the framework of local-level population policies. The Malthusian relationships held as long as territorially based systems of social control were working effectively. With the onset of industrialization and the expansion of markets, along with rapid economic growth, the control systems broke down. The result was a radical change in the environment in which individual couples found themselves, and fertility was among those behaviors affected by the new structure of opportunities and obligations. Again, the institutional approach provides a useful research frame.

NOTES

1. It is important to emphasize that this evaluation is not tied to a particular view of how the economic value of children eventually influences reproductive behavior. How economic considerations are

evaluated in parental decisions about an additional child or in the formation of social norms about fertility-related behavior are questions addressed elsewhere (Hollerbach, in these volumes).

2. It should be observed, though, that Smith does not provide empirical support for his belief that servants did not send an appreciable portion of their earnings back to the household of origin. If they did, the institution of agrarian service could be seen as having constituted an important prop for high fertility in this setting, permitting poorer households to export their surplus family labor "to the farms of the more comfortably situated members of the agrarian populace" (p. 605) in exchange for either remittances or guarantees of support in times of crisis.

3. The belief that wage labor in urban-industrial settings is associated with fewer expected returns from child labor was at least partly responsible for the inclusion of variables such as the "proportion of the labor employed in agriculture" in a variety of macro-level multivariate analyses of the relations between modernization and fertility (Richards, in these volumes). A recent empirical study that sought to explicitly test the influence of a "familial, labor intensive mode of production" on the speed of the fertility transition in the subdivisions of various European countries at (about) the turn of the last century has been circulated in draft form by Lesthaeghe and Wilson (forthcoming). The proxy used depended on the country under consideration; in the cases of Belgium, Switzerland, and Germany it was the proportion of the economically active population in agriculture or cottage industry rather than in agriculture alone. While the mode-of-production variable accounted for a large proportion of the variance in the dependent variable, here, as in previous studies, the results lend themselves to a variety of interpretations besides those based on the declining role of child labor.

4. On the other hand, Ben-Porath (1980:18) has reasoned that "the initial entry into a turbulent labor market is associated with increased risks: parents may gamble and reduce risks by pooling the fortunes of several children. The simultaneous entry into the market of several relatives may have the advantage of information and connections that strengthen rather than weaken family ties." Much the same idea was expressed by Caldwell (1976:340) when he wrote that a large family "forms an excellent springboard to success for young aspirants in the modern sector of the economy." Lastly, in a similar vein, Ben-Porath (1980:18) makes reference to the complementarities that are likely to exist between the family and the emerging capital market.

5. In a recent paper, Caldwell (1981) pointed out that violence is an important fact of life in many parts of the South and that large family size is an essential defense against this threat. Ben-Porath (1980:12) makes essentially the same point when he notes that "family relationships also play an important part in the struggle over the establishment of property rights and their physical protection, as is evident in any frontier movie."

6. Lesthaeghe (1980:536) appears to have a very clear idea of the church's self-interest in teaching a stricter family morality.
7. The results of the first phase of the analysis of the PNRH were published in individual monographs on the respective study areas, two of which included both a rural and an urban municipality. A general description of the objectives and content of the survey is available in a paper by Berquo (1978). Very recently, a comparative study of the role of institutions in influencing reproductive behavior was published by Loyola and Quinteiro (1982); their volume contains a good summary of the findings related to institutions that appear in the previous seven volumes.
8. Note that both are, at least partially, closed populations. Only women have the possibility of leaving the lineage (by marriage outside of it, which may be infrequent), and only those tenants who have avoided falling into debt with the landlord may leave the hacienda.
9. Perhaps this difficulty should not be exaggerated, however, since the great structural heterogeneity found in most societies of the South may guarantee that the sorts of geographically defined communities to be included in a sample would be relatively insensitive to the theoretical framework underlying the stratification scheme. In the Brazilian PNRH, for instance, mode of production was chosen as the principal basis for stratifying the sample of nine communities, but a quite similar set of communities might well have been drawn if the basis had been some index of modernization.

BIBLIOGRAPHY

Almeida, A. L. O. de (n.d.) Share Tenancy and Family Size in the Brazilian Northeast. Instituto de Planeamiento Economico e Social, Rio de Janeiro.

Arthur, W. B., and G. McNicoll (1978) An analytical survey of population and development in Bangladesh. Population and Development Review 4:23-80.

Ben-Porath, Y. (1980) The F-connection: Families, friends, and firms and the organization of exchange. Population and Development Review 6:1-30.

Berquo, E. (1978) A pesquisa nacional sobre reproducao humana. In San Jose Dos Campos, Estado de Caso: Dinamica Poblacional, Transformacoes Socio-economicas, Atuacao das Instituicoes, Vol 1. Sao Paulo: CEBRAP.

Cain, M. (1981a) Extended Kin, Patriarchy, and Fertility. Paper presented to the Seminar on Family Types and Fertility in Less Developed Countries, Sao Paulo, Brazil.

Cain, M. (1981b) Risk and insurance: Perspectives on fertility and agrarian change in India and Bangladesh. Population and Development Review 7:435-474.

Cain, M., S. R. Rokeya, and S. Nahar (1979) Class, patriarchy, and women's work in Bangladesh. Population and Development Review 5:405-438.

Caldwell, J. C. (1976) Toward a restatement of demographic transition theory. Population and Development Review 2:321-366.

Caldwell, J. C. (1978) A theory of fertility: From high plateau to destabilization. Population and Development Review 4:553-577.

Caldwell, J. C. (1980) Mass education as a determinant of the timing of fertility decline. Population and Development Review 6:225-255.

Caldwell, J. C. (1981) The mechanisms of demographic change in historical perspective. Population Studies 35:5-27.

Carvalho, J. A. M. de, P. de T. A. Paiva, and D. R. Sawyer (1981) The Recent Sharp Decline in Fertility in Brazil: Economic Boom, Social Inequality, and Baby Bust. Working Paper No. 8. Population Council, Mexico.

Casterline, J. (1981) Community Effects on Individual Demographic Behavior: Multilevel Analysis of WFS Data. Paper presented to the International Union for the Scientific Study of Population International Population Conference, Manila.

Coale, A. J. (1973) The demographic transition reconsidered. Pp. 53-71 in International Population Conference, Liege, 1973, Vol. 1. Leige: International Union for the Scientific Study of Population.

Cochrane, S. H. (1979) Education and Fertility: What Do We Know? Baltimore, Md.: The Johns Hopkins University Press.

Fawcett, J. T., and S.-E. Khoo (1980) Singapore: Rapid fertility transition in a compact society. Population and Development Review 6:549-579.

Freedman, R. (1979) Theories of fertility decline: A reappraisal. In P. M. Hauser, ed., World Population and Development. Syracuse, N.Y.: Syracuse University Press.

Garcia, B., H. Munoz, and O. de Oliveira (1982) Hogares y Trabajadores en la Ciudad de Mexico. Mexico City: El Colegio de Mexico.

Gomes da Silva (1975) O boia fria: Contradicao de una agricultura em tentativa de desenvolvimiento. Reforma Agraria 5:2-44.

Lamounier, B. (1981) Instituicoes e Comportamento Reprodutivo: O Caso de Recife. Mimeo. Sao Paulo, CEBRAP

Lesthaeghe, R. (1980) On the social control of human reproduction. Population and Development Review 6:527-548.

Lesthaeghe, R., and C. Wilson (forthcoming) Modes of production, secularization, and the pace of fertility decline in Western Europe, 1870-1930. In S. Watkins, ed. Proceedings of a Conference on the European Fertility Project. Princeton, N.J.: Princeton University Press.

Lindert, P. H. (1980) Child costs and economic development. In R. A. Easterlin, ed., Population and Economic Change in Developing Countries. Chicago: University of Chicago Press.

Loyola, M. A., and M. de Conceicao Quinteiro (1982) Instituicoes e Reproducao, Vol. 8. Sao Paulo: CEBRAP.

McNicoll, G. (1975) Community level population policy: An exploration. Population and Development Review 1:1-21.

McNicoll, G. (1978a) The demography of post-peasant society. In Economic and Demographic Change. Issues for the 1980s: Proceedings of the Conference, Vol. 2. Liege: International Union for the Scientific Study of Population.

McNicoll, G. (1978b) On fertility policy research. Population and Development Review 4:681-693.

McNicoll, G. (1980) Institutional determinants of fertility change. Population and Development Review 6:441-462.

Paiva, P. de T. A. (1982) O Proceso de Proletarizacao como Fator de Destabilizacao dos Niveis de Fecundidade no Brasil. Paper presented to the Seventh Meeting of the Working Group on Human Reproduction, Commission on Population and Economic Development, CLACSO, Cuernavaca, Morelos, Mexico.

Parish, W. L., and M. K. Whyte (1978) Village and Family in Contemporary China. Chicago: University of Chicago Press.

Polanyi, K. (1944) The Great Transformation. Boston: Beacon Press.

Population Council (1981) Research on the determinants of fertility: A note on priorities. Population and Development Review 7:311-324.

Roumasset, J. R., and J. Smith (1981) Population, technological change, and the evolution of labor markets. Population and Development Review 7:401-419.

Saint, W. S. (1981) The wages of modernization: A review of the literature on temporary labor arrangements in Brazilian agriculture. Latin American Research Review 16:91-110.

Schejtman, A. (1980) The peasant economy: Internal logic, articulation and persistence. CEPAL Review 11:115-134.

Smith, R. M. (1981) Fertility, economy, and household formation in England over three centuries. Population and Development Review 7:595-622.

Thadani, V. N. (1980) Property and progeny: An exploration of intergenerational relations. Center for Policy Studies Working Paper No. 62. Population Council, New York.

Tilly, C. (1978) The historical study of vital processes. Pp. 3-56 in C. Tilly, ed., Historical Studies of Changing Fertility. Princeton, N.J.: Princeton University Press.

Chapter 36

EFFECTS OF CULTURE ON FERTILITY: ANTHROPOLOGICAL CONTRIBUTIONS*

Robert A. LeVine and Susan C. M. Scrimshaw

The value of anthropological research for understanding human population patterns in general and those of the developing world in particular has been recognized for some time, though its relevant findings and perspectives are not always considered in demographic theory and policy analysis. There is a growing literature of population anthropology containing empirical evidence and theoretical formulations bearing on the determinants of fertility. That literature has been reviewed by Barlett (1980), Nag (1973, 1980), Oppong (in these volumes), Nardi (1981), and Weiss (1976). Although an exhaustive review of this literature is not possible within the confines of the present paper, its major concepts can be outlined. In addition to briefly describing the major anthropological approaches to understanding fertility-related behavior, the discussion will focus on areas in which the anthropological contribution seems most relevant to these volumes, particularly in complementing the work of the other population sciences.

This chapter reflects, without attempting to report, the proceedings of a February 1981 Workshop on the Anthropology of Human Fertility at the National Academy of Sciences.[1] It begins by reviewing the concept of culture and its application to fertility, in particular the critical perspective it provides on some current demographic concepts, such as natural fertility. It then briefly reviews anthropological areas of research related to fertility. Next, it discusses the important issue of research methodology, and how the anthropological method complements demographic approaches. Finally, a brief summary of research needs in the area of culture and fertility is presented.

*Editors' note: Unlike the other papers in this report, this paper does not confine itself to particular fertility determinants but discusses in broad terms the contributions of one discipline, illustrating in its approach the anthropological preference for dealing with specific elements in their social and cultural context.

CULTURE AND FERTILITY

This is an area in which the anthropological contribution to the understanding of fertility determinants should be strongest and most integrated with demographic research. A good deal has been written about culture and fertility, both in general and for specific populations, and there have been efforts to incorporate cultural factors into demographic theory and research. Problems remain, however, particularly conceptual ones. The discussion below attempts to clarify those that seem to pose the greatest obstacles to productive research.

The first of these problems concerns the concept of culture itself. When demographers and economists write about cultural factors in the determination of fertility in the developing countries, they tend to treat those factors as discrete rules or beliefs: "irrational" norms, tastes, and taboos on the one hand, and "rational" perceptions of local cost-benefit contingencies on the other. Anthropologists, however, tend (particularly in recent years) to see culture as an organized system of shared meanings, often more pervasive than explicit, a set of basic assumptions and images that generates rules and beliefs, but is not reducible to them. In the influential formulation of Geertz (1973), culture refers to "models of" and "models for" reality--organized images and conceptions that reflect environmental contingencies and guide social behavior, respectively. A cultural model thus includes both existential and normative aspects (implications of what is and what ought to be) combined in a single symbolic code that is not merely shared by a community, but taken for granted as a matter of "common sense."

The rules generated from such a model presume as the context for their application the validity of certain beliefs about reality; those beliefs are in turn shaped by the normative or moral standards of the model. This unreflective fusion of fact and value, rejected by Western positivism, is nevertheless the basis of folk cultures, as well as religious doctrines and political ideologies. The most important research implication is that no rule or belief can be interpreted out of the context that gives it meaning, and that is uncovered by ethnographic work. Geertz (1973) has argued this view of culture in terms derived from epistemology, aesthetics, and social theory, and has published superior examples of cultural interpretation. In so doing, he has become the spokesman for anthropologists in the field who have found that observed rules and beliefs derive their meaning from tacit assumptions retrievable through ethnographic work. While not all social anthropologists hold this view, it prevails among those who put the concept of culture at the center of anthropological research.

Culture is also seen by anthropologists as having facilitated humanity's adaptation in the Darwinian sense: it has helped us to increase our reproductive success and to compete in a wide variety of environments. Obviously, a key feature of this adaptation is the ability to communicate and to pass information from one generation to the next; however, the content of that communication is also seen as

having adaptive value. Cultures evolve in response to specific environmental pressures; thus, behaviors that affect birth, death, and disease rates reflect adaptive responses to the environment (Alland, 1970:203). Because culture evolves over a long time, many of the behaviors that affect fertility and mortality rates are not necessarily perceived as doing so directly. They are, however, supported by other aspects of the culture, as noted above.

The implications of this are that human populations have always regulated fertility and mortality to some degree. Many anthropologists believe this regulation has been greater than frequently acknowledged by demographers, and that there has been a good deal of variation in the amount and type of fertility regulation from one society to the next (Polgar, 1972:203-211). Polgar, Hassan (1973), and Cowgill (1975), among others, have demonstrated that both fertility and mortality have been controlled since before the existence of written records. As Polgar points out, this has implications for the interpretation of fertility-related behavior. It is one thing to posit that women have as many children as possible, unaware that mortality is dropping and they will now have more living children; it is another to see them making a careful adjustment between fertility and mortality, disrupted by external forces (such as public health measures that reduce disease rates). The latter model implies an underlying purpose to the behavior, and social systems that support it. To ignore this is to misunderstand both the behavior and its place in the culture. White (1981:6) puts it as follows:

> Population growth, then, must be seen as a positive rather than a passive response of the society (or more precisely, of the class) concerned. The question whether changes in a population are due primarily to reductions in mortality or to increased fertility is not the basic question. The matter at issue is not how, but why a population . . . allows itself to depart from the state of demographic equilibrium in which fertility and mortality vary inversely in the short term.

Applying this perspective to the determinants of fertility implies that there are cultural models for reproduction; these models reflect the shared beliefs and expectations of a population about the reproductive process in general and its own fertility-mortality situation in particular, and prescribe and proscribe certain reproductive behaviors. The meanings of conception, pregnancy, birth, lactation, infant care, infant mortality, and lifetime fertility for a population are constituted by their place in the model. The fertility pattern that characterizes a population in demographic terms--e.g., its crude birth rate, age-specific fertility rates, and total fertility rate--has a cultural rationale based on certain assumptions, some "rational" (reflecting the actual environment) and others "irrational" (reflecting normative traditions), but all accepted by the population to be principles of common sense. This cultural rationale for a fertility pattern, though often unstated, is accessible through ethnographic study. Because it provides the best

indication of why the pattern is being maintained, descriptions of this rationale, and of the cultural models of reproduction and parenting from which it is derived, are highly relevant to the design of programs seeking to change fertility levels.

The cultural approach to fertility can be illustrated by discussion of the conceptual problem of natural fertility, a concept well known to demographers but not to anthropologists. Knodel (in these volumes) provides a lucid introduction to this concept. A society is characterized by natural fertility if its reproducing women make no deliberate effort to stop bearing children. There can be much variation in fertility among natural-fertility populations, based on factors such as length of the birth interval, age at marriage, and health factors affecting fecundity, but not on deliberate termination of childbearing.

From the viewpoint of anthropology, the term "natural" is misleading since it suggests something genetically determined, as in "nature vs. nurture"; precultural, as in Levi-Strauss' "nature vs. culture"; or free of technological intervention, as in "natural childbirth." Such connotations are not meant to be implied by the concept of natural fertility, which is straightforward and extremely useful within the context of historical and comparative demography. At the same time, it is likely to be of limited value for anthropological research on fertility, for reasons that illustrate the complementarity of the two disciplines in the population field. The concept of natural fertility combines historical and contemporary populations with high birth rates, and contrasts them with those (largely industrialized) populations which deliberately limit their fertility. One advantage of this division is that it permits operationalization of demographic transition theory, with standard census categories as the basis of quantitative and revealing differences between stages (pretransition, transitional, and posttransition). For example, the Coale-Trussell (1974) index of family limitation, m, is based on the fact that widespread birth limitation affects age-specific fertility rates (concentrating childbearing in a woman's young adult years). Thus societies with controlled fertility show concave curves of age-specific fertility, while those with natural fertility show convex curves--regardless of their total fertility rates. The effect of m in homogenizing natural-fertility societies according to the shape of their age curves is considered an advantage, the better to heighten contrasts with controlled-fertility societies and to detect the effects of parity-dependent limitation when it appears (Knodel, 1977; in these volumes). This accords with the aims of demographic research on fertility.

Anthropologists work largely with societies lacking (or which until recently lacked) parity-dependent birth limitation; their aims are to identify and analyze the social and cultural aspects of reproduction that have significant fertility outcomes in those societies. To categorize societies according to what they <u>lack</u> (as the distinction between natural and controlled fertility does) is of limited value in understanding how they operate the way they do.

Natural-fertility societies vary widely in their total fertility rates because of variations in the proximate and indirect determinants of fertility that are the primary objects of anthropological investigation. African societies, for example, differ in fertility rates as a result of diverse periods of abstinence in their childspacing systems (Page and Lesthaeghe, 1981), as well as the varying prevalence of diseases causing infertility, to mention just two of the factors involved. The anthropologist focuses on these differences not only to explain fertility variations among populations at a given point in time, but also to help forecast the direction of change when the social and cultural supports for a particular fertility level are altered by changing conditions of health, infant care, marriage, and sexual conduct. Some anthropologists believe that the concept of natural fertility obscures these differences, and that it creates a category which may well prove to be as variable internally as the stages of the demographic transition are from each other. Future research may help decide these issues. There can be no doubt, however, that anthropological research can make major contributions by continuing to emphasize the diversity within natural-fertility patterns.

The study of culture also involves the study of when, how, and why cultures change. As advocates of modern contraception have discovered, people do not always welcome a new technology enthusiastically. Arensberg and Niehoff (1971) comment that, in the past, cultural change took a long time, and the persistence of obsolete behaviors or other aspects of culture was less significant. Today, because change is more rapid, there is a greater need to understand how the process of change affects behaviors related to fertility and mortality. Changes that led to the increased population growth rates of the twentieth century provide a dramatic example.

In most cases, forces of cultural conservatism, competition between groups, and diffusion from other cultures operate simultaneously. Cultural change often begins at the individual level, although individuals function within society. When contemplating a change, people weigh their wants and needs against the prevailing norms, beliefs, and customs in the society (Goodenough, 1963). Each person perceives the need for action according to his or her own precepts; for example, if a woman expects half her children to die, she may not view another pregnancy in a negative way. Goodenough suggests that cultural change depends on people's ability to organize new experience and relate it to conditions they cannot handle within their own cultural context. They may revert to former habits if the new ones do not produce the desired results. This happens frequently with contraceptive technology, particularly when undesirable side effects are attributed to a given method, or when pregnancy occurs after either method or user failure. People also tend to adapt one form of behavior to another purpose if it seems feasible, or even to rearrange or substitute behaviors. Thus anthropologists suggest that new contraceptive methods that resemble existing ones or accepted medications are most likely to be adopted.

Both in understanding the cultural context of fertility and in

examining the process of cultural change, anthropologists can make important contributions to demographic transition theory. For example, Nag (1980) has shown that earlier and simpler views of the fertility transition must be modified in the face of growing evidence that "modernizing influences" increase fertility in natural-fertility societies, at least temporarily, mainly through social changes that reduce age at marriage and decrease the interval between births. This finding, like the description of childspacing patterns as fertility determinants (Page and Lesthaeghe, 1981), illustrates one contribution of anthropological research: the identification of apparently culture-specific, short-term patterns that in fact have widespread and substantial effects on fertility and its direction of change.

Anthropologists can also contribute to an understanding of the relationship between mating patterns and fertility. In most of the demographic literature, people are treated as married or unmarried, with the implicit assumption that children are desired by married and not by unmarried couples. There has also been the assumption that marital unions are more stable than nonmarital ones (Stycos, 1963:226). These assumptions have led to endless difficulty in the interpretation of fertility behavior. In fact, what in U.S. society is called marriage might better be called a formalized union, that is, formalized by the social mechanisms appropriate for that culture; however, in many societies (for example, in most of Latin America), individuals can spend years in unions which are not formalized, but which function like marriage in every other way. Because they look at the form and not the function, demographers have trouble understanding why unions they assume to be "unstable" produce as many children as "marriages." To complicate matters further, there are other union types, such as visiting relationships, which may be expected to produce children, as well as multiple unions such as polygamy and polyandry. Desires for children and fertility-related behavior (such as frequency of intercourse) may vary from one union type to another and from one spouse to another in a polygamous union. In addition, individuals and couples can move from one union type to another, presenting a dynamic rather than a static pattern. This may necessitate longitudinal studies, or at least longitudinal analyses. Understanding the motivations and behaviors surrounding union types can help explain variations in fertility and mortality rates; however, as Nag (1975a:289) says, "Demographers have concentrated on the end-products of such interaction without relating those to family and kin" (cf. Burch, in these volumes).

This contrast between the demographer's tendency to concentrate on behavioral results and the anthropologist's concerns with intention, planning, volition, and context indicates a number of specific potential anthropological contributions to the study of the intermediate fertility variables (Davis and Blake, 1956) and in particular the proximate variables (Bongaarts, 1978). Newman (1981) has suggested an additional set of variables which she calls context variables. These include ideological, interpersonal, contraceptive, and reproductive variables; for example, under reproductive she includes the wantedness or value of children. These variables are

seen as influencing the intermediate or the proximate variables. Anthropologists can also contribute to the understanding of all these variables because many are not easily derived from survey material or secondary data sources, but instead are amenable to ethnographic investigation. The discussion that follows focuses on the major areas in which anthropological research can contribute to the study of fertility.

MAJOR ANTHROPOLOGICAL AREAS OF FERTILITY RESEARCH

Anthropological work on the determinants of human fertility can be divided into two broad areas: macro (treating large populations such as societies and communities) and micro (treating individuals and families). At each level, fertility behavior and its determinants have been studied both in the past (including the archeological and paleontological records predating written history) and in the present. Major topics of study at both levels are described in the subsections below. Each topic could easily be the subject of its own chapter; all that is possible here is to provide a brief definition and example for each, with a few sample references.

Macro-Level Areas of Research

The major macro-level areas of anthropological fertility research are listed in Table 1, and briefly described below.

TABLE 1 Anthropological Areas of Fertility Research: Macro-Level

Topic	References
1. Population homeostasis	Alland, 1970; Abernethy, 1980; Swedlund, 1978; Polgar, 1973
2. Culture and reproductive success	Irons, 1979, 1980; Blurton-Jones and Sibley, 1978; Chagnon, 1979
3. Social structure and fertility	Harris, 1976; Yengoyan, 1972; Schneider, 1955; Wagley, 1952; Abernethy, 1979
4. Cultural evolution and population growth	Nag, 1973; Polgar, 1975; Bartlett, 1980; Netting, 1974; Dumond, 1965; Harner, 1970
5. Environment and reproduction	Baker, 1978; Clegg, 1978; McClung, 1969

Population Homeostasis

The concept of population homeostasis, based on Wynne-Edwards' (1962) work, centers on the idea that population size represents an adaptation to a specific environment, including the way that environment is utilized (in extracting food and other resources from it). If an environment and the way it is used remain the same, the population also remains stable, and does not grow enough to damage the environment to the point at which the population's survival chances are threatened (usually expressed in terms of food scarcity). A key point in this theory is that human populations have not simply been victims of high mortality rates necessitating high fertility rates, but have always regulated both fertility and mortality to some degree (Alland, 1970; Abernethy, 1979; Swedlund, 1978; Polgar, 1971, 1972, 1973). As Alland (1970:2) puts it, "beliefs and behaviors that affect fertility, death, and disease rates are major factors in the adaptations of human societies. Over time, every society develops behavioral strategies which maximize gains and minimize losses in its population size relative to particular environments."

Culture and Reproductive Success

Culturally patterned behaviors will frequently ensure maximum reproductive success in the form of genetic representation in the next generation. For example, Blurton-Jones and Sibly (1978) argue that Kung Bushman birth spacing ensures the survival of more children to adulthood than if birth intervals were shorter. Although the cultural spacing norm of four to five years produces fewer children, mortality rates are lower, guaranteeing more and healthier representatives in the next generation.

Social Structure and Fertility

Although environment, particularly food resources, is a major potential limiting factor, societies may find many different ways to function effectively in the same environment. Thus, Australian aborigines and sheepherders have very different cultures, but both function successfully in the same environment. Social structure, the way a society is organized, produces behavioral norms that influence fertility (among many other facets of life). Sometimes these norms function to limit fertility more than is absolutely necessary in the particular environment, but in ways consistent with harmonious social organization. An example is two Amazon cultures studied by Wagley (1969). Although the Tapirape had a social structure that made forming new communities difficult or impossible, the agricultural and hunting system could not support villages larger than 200 people. The Tapirape had a strict policy limiting families to three children, and this was enforced through infanticide. In the same environment, the Tenetehara had a social structure that facilitated dividing villages

to form new ones when the original village became too large to be practical; there were no limitations on family size (see also Potter, in these volumes).

Cultural Evolution in Relation to Population Growth

These discussions tend to center around the role of population pressure (or its lack) in the development of many cultural patterns, particularly agriculture and social stratification (Barlett, 1980; Dumond, 1975; Harner, 1970; Polgar, 1975). For example, there is much discussion of whether population growth stimulated the intensification of agriculture or whether new agricultural techniques permitted population growth. Much of this debate is summarized by Netting (1974), who provides evidence of increasing intensification of agriculture as at least a concomitant of increased population density.

Environment and Reproduction

Physical anthropologists have looked specifically at the effects of various environments on the probability of conception, the maintenance of gestation, and intrapartum mortality. For example, much has been done on the effects of high altitudes on reproduction (Baker, 1978; McClung, 1969). The evidence suggests that, despite compensations such as larger placentas, more fetal wastage is experienced at high altitudes (10,000 feet and over), as is higher perinatal mortality, in part due to lower birth weights (McClung, 1969; Clegg, 1978).

Micro-Level Areas of Research

The major micro-level areas of anthropological fertility research are shown in Table 2, and briefly described in the following subsections. Some of these areas, such as the intermediate fertility variables described by Davis and Blake (1956), have, of course, been discussed by sociologists and others. Anthropologists have taken these topics and explored them in depth, looking not only at actual behaviors but also at etiology and causality and at relationships between the behaviors.

Union Formation and Dissolution

Mating patterns have been a classical area of anthropological study, so their analysis in relation to fertility is no surprise. Anthropologists have looked at age at marriage and fertility (Gulick and Gulick, 1975b; Scrimshaw, 1978a; Low, 1978); nonmarital fertility (Low, 1978); interruptions in unions and fertility (Chen et al., 1974); and many similar behaviors. Some of the most detailed work in this area has been done by Nag (1968), who first explored the Davis

TABLE 2 Anthropological Areas of Fertility Research: Micro-Level

Topic	References
1. Union formation and dissolution	Nag, 1980; Gulick and Gulick, 1975; Chen et al., 1974
2. Sexual intercourse within unions	Nag, 1967, 1968; Abernethy, 1979; Ford, 1964; Mead, 1949; Malinowski, 1929; Saucier, 1972
3. Contraceptive use: acceptability, method preferences, consistency of use	Hines, 1963; Polgar, 1971, 1972, 1973; Carr-Saunders, 1922; Polgar and Marshall, 1976; Scrimshaw, 1972, 1976, 1980a, 1980b; Shain, 1980; Marshall, 1977
4. Abortion	Ford, 1964; Schneider, 1955; Devereux, 1967
5. Infanticide	Dickeman, 1975, 1979; Wagley, 1952; Ford, 1964; Langer, 1974; Abernethy, 1979; Firth, 1961
6. Fertility decision making	Hull, 1982; Shedlin and Hollerbach, 1981; Scrimshaw, 1978
7. Family form and fertility	Lorimer, 1954; Nag, 1968; Sipes, 1974; Hammel, 1961, 1977
8. Women's activities and roles	Ford, 1964; LeVine, 1980; Oppong, 1981
9. Value of children	Nag et al., 1978; Cain, 1977; Yengoyan, 1974
10. Infant mortality and fertility	Scrimshaw, 1978; Harris, 1977; Lewis, 1963; Neel, 1970

and Blake (1956) variables from an anthropological perspective and found that their assumptions about factors affecting fertility in nonindustrial societies needed revision. For example, he found that methods of fertility regulation in nonindustrial societies were not determined solely by factors most closely related to gestation and parturition (Nag, 1968:149). In a more recent article on relationships between modernization and fertility, Nag (1980:579) has continued to explore areas such as the effect of improved mortality rates on the duration of unions, and hence on fertility.

Sexual Intercourse Within Unions

This is a difficult area to research either qualitatively or quantitatively. Sexual behavior has been studied by many anthropologists, including Mead (1949), Malinowski (1929), Ford (1964) and Nag (1967, 1968). The qualitative, descriptive work is useful in that it gives some indication of attitudes towards intercourse and hints at frequency. For example, stories about the illnesses or

disorders that can result when intercourse does not take place several times a week hint at cultural expectations of frequency. Women's accounts of fearing intercourse and their search for excuses to avoid it also allow the researcher to ask about actual frequency with some sense of the accuracy of the answer. In a society where intercourse is regarded as a very private matter and where there are few opportunities for privacy, frequency may be more limited than in contexts where those constraints do not exist. For example, Nag (1967:161-163) mentions lower frequency of intercourse for extended families than for nuclear families because of the lack of privacy in the former. Anthropological research can also help establish behavioral ideals, and the extent to which these are upheld or disregarded. For example, many cultures have ritual periods when intercourse is forbidden; these are frequently related to preparation for warfare or hunting (Ford, 1964:28-29), or to the postpartum period (Saucier, 1972; see also Nag, in these volumes).

Contraceptive Use

This area includes the concepts of method and program acceptability as well as contraceptive choice and consistency (Hermalin, in these volumes; Bogue, in these volumes). When family planning programs began to proliferate in the 1960s, the underlying assumption of some population activists and some demographers was that there was a large, eager population just waiting for the opportunity to use modern contraceptives. When programs did not have the success expected, anthropologists began pointing out that there might be instances where people wanted to prevent fertility, but where either the methods themselves or the programs delivering them were not culturally acceptable (Polgar, 1973; Polgar and Marshall, 1976; Newman, 1972; Shain, 1980; Scrimshaw, 1972, 1976, 1980a, 1980b).

Questions of both method and program acceptability have been addressed to some extent by fields other than anthropology. One of the important aspects of the anthropological treatment of these topics is the range and scope of factors considered. Acceptability of both methods and programs is looked at in light of such diverse factors as social structure, sexuality, male and female roles, women's modesty, family structure, marriage patterns, perceptions of blood and other body secretions, and so on. For example, see the collection of papers in Culture, Natality, and Family Planning (Marshall and Polgar, 1976). Because human behavior is not unilinear or unidimensional, such broadly based analyses of contraceptive behavior are likely to be extremely valuable.

Induced Abortion

This topic has been widely discussed in the anthropological literature (Ford, 1964; Schneider, 1955; Devereux, 1955). Much of the work has focused on the existence of induced abortion in a given society, on

the techniques used, and on the way it is perceived within the culture. Some studies have examined its demographic impact (see, e.g., David, in these volumes; see also Schneider, 1955, for a discussion of its role in the depopulation of Yap).

Infanticide

This topic has also been frequently mentioned in the anthropological literature (Ford, 1964; Langer, 1974; Scrimshaw, in these volumes); analyses of infanticide in relation to fertility have been done by Wagley (1969), Dickeman (1975), Abernathy (1979), and Firth (1961). Infanticide and fertility have also been discussed in relation to East Indian social behavior, such as decisions to keep newborn females more frequently in the lower than the upper classes because of the tendency for women to marry "up" (Dickeman, 1979). Perhaps the most controversial discussion of infanticide was provided by Divale and Harris (1976), who related the practice to warfare, with war generating higher status for males and thus creating an incentive for female infanticide; they therefore suggested that war and female infanticide together act as population-regulating mechanisms. This argument has been strongly criticized, particularly for its lack of precise quantitative data (Lancaster and Lancaster, 1978).

Fertility Decision Making

This subject has been discussed at the levels of the individual, the couple, and the family. For example, Shedlin and Hollerbach (1981) provide a classic anthropologically oriented analysis in describing and documenting the complex factors influencing fertility decision making in a Mexican community. Similarly, Scrimshaw (1978b) discusses the changes in men's and women's relative influence on the fertility decision-making process as the woman passes through different stages in her life cycle, stages which are both biologically and culturally determined. Many other examples are provided by Hull (in these volumes) and Beckman (in these volumes).

Family Form and Fertility

Family form refers to distinctions such as nuclear versus extended families, and can also be used to refer to residence patterns, (matrilocal, patrilocal, neolocal). For example, as noted above, there has been a great deal of discussion on whether couples living in extended family situations have fewer children because of a lack of privacy (Nag, 1967, 1974, 1980); alternatively, they may have more children since there are more potential caretakers around. The consensus in the literature seems to favor the former argument (Sipes, 1974). Another series of studies has looked at strong corporate

descent groups and found that they are not associated with high fertility (Sipes, 1974; Nag, 1968; see also Burch, in these volumes).

Women's Activities, Parental Roles, Childcare, and Fertility

This area covers topics ranging from women's work and lactation (Nerlove, 1974) to women's status and fertility (see Oppong, in these volumes). For example, Newman (1978) argues that children are so important to the status of East Indian women that it is essential to produce them as soon as possible after marriage. Women's work and its relationship to fertility seems to be influenced by the availability of childcare (Nardi, 1981; see also Standing, in these volumes). Research relating women's schooling to fertility in developing countries has been reviewed by LeVine (1980).

Value of Children

Along with psychologists and sociologists (Fawcett, in these volumes), anthropologists have looked closely at the value of children, taking advantage of participant observation and time budget studies, observing as well as interviewing. A series of studies under Nag's direction showed that children in large families work more than those in small families, so that large families may be more productive (Nag et al., 1978; White, 1975). These same studies and others (Cain, 1977; Marshall, 1972) indicate that, in many societies, children are economically valuable at a relatively young age (but see Lindert, in these volumes; Lee and Bulatao, in these volumes). Caldwell has also shown that older children continue to be valuable by contributing money to the household, even from a distance (1974, 1977, in these volumes). The question of the quality of children has also been discussed by anthropologists who have suggested that spacing may be a way of ensuring heathier, better-educated children, considered more valuable than a larger family of poor-quality children (Nag et al., 1978; Scrimshaw and Pelto, 1979).

Relationships Between Infant Mortality and Fertility

Some anthropologists feel there is evidence that in some societies and subcultures (particularly where there are economic constraints), differential parental care (conscious or unconscious) results with children who are not wanted: those that are too closely spaced, a sex considered less desirable (usually females), a high birth order in a large family, the product of an illegitimate union, or a child not wanted for some other reason (Scrimshaw, 1978c; Harris, 1977; Lewis, 1963: Neel, 1970). Thus high mortality can be a behavioral consequence of high fertility, rather than the reverse; that is, people who lose children to mortality may not necessarily rush to

replace them as had been thought (Taylor et al., 1976). Anthropologists are continuing to study the specific behavioral mechanisms through which differential care might operate (Scrimshaw and Pelto, 1979). These include infant and child feeding, response to illness (use of medical services), accident prevention, and other physical and emotional support.

METHODS

The most distinctive feature of social anthropology is ethnographic field work, its method of data collection in contemporary populations (Pelto and Pelto, 1978; Johnson, 1978). Ethnography involves a single anthropologist (or a couple) in direct and prolonged contact with individuals of the population under study, using various techniques and perspectives to record social behavior patterns in their natural contexts--ecological, socioeconomic, linguistic, and cultural. Like natural historians of Darwin's day and contemporary ethologists investigating animal behavior, the ethnographer selects methods appropriate to the particular setting, its patterns of adaptation, and its peculiar opportunities for and constraints on observation. The ethnographer collects both quantitative and qualitative data, interprets them in context, and synthesizes them in a detailed published description made available to the scientific community and the general public. The use of specific bodies of data to test hypotheses and evaluate policy follows this contextual study.

This approach is clearly limited for examining large-scale problems of population change. However, it serves as a unique complement to the macro-level methods of demography. In fact, ethnographic data are strongest just where standard demographic data are weakest.

First, ethnography can provide contextual knowledge. Unlike the analyst of national censuses or large-scale surveys, the ethnographer is personally involved in both the collection and analysis phases of research and, having lived in the communities studied, knows the local scene and many of the individuals in it. Conducting a small-scale survey, he or she is able to examine each interview in the light of other information already collected on the same respondent individuals and families, checking for errors and discrepancies while there is still a chance to correct them. This cross-checking of data sources guarantees the validity of the data to a degree not possible in large-scale surveys. Contextual knowledge also facilitates valid interpretation, particularly for anomalous and deviant findings, since the ethnographer has, in his reservoir of local information, an empirical basis for explanation that is independent of any particular survey. The ethnographer is also in a position to assess the relative plausibility of alternative explanations, such as whether results reflect errors of reporting or demographic realities with vernacular meanings. In an example noted by Page and Lesthaeghe (1981), demographers examining African birth histories believed they had no grounds for deciding whether long birth intervals represented a real

social constraint on fertility or defective sampling or reporting. The anthropologists who reported such data, however, knew from their ethnographic research on African families that these intervals were due not to methodological errors, but to institutionalized postpartum abstinence, a cultural pattern of great normative significance in some African communities that has important consequences for total fertility. The anthropological interpretation was confirmed by subsequent demographic research (Caldwell and Caldwell, 1977; Page and Lesthaeghe, 1981), thus demonstrating the value of contextual knowledge to the scientific understanding of fertility.

Another area where the anthropological method is particularly effective is in measuring proscribed behavior. Since such behavior is often related to reproduction, this has important implications for demographers. Depending on the culture, behaviors such as induced abortion, infanticide, contraceptive use, and forbidden sexual intercourse may all be concealed to some extent. Anthropologists can obtain data on these behaviors through repeated, subtle conversations, through observation, through the flexibility of changes in approaches to a topic, and through the increased trust that comes from time spent in a community. For example, each of several women interviewed during the first two months of field work in Barbados claimed to have had a single father for all her children; later, one by one, they "confessed" that their children had "several fathers," and then provided accurate union and fertility histories (Scrimshaw, 1969).

Population researchers have had a great deal of difficulty in addressing the related questions of achieved behavior versus intentions and real versus ideal behavior, questions that are important in understanding fertility and family planning. Here, the strength of the anthropological method lies in its combination of questions, conversation, and observation over time in the field. A woman who states she will seek contraception can be observed to see if she actually does, and what obstacles she encounters along the way. A woman who categorically states she is against induced abortion and later asks the researcher to loan her money so she can get one is demonstrating the discrepancy between real and ideal behavior. Typically, the anthropologist accumulates cases like these, and uses them as a basis for estimating the frequency of such occurrences. Often, a few case histories can reveal problems which survey researchers had not suspected were present, thus allowing appropriate questions to be incorporated into surveys.

The ethnographic method is particularly important for population studies in developing countries that lack birth and death registration, where national census interviews are used to estimate ages and proportions of children who have died. Although government census bureaus have become more sophisticated in constructing local event calendars for age determination, and demographers have devised methods of estimating ages and other vital statistics from censuses known to be based on approximations, community census surveys conducted by anthropologists can make unique contributions. In some cases, they provide census material in which ages have been carefully ascertained, taking much more time and effort than a government

enumerator could afford, and including exact birth dates for children born during the field research period. An increasing number of anthropologists have worked in the same communities over 20 years or more, collecting data indicative of demographic trends and dynamics in a small population. There is reason to believe that much more information of this kind has been collected on peoples throughout the developing world than has been published to date; were these data to be made available to the demographic research community, research on fertility change would probably benefit substantially.

Ethnographic work is thus stronger in validity and in the extent to which one is actually measuring what one is attempting to measure; however, survey work is stronger in its reliability and replicablity (Pelto and Pelto, 1978). Because of this complementarity, researchers are increasingly attempting to combine the two. Ideally, this combination should consist of ethnographic work applied to the survey design, and then some in-depth work with a small, randomly selected subsample of the survey population. The presurvey ethnographic work provides the research investigation with the contextual richness described above, and guides the framing of the questions themselves. For example, when this combination of methods was applied in Ecuador in the early 1970s, barriers to contraceptive use such as fears of specific methods and of family planning clinics, as well as problems with access to the clinics, emerged from conversations between the ethnographer and women in the community. Related questions were then built into the survey which confirmed the existence of these problems in the larger population and established their magnitude. At the same time, a question on whether or not women knew how to "avoid children," which had successfully elicited information about contraception from Puerto Rican women in New York, was interpreted in Ecuador as meaning knowledge about abortion. The wording had to be changed to "avoid becoming pregnant." Even working in the same language, it was necessary to make such changes from one country to another (Scrimshaw, 1974).

Ethnographic work done concurrently with a survey can be used to establish greater depth on a subsample, thus enhancing the interpretation of survey results. For example, in one study of seasonal migration in Guatemala, the researcher migrated with a subsample from one of the communities studied. She rode the trucks from the highlands to the coast, ate and slept under the same conditions as the migrants, and picked up a great deal of detail on their feelings about migration, their reasons for it, and their methods of coping with it (Hurtado, 1980).

Finally, surveys and ethnographies can be combined in the data analysis and writing phase. In Ecuador, 65 families studied ethnographically were interviewed as a special subsample of the survey, so that the researcher had both kinds of data for them. It was gratifying that the fertility histories were identical, down to admitted induced abortions, since the ethnographic work had led to the development of detailed probes and questions for each topic. Other items, however, were less accurate. A question about sanitary facilities was designed as both an economic and a health measure.

Unfortunately, people surveyed (2,200 families throughout the city) often insisted they had facilities which the ethnographer knew did not exist in their areas. The information on family income was not consistent with ethnographic records; however, other culturally appropriate measures of socioeconomic status, developed during the ethnographic phase, appeared to place each family accurately (Scrimshaw, 1974).

The ethnographic data often also served to reveal the meaning behind the statistics. For example, women's determination to obtain contraception despite their husbands' objections could be illustrated by their stories of how they tried to do so. In another example, detailed analysis of fertility histories revealed that the second of two closely spaced infants was more likely to die than its older sibling, a reverse of the usual mortality pattern. The survey data yielded no clue as to the reason for this (Wolfers and Scrimshaw, 1975); however, the reason was painfully clear from the ethnographic observations of differential treatment of siblings, with the older likely to receive more food and medical attention than the younger (Scrimshaw, 1978c). Without the data from both methods, the two halves of this puzzle could not have been put together.

Although it will not always be possible to conduct such combined field research, demographers can make greater use of existing ethnographic research and of ethnographers in areas where survey research or other data analysis will be conducted. Moreover, ethnographic work and ethnographers can be used in the design of data collection and analysis and in the interpretation of results.

CONCLUSIONS

Anthropologists and demographers have examined many of the same problems, although often in different populations and from different perspectives. However, the mutual influence that might have been expected has been relatively slight, in part because of a lack of awareness by investigators of relevant research outside their own disciplines. The contributions that anthropology and its unique methods can made to the scientific understanding of fertility and its determinants in developing countries will be realized only when more anthropologists read the population literature, address their research and writings to issues in population studies, and include demographic methods in their research. Conversely, more demographers, especially those working in developing countries, need to be aware of the anthropological evidence. More specifically, the advantages of ethnographic inquiry should be combined with quantitative research, as separate stages of a single project and through the intensive study of subsamples from survey populations.

Anthropological research, as reviewed in this chapter, has made some contributions to the understanding of fertility determinants, but these could be substantially enhanced by field studies focused on such topics as factors affecting fertility decline, particularly in some of the larger national populations; factors affecting contraceptive

acceptability; and changes in the value of children with migration from rural to urban areas. Whatever the location and problem focus of their studies, however, anthropologists should continue to do what they do best: provide holistic and accurate pictures of communities and the cultures, behaviors, relationships, and motivations of people within those communities, in this case with respect to fertility and fertility change. To be fully effective at this, anthropologists must learn enough of the problems, language, and culture of demography to put their research into terms comprehensible to other disciplines within the population field.

NOTE

1. Participants at the workshop were John W. Adams, J. Lawrence Angel, Mead T. Cain, John C. Caldwell, Mary Elmendorf, B. M. Gray, John Gulick, Eugene A. Hammel, Nancy Howell, William Jansen, Alice Bee Kasakoff, Robert A. LeVine, Richard Lieban, Moni Nag, Robert M. Netting, Lucile F. Newman, Priscilla Reining, Susan C. M. Scrimshaw, Michele Shedlin, Mayling Simpson-Hebert, Richard G. Sipes, Benjamin White, and Aram Yengoyan, in addition to members and staff of the Panel on Fertility Determinants: Rodolfo A. Bulatao, Ronald Freedman, Paula E. Hollerbach, Robert J. Lapham, W. Parker Mauldin, Toni Richards, and Carol Bradford Ward. Many of the anthropologists prepared short papers for the workshop, which are reflected to some extent in this chapter. In particular, the chapter draws on the extensive bibliographic work and discussion paper prepared for the workshop by Reining (1981).

BIBLIOGRAPHY

Abernathy, V. (1979) Population Pressure and Cultural Adjustment. New York: Human Sciences Press.

Alland, A. (1970) Adaptation in Cultural Evolution: An Approach to Medical Anthropology. New York: Columbia University Press.

Arensberg, A., and A. Niehoff (1971) Introducing Social Change: A Manual for Community Development. Chicago: Aldine-Atherton.

Baker, P. T. (1978) The Biology of High Altitude Peoples. London: Cambridge University Press.

Baker, P. T., and J. S. Dutt (1972) Demographic variables as measures of biological adaptation: A case study of high altitude populations. In G. H. Harrison and A. J. Boyce, eds., The Structure of Human Populations. Oxford, Eng.: Clarendon Press.

Barlett, P. F. (1980) The anthropological approach to fertility decision-making. In T. K. Burch, ed., Demographic Behavior: Interdisciplinary Perspectives on Decision-Making. Boulder, Colo.: Westview Press.

Blurton-Jones, N. B., and R. M. Sibly (1978) Testing adaptiveness of culturally determined behavior: Do Bushmen women maximize reproductive success by spacing births widely and foraging seldom? In N. B. Blurton-Jones and V. Reynolds, eds., Human Behavior and Adaptation. Symposium Number 18 of the Society of the Study of Human Biology. London: Taylor-Francis.

Bongaarts, J. (1978) A framework for analyzing the proximate determinants of fertility. Population and Development Review 3:63-102.

Cain, M. T. (1977) The economic activities of children in a village in Bangladesh. Population and Development Review 3:201-228.

Caldwell, J. C. (1974) The Study of Fertility and Fertility Change in Tropical Africa. WFS Occasional Papers, No. 7. London: World Fertility Survey.

Caldwell, J. C. (1977) The economic rationality of high fertility: An investigation illustrated with Nigerian survey data. Population Studies 31:5-27.

Caldwell, J. C., and P. Caldwell (1977) The role of marital sexual abstinence in determining fertility: A study of the Yoruba in Nigeria. Population Studies 31:193-217.

Carr-Saunders, A. M. (1922) The Population Problem. Oxford, Eng.: Clarendon Press.

Chagnon, N. A. (1979) Kin selection and conflict: An analysis of a Yanomano ax fight. In N. A. Chagnon and W. Irons, eds., Evolutionary Biology and Human Social Behavior: An Anthropological Perspective. North Scituate, Mass.: Duxbury Press.

Chen, K. H., S. Wishik, and S. Scrimshaw (1974) The effects of unstable sexual unions on fertility in Guayaquil, Ecuador. Human Biology 21:353-359.

Clegg, E. J. (1978) Fertility and early growth. In P. Baker, ed., The Biology of High Altitude Peoples. London: Cambridge University Press.

Coale, A. J., and T. J. Trussel (1974) Model fertility schedules: Variations in the age structure of childbearing in human populations. Population Index 40:185-258.

Cowgill, G. (1975) On causes and consequences of ancient and modern population changes. American Anthropologist 77:505-525.

Davis, K., and J. Blake (1956) Social structure and fertility: An analytical framework. Economic Development and Cultural Change 4:211-235.

Devereux, G. (1955) A Study of Abortion in Primitive Societies. New York: Julian Press.

Dickeman, M. (1975) Demographic consequences of infanticide in Man. Annual Review of Ecology and Systematics 6:100-137.

Dickeman, M. (1979) Female infanticide, reproductive strategies and social stratification: A preliminary model. In N. A. Chagnon and W. Irons, eds., Evolutionary Biology and Human Social Behavior: An Anthropological Perspective. North Scituate, Mass.: Duxbury Press.

Divale, W., and M. Harris (1976) Population, warfare and the male supremist complexes. American Anthropologist 78:521-538.

Dumond, D. E. (1975) The limitation of human population: A natural history. Science 187:713-721.

Firth, R. (1957) We, The Tikopia. London: Allen and Unwin.

Firth, R. (1961) Elements of Social Organization, 3rd ed. Boston: Beacon Press.

Ford, C. S. (1964) A Comparative Study of Human Reproduction. New Haven, Conn.: Human Relations Area Files Press.

Geertz, C. (1973) The Interpretation of Cultures. New York: The Free Press.

Goodenough, W. (1963) Cooperation in Change. New York: Russell Sage.

Gulick, J., and M. E. Gulick (1975a) Final Considerations About Their Children Among Parents in the Iranian City of Isfahan. Paper presented at the annual meeting of the American Association for the Advancement of Science, New York.

Gulick, J., and M. E. Gulick (1975b) Migrant and native married women in the Iranian city of Isfahan. Anthropological Quarterly.

Hackenberg, R. A. (1974) Genealogical method in social anthropology: The foundations of structural demography. In J. Honigman, ed., Handbook of Social and Cultural Anthropology. New York: Rand McNally.

Hammel, E. A. (1961) The family cycle in a coastal Peruvian slum and village. American Anthropologist 63:989-1005.

Hammel, E. A., and D. W. Wachter (1977) Primonuptuality and ultimonuptuality: Their effects on stem-family-non-household frequencies. In R. D. Lee, ed., Population Patterns in the Past. New York: Academic Press.

Harner, M. J. (1970) Population factors and the social evolution of agriculturalists. Southwestern Journal of Anthropology 26:67-86.

Harris, M. (1977) Cannibals and Kings: The Origins of Cultures. New York: Random House.

Hassan, F. A. (1973) On the mechanisms of population growth in the neolithic. Current Anthropology 14:535-542.

Himes, N. E. (1963) Medical History of Contraception. New York: Gamut Press.

Hurtado, E. (1980) Personal communication.

Irons, W. (1979) Culture and biological success. In N. A. Chagnon, and W. Irons, eds., Evolutionary Biology and Human Social Behavior: An Anthropological Perspective. North Scituate, Mass.: Duxbury Press.

Irons, W. (1980) Is Yomut social behavior adaptive? In G. W. Barlow, and J. Silverberg, eds., Sociobiology: Beyond Nature? American Association for the Advancement of Science Selected Symposium 35. Boulder, Colo.: Westview Press.

Johnson, A. W. (1978) Quantification in Cultural Anthropology: An Introduction to Research Design. Stanford, Calif.: Stanford University Press.

Kaplan, B. A. (1976) Anthropological Studies of Human Fertility. Detroit, Mich.: Wayne State University Press.

Katz, S. H. (1972) Biological factors in population control. In B. Spooner, ed., Population Growth: Anthropological Implications. Cambridge, Mass.: MIT Press.

Knodel, J. (1977) Breastfeeding and population growth. Science 198:111-115.

Kunstadter, P. (1971) Natality, mortality and migration of upland and lowland populations in northwestern Thailand. In S. Polgar, ed., Culture and Population: A Collection of Current Studies. Cambridge, Mass.: Schenkenmapp.

Kunstadter, P., R. Buhler, F. Stephan, and C. F. Westoff (1963) Demographic variability and preferential marriage patterns. American Journal of Physical Anthropology 21:511-519.

Lancaster, C., and J. Lancaster (1978) On the male supremist complex: A reply to Divale and Harris. American Anthropologist 80:115-117.

Langer, W. (1974) Infanticide: A historical survey. History of Childhood Quarterly 1:353-365.

LeVine, R. (1980) Influences of women's schooling on maternal behavior in the Third World. Comparative Education Review 24:S78-S104.

Lewis, O. (1963) Life in a Mexican Village. Pregnancy and Birth. Urbana, Ill.: University of Illinois Press.

Lorimer, F. et al. (1954) Culture and Human Fertility. Paris: UNESCO.

Low, S. (1978) Family formation in Costa Rica. In W. B. Miller and L. F. Newman, eds., The First Child and Family Formation. Chapel Hill, N.C.: Carolina Population Center.

Malinowski, B. (1929) The Sexual Life of Savages. New York: Harcourt, Brace and World.

Marshall, J. F. (1972) Culture and Contraception: Response Determinants to a Family Planning Program in a North Indian Village. Unpublished Ph.D. dissertation. Department of Anthropology, University of Hawaii, Honolulu.

Marshall, J. F. (1977) Acceptability of fertility regulating methods: Designing technology to fit people. Preventative Medicine 6:65-73.

Marshall, J. F., and S. Polgar, eds. (1976) Culture, Natality, and Family Planning. Chapel Hill, N.C.: University of North Carolina.

McClung, J. (1969) Effects of High Altitude on Human Birth. Cambridge, Mass.: Harvard University Press.

Mead, M. (1949) Male and Female: A Study of the Sexes in a Changing World. New York: William Morrow and Company.

Nag, M. (1967) Family type and fertility. Pp. 160-163 in Proceedings of the World Population Conference, Vol. 2. New York: United Nations.

Nag, M. (1968) Facts Affecting Human Fertility in Non-Industrial Societies: A Cross Cultural Study. New Haven, Conn.: Human Relations Area Files.

Nag, M. (1973) Cultural factors affecting family planning. Journal of Family Welfare (India) 19:3-7.

Nag, M. (1974) Socio-cultural patterns, family cycle, and fertility. Pp. 289-312 in The Population Debate: Dimensions and Perspectives, World Population Conference 3, Bucharest, Vol. 2. New York: United Nations.

Nag, M. (1975a) Population anthropologists at work. Current Anthropology 16:264-266.

Nag, M. (1975b) Population and Social Organization. The Hague: Mouton.

Nag, M. (1980) How modernization can also increase fertility. Current Anthropology 21:571-587.

Nag, M., B. N. F. White, and R. C. Peet (1978) An anthropological approach to the study of the economic value of children in Java and Nepal. Current Anthropology 19:293-306.

Nardi, B. A. (1981) Modes of explanation in anthropological population theory: Biological determinism vs. self-regulation in studies of population growth in Third World countries. American Anthropologist 83:28-56.

Neel, J. V. (1970) Lessons from a 'primitive' people. Science 170:815-822.

Nerlove, S. B. (1974) Women's workload and infant feeding practices: A relationship with demographic implications. Ethnology 13:207-214.

Netting, R. M. (1974) Agrarian ecology. Annual Review of Anthropology 3:21-56.

Newman, L. F. (1970) Cultural factors in family planning. Annals of the New York Academy of Sciences 175:833-846.

Newman, L. F. (1972) Birth Control: An Anthropological View. Reading, Mass.: Addison-Wesley.

Newman, L. F. (1978) Symbolism and status change: Fertility and the first child in India and the United States. In W. B. Miller and L. F. Newman, eds., The First Child and Family Formation. Chapel Hill, N.C.: Carolina Population Center.

Newman, L. F. (1981) Anthropological Contributions to Fertility Research. Paper presented at the annual meeting of the American Anthropological Association, Los Angeles, Calif.

Page, H. T., and R. Lesthaeghe, eds. (1981) Childspacing in Tropical Africa: Tradition and Change. New York: Academic Press.

Pelto, P. J., and G. H. Pelto (1978) Anthropological Research: The Structure of Inquiry. New York: Cambridge University Press.

Polgar, S., ed (1971) Culture and Population: A Collection of Current Studies. Carolina Population Center Monograph No. 9. Chapel Hill, N.C.: University of North Carolina.

Polgar, S. (1972) Population history and population policies from an anthropological perspective. Current Anthropology 13:203-211.

Polgar, S. (1973) Modernization, Population and the Family: Cultural and Historical Perspectives. Paper for the World Population Conference Symposium on Population and the Family, UNESCO, Honolulu, Hawaii.

Polgar, S. (1975) Population, Ecology and Social Evolution. The Hague: Mouton.

Polgar, S., and J. F. Marshall (1976) The search for culturally acceptable fertility regulating methods. In J. F. Marshall and S. Polgar, eds., Culture, Natality, and Family Planning. Chapel Hill, N.C.: University of North Carolina.

Reining, P., ed. (1977) Village Women: Their Changing Lives and Fertility. Studies in Kenya, Mexico, and the Philippines. Publication No. 77-6. Washington, D.C.: American Association for the Advancement of Science.

Reining, P. (1981) Anthropology of Fertility. Paper prepared for the Workshop on the Anthropology of Human Fertility, Washington, D.C.

Saucier, J. F. (1972) Correlates of the long postpartum taboo: A cross-cultural study. Current Anthropology 13:238-249.

Schneider, D. M. (1955) Abortion and depopulation on a Pacific island. In B. Paul, ed., Health, Culture and Community. New York: Russell Sage.

Scrimshaw, S. C. M. (1969) A Critique of the Anthropological Method as an Instrument for Research on Human Reproduction: A Case Study in Barbados. Unpublished Ph.D. dissertation. Columbia University, New York.

Scrimshaw, S. C. M. (1972) Anthropology and Population Research: Application in Family Planning Programs. Evaluation Manual. New York: International Institute for the Study of Human Reproduction.

Scrimshaw, S. C. M. (1974) Culture, Environment, and Family Size: A Study of Urban In-Migrants in Guayaquil, Ecuador. Ph.D. Dissertation. Columbia University, New York.

Scrimshaw, S. C. M. (1976) Women's modesty: One barrier to the use of family planning clinics. In J. Marshall and S. Polgar, eds., Culture, Natality and Family Planning. Chapel Hill, N.C.: University of North Carolina.

Scrimshaw, S. C. M. (1978a) Family formation and first birth in Ecuador. In W. B. Miller and L. F. Newman, eds., The First Child and Family Formation. Chapel Hill, N.C.: University of North Carolina.

Scrimshaw, S. C. M. (1978b) Stages in women's lives and fertility decision-making in Latin America. Medical Anthropology 2:41-58.

Scrimshaw, S. C. M. (1978c) Infant mortality and behavior in the regulation of family size. Population and Development Review 4:383-403.

Scrimshaw, S. C. M. (1980a) Cultural factors affecting the acceptability of vaginal contraceptives. In G. I. Zatuchni, A. J. Sobrero, J. J. Speidel, and J. J. Sciarra, eds., New Developments in Vaginal Contraception. New York: Harper and Row.

Scrimshaw, S. C. M. (1980b) Acceptability of new contraceptive technology. In G. I. Zatuchni, M. H. Labbock, and J. J. Sciarra, eds., Research Frontiers in Fertility Regulation. New York: Harper and Row.

Scrimshaw, S. C. M., and G. H. Pelto (1979) The impact of nutrition and health programs on family size and structure. Pp. 183-217 in R. Klein, M. S. Read, H. Riecken, A. Pradilla, and C. Daza, eds., The Practice of Impact Evaluation. New York: Plenum Press.

Shain, R. M. (1980) Acceptability of contraceptive methods and services: A cross-cultural perspective. In R. M. Shain and C. J. Pauerstein, eds., Fertility Control: Biological and Behavioral Aspects. Hagerstown, Md.: Harper and Row.

Shedlin, M. G., and P. E. Hollerbach (1981) Modern and traditional fertility regulation in a Mexican community: The process of decision-making. Studies in Family Planning 12:278-296.

Sipes, R. (1974) A Hologeistic Investigation of the Influence of Three Sociocultural Factors on Population Growth Rates. Unpublished Ph.D. dissertation. SUNY, Buffalo.

Stycos, J. M. (1963) Culture and differential fertility of Peru. Population Studies 16:257-270.

Swedlund, A. C. (1978) Historical demography as population ecology. Annual Review of Anthropology 7:137-173.

Taylor, C. E., J. S. Newman, and N. U. Kelley (1976) The child survival hypothesis. Population Studies 30:263-278.

Wagley, C. (1969) Cultural influences on population: A comparison of two Tupi tribes. In A. P. Vayda, ed., Environment and Cultural Behavior. New York: The Natural History Press.

Weiss, K. M. (1976) Demographic theory and anthropological inference. Pp. 351-381 in B. J. Siegel, A. R. Beals, and S. Tyler, eds., Annual Review of Anthropology, Vol. 5. Palo Alto, Calif.: Annual Reviews.

White, B. (1975) The economic importance of children in a Javanese village. In M. Nag, ed., Population and Social Organization. The Hague: Mouton.

White, B. (1981) Statement Prepared for the Workshop on the Anthropology of Human Fertility. Committee on Population and Demography, National Research Council, Washington, D.C.

Wolfers, D., and S. C. M. Scrimshaw (1975) Child survival and intervals between pregnancies in Guayaquil, Ecuador. Population Studies 29:479-496.

Wynne-Edwards, V. C. (1962) Animal Dispersion in Relation to Social Behavior. Edinburgh: Oliver and Boyd.

Yengoyan, A. A. (1972) Biological and demographic factors in Aboriginal Australian socio-economic organization. Oceana 43:88.

Yengoyan, A. A. (1974) Demographic and economic aspects of poverty in the rural Philippines. Comparative Studies in Society and History 16:58-72.

Chapter 37

STATISTICAL STUDIES OF AGGREGATE FERTILITY CHANGE. TIME SERIES OF CROSS SECTIONS

Toni Richards

INTRODUCTION

The statistical analysis of the determinants of fertility change in developing countries is a difficult problem. The long time series needed to disentangle trend, cycle, and short-run fluctuations are simply not available. At best, we have replicated short time series for some set of cross-sectional units or time series of cross sections. The cross-sectional units are geographically defined and may be countries (cross-national analysis) or areal units within a country (within-country analysis). The time period for which data are available is typically short. The analysis of time series of cross sections presents special interrelated theoretical and statistical problems. Most theoretical work has assumed what will be called "structural stability"; that is, most work has assumed that the same process that accounts for cross-sectional variability can account for changes over time. Thus, if some association between variables is observed in the cross section, structural stability would suggest that a change in one variable will produce a change in the other over time. Empirically, this turns out to be unjustified. (This is not a new point. It has been made repeatedly by other authors, for example, Hermalin [1978] and Schultz [1973]). The reasons for this are relatively straightforward. Much of the research has concerned the impact of modernization on fertility decline. In the rather short periods for which data are available, these variables tend to change rather slowly. However, cross-sectional differentials, either between countries or between regions within countries, tend to be rather large; these cross-sectional differentials can be thought of as the result of some long historical process. It is unlikely that the same model that accounts for changes in fertility over the period of observation will also account for differentials arising from long-term historical evolution. Indeed, it seems plausible that any model used to account for fertility change over some period must somehow take into account (condition on) the history of the areas that form the basis of the analysis. This makes assessing the impact of modernization on fertility decline somewhat delicate. This point will be reiterated below when statistical models appropriate to the analysis of time series of cross sections are considered.

The present paper reviews a sampling of recent work that analyzes fertility change in developing countries using time series of cross sections as data sets. These include both studies of a single country, such as Schultz's (1973) Taiwan study, and cross-national studies, such as Gregory and Campbell's (1976), that include a longitudinal component. The work of both sociologists and economists is represented. All of the studies are based on aggregate data, and all include at least some time series information for repeated cross-sectional units. The discussion has five parts. First is a brief examination of theoretical models; this is necessitated by the controversy over the relevance of socioeconomic factors as explanations of fertility change (see, e.g., van de Walle and Knodel, 1980; Freedman, 1979), as well as by the variety of approaches used by the authors reviewed. Next is a section on methodology. This is followed by a discussion of the empirical literature in two parts: within-country and cross-national studies. Finally, some suggestions for further research are offered, followed by a number of propositions summarizing and assessing the evidence discussed in the paper.

THEORETICAL ASPECTS

Arguments concerning the effects of socioeconomic development on fertility decline seem to have fallen out of favor as explanations of the demographic transition in Europe. However, measures of socioeconomic development, along with mortality, are the principal independent variables used to predict fertility change in the studies reviewed for this paper.[1] Another common variable is information on contraception or family planning programs. When the research is carried out by sociologists, the arguments are based on the "theory of the demographic transition." This view has been summarized in a critical essay by Freedman (1979:2):

> Briefly, changes in macro-developmental variables--urbanization, industrialization, literacy, and the like--resulted in a shift from major dependence on relatively self-contained local institutions to dependence on larger social, economic, and political units. Such a shift implies a change in the division of labor from one in which the family and local community are central to a larger complex [to one] in which the family gave up many functions to larger, specialized institutions. The satisfactions derived from children and family are both economic and noneconomic; and for both, new nonfamilial institutions were of growing importance. Greater literacy and the development of effective communication and transportation networks were essential to all these changes.
>
> As units of interdependence expanded and took over familial functions, the benefits and satisfactions derived from numerous children lessened. The costs of children increased, partly because they interfered with new nonfamilial activities and partly because improving standards of living, the increased education,

and the opportunities in the new expanded system of interaction led to rising aspirations. Parents wanted more for themselves and their children. Under the new conditions, many satisfactions, such as those derived from the achievements of their children, were more likely to be derived from investing in fewer rather than more children.

In this classical model, primary emphasis was on the changes in the objective structural developmental levels as primary in fertility decline. The new aspirations, the changes in the functions of the family, and the new perceptions of the costs and benefits of children were seen as the necessary and almost incidental consequences of the developmental changes which lead to the demand for fewer children.

Recently, transition theory has been criticized for being too automatic, for paying too little attention to the mechanisms through which modernization leads to fertility decline, and for being empirically inaccurate. In the same article, Freedman points out that there are cases where less advanced areas began their decline before more advanced ones and that culturally similar areas tend to have similar fertility regardless of their level of development. He suggests that some subset of changes in life conditions along with access to new ideas may be sufficient for fertility decline; he emphasizes the importance of legitimation of family limitation, and the importance of the availability of contraceptive methods. In many ways, this is a restatement of Coale's preconditions for fertility decline, with a much-diminished emphasis on economic aspects (Coale, 1973). In a somewhat similar vein, van de Walle and Knodel (1980) have also criticized transition theory. They argue that a "new mentality" is required for the onset of fertility decline (p. 35). The support for their argument is largely the same as Freedman's. Given the concentration in time of fertility decline in historical Europe and the diversity of socioeconomic conditions then existing, van de Walle and Knodel argue that "differences in the start and speed of fertility decline seem to have been determined more by cultural setting than by socioeconomic conditions" (p. 21). Pointing to the relative invariance of the mean age at last birth (p. 11), they emphasize the absence of target family size in pretransition populations. They conclude that a new mentality was required for fertility decline, and that this predisposition is governed by cultural factors (p. 34).

Criticism of transition theory is not new. Earlier criticism emphasized its lack of precision. In 1975, Teitlebaum remarked: "The theory of the demographic transition is essentially a plausible description of complex social and economic phenomena which took place in 19th century Europe. It is notably lacking in such components of theories as a specifiable and measurable mechanism of 'causation' and a definite time scale." The new criticisms both deny the theory's empirical accuracy for Europe and seek new culturally based mechanisms to account for fertility decline. The question that must be raised is whether, in light of these criticisms, it still makes sense to include

measures of modernization among the independent variables used to account for fertility change in developing countries, and how well such models are likely to perform. The principal issue is what can be reasonably expected from statistical models of fertility decline.

It will be argued here that some of the results cited by van de Walle and Knodel and by Freedman as evidence for the relative unimportance of modernization for fertility decline may have been far too strict a test of the theory. Critics of transition theory have regarded the onset of family limitation as a decisive break with the past. In empirical analysis, they have examined the date when fertility declined 10 percent or more, never to return to its previous levels. On this basis, they have noted that regions with far different levels of modernization tend to have similar dates of fertility decline and that those regions with similar dates of decline tend to cluster geographically and culturally. On this basis, they have concluded that economic modernization is relatively unimportant for fertility decline and that cultural and linguistic factors that facilitate the communication of new ideas are more important. However, this analysis may be too strong a test for what seems to be a relatively weak hypothesis. What the test amounts to is predicting the turning point in fertility from the level of modernization. This is a difficult task. If the level of fertility at any given point in time is regarded as the outcome of some long historical process (Hermalin, 1975), it seems unreasonable to expect to predict the turning point in such a series from a single factor, without more knowledge of the process. It is like trying to draw inferences about a moving picture from a single still frame. A perhaps less restrictive test is to ask whether, in some set of regions over some time period, an increase in modernization is associated with a decline in fertility, once one has somehow accounted for the history of the process. A variety of statistical models are available for such analyses; the present discussion will emphasize selecting a model that makes sense theoretically, at the same time pointing out how different statistical models make different assumptions about the dynamics of fertility and its responsiveness to change.

The arguments just described have been primarily among sociologists; the hypotheses involved properly concern aggregate behavior. However, the causal mechanisms are sometimes ambiguous. In contrast, the work of economists examined next proceeds from an explicit model of decision making developed at the household level,[2] so that the causal mechanisms are clearly stated. However, aggregation from the household to the population level is somewhat vague. The model of decision-making assumes some desired family size or target number of surviving children, and proceeds from the theory of consumer choice. Schultz (1973) summarizes it as follows: "The object is to specify a relation between the birth rate parents want and the price, income, and information constraints that are not themselves determined simultaneously with or subsequently by, the objective number of births." The result is a single reduced-form derived demand equation for (surviving) children.[3] The price and income effects arising from some structural change are traced through

the model of the demand for children, with a goal of predicting at least the sign on the elasticities.[4] Even so, considerable indeterminancy can result. This is exacerbated when the households are aggregated and when indicators must be used instead of prices and income. This work of economists differs substantially from that of the sociologists who have criticized transition theory; it resembles more the older view in which the demographic transition is seen not as a drastic change in the decision-making process, but as the result of a change in opportunities and constraints resulting from structural economic change.

A NOTE ON DATA AND METHODS

All of the data sets in the studies considered here are time series of cross sections. The estimation procedures rely on the general linear model. These data sets pose specific methodological problems that must be handled carefully. First, the cross-national data sets raise questions of comparability both cross-sectionally and over time. Such problems are less severe for the within-country studies. Cavanaugh (1979), for example, questions the quality of international fertility data, given the variability of estimates from different sources, and suggests that it may be impossible to draw conclusions from such dubious data. However, examination of the data he presents indicates that the problems may be less serious than originally suggested. Although the level of fertility in any particular country at any particular time may not be precisely known, the overall pattern is quite consistent among the various sources, and the conclusions to be drawn from regression estimates are likely to be largely the same since the coefficient estimates depend not on the level but on the pattern.[5] The discussion below will describe some of the sources of bias that can be controlled through suitable estimation procedures. A more serious problem is the cavalier treatment of missing data and sampling problems in cross-national studies.[6]

The present discussion will focus only on the most basic issues involved in analyzing time series of cross sections, and will describe only some of the simpler statistical models. In recent years, there has been an explosion of new models and new estimation techniques, many of which have been collected in the Annales de l'INSEE, 1978. However, although these new models are substantially more sophisticated than the simpler ones described here, the basic principles remain the same. Moreover, the available empirical research relies on the simpler models; the more sophisticated models appear not to have been applied to demographic problems.

A time series of cross section data set can be thought of as an analysis of covariance design with a two-way layout (with or without interactions): the cross-sectional units--regions or countries in this case--form one classification; the time observations--years--form the second classification.[7] As with any analysis of variance problem of this sort, for each classification, the total sum of squares can be decomposed into two orthogonal components--the within

and the between sums of squares--and independent parameter estimates can be computed from each sum of squares.[8] Clearly, the results can be quite different depending on which component of the variance is analyzed. This independence of the within and the between sum of squares estimates is fundamental to the remainder of this discussion.

In addition to analysis of variance issues, time series of cross sections raise some of the same questions as standard time series, without having the necessary observations to resolve them. Relevant here are the consequences of focusing on one classification rather than another--regions or countries versus time periods--and what is represented by each component of the variance. The theoretical and statistical problems are further compounded by some of the characteristics of the data sets analyzed. This will be discussed below, following a review of some of the more formal aspects of the problem. Recall that the basis of the analysis of variance and of covariance is the decomposition of the total sum of squares into between- and within-category variation. The analysis of the between sum of squares is based on the category means; the analysis of the within sum of squares is based on deviations from those means. First consider the country or region classification. Do the country or region means, computed over time, reflect persisting characteristics resulting from the unique historical experience of the region or country that either cannot be explained by variables typically available or are not of interest? Or do they represent long-term trends that it is essential to understand? Does the within-country or within-region over time variance (the deviations from the country or region means) represent only short-run fluctuations, or can inferences about trends be drawn from this component? Now consider the time period classification. It can be argued that, under conditions of structural stability, where coefficients do not change with time or with different levels of development (no interactions), estimates based on within-cross-section variance represent the long term by averaging effects for several time periods (see Chenery and Syrkin, 1977). Unfortunately, hypotheses about stability of coefficients are rarely verified, and, when verification is attempted, seem unfounded.[9]

In addition to these theoretical questions, the data sets themselves have certain characteristics that complicate the issues. The period of analysis tends to be relatively short, and the variables in question tend to change slowly; as a consequence, the data sets tend to have considerably more cross-sectional than temporal variation. In the context of the analysis of variance just discussed, this means that the total sum of squares is dominated by the region or country means, where these are computed over time. It is the contention here that these region or country means are correctly viewed as the result of a long-term historical process about which relatively little is known. It seems unlikely that, in the context of the demographic transition, the assumption of structural stability will be met, that is, that the pretransition and posttransition processes that describe the time path of fertility will be the same. Thus the between-region variability must be treated with special care,

since the regional means are presumably the result both of pretransition differentials and of the process of transition, and special modeling is required. Examination of the within-region variability eliminates this long-run variability from the analysis, making it possible to ask about relationships among the variables within regions over time, and in a limited sense takes into account (conditions on) the longer-term process. Because variability between and within regions may arise from different processes, and because the estimates are statistically independent, analyses based on one component or the other may give different results. It is therefore important that researchers carefully consider which portion of the variance they wish to analyze and which is more relevant to the hypotheses of interest. In this context, the choice of statistical model is far from arbitrary.

The paucity of time series observations not only makes it difficult to distinguish long-run from short-run variability; it also creates problems in cases where the response of the dependent variable depends not on the value of the independent variable at some specified time point, either present or past, but on a set of current and lagged values of the independent variables, that is, where a distributed lag is required. Usually, only contemporaneous values or a single lag is available; thus the estimated coefficient may be biased due to the omitted lags, and the dynamics of the relationship obscured.[10]

On the positive side, the analysis of covariance framework does make it possible to eliminate some of the effects of certain systematic errors in the data. This may be particularly valuable for cross-national studies that are plagued by data problems. Removing the regional or country means and analyzing the within-country variance simultaneously removes any consistent country- or region-specific biases from the data. Similarly, removing time-period means and analyzing within-cross-section variance removes any consistent bias that affects all countries from a particular period. In this way, the country or region means (calculated over time) capture the biases of particular countries; likewise, the cross-sectional means (calculated over countries) capture the global time trend in such biases as it affects all countries in a given period. This is yet another reason why the between sum of squares must be handled with particular care.

EMPIRICAL STUDIES

Within-country Studies

Only three studies are examined in this section. This is due in part to the difficulty of obtaining repeated time series observations for a reasonably fine areal partition of a country. Two of the studies examined are Schultz's (1973) Taiwan study and Nerlove and Schultz's (1970) Puerto Rico study (also see Schultz, 1969); the other is Hermalin's (1978) Taiwan study. The first two studies have similarly structured data sets, and use the same methodology and the same

theoretical framework of household decision making; Hermalin analyzes largely the same data set as Schultz, although the approach is somewhat different. From the point of view of statistical analysis, as well as from a substantive point of view, these three studies are some of the best work on fertility change, providing a model for future research.

Nerlove and Schultz's (1970) Puerto Rico study examines five aspects of the demographic system: family size, female labor force participation, marriage patterns, personal income, and rural-urban migration. Data were recorded for 75 municipios (regions) for the period 1950-60, with the bulk of information on population characteristics coming from the two censuses (1950 and 1960), supplemented by vital registration data (births and deaths) for the intercensal years. Fertility equation estimates are based on 11 annual observations. Values of the relevant independent variables, taken from the census, are interpolated for the intercensal years.[11] The other equations are estimated only for the census years.

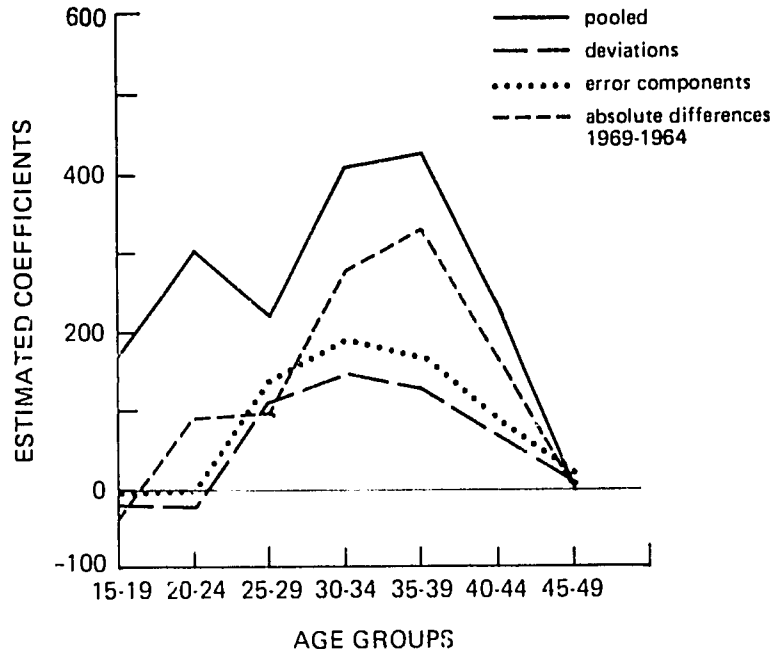
The results for the fertility equation are summarized here. The dependent variable is the crude birth rate. The independent variables include measures of income, education of children, education of adults, female labor force participation, consensual and legal unions, age composition,[12] and mortality. Three sets of estimates for the births equation are presented: (1) based on the pooled sample of time series of cross sections (total sum of squares); (2) based on deviations from the regional means, where the means are computed over time (within-region temporal variation); and (3) error components estimates that weight the within and between sum of squares by the inverse of the error variance. As with the other studies reviewed, there is considerably more variability between the municipios than there is change over the period of study. Thus the results for the pooled model tend to be heavily dominated by cross-sectional variability. This problem is exacerbated by the use of interpolated values for the independent variables. Nerlove and Schultz present both ordinary least squares (OLS) and instrumental variables (IV) estimates;[13] they do not present estimates based primarily on cross-sectional variation, nor do they test the hypothesis that the coefficients are constant over time (interaction model).

The results of these estimation procedures are quite erratic and are correspondingly difficult to interpret and summarize. Aside from expected differences between estimates relying on the total sum of squares--which tends to be dominated by cross-sectional variation--and those based on temporal variation,[14] the IV and the OLS estimates based on the same component of variance often differ substantially.[15] The authors give most weight to the IV estimates based on an error components model. In addition, they find that the age-composition variable tends to reflect persisting characteristics of municipios. For example, a young age structure is the result of persisting high fertility, and, for this reason alone, the age composition variable tends to be highly correlated with the level of fertility in the estimates based on the total sum of squares

(pooled). The variable does not perform much better in the deviations model, and the coefficient is consistently much smaller than would theoretically be expected. An increase in legal unions is associated with a somewhat higher birth rate, with the effect somewhat larger for legal than for consensual unions. Female labor force participation is negatively related to the birth rate if one considers only temporal variability, but positively related to the birth rate in the pooled model. This suggests that, although regions with high fertility have a high rate of female labor force participation for reasons that are unaccounted for by the model, within regions over time, female labor force participation may be associated with fertility decline. The OLS estimate for the income coefficient is negative, but the effect is positive or zero in the case of the IV estimates. Nerlove and Schultz conclude that this evidence suggests children are not a superior good. Although increased education among parents is associated with lower fertility, increased education for children, which would be expected to increase the cost of children, has only a small effect on the birth rate. Nerlove and Schultz suggest that this weak result may be due to their failure to take into account the supply of schools. Mortality, lagged three or four years, is positively associated with fertility.

Schultz's (1973) Taiwan study focuses exclusively on fertility. Data cover a period of six years for 361 administrative units. A reduced-form demand equation for the number of births is estimated. The independent variables that predict the demand for births are child mortality (returns to investments in children), proportion of males in agriculture (relative prices), male educational attainment (income effects), female educational attainment (price effects),[16] and two measures of family planning activity information (p. 243). All variables are lagged three years, except the family planning variables, which are lagged two years. These discrete lags were chosen after examination of more complex distributed lags. The estimation procedure is similar to that of Nerlove and Schultz (1970), but includes a better sampling of estimates based on cross-sectional variability. Since the dependent variables are age-specific fertility rates, it is possible to graphically trace the pattern of coefficients across various age groups, although Schultz does not fully exploit this opportunity. Because this is an exemplary piece of work that demonstrates some of the advantages and problems of time-series cross-section analysis, some of Schultz's estimated coefficients are shown graphically in Figures 1 and 2.

Figure 1 shows the estimated coefficients for child mortality. Age groups are arrayed along the horizontal axis, with the values of the estimated coefficients on the vertical axis. The lower panel shows estimates based on two cross sections (1965 and 1969) and for the pooled sample based on all six cross sections; the upper panel shows estimates based on pooled, deviations and error components estimates, and estimates based on first-differenced data. Comparison of the lower and upper panels shows how estimates based on the pooled sample are dominated by cross-sectional variability, and how estimates based on the cross section can differ substantially from those based



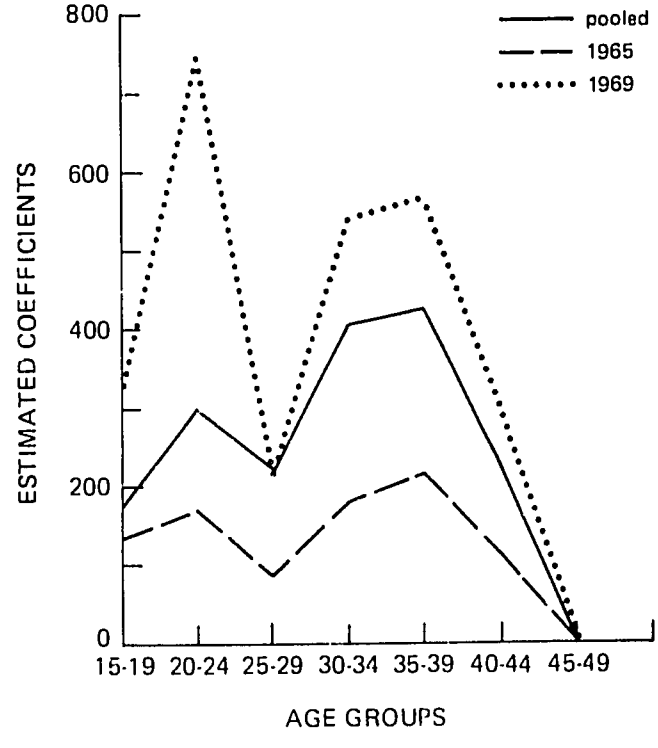


FIGURE 1 Estimated Coefficients for Child Mortality in Regressions for Age-Specific Fertility, Taiwan

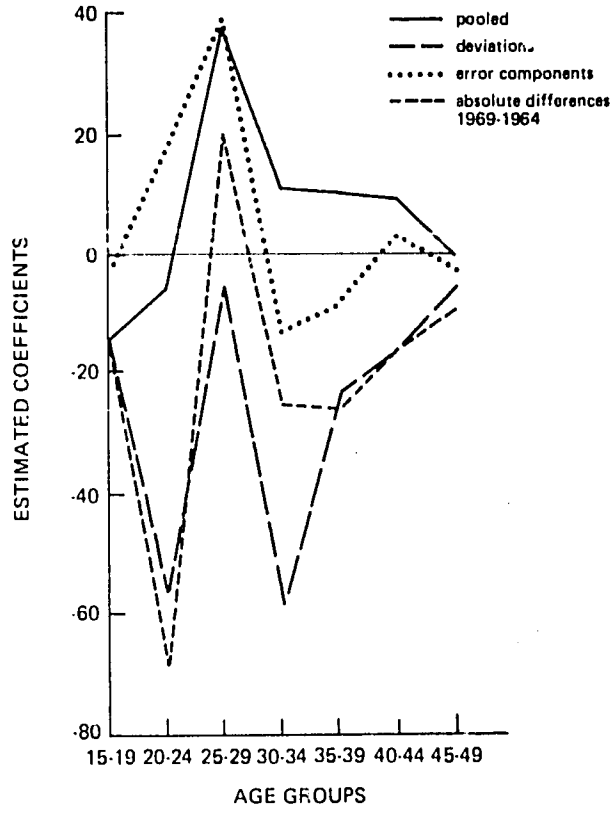
Source: Schultz (1973).

on temporal change. First consider the effects of infant and child mortality on fertility. On theoretical grounds, older women should be more likely than younger ones to try to replace children who die. Thus larger coefficients should be expected in the older than in the younger age groups, tapering off for the oldest age groups as fewer and fewer women are fecund. Estimates based on the within-region temporal variation shown in the upper panel (the broken lines) display a cohesive age pattern in which the expected greater propensity of older women to replace children who have died is clearly evident.[17] In contrast, estimates based on the pooled data set (the solid line in both the top and bottom panels) deviate considerably from this pattern for the two youngest age groups. The lower panel allows a comparison of these results: the estimates for the pooled model fall between those for the two cross sections, and it is apparent that the large coefficients for the two youngest age groups are the result of cross-sectional variability rather than temporal change. Schultz (1973:253) suggests that this result is due to long-run differences between regions in the proportion married among teenagers. Thus persisting regional characteristics that may not be of theoretical interest can dominate estimates based on pooled time series of cross sections if care is not taken in the choice of estimation procedure.

Estimates of the effect of the proportion of males in agriculture, given in Figure 2, show a similar disparity. From the cross-sectional evidence, one would infer that there is higher fertility in agricultural areas. However, the coefficients based on temporal variability behave erratically and are not statistically significant. Thus it cannot be inferred that decreases in the proportion employed in agriculture are associated with lower fertility.

In contrast, male education shows no consistent, theoretically explicable impact on fertility in the cross section, but has a clear and consistent impact when temporal variability is considered. Results for female education are similarly well behaved when temporal variation is considered. Likewise, the impact of family planning workers is clear within regions over time, but not in the cross section. These results demonstrate, at least to some extent, the contention here that, although socioeconomic characteristics may not account for the onset of fertility decline, they can sometimes help explain temporal change in fertility.

Hermalin (1978) analyzes nearly the same data set as Schultz (1973). However, Hermalin's approach is theoretically and methodologically different: while Schultz's work focuses primarily on economic change, Hermalin pays special attention to family planning programs and to the spatial and temporal pattern of fertility decline. In particular, he notes that those areas which decline later tend to decline more rapidly, and that decline begins first in the cities, then in the rural areas. Thus there is more rapid fertility decline in urban areas in the first part of the period of analysis (1961-65) and more rapid decline in rural areas in the second part (1965-72). His strategy for handling this problem is rather different from that used by Schultz or Nerlove and Schultz and implies a different view of the process of fertility decline. Hermalin analyzes



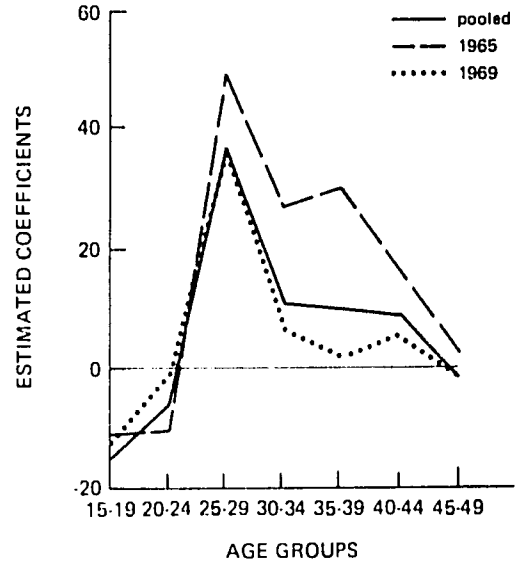


FIGURE 2 Estimated Coefficients for Agricultural Composition in Regressions for Age-Specific Fertility, Taiwan

Source: Schultz (1973)

three dependent variables: the total fertility rate in 1966, the slope of fertility decline 1961-65, and the slope 1965-72. The analysis of the first of these is a straightforward cross-sectional analysis. The analysis of the slopes is more complex: for each region in each subperiod, Hermalin regresses the annual total fertility rate on time; the estimated slope of this regression or the estimated average annual rate of change in fertility for each of the regions is the dependent variable.[18] The independent variables in all three cases are the levels of child mortality, education of adults, school attendance, percent of the male labor force engaged in agriculture, population density, and distance to the nearest city. The levels of these variables are measured near the midpoint of the first subperiod used in the analysis, and are used for both subperiods. Hermalin also examines a first difference model. However, results for this estimation procedure rely on only two time points, and the estimated coefficients vary considerably depending on the choice of year for the endpoints (1965-70 versus 1965-72). This indicates the danger of analyzing only two time periods and the need for sampling as many time points as possible.

Before turning to the empirical results, let us consider the substantive implications of this model. As specified, it states that the level of a set of independent variables, all measuring socioeconomic conditions (roughly for the years around 1963-64), is related first to the level of fertility two or three years later (1966), second to between-region differences in the rate of fertility decline for a time period (1961-65) straddling the date at which the independent variables are measured, and third to between-region differences in the rate of fertility decline for a time period (1965-72) following the date at which the independent variables are measured. Although the independent variables may change rather slowly over the period in question, it is not clear that their value at the midpoint of some interval should be expected to predict between-region differences in the rate of fertility decline, or how differences in the performance of the statistical model for the three dependent variables should be interpreted since quite different conceptual models of the dynamics of fertility change are implicit in each case. In particular, it seems inappropriate to compare the two estimates where the slope of fertility is the dependent variable: in one case, the independent variables are measured at the midpoint of the interval; in the other, they are measured before the start of the interval. Because rather different results are obtained from the three sets of estimates, it is unclear which set of findings to report. Not all variables will change at the same rate for all regions; thus researchers should take special care that the leads and lags defining the dynamics of fertility decline are the same when they wish to compare results across subperiods.

Hermalin's results for the family planning variables are largely cross-sectional. These results suggest that areas that are more modern and those with a high cumulative acceptance rate for contraceptives tend to have lower fertility. A recursive structural equations model shows that more modern areas tend to have lower

proportions married in the younger age groups, and that the most important determinant of contraceptive acceptance is fieldworker input. Elsewhere in the paper, Hermalin demonstrates the importance of the intermediate variables such as breastfeeding and nonprogram contraception in accounting for differences between areas in fertility levels. He also examines a model in which both the independent and the dependent variables are differenced. These results most closely approximate within-region temporal change in terms of the portion of the variance analyzed. When only temporal change is considered, increases in worker input are associated with fertility decline, but increases in the acceptance rate for contraceptives are not, and increasing modernization has no statistically significant impact on fertility decline. Increased proportions married in the age group 20-24 and higher rates of child mortality are both associated with higher fertility.

Cross-national Studies

The number of cross-national studies of fertility determinants that include a temporal dimension is somewhat larger than the number of within-country studies. Although the variables included in these studies often overlap, each study tends to focus on a different aspect or determinant of fertility decline, and the same variable is often interpreted differently. These differences in theoretical approach and substantive focus make a cohesive summary difficult.

Gregory and Campbell's (1976) study is based on a theoretical framework similar to that of Schultz (1973) and Nerlove and Schultz (1970), reviewed above. Data are based on 18 Latin American countries for two time points, 1950 and 1960. Since Gregory and Campbell have only two time series observations, there is no decomposition into cross-sectional and temporal variation.[19] Instead, there is a careful examination of multiplicative interactions among the variables. The dependent variable is the crude birth rate; the independent variables are per capita income, the infant mortality rate, percent urban, the female labor force participation rate, and per capita energy consumption. The percent urban is used as a proxy for attitudinal changes. Other variables measure income and child costs (p. 162). In addition, interactions of percent urban with the other independent variables are also examined.[20] The authors present both ordinary least squares (OLS) estimates and two stage least squares (2SLS) estimates where per capita income is endogenous.

From a theoretical point of view, Gregory and Campbell (1976:61) claim to be estimating a demand equation for births, with the insertion of percent urban regarded as an integration of economic and sociological theory. The interaction model looks at income and substitution effects on fertility, net of the level of modernization. The measures are not pure, since urbanization also modifies the costs of children. Even if Gregory and Campbell's arguments about attitude change are not compelling to sociologists, or if the integration of economic and sociological theory is not satisfactory, they are to be

commended for testing a substantively interesting set of interactions. Such an examination can indicate important nonlinearities and may lead to new theoretical developments.

Their most interesting substantive findings in fact come from the examination of "modernization turning points," the values of the percent urban at which the elasticities of fertility with respect to other variables change sign.[21] For example, the elasticity of fertility with respect to per capita income changes from positive to negative when the percent urban reaches 69 percent, reflecting a lessening of the income effect at higher levels of modernization. This sort of empirical result may help resolve some of the indeterminacies in the theory of household choice, since it allows researchers to trace the points at which substitution effects replace income effects. However, it is difficult to tell just how much weight to give estimates of turning points when the estimation procedures fail to take into account the structure of the data. Gregory and Campbell simply pool the data from the two cross sections without explicitly considering time series aspects. As was suggested above, such estimates are likely to be dominated by cross-sectional variability. An examination of differences between 1950 and 1960 would have focused on temporal variability and provided an interesting comparison. In any case, two points is a very small sample from a time series. Moreover, because all estimates refer to contemporaneous association of variables, the results may be contaminated with considerable long-run variability, unexplained characteristics of countries, and misspecification of the lag structure. For example, the authors find that infant mortality is positively associated with fertility until the population is about 80 percent urban, at which point the coefficient changes sign. They attribute this to replacement effects dominating cost over most of the course of modernization. However, this change may just as well reflect changes in the cause structure of mortality and the proxy effect of morbidity on fertility that may accompany urbanization. In any case, it seems reasonable that Gregory and Campbell's results cannot be given any time series interpretation.

An alternative investigation of economic modernization can be found in Chenery and Syrkin (1977), who study patterns of development, with extensive exploration of national income accounts. Although fertility is not a central focus of this study, some of the information from their typology of development might usefully be included in studies of fertility. Data are based on 100 countries, for 20 years, with some estimates based on subsets of countries and many on a single cross section for 1965. Unfortunately, the study is not clear as to what data are available for particular years and countries and how missing data are handled. Typically, pooled estimates pay attention to the classification by year only; Chenery and Syrkin argue that the estimated average cross-sectional coefficients are representative of the long run. However, since there are no tests for interactions, this hypothesis is not verified. There is some analysis of within-country variability, which the authors claim represents short-run relationships.

Ten development processes are defined based on national income accounts. The independent variables in each case are income level (an overall index of development) and population (a measure of market size). The model assumes uniformity in the development process; that is, a consistent pattern of change in resource allocation, factor use, and other structural features (p. 17). Results are broken into allocation and accumulation processes. The goal of the analysis seems to be to determine the income level at which visible shifts in production, trade, resource use, and so on take place. Development is seen as an S-shaped curve, involving a transition from one relatively constant structure to another (p. 10).

Chenery and Syrkin find that theories of balanced growth most aptly describe large countries where levels of exports and imports are sufficient to offset the implied relationship between domestic demand and domestic supply of major commodities, and specialization is therefore not pronounced. In small countries, imports and exports are more important; sustained growth therefore requires a shift in export composition towards manufacturing, and human and physical capital must increase relative to unskilled labor. Small countries can therefore be characterized as having a primary or an industry orientation. Such information on the nature of economic growth during the course of development might well be included in models of fertility, since considerably different labor force structures are involved in the two paths of development described, and such differences could logically be expected to be reflected in fertility. Although the authors do not trace the demographic consequences of these contrasting patterns of development, they do find that, in the cross section among developing countries, higher levels of education and lower levels of infant mortality are associated with a lower crude birth rate.

Noneconomists have also examined the determinants of fertility decline. One example is Mauldin and Berelson's (1978) study of the relative role of development and family planning programs. They define "demand" and "supply" in a somewhat different manner from that used by economists: "'demand' represents the basic determinants of fertility--the fundamental socioeconomic, cultural, social-structural factors that give rise to interest or motivation to limit family size; 'supply' represents one of the proximate determinants or intermediate factors" (p. 90). Four variables are used to measure demand: education (adult literacy and school enrollment), health (mortality), economy (employment outside agriculture, GNP), and urbanization. One variable--family planning effort--is used to measure supply. Although it includes a number of objective criteria, this variable appears to be defined according to a somewhat qualitative evaluation on the part of the authors. Furthermore, although it is a summed scale, the variable appears to be ordinal, yet enters the model linearly. As a consequence, it is difficult to know what meaning to attach to its estimated coefficient. The dependent variable is the change in the crude birth rate, which is decomposed into changes due to age structure, to marriage patterns, and to marital fertility. The specification of temporal relations is somewhat unusual in that levels of the independent variables for 1970 are used to predict change

between 1965 and 1970 in the dependent variable; levels for 1960 are used with similar empirical results. In the first case, this means that, if the equation were rewritten with lagged values of the dependent variable on the right hand side instead of differences being used as the dependent variable, current (1970) values of the independent variables and lagged (1965) values of the dependent variable would be expected to predict current fertility; in the second case, lagged values of the independent and dependent variables would be expected to explain current fertility. The choice of end points for computing fertility change and the selection of lags appears to be arbitrary. Mauldin and Berelson find that the impact of family planning effort outweighs that of the various economic indicators in terms of contribution to the explained variance. In an addendum using exploratory data analysis techniques, Sykes finds that the program effort variable best describes the bimodal distribution of fertility change.

Tsui and Bogue (1978) carried out a study that in many ways resembles the Mauldin and Berelson piece. Data for 113 developing countries for the period 1968-75 are examined. The independent variables include per capita GNP, percent urban, the infant mortality rate, life expectancy, percent of the employed female population working in agriculture, percent literate, and school enrollment. These are "eight socioeconomic indicators which represent factors in development that can be presumed to be among the most important in affecting fertility motivations" (p. 5). Tsui and Bogue also include the Mauldin-Berelson family planning effort scale among the independent variables. The dependent variables are the total fertility rates for 1968 and 1975. Many of the rates are estimated. One useful exercise they perform is to compare estimates of fertility from several sources to show that the overall conclusions are generally similar. They provide considerable descriptive detail for the levels and trends of fertility, measures of social and economic development, and information on family planning programs, all broken down by region; they also estimate a regression equation where fertility in 1975 depends on fertility and socioeconomic indicators in 1968 and the family planning score in 1972. There is little justification for their choice of years or lag structure. The analysis is performed for Africa, Asia, and Latin America separately. These cross-sectional results show, not surprisingly, that the principal determinant of current fertility is past fertility. No standard errors or tests of significance are presented, and all results are discussed according to the fraction of the variance explained. As a consequence, it is difficult to evaluate their results. They find that income is sometimes positively, sometimes negatively related to the total fertility rate; percent urban is negatively related to fertility in Africa and Latin America but not in Asia; infant mortality is positively associated with fertility; the percent of the female labor force employed in agriculture is not related to fertility in a consistent manner; and female school enrollment is negatively related to fertility, as is family planning effort. They provide little discussion of the sources of

interregional differences or the apparent instability of certain coefficients.

Finally, Entwisle and Winegarden's (1981) study of the relationships between state-sponsored pension programs and fertility change is of interest since it treats fertility and government expenditures on pension programs as endogenous variables in a simultaneous system, then examines direct and indirect effects with some care. The two dependent variables are the total fertility rate and government expenditures for old age security as a fraction of the gross domestic product. Data come from about 50 countries for the period 1965-70. Fertility is a function of past government expenditures on pension benefits, life expectancy, per capita income, adult literacy, percent of the labor force employed in agriculture, family planning effort (from Mauldin and Berelson, 1978), and a dummy variable indicating those countries having a family planning program that is at least ten years old. Government expenditures on pension programs depend on past fertility, a quadratic in life expectancy, per capita income, the old age dependency burden, and the proportion of gross domestic product originating in agriculture. In both equations, all right hand side variables are lagged five years. The specification is somewhat unusual in the choice of the time frame: although data appear to be available for at least three time points, suggesting a pooled time series of cross sections, only two cross-sectional equations are estimated. The fertility equation is estimated using rates for 1975, with 1970 values of the independent variables; the pension equation is estimated for expenditures in 1970, using values of the independent variables for 1965. It is difficult to see why a more general time index was not used and the cross sections pooled. It has already been noted that discrete lags in cross-sectional estimates may be biased because they include considerable long-run variability.[22]

Entwisle and Winegarden's results include estimates for both structural parameters and reduced form equations; only the former results are summarized here. They find that mortality is positively related to fertility in countries where life expectancy is less than 53 years and negatively where life expectancy exceeds 53 years; they conjecture that the positive association at lower levels of life expectancy may be due to initial health benefits associated with the early stages of mortality decline. They find further that pension expenditures, literacy, and family planning effort are negatively associated with fertility, as is the percent employed in agriculture. Although they are unable to account for the negative association between percent employed in agriculture and fertility, it may be the result of the cross-sectional nature of their estimates. When they estimate an equation where pension expenditures is the dependent variable, they find that expenditures are reciprocally related to fertility. However, it is not clear why fertility five years earlier ought to affect pension expenditures since children born at that time would just be entering the school system and should not strongly influence government decision making with regard to pension expenditures. Furthermore, it is difficult to draw conclusions about

reciprocal causation from cross-sectional results. More extensive use of time series data might have provided better insight into the dynamics of these relationships, which would seem, at least potentially, to involve long delays.

SUMMARY AND SUGGESTIONS FOR FUTURE RESEARCH

This review of the literature has focused on determining what questions can be answered by a particular data set with a given set of analytical techniques. The discussion has therefore been more methodological than is common in such reviews. It was felt to be particularly important to determine when findings refer to cross-sectional differences, when they refer to temporal change, and when the former can be used to make inferences about the latter. It was found that, all too often, results are dominated by cross-sectional variability, and that, when results clearly based on cross-sectional variability can be compared with those clearly based on temporal variation, the two sets of results are often quite different. Considerable disagreement was noted among researchers over what portion of the variance ought to be examined, whether the long term or the short term demands explanation. In addition, many of the cross-national studies are, of course, plagued with data problems; the relatively small number of within-country studies demonstrates a similar difficulty in obtaining replicated cross sections.

The most conservative strategy requires display of the full analysis of covariance for within and between sums of squares for each classification (years and areal units) separately and for both classifications combined. Care must be taken that, when the response of the dependent variable is expected to follow a change in the independent variable five years earlier, the coefficient reflects the expected response over the five-year period rather than some long-run association of the two variables, where the latter need not imply a causal connection. At a minimum, this means that within-areal-unit estimates must be compared to those based on simple pooling of the data, and preferably to those based on cross-sectional variation as well. In addition, past research has shown that there are likely to be considerable nonlinearities in the relationships which must be more fully and systematically investigated.

Finally, it would seem desirable to develop a theory for aggregate fertility that reflects some of the nonlinearities and turning points revealed in empirical studies. Better account should be taken of the structure of development and possible implications for fertility. A logical starting point may be the new home economics theory of household choice, since this approach has been fruitful in linking microeconomic and demographic change to the costs and returns of childbearing. A version of this approach emphasizing social and economic structure might be worthwhile. Although it has not been discussed here, there is a considerable literature on the sociostructural and economic determinants of mortality change (see, e.g., Preston, 1980). Since mortality frequently enters the fertility

equations, a simultaneous equations approach might be indicated. From a statistical point of view, recent years have seen an explosion of methodology for the analysis of time series of cross sections. Such new estimation procedures allow the specification of sophisticated dynamic models (see Mundlak, 1978, for example); however, their application awaits the development of more specific theoretical models.

PROPOSITIONS

The above discussion was primarily methodological, focusing on what questions it is possible and proper to answer with a given data set and statistical procedure. This section will be more substantive, assessing the evidence related to questions raised by particular authors; to some extent, this will also serve as a summary of empirical findings. The section has been organized according to the variables included in the studies, divided into three groups: those referring to social and economic structure, demographic variables, and variables concerning family planning.

Because there is no driving theoretical perspective shared by the studies, the derived propositions are empirically based. As each variable is discussed, associated concepts and arguments will be noted. In nearly all cases, the variables included are proxies for other variables that should be measured at the individual level or for some broader concept of structural change. Results are separated according to whether estimates refer to time series or to cross-sectional variation, so that the two can be contrasted; cross-sectional results are taken only from studies including a temporal dimension (the purely cross-sectional literature has been reviewed elsewhere; see, e.g., Birdsall, 1977). Although there is no theory for aggregate fertility time series that is distinguishable from propositions concerning cross-sectional differentials, it is hoped that the results presented here may display some patterns to guide future theoretical efforts.

Sociostructural and Economic Variables

Proposition 1 Fertility decline is influenced by industrialization, more precisely by compositional changes in the labor force involving a shift from agriculture to industry.

From an economic point of view, shifts in the labor force from agriculture to industry require investments in human and physical capital. Thus the situation shifts from one in which many unskilled laborers are required and children are easily employed to one in which fewer, more skilled laborers are needed, children are less easily employed, and the economic returns from children are therefore diminished. From a sociological point of view, the salient characteristic is the separation of place of work from place of residence, leading to exposure to new ideas and the end of the family as simultaneously unit of production and unit of consumption. At the

same time, traditional values that may have fostered high fertility are replaced by more individualistic decision making. (Note that industrialization is not to be confused with urbanization.)

Measures Proportion of males employed in agriculture (and fishing); proportion of the labor force in agriculture.

Concepts Schultz (1973) uses the percent of males in agriculture to measure relative price effects: lower costs of rearing children and lower expected returns to the education of children in rural areas. Hermalin (1975) uses the proportion of males employed in agriculture as one of several measure of modernization; Entwisle and Winegarden (1981) use it as a control variable.

Cross-sectional Results Schultz (1973) finds a consistent positive association between proportion of males in agriculture and age-specific fertility rates in Taiwan. The largest estimated coefficient is for the age group 25-29, which may reflect different marriage patterns between agricultural and nonagricultural regions. In contrast, Hermalin (1978) finds a negative relationship between the proportion of males employed in agriculture and the total fertility rate, a conflict in findings that does not seem resoluble. Tsui and Bogue (1978) find that the relationship is negative once family planning effort is added to the equation. Entwisle and Winegarden (1981) find an inverse relationship using cross-national data; however, since their measure refers to the entire labor force, it may be contaminated by differential reporting of female labor force participation in agriculture among the countries sampled.

Time-series Results Schultz (1973) finds no consistent, statistically significant relationship. Using differenced data for two time periods (1965-70 and 1965-72), Hermalin (1978) finds that the coefficient is negative and significant in the first instance and positive and insignificant in the second. This points out the dangers of choosing two arbitrary cross sections for an analysis of first differences, as well as the need to sample several time points if at all possible.

Other Results Mauldin and Berelson (1978) find a positive association between proportion of males employed outside agriculture (levels) and fertility decline (change). Hermalin (1978) finds that the proportion employed in agriculture is positively related to the estimated rate of fertility decline in Taiwan.

Conclusions There is no strong time-series evidence to suggest that industrialization will lead to fertility decline. However, the hypothesis has really been tested in only one instance.

Proposition 2 Rising incomes are expected to lead to increases in fertility.

Most arguments concerning this variable arise from economic theory. However, higher incomes may be associated with increases in the value of time, particularly the mother's time, if income is a proxy for women's wages, and this may lead to lower fertility. In addition, tastes may shift so that, at higher incomes, fewer, higher-quality children are preferred, or consumption may shift away from children to other goods. Thus, the household decision-making model yields indeterminate results (see Mueller and Short, in these volumes). Empirically, this means there may be important nonlinearities or discontinuities in the relationship.

Measures Gross national product (GNP) per capita; gross domestic product (GDP) per capita; personal income.

Concepts Chenery and Syrkin (1977) use per capita GDP as an overall index of development. Tsui and Bogue (1978) use GNP to the same end. Gregory and Campbell (1976) expect fertility decisions to change with income, ceteris paribus, with the sign depending on the relative magnitude of income and substitution effects. Nerlove and Schultz (1970) make a similar argument: if children are a normal good, increases in income will result in increases in desired family size; if the costs of childrearing rise sufficiently rapidly with income, increases in income will result in decreases in desired family size.

Cross-sectional Results Analyzing cross-national data for 1965, Chenery and Syrkin (1977) find that the fall in the crude birth rate is greater than that in the crude death rate at incomes above $200. Gregory and Campbell (1976) find a positive relationship between per capita income and fertility when the percent urban is below 69 percent; this coefficient is large only at low levels of urbanization. When results are broken down by region, Tsui and Bogue (1978) find that the estimated coefficient is sometimes positive, sometimes negative, with the sign depending on what other variables are included in the equation.

Time-series Results Nerlove and Schultz (1970) find no relationship when instrumental variables (IV) estimates are examined for the Puerto Rican data.

Other Results Mauldin and Berelson (1978) find a positive relationship between the level of GNP and fertility decline.

Conclusions There is no strong time series evidence that rising incomes lead to either increases or decreases in fertility, although there may be important nonlinearities that have not been investigated.

Proposition 3 Urbanization leads to fertility decline.

The economic arguments concern higher costs of children in urban areas; the sociological arguments concern implicit changes in life

style, the breakdown of traditional family structures, and the fact that urban areas are a source of new ideas. (As noted above, urbanization is often confused with industrialization.)

Measures Percent of the population living in urban areas; distance from the nearest city; density.

Concepts Gregory and Campbell (1976) use urbanization as a measure of changes in attitudes associated with development. Tsui and Bogue (1978) emphasize the increased opportunities for work and education, particularly for women, leading to delayed marriage and increased costs of childrearing.

Cross-sectional Results Gregory and Campbell (1976) find that percent urban is an important interaction variable. They also find that it has a consistent negative impact on the crude birth rate, net of the interaction effects. Chenery and Syrkin (1977) find no effect of urbanization net of education, income level, and infant mortality. Both sets of results are based on cross-national data. Tsui and Bogue (1978) find the percent urban negatively related to fertility in Africa and Latin America, but positively related to fertility in Asia. Hermalin (1978) finds that, in Taiwan, population density is negatively related to the total fertility rate, but distance to the nearest city is unrelated to the area's level of fertility.

Time-series Results No studies of fertility change in developing countries include this variable.

Other Results Hermalin (1978) finds that population density is positively related to the estimated slope of fertility change and that the strength of the relationship increases between the two subperiods (1961-65 and 1965-72) examined. He also finds that distance to the nearest city is positively related to the estimated slope of fertility decline in the first subperiod, but that the relationship is insignificant in the second subperiod. This suggests that the two variables may be alternative measures of the same thing.

Proposition 4 Increased education of the adult population leads to fertility decline.

Economic arguments concern the increased value of parents' time and rising opportunity costs. Sociological arguments concern the emancipating effect of education and the decreasing impact of traditional values. Increased education may also lead to later marriage. Some economists separate the impact of mother's education from that of father's education (see Cochrane, in these volumes).

Measures Male and female educational attainment; median education of adult population; percent literate.

Concepts Schultz (1973) argues that educational attainment

measures potential lifetime earnings. He expects male educational attainment to have an income effect on fertility, whereas female educational attainment increases the opportunity costs of childbearing. Nerlove and Schultz (1970) emphasize the increased value of parents' time. Gregory and Campbell (1976) also use educational attainment as a measure of potential wages, although their data do not allow separation of results by sex. Entwisle and Winegarden (1981) use education as a control variable.

Cross-sectional Results Schultz (1973) finds that male educational attainment depresses fertility for all age groups except 25-29; female education is negatively associated with fertility at 25-29, but is positively associated with fertility in the older age groups. Schultz suggests this may be due to a collinearity problem. Hermalin (1978) finds that female educational attainment is negatively related to the total fertility rate. Gregory and Campbell (1976) find that the elasticity of fertility with respect to the percent illiterate is positive until the population reaches about 60 percent urban, and suggest that literacy may be picking up changes in fertility control. Entwisle and Winegarden (1981) find an inverse relationship between the percent literate and fertility.

Time-series Results Schultz (1973) finds that the pattern of coefficients for the effects of male education on fertility is similar to the cross-sectional estimates when time-series variation alone is examined; however, the time-series estimates are considerably smaller. Over time, female education has a consistent negative impact on the fertility of all age groups. Nerlove and Schultz (1970) find an inverse relation between the education of adults and fertility. Analyzing differences between 1965-70 and 1965-72, Hermalin (1978) finds no statistically significant relationships; this result may be due to the choice of cross sections, or to instability of the model as the coefficients change signs with only slight changes in the specification.

Other Results Mauldin and Berelson (1978) find a positive relation between levels of literacy and the extent of fertility decline. Hermalin (1978) finds a positive relationship between female educational attainment and the estimated slope of fertility decline in Taiwan for 1961-65, but only a very weak relationship for 1965-72.

Conclusions Both in the cross section and over time, fertility and the educational attainment of adults are inversely related, although there may be important nonlinearities and considerable differences by sex. Over time, increased education of females depresses fertility for all age groups.

Proposition 5 Increased female labor force participation in the modern sector leads to fertility decline.

Economic arguments concern increased value of women's time and

higher opportunity costs of childbearing and rearing; sociological arguments add changes in the role of women and increased equality between men and women in the fertility decision-making process (see Standing, in these volumes).

Measures Proportion of women in the labor force; proportion of employed women working in agriculture.

Concepts Nerlove and Schultz (1970) emphasize decreased time for home activities and consequently smaller family-size desires. Gregory and Campbell (1976) point to increased costs of childbearing. Tsui and Bogue (1978) point out that the decline of female employment in agriculture reflects both women's release from childbearing as more children survive and increases in opportunities to work in nonfarm situations.

Cross-sectional Results Gregory and Campbell (1976) find that the elasticity of fertility with respect to female labor force participation changes from positive to negative when the population is 28 percent urban. They suggest that, at low levels of modernization, female labor force participation may be concentrated in agriculture rather than in the modern sector, where work may be less compatible with childbearing. Nerlove and Schultz (1970) find a positive association between female labor force participation and fertility when they examine estimates based on pooled data. Tsui and Bogue (1978) find a weak positive relationship between the proportion of employed females working in agriculture and fertility, but the coefficient is close to zero and negative once family planning effort is added to the equation.

Time-series Results Nerlove and Schultz (1970) find an inverse relation between female labor force participation and fertility.

Conclusions Cross-sectional evidence suggests there may be important nonlinearities in the relationship between female labor force participation and fertility, induced by the failure to separate employment in the traditional sector from that in industry. Time-series results suggest that increasing female labor force participation may be important for reducing fertility. However, better measures are needed for more definitive conclusions, and work in the modern sector must be separated from that in agriculture.

Proposition 6 Increasing education of children leads to fertility decline.

Economic arguments concern the conflict between schooling and labor force participation of children; these arguments often combine assumptions about the changing structure of production and opportunities for child labor. Sociologists and economists both emphasize the changing role of children in the family, evidenced by increasing investments in child quality (Caldwell, in these volumes;

Lindert, in these volumes).

Measures School enrollment.

Cross-sectional Results Chenery and Syrkin (1977) and Hermalin (1978) find an inverse relationship between school enrollment and fertility.

Time-series Results Nerlove and Schultz (1970) find a weak inverse relationship between increasing school enrollment and fertility; Hermalin (1978) finds a positive relationship using a differenced model.

Conclusions School enrollment is at best a weak proxy for parental investment in child quality. Both cross-sectionally and over time, this variable is contaminated with differences and changes in the supply of schools, as well as in parental demand for education. Better measurements of investment in child quality are particularly important for the analysis of fertility change in developing countries. Bulatao (1980) is the only study that includes data on child employment, school enrollment, and perceived returns to and costs of children; unfortunately, his analysis is not designed so that the various effects can be disentangled.

Demographic Variables

Proposition 7 Falling mortality leads to fertility decline.

Parents value surviving children, not births, whether as additional workers or as a possible source of support in old age. However, it can be shown that mortality decline will not lead to compensating fertility decline unless desired family size also declines (see O'Hara, 1975; also Heer, in these volumes). Increasing probabilities of survival also increase the expected returns from investment in child quality; this may in turn encourage investment in child quality as opposed to child quantity, thereby lowering fertility.

Measures Life expectancy at birth (e_0); the infant mortality rate; the crude death rate; child survival rates.

Concepts Schultz (1973) argues that the relationship between child mortality and fertility embodies both a decrease in the costs of rearing a surviving child and a decline in the marginal return of additional children. Gregory and Campbell (1976) claim that the expected sign on the elasticity depends on whether the demand for surviving children is highly price elastic or not. Mauldin and Berelson (1978) use mortality as an index of the health of the population. Entwisle and Winegarden (1981) allow mortality to have a nonlinear relationship to fertility to allow for the proxy effects of morbidity: initial rises in life expectancy may reflect improvements in health conditions and have a fertility-enhancing effect; as

mortality decline progresses, the inverse relationship between child survival and fertility emerges.

Cross-sectional Results Schultz (1973) finds a moderately strong positive association between child mortality and fertility for young women and for older women, with considerable change between the two cross sections for which estimates are given. Hermalin (1978) finds a moderate positive association between child mortality four years previous and the total fertility rate. Gregory and Campbell (1976) find that the elasticity of fertility with respect to mortality is positive for populations that are less than 80 percent urban, after which it becomes negative; they interpret this to mean that replacement effects dominate substitution effects over most of the course of modernization. Chenery and Syrkin (1977) find that infant mortality and fertility are positively associated in less developed countries, but that the relationship is not significant in more developed countries. Entwisle and Winegarden (1981) find that fertility is positively associated with mortality up to a life expectancy of about 53 years. Tsui and Bogue (1978) find a positive relationship between the level of infant mortality seven years earlier and fertility in Africa, Asia, and Latin America.

Time-series Results Schultz (1973) finds a consistent positive relationship between fertility and child mortality (lagged three years) that is particularly marked for older women. Nerlove and Schultz (1970) find a positive association between the crude death rate (lagged three and four years) and fertility. Using five- and seven-year differences, Hermalin (1978) also finds a positive relationship between the change in child mortality five years earlier and the change in fertility.

Other Results Mauldin and Berelson (1978) find that both high levels of infant mortality and low levels of life expectancy are inversely associated with the amount of fertility decline. Hermalin finds no relationship between the level of child mortality and the estimated slope of fertility change for the period 1961-65, but finds a moderate negative relationship for the later period; however, it is difficult to interpret this result since the lag structures for the two subperiods are not the same.

Conclusions The association between mortality and fertility may reflect a wide variety of influences other than the replacement effects that some researchers are attempting to measure. There appears to be considerable confusion as to whether replacement or the general health status (morbidity) of the population ought to be examined. Contemporaneous correlations pick up a considerable portion of the proxy effect of morbidity; when mortality is lagged two to four years, both physiological and behavioral portions of the replacement effect are likely to be captured. Time-series results suggest that fertility decline and mortality decline (appropriately lagged) are positively associated.

Family Planning

Proposition 8 Family planning programs are expected to reduce fertility by disseminating information on contraception and distributing contraceptives (see Hermalin, in these volumes).

Concepts Economists are interested in the demand for children. They regard family planning efforts as an information variable that alters the costs of fertility regulation. Mauldin and Berelson (1978) call family planning effort a "supply" factor to indicate that such programs also supply contraceptives.

Measures Number of family planning field workers (person months per 1,000 women aged 15-49); "family planning effort"; cumulative acceptance rate.

Cross-sectional Results Although Schultz (1973) finds no consistent effects, results for different cross sections suggest that the impact of the program is more evident soon after the program has been initiated than several years later. Hermalin (1978) also finds that, although worker input was generally less in areas with low preprogram fertility than in other areas, acceptance rates in the first five years of the program tended to be higher. In addition, the acceptance rate is negatively related to fertility, and the relationship is strongest in areas where the preprogram fertility level was highest. This holds in a model where the cumulative acceptance rate is treated as endogenous. Entwisle and Winegarden (1981) find that Mauldin and Berelson's measure of family planning effort is associated with lower fertility; they also find that countries where the family planning program is at least ten years old have lower fertility than those where the program is more recent.

Time-series Results Schultz (1973) finds a consistent negative impact of family planning field workers on fertility that is particularly marked for women aged 25-29 and 30-34. In a model that analyzes differences between 1965-70 and 1965-72, Hermalin finds that changes in worker input are more important than changes in the acceptance rate in predicting fertility decline. This may be due to collinearity between the two variables.

Other Results Mauldin and Berelson (1978) find their index of family planning effort to be more highly correlated with fertility decline than are socioeconomic variables. They also find that programs in place ten or more years are associated with larger fertility declines than are newer programs.

Conclusions Although family planning programs appear to be associated with fertility decline, cross-sectional and within-country studies appear to yield conflicting results. Schultz's results for Taiwan suggest that the impact is larger initially than several years later; however, these results refer only to cross-sectional

differences. Time-series results show a consistent negative impact when the independent variable is lagged one year. Mauldin and Berelson's and Entwisle and Winegarden's results suggest a ten-year delay before national-level programs have an effect, although part of this discrepancy may be due to the indirect way in which Mauldin and Berelson's index is constructed.

NOTES

1. There are of course variants to this general approach. Kirk (1971) and Oechsli and Kirk (1975) have emphasized the holistic nature of the development process and have preferred to use composite indices of development rather than individual variables.
2. A possible exception is McNicoll's (1980) work on community and institutional factors.
3. Easterlin's work (1978) is one of the few exceptions which considers both the demand and the supply side.
4. A good example of an application of the new home economics to the study of fertility change is Schultz (1969, 1973). Williams (1976) summarizes much of the literature and does a particularly careful job of tracing the consequences of development for the costs of children. Cassen (1976) provides a good critique of the literature which examines the value of children as an investment. He makes the important point that, in many societies, children are the only possible investment, however low and uncertain their rate of return. O'Hara (1975) and Heer and Smith (1968) develop formal models of the effects of mortality decline, given the desire to have surviving children in one's old age.
5. To test the worst case, Cavanaugh's (1979:289, Table 3) estimate of the minimum change in the crude birth rate for 24 countries between 1965 and 1975 from any two sources was correlated with the maximum change. This entailed considerable scrambling of data sources. The result was a respectable rank order correlation of 0.70 with approximate standard error 0.10. The various estimates of change in the crude birth rate were also examined as they relate to international expenditures on family planning programs (Cavanaugh, 1979:290, Figure 1). Again, regardless of the data source considered, the conclusion is largely the same: there is no or at most a very weak negative relationship. Of course, this is merely a test of internal consistency and not of the validity of the data. This is troublesome since many of the sources borrow information from one another.
6. A counter example is Entwisle and Winegarden (1981).
7. In the regression framework, this is the same as putting in dummies for region and for time.
8. Random effects or error components models offer a compromise by weighting the two estimates (based on within and between sums of squares) inversely by their error variances. Unfortunately, the clarity of the decomposition is sometimes obscured as a result.

9. A counter example to this is Preston's work (1980) on the socioeconomic determinants of mortality decline.
10. For example, if current values of the independent variable and lagged values up to ten years previous are appropriate and only the value five years earlier is included, the coefficient on the independent variable (lagged five years) will "pick up" both the effects that would have occurred in the five years between the value of the independent and the value of the dependent variable and some longer-term effects. However, the shorter- and longer-term effects may be quite different, and results obtained from the inclusion of a single lag quite misleading.
11. This procedure is somewhat discomfiting given the smooth exponential trends that are necessarily fit to most of the independent variables. It would seem that this procedure would lead to quite a high degree of collinearity among the variables where values must be interpolated. Furthermore, this procedure leaves the within-region variance rather precariously defined.
12. This variable is designed to capture the effects of persisting high fertility on the age structure, but does not perform as expected. Nerlove and Schultz eliminate it in some estimations.
13. The IV estimates use all exogenous variables as instruments. However, there is little discussion of the choice of instruments or of the causal structure of the model.
14. Because of the high autocorrelation typically present in such data sets, deviations models and error components models tend to yield similar estimates. This is particularly true for the Nerlove and Schultz work, where there is heavy reliance on interpolated series.
15. Again, this instability of estimated coefficients may be due to collinearity induced by the interpolation procedure.
16. It is common in the economics literature to use education as a proxy for potential income.
17. In the analysis of the total fertility rate, Schultz (1973:237) finds that estimates based on intertemporal variability are much smaller than those based on cross-sectional differentials. He suggests that estimates of short-run response are biased upward in the cross-sectional estimates.
18. It is not clear that this procedure explicitly models the pattern of urban and rural decline, although such explicit modeling is possible.
19. In the preceding review of within-country studies, it was found that relationships that hold in the cross section need not hold when temporal variability is examined. Further, it was noted that estimates based on a simple pooled sample tend to be dominated by cross-sectional differences, some of which can be attributed to long-term variability. Thus Gregory and Campbell's results must be treated with some caution.
20. The use of percent of the population living in urbanized areas is a rather arbitrary choice as a measure of the attitudinal changes accompanying development. Gregory and Campbell also examine interactions of the other independent variables with literacy, but find that a model incorporating both sets of interactions does not

perform as well as one which includes only interactions with the percent urban. It is not clear how much this may be due to collinearity problems and loss of degrees of freedom. Cassen (1976:75) proposes that urbanization represents "a concentrated form of those general societal developments which affect fertility." This supports Gregory and Campbell's contention that urban residence implies a change in life style. However, it seems odd that they also include industrialization as part of this same concept.

21. For an alternative look at turning points, see Kirk (1971).
22. This criticism also applies to their procedure for searching for the appropriate lag.

BIBLIOGRAPHY

Birdsall, N. (1977) Analytical approaches to the relationship of population growth and development. Population and Development Review 3:63-102.

Bulatao, R. A. (1980) The Transition in the Value of Children and the Fertility Transition. Paper presented at Seminar on the Determinants of Fertility, Bad Homburg.

Cassen, R. H. (1976) Population and development: A survey. World Development 4:785-830.

Cavanaugh, J. A. (1979) Is fertility declining in less developed countries? An evaluation analysis of data sources and population program assistance. Population Studies 332:283-293.

Chenery, H., and M. Syrkin (1977) Patterns of Development 1950-1970. Oxford, England: Oxford University Press.

Coale, A. (1973) The demographic transition. Pp. 53-72 in International Population Conference, Liege 1973, Vol. 1. Liege: International Union for the Scientific Study of Population.

Easterlin, R. A. (1978) The economics and sociology of fertility: A synthesis. Pp. 57-134 in C. Tilly, ed., Historical Studies of Changing Fertility. Princeton, N.J.: Princeton University Press.

Entwisle, B., and C. R. Winegarden (1981) Fertility and Pension Interrelationships in Developing Countries: Econometric Evidence. Research Report 81-9, University of Michigan, Ann Arbor.

Freedman, R. (1979) Theories of fertility decline: A reappraisal. Social Forces 58:1-17.

Gregory, P. R., and J. M. Campbell, Jr. (1976) Fertility and economic development. Pp. 160-188 in M. C. Keeley, ed., Population, Public Policy and Economic Development. New York: Praeger.

Heer, D., and O. D. Smith (1968) Mortality level, desired family-size and population increase. Demography 5:104-121.

Hermalin, A. I. (1975) Regression analysis of areal data. In C. Chandrasekaran and A. I. Hermalin, eds., Measuring the Effect of Family Planning Programs on Fertility. Liege: International Union for the Scientific Study of Population.

Hermalin, A. I. (1978) Spatial Analysis of Family Planning Program Effects in Taiwan, 1966-72. Papers of the East-West Population Institute No. 48. Honolulu: East-West Population Institute.

Janowitz, B. S. (1973) An econometric analysis of trends in fertility rates. Journal of Development Studies 9:413-425.

Kirk, D. (1971) A new demographic transition? Pp. 138-145 in Rapid Population Growth. Baltimore, Md.: The Johns Hopkins University Press.

Mauldin, W. P., and B. Berelson (1978) Conditions of fertility decline in developing countries, 1965-75. Studies in Family Planning 9:89-147.

McNicoll, G. (1980) Institutional Determinants of Fertility Change. Paper presented at Seminar on Determinants of Fertility Trends, Bad Homburg.

Mundlak, Y. (1978) Models with variable coefficients: Intergration and extension. Annales de l'INSEE (no. 30-31):483-509.

Nerlove, M., and T. P. Schultz (1970) Love and Life Between the Censuses: A Model of Family Decision-Making in Puerto Rico. Rand Monograph RM-6322-AID. RAND Corporation, Santa Monica, Calif.

Oechsli, F. W., and D. Kirk (1975) Modernization and the demographic transition in Latin America and the Caribbean. Economic Development and Cultural Change 23:391-420.

O'Hara, D. (1975) Microeconomic aspects of the demographic transition. Journal of Political Economy 83:1203-1216.

Preston, S. (1980) Causes and consequences of mortality declines in LDC's during the Twentieth Century. Pp. 289-360 in R. A. Easterlin, ed., Population and Economic Change in Developing Countries. Chicago: University of Chicago Press.

Schultz, T. P. (1969) An economic model of family planning and fertility. Journal of Political Economy 77:153-180.

Schultz, T. P. (1973) Explanation of birth rate changes over time: A study of Taiwan. Journal of Political Economy, Supplement 81:238-274.

Teitlebaum, M. (1975) Relevance of the demographic transition for developing countries. Science (May 2).

Tsui, A. O., and D. J. Bogue (1978) Declining world fertility: Trends, causes, implications. Population Bulletin 33(4).

van de Walle, E., and J. Knodel (1980) Europe's fertility transition: New evidence and lessons for today's developing world. Population Bulletin 34(6).

Williams, A. D. (1976) Determinants of fertility in developing countries. Pp. 117-159 in M. C. Keeley, ed., Population, Public Policy and Economic Development, New York: Praeger.

Winegarden, C. R. (1978) A simultaneous equations model of population growth and income distribution. Applied Economics 10:319-330.

Chapter 38

COHORT AND PERIOD MEASURES OF CHANGING FERTILITY

Norman B. Ryder

Fertility change over time is a central issue in demography. If data are available to calculate birth rates for successive (birth) cohorts in successive periods, those rates can be summarized either by adding the rates for each particular cohort over the span of periods in which it is engaged in reproduction, or by adding the rates in each period over the span of cohorts engaged in reproduction in that period. The time series of indices resulting from these two operations ordinarily differ; the focus of the present paper is that discrepancy.

The discrepancy is illustrated by the long time series of fertility data available for the United States (Heuser, 1976). The series of period and cohort total fertility rates differ in two distinct ways. First, period fertility is much more variable than cohort fertility from year to year. This is shown by the relative deviations of fertility for each year from a fitted value based on a five-term moving quadratic. For the years 1927-66, the average deviation per thousand is nine; for cohorts 1900-39, the average deviation per thousand is one. (The difference of 27 years in the time spans is based on an approximate mean age of fertility of 27 for cohorts during the era.) There is substantial dispersion in the deviations for periods: the values were 15 per thousand in 1929-34 and 20 per thousand in 1945-50. For cohorts, the only nontrivial deviations were 3 per thousand for the cohorts of 1917-21, and there is reason to suspect that those deviations reflect difficulties in estimating cohort size. Second, short-term changes in fertility are characteristically associated with changes in the environment within which reproduction takes place, an environment more or less shared by cohorts of childbearing age. From a period standpoint, the changing climate leads to fertility variations in one direction, followed shortly by countermovements; from a cohort standpoint, the change is manifested in a displacement of births from one period to another, with little net influence on the eventual cohort total fertility rate.

Aside from these short-term variations, there is also a systematic tendency for period and cohort fertility to diverge over the longer term. This divergence falls into three phases in the available American experience: relative to cohort fertility, period fertility was 9 percent higher in 1917-30, 7 percent lower in 1931-44, and 15 percent higher in 1945-64. A simple explanation has been proposed for

these discrepancies (Ryder, 1979b): change in the age distribution of cohort fertility signifies a change in the way cohorts are allocating their fertility among the successive periods of their eproductive experience; thus period fertility tends to swing around cohort fertility as a manifestation of that change.[1] The annual change in the mean age of cohort fertility within the three time spans was -0.08, +0.06, and -0.15, respectively. The discrepancy between period and cohort fertility is approximately the complement of the annual change in the mean age of cohort fertility. If the only changing aspect of the distribution of cohort fertility by age were its mean, this would be an exact relationship. This point is developed more fully below.

The discrepancy between period and cohort time series of fertility is of both practical and theoretical interest.

From a practical standpoint, the prime consideration is the kind of data available. There are essentially three sources of fertility data. The first is birth rates calculated from vital registration data. Unless the registration system has been functioning effectively for a long time, the only feasible measures of fertility over the life cycle are period total fertility rates (and associated indices). The second source is census data on children ever born per ever-married woman. For women beyond the maximum age of reproduction, the mean number of children ever born multiplied by the proportion ever married yields the equivalent of a cohort total fertility rate. To determine the extent of fertility decline by comparing these data sets, one must consider potential discrepancies because the measures are based on different modes of temporal aggregation. There are other sources of difference as well: the quality of reporting tends to vary inversely with the length of recall required, and the information available through enumeration is necessarily restricted to those women who are members of the cohort in question at the time (since the mortality and migration of which they are survivors may not be unselective with respect to reproductive characteristics). Because of incomplete registration and infrequent as well as incomplete enumeration, the third data source--the fertility survey, or a cross-sectional sample of women below the maximum age of reproduction at the time of interview (Ryder, 1975b)--has become important. For the oldest of these women, members of the earliest birth cohort represented, this provides the same kind of data as enumeration, that is, a cohort total fertility rate. If each respondent reports a birth history, it is also feasible to tabulate births by time of occurrence and age of mother at that time; this will yield the equivalent of a period total fertility rate for the most recent period prior to the survey date. Again, to determine fertility changes by comparing these two calculations, one must consider potential discrepancies due to mode of temporal aggregation.

From a theoretical standpoint, the issue is whether the available data are in a form appropriate to testing the hypotheses being investigated. The fertility of a cohort in a particular period can be seen as resulting from the interaction of two factors: the circumstances peculiar to the period in question, or the environment

for the behavior, and characteristics descriptive of the cohort and its constituent actors, or the history and experience they bring with them into the period. Although there may be considerable controversy over the sources of temporal variations in fertility, some of them are unquestionably period-specific, whereas other are more aptly considered as properties associated with each particular cohort. Ideally, the form of the measure should be adapted to the nature of the hypothesis.

With respect to long-term change, the case for a cohort orientation, ceteris paribus, seems strong (Ryder, 1964a, 1965). The character of a cohort can be specified in two ways: according to the life of each individual member, and according to the distribution of the aggregate membership with respect to influential variables.

As for individual qualities, most fertility research considers these to be described by both demographic characteristics (such as age at marriage or parity) and sociocultural characteristics (such as religion or ethnic origin). In addition, an individual enters each period with mental constructs such as knowledge and attitudes, with an endowment of physical property, with long-term commitments, and with an established structure of relationships with others. To the extent that such considerations are important, the cohort orientation to fertility data is appropriate.

The integrity of the cohort as a unit of analysis also holds on the aggregate level. The distribution of individuals within a cohort with respect to various characteristics affecting fertility variables tends to be relatively fixed, and to differ between cohorts. An example would be the proportion of the cohort that has completed an elementary school education. Although the composition of the cohort can change over time, even for characteristics that for the individual are fixed for life--because of the selective effects of mortality and migration--the cohort tends empirically to maintain a distributional integrity through time. This also speaks for a cohort orientation to analysis.

Thus, although period measures are disproportionately represented in the literature, this does not reflect a theoretical judgment that the sources of temporal variation in fertility are period-specific (apart from short-term change). Rather, it reflects the relative ease with which the most recent evidence (ordinarily the most interesting, at least from a policy standpoint) can be aggregated to produce period measures. Because most of the cohorts responsible for this reproduction are far from having completed their fertile age span, the calculation of total fertility rates for them must necessarily be deferred. In a later section, an alternative approach that addresses this problem is explored.

SOME FORMAL RELATIONS BETWEEN COHORT AND PERIOD FERTILITY MEASURES

The nature of the relationship between period and cohort total fertility rates can be indicated in the following way. Assume a group

of cohorts born in the period from t-z to t, where z is any age greater than the maximum age of fertility. Assume further that they follow a pattern of fertility by age, say g'(a), for which the total is G' and the mean age of fertility M'. Then the amount of fertility in the period from t to t+z that is attributable to these cohorts is

$$\int_0^z ag'(a)da = G'M'.$$

Next, assume that all cohorts born in the period from t to t+z follow another pattern of fertility by age, say g"(a), for which the total is G" and the mean age M". Then the amount of fertility in the period from t to t+z that is attributable to these cohorts is

$$\int_0^z (z - a)g''(a)da = G''z - G''M''.$$

Then the average annual fertility in the period from t to t+z is

$$F = (G'M' + G''z - G''M'')/z.$$

This expression can be simplified to bring out its significance. Let $(G' + G'')/2 = G$; $(M' + M'')/2 = M$; and $(M'' - M')/z = m$. Furthermore, since the value of z is arbitrary (provided only that it is large enough), it is convenient to let $z = (M' + M'')$. Substituting these values, we have

$$F = G(1 - m).$$

This suggests the basis for the empirical relationship observed in the first section.

Provided there is no change in the mean age of fertility from the earlier to the later cohort (if m = 0), the level of period fertility in the interim is the average of the levels of cohort fertility before and after. However, if the mean age is lower in the later cohorts (so that m is negative and [1 - m] is greater than unity), the average level of period fertility is inflated above the average level of cohort fertility. Period fertility just before the change (when the first member of the later cohort set appears in the youngest fertile age) is equal to G'; just after the change is completed (when the last member of the later cohort set appears in the oldest fertile age), period fertility is equal to G". It therefore follows that the time path of period fertility in such circumstances is concave relative to a straight line from G' to G". On the other hand, if the mean age of cohort fertility is higher for the later cohort set, the converse holds; in this case, the path of period fertility is convex relative to a straight line from G' to G". The nature of the time series of period fertility between t and t+z cannot be stated more precisely since it would depend on the particular shape of the cohort fertility

functions (about which nothing was assumed above).

The import of this finding is that, given two populations with a common decline in the cohort total fertility rate, the mean age of fertility could be rising in one population and declining in the other. The period-by-period pattern in the former case would be more rapid decline at first and less rapid decline later (relative to the cohort series); in the latter case, it would be less rapid decline at first and more rapid decline later. This is clearly a matter for concern in conducting comparative analysis, and is explored in more detail in a later section.

Although the above demonstration has the advantage of simplicity, it is clearly unrealistic to posit that fertility change occurs in one discontinuous step. Moreover, the approach does not resolve the related question being addressed here of the respective time series of period and cohort mean ages of fertility.

The following model sheds light on this question (Ryder, 1964b). First, distinguish between the quantum of fertility, G(T), and its tempo, or distribution by age, D(a,T), where D(a,T) = g(a,T)/G(T). Assume a linear change in G(T) amounting to g per annum, and a linear change in D(a,T) amounting to d(a) per annum. (A constraint on the latter assumption is that the proportions must remain between zero and one.)

The mean age of fertility is defined as follows:[2]

$$M(T) = \sum aD(a,T).$$

With linear changes in D(a,T), there is also linear change in M(T). The annual change in M(T) is symbolized by m. Likewise, the variance in the age distribution of fertility is

$$V(T) = \sum a^2D(a, T) - M^2(T).$$

With linear change in D(a,T), there is quadratic change in V(T). The annual change in V(T) is symbolized by v(T). Similarly, there is cubic change in the third moment about the mean, say W(T), and the annual change in W(T) is symbolized by w(T).

Next, consider age to be coded in integral values, with the youngest age of fertility set at 1. Then let F(X) be the total fertility rate for the period in which the cohort having total fertility rate G and distribution D(a) is in age X:

$$\begin{aligned} F(X) &= \sum (G - (a - X)g) * (D(a) - (a - X)d(a)) \\ &= (G + Xg) * (\sum D(a) + X\sum d(a) - \sum ad(a)) \\ &\quad - g * (\sum aD(a) + X\sum ad(a) - \sum a^2d(a)). \end{aligned}$$

Now $\sum D(a) = 1$; $\sum d(a) = 0$;
$\sum aD(a) = M$; $\sum ad(a) = m$;
$\sum a^2D(a) = V + M^2$; $\sum a^2d(a) = v + 2Mm$.

Substituting, we have

$$F(X) = G(1 - m) + g((X - M) * (1 - 2m) + v).$$

Letting X = M, we have

$$F(M) = G(1 - m + rv),$$

where r = g/G, the rate of change in the cohort total fertility rate. This result is almost the same as the earlier expression, G(1 - m), since the product rv involves two derivatives and is thus of the second order of smalls.

Furthermore, we have the interesting result that the annual change in period total fertility rate, say f, equals g(1 - 2m). Thus change in the cohort mean age of fertility causes twice as large a discrepancy in the change in the period total fertility rates as in the total fertility rate itself.

The same approach can be used to establish the relationship in this model between the period and cohort mean ages of fertility. The numerator of the period mean age of fertility is

$$\sum a * (G - (a - X)g) * (D(a) - (a - X)d(a)).$$

Noting that

$$\sum a^3 D(a) = W + 3MV + M^3 \quad \text{and}$$
$$\sum a^3 d(a) = w + 3mV + 3Mv + 3M^2 m,$$

we make the substitutions as before and arrive at the following expression for the period mean age of fertility:

$$M_p = M - \frac{Gv + g(V(1 - 3m) - w)}{G\ (1 - m) + gv}.$$

Although this is a clumsy expression that does not immmediately evoke the sense of the situation, there is a close approximation: M - Vr, where r = g/G as before. Likewise, the approximate derivative is m - r(v - Vr).

The relationship between the period and cohort mean age of fertility signifies that, when the total fertility rate is declining from cohort to cohort (r negative), the period mean age of fertility is higher than the mean age for the corresponding cohort.[3] This is an intuitively plausible result since fertility decline from cohort to cohort implies from a period standpoint that those in the younger ages will represent lower fertility overall, while those in the older ages will represent higher fertility overall.

These approximate expressions--F = G(1 - m) and M_p = M - Vr--indicate the way in which cohort change is manifested period by period. They also suggest ways in which models predicated on cohort change will lead to period results that can differ markedly. The symmetry of the findings may also be noted: the tempo of period fertility is a distorted version of the tempo of cohort fertility when

the quantum of cohort fertility is changing; likewise, the quantum of period fertility is a distorted version of the quantum of cohort fertility when the tempo of cohort fertility is changing.

SOURCES OF CHANGE IN THE MEAN AGE OF COHORT FERTILITY

It is evident from the above discussion that time series of period fertility measures depend on change in the mean age of cohort fertility, a subject seldom addressed in the literature. It is almost self-evident that the average age at which childbearing occurs depends on when the reproductive process begins, how many babies are born, and how long it takes to bear each child. More specifically, the total fertility rate can be divided into the equivalent calculation restricted to births of a particular order and the associated mean age at occurrence of births of that order. Let the nth-order total fertility rate and mean age of fertility be $G(n)$ and $M(n)$, respectively. For simplicity's sake, assume that $M(n + 1) - M(n) = J$; that is, the difference between the time of occurrence of births of successive orders is independent of the order. It is important to note that J is not the length of the birth interval as that is ordinarily understood, but rather something shorter, since those who progress to a birth of the next higher order ordinarily have the preceding birth at a younger age than those who do not.

Then, if we symbolize the mean age at marriage by $M(0)$, we have $M(n) = M(0) + nJ$.

$$\begin{aligned} M &= \Sigma\, G(n) * M(n)/G \\ &= \Sigma\, G(n) * (M(0) + nJ)/G \\ &= M(0) + J * (\Sigma\, nG(n)/G), \end{aligned}$$

where the summations are over all birth orders. The coefficient of J in this expression, and thus the number of reproductive events going into the calculation of the mean age of fertility, M, is the mean order of birth, say ϕ. That is closely related to the total fertility rate; however, another facet of reproductive behavior (in the aggregate) is involved. Let $p(i)$ be the proportion of women in the cohort who have (completed) parity i. Then $G(n) = \sum_{i=n}^{z} p(i)$, where z is the highest parity.

$$G = \sum_{n=1}^{z} G(n) = \sum_{n=1}^{z} \left(\sum_{i=n}^{z} p(i) \right) = \sum_{i=1}^{z} ip(i)$$

$$\sum_{n=1}^{z} nG(n) = \sum_{n=1}^{z} \left(n \sum_{i=n}^{z} p(i)\right) = \sum_{i=1}^{z} \frac{i(i+1)}{2} p(i)$$

$$= \left(\sum_{i=1}^{z} i^2 p(i) + \sum_{i=1}^{z} ip(i) \right)/2.$$

Now mean parity is

$$\sum_{i=1}^{z} ip(i) = G,$$

and the variance in parity is

$$\sum_{i=1}^{z} i^2p(i) - G^2.$$

It follows that

$$\phi = (\sum_{n=1}^{z} nG(n))/G = (G(1 + c^2) + 1)/2,$$

where c is the coefficient of variation of the parity distribution (the ratio of the standard deviation to the mean).

Thus we see that the mean age of fertility depends on two parameters of the parity distribution: first, the quantum parameters--not only the mean of the parity distribution, G (the total fertility rate), but also its heterogeneity, as measured by the coefficient of variation (c); second, two temporal parameters--M(0), the mean age at marriage, and J, the time difference between birth orders. The influence of each of these parameters on change in the mean age of fertility, and thus on the relation between period and cohort total fertility rates, is discussed below.

Change in the Quantum Parameters

If all components of the mean age of fertility except the total fertility rate are invariant over time, then the change in the mean age of fertility is equivalent to $g * (J(1 + c^2)/2)$, where g, as before, is the annual change in the total fertility rate. Consider a path of fertility change in which the total fertility rate follows a downward ogive, with decline reaching its maximum in the middle of the transition. Then the change in the mean age of fertility also reaches its maximum at that point, as does the relative discrepancy between the period and cohort total fertility rates.

A convenient functional form for a decline of the postulated type is a symmetrical cubic

$$G(T) = GA - (GA - GZ) * ((3T^2/N^2) - (2T^3/N^3)),$$

giving a decline from GA to GZ over the course of N years. The second column of Table 1 shows the pattern for an example in which GA = 6, GZ = 2, and N = 60. The value of g at the midpoint is -0.10. To derive the value of m, we need assumptions about J and c. Plausible values

over a wide range of populations would be J = 2 and c = 0.6. Then m = -0.136, and F' = G(1 - m) = 4 * 1.136 = 4.544 at the midpoint of the transition. The values of F' associated with these assumptions are shown in the fourth column of Table 1. Change in the period total fertility rate is very small at first, but becomes large during the last half of the transition. This is an artifact of the changing time distribution of cohort fertility.

Note that period fertility is higher than cohort fertility throughout the entire transition. This seems problematic since the source of both calculations is the same surface of fertility rates by age and time. However, if the two fertility series, period and cohort, were integrated over the time span of the transition, the ratio of the former to the latter would be (N + MA - MZ)/N, where MA and MZ are the mean ages of fertility at the beginning and end of the transition. In effect, cohort fertility is being compressed into a smaller number of (period) years by the decline in its mean age. The ratio just given is another form of the expression (1 - m) for distributional distortion.

Of course, it is unrealistic to assume that the coefficient of variation of the parity distribution will remain invariant during a decline in fertility. A more plausible model would predicate a gradual decrease in the proportion of the population following the initial reproductive pattern, and a gradual concomitant increase in the proportion adopting the final reproductive pattern. This idea can be captured by rewriting the previous expression for G(T) as follows:

$$G(T) = GA * P(T) + GZ * (1 - P(T)),$$
$$\text{where } P(T) = 1 - (3T^2/N^2) + (2T^3/N^3).$$

Although this is the same time series as before, one implication of the new formulation is that the coefficient of variation of the

TABLE 1 Changes in the Cohort Total Fertility Rate (G) and the Period Total Fertility Rate without Change in Heterogeneity (F') and with Change in Heterogeneity (F")

T	G	Change	F'	Change	F"	Change
0	6.000		6.000		6.000	
		-0.625		-0.077		-0.397
15	5.375		5.923		5.603	
		-1.375		-1.389		-1.195
30	4.000		4.544		4.408	
		-1.375		-1.651		-1.317
45	2.625		2.893		3.091	
		-0.625		-0.893		-1.091
60	2.000		2.000		2.000	

parity distribution increases during the early part of the transition; this is because variance between groups is being added to variance within groups. If each part of the population (that following the traditional and that following the modern pattern) has the same coefficient of variation of the parity distribution, c, then it may be shown that the coefficient of variation for the population as a whole, say k(T), is determined by the expression

$$(1 + k^2(T)) = (1 + c^2) * ((GA^2 * P(T)) + (GZ^2 * (1 - P(T))))/G^2(T).$$

In the previous model, in which the coefficient of variation was invariant over time, the values of m at T = 15, 30, and 45 were -0.102, -0.136, and -0.102, respectively. With the revised model, the values become -0.042, -0.102, and -0.178. The results are shown in Table 1 in the column labeled F". The change in the final quarter of the transition is even more pronounced than was the case with F'.

Two conclusions can be drawn from this exercise. First, there is reason to expect that fertility decline, as portrayed by period measures, will proceed more slowly in the first half of a transition and more rapidly in the last half, relative to the pattern portrayed by cohort measures. Second, the pattern of discrepancy can be substantially affected by the way different parts of the population participate in the decline, which will affect the heterogeneity of the parity distribution through time.

Change in the Tempo Parameters

Because rising age at marriage is a common aspect of reproductive change in developing societies, its consequences for the discrepancy between period and cohort fertility are of considerable interest. If all factors in the equation for the mean age of fertility other than age at marriage were invariant over time, then the period total fertility rate would equal the product of the cohort total fertility rate and the complement of the annual change in the mean age at marriage. If, for example, age at marriage followed a symmetrical rising cubic (of the form specified above) from an initial value of 20 to a final value of 24 over the course of two decades, the slope of the mean age at marriage, and thus of the mean age of fertility, would be +0.3 at the midpoint in this change. Thus the period total fertility rate would decline by 30 percent during the first decade, and then rise to its original level by the end of the second decade. To make this surprising result more plausible, consider what would happen if all of a cohort's childbearing were concentrated in one year. Then a rise in the (mean) age of fertility by one year would be manifested from a period standpoint in a year in which no fertility occurred; a rise in the mean age of fertility (associated with the postulated change in age at marriage) of four years over the course of twenty years would be equivalent to the allocation of only sixteen years of cohort fertility to those twenty periods. Although much

better evidence than is currently available would be needed to document the point, the recent rapid decline in the crude birth rate (a period measure) in China may have resulted at least partly from the reproductive strategy of raising the age at marriage. It may further be posited that cessation of the rise in age at marriage would be accompanied by a rise in period fertility. It should be emphasized that what is being described here is a source of discrepancy between period and cohort fertility. From the standpoint of eventual population growth, any reduction in the birth rate, whether or not it signifies a change in the quantum of cohort fertility, and whether or not it is transitory, leads to a lower ultimate population size than would otherwise be the case (Ryder, 1975a).

The implications of a lengthening or shortening of the time difference between successive births (J) are comparable to those of a change in age at marriage. Although the magnitude of change in J is likely to be much less than that in M(0), any change becomes weighted by the mean order of birth (ϕ) and can therefore lead to an appreciable distortion of period fertility when fertility is high.

To summarize, the key element causing the values of period and cohort total fertility rates to diverge is the annual change in the mean age of cohort fertility. Four variables have been identified as responsible for that change: the level of fertility and the heterogeneity of the parity distribution, on the one hand, and the mean age at marriage and mean time difference between births of successive orders, on the other. Populations having identical time series of their cohort total fertility rates may therefore have very different time series of their period fertility measures, depending on their particular experience with these variables.

ESTIMATION OF COHORT PARAMETERS FROM DATA FOR PERIODS

The foregoing discussion indicates generally the kinds of discrepancy between period and cohort fertility measures that may be expected in various configurations of demographic change. However, it is unresponsive to the practical problem noted above that data for cohorts with completed fertility are irrelevant to analysis of the most recent reproductive experience of a population, and period measures will therefore be used, giving a distorted picture of temporal variations in cohort fertility.

To exemplify this problem and indicate one direction for resolving it, one can draw on some results from the 1976 Colombian National Fertility Survey (Ryder, 1979a). Figure 1 shows the period-specific and cohort-specific fertility information provided by the Survey. For each cohort, births per woman are shown along a positively sloping diagonal for each successive period of the cohort's history up to interview (the upper right negative diagonal); successive cohorts proceed from left to right by time of birth. The fertility in each period is represented along a negatively sloping diagonal, terminated by the upper left positive diagonal (representing the time of birth of the oldest respondent in the survey). Four-year units are used for

both cohorts and periods. The birth date limits for the first cohort are 1926.5/1930.5, for the second cohort 1930.5/1934.5, and so forth; the time limits for the last period are 1973.0/1977.0, for the second to last period 1969.0/1973.0, and so forth. For convenience, the cohorts are numbered from 1 to 9 and the periods from 2 to 10. Age is defined implicitly by the period/cohort intersection, so that the first "age" for each cohort is coded "1" (the difference between the period number and the cohort number).

Reasonably complete life-cycle information is available only for the earliest cohort and the latest period: the earliest cohort has a total fertility rate of 6.78 and the latest period a total fertility rate of 4.42. The question is to what extent a comparison of these numbers gives a flawed picture of the temporal change in fertility that has been occurring in Colombia. (Other questions that are relevant to such a comparison, like the quality of information for the earliest cohort, which has the most difficult recall problems, are set aside for the present discussion.)

One tempting procedure is to devise a projection for each cohort of fertility in the periods subsequent to the interview date, in

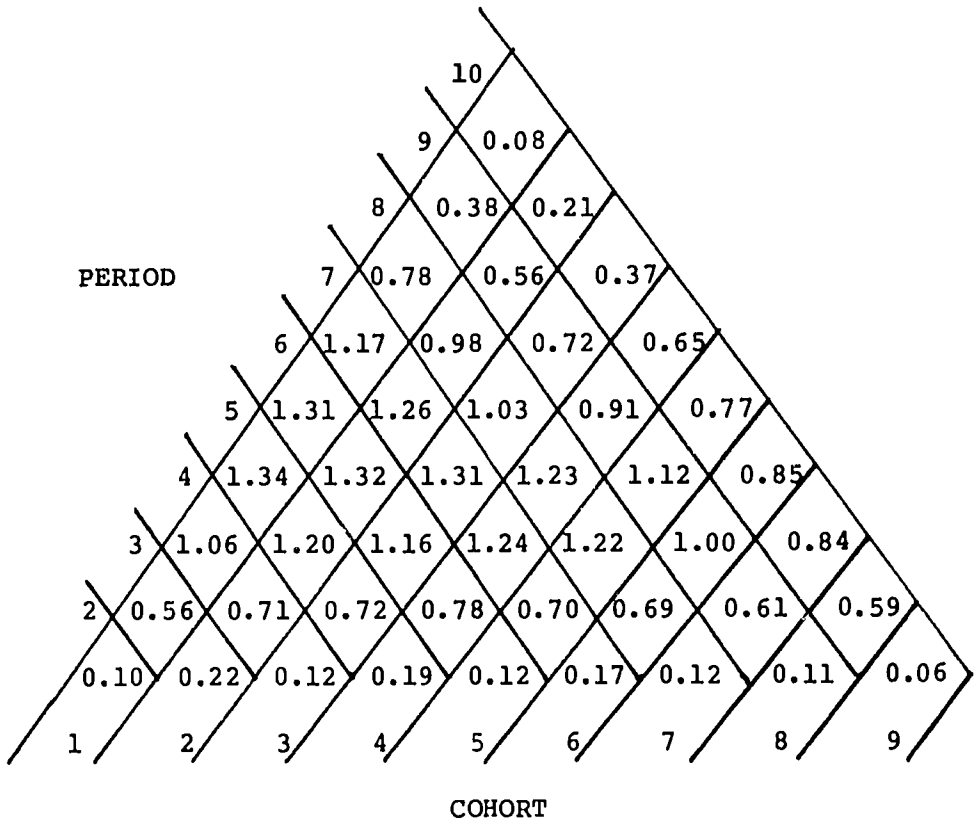


FIGURE 1 Births per Woman by Cohort and Period, in Four-Year Time Units, 1976: Colombia

Note: Cohort #1 was born 1926.5/1930.5. Period #10 is 1973.0/1977.0.

Source: Colombian National Fertility Survey (Ryder, 1979a).

effect turning the triangle into a rhombus. However, there are as many ways of performing this procedure as there are demographers, and the result would go well beyond what is ordinarily understood as data analysis. Another popular idea, also a projection procedure, is to obtain from each respondent an estimate of the number of her expected future births. However, experience with this approach over the last several decades in the United States has been disappointing: the future is no less unpredictable for the individual respondent than for the demographer (Westoff and Ryder, 1977). On the other hand, an interesting model has been developed to exploit such data for the analysis of period-specific change (Lee, 1977, 1980).

In an earlier section, a derivation of period parameters from assumptions about change in cohort fertility functions was presented. There is no formal difficulty in employing the same approach in reverse, that is, making assumptions about change in period fertility functions and deriving the consequent cohort parameters. Assume that the total fertility rate for period t is F(t), and that it is changing linearly by f; assume that the proportion of the (period) total fertility rate occurring in age a is D(a,t), and that it is changing linearly by d(a). Then the fertility in age a, for cohort $T = t - M_p(t)$ (where $M_p(t)$ is the mean age of period fertility), is

$$(F(t) + (a - M_p(t))f) * (D(a,t) + (a - M_p(t))d(a)).$$

The development proceeds in the same fashion as before. The total fertility rate for cohort T is

$$G(T) = (F(t)) * (1 + m_p + r_p v_p),$$
$$\text{with derivative } g = f(1 + 2m_p).$$

Similarly, we have as the mean age of cohort fertility

$$M(T) = M_p(t) + \frac{Fv_p + f(V_p\ (1 + 3m_p) + w_p)}{F(1 + m_p) + fv_p}.$$

In applying these formulae to the data in Figure 1, the values for the total fertility rate (F), the mean (M_p), and the variance (V_p) refer to period 10: $F = 4.42$; $M_p = 4.5023$; and $V_p = 3.3224$. The values for changes in the various functions are based on a comparison of the data for periods 9 and 10 (deleting from period 10 the experience of cohort 1, in order to ensure life-cycle comparability). The required values are $f = -1.08$; $m_p = 0.1273$; $v_p = 0.2836$; and $w_p = 0.0104$. Insertion of these values in the formulae gives the following values for cohort 5.50 ($T = t - M_p = 10 - 4.50$), which is the cohort born 1944.5/1948.5: $G(T) = 4.1637$; and $M(T) = 3.6658$. Thus the cohort total fertility is 6 percent less than its period counterpart, and the cohort mean age of fertility is 3.34 years less than its period counterpart (remembering that the unit is 4 years).

These results are what one would expect, drawing on the previous discussion, from substantial decline in both the cohort total

fertility rate (which elevates the period mean age of fertility) and the cohort mean age of fertility (which elevates the period total fertility rate). The total fertility rate for cohort 1, referring to Figure 1, is 6.78; thus the decline per annum in cohort fertility is estimated to be about 2.7 percent. The mean age of fertility for cohort 1 is 4.8009 (in coded form); thus the decline per annum in the cohort mean age of fertility is estimated to be about 0.25 years. It should be noted that a direct comparison of the mean for cohort 1 (4.8) with the mean for period 10 (4.5) would have indicated no such rapid decline in the mean age of fertility.

In a previous section, it was noted that the translation formula for the total fertility rate, moving from cohort to period, can be simplified by ignoring the term rv. The equivalent approximation, moving from period to cohort, would be $G = F(1 + m_p)$. In the Colombian data, that would be a bad approximation, because the period functions being summarized showed large values for both r_p and v_p. Accordingly, the approximation is not recommended as a general rule. On the other hand, the approximate formula for the mean age of fertility is quite convenient because of its relative simplicity; it may also be preferable because of the well-known sensitivity of the calculation of higher moments to vagaries in the data base. In the period-to-cohort direction, the approximation is $M = M_p + r_p V_p$. In the Colombian data, that gives 3.69 instead of the 3.67 yielded by the complete formula Experimentation would be needed to determine whether this approximation is indeed as robust as this example suggests. It may be noted further that the formula for the change in the mean age of fertility, based on this approximation, is $m = m_p + r_p(v_p - r_p V_p) = 0.26$, essentially the same value as that reported above.

PROPOSITIONS AND CONCLUSIONS

The following propositions can be derived from the foregoing discussion.

1. The period total fertility rate ordinarily differs from the comparable measure for the cohort that is at its mean age of fertility in the period in question. The relative difference is approximately the complement of the annual change in the mean age of cohort fertility.

2. The period mean age of fertility ordinarily differs from the comparable measure for the cohort that is at its mean age of fertility in the period in question. The difference is approximately the product of the rate of change in the cohort total fertility rate and the variance in the age of cohort fertility.

3. Since the mean age of cohort fertility is ordinarily changing along with the cohort total fertility rate (because of its dependence on both the mean and the coefficient of variation of the parity distribution), the time series of period total fertility rates may be expected to diverge from the comparable series for cohorts during an

era of fertility transition.

4. Given the close dependence of the cohort mean age of fertility on the mean age at marriage, change in the latter may cause substantial divergence between the period and cohort total fertility rates.

5. Fertility functions for recent periods may be used to estimate the contemporary cohort total fertility rate and mean age of fertility.

Although these propositions are presented according to fertility rates specific for age and time, they have a wider applicability since they are essentially mathematical in character. Period measures of fertility may be defined as those in which the temporal identification is established by the time of occurrence of the births in their numerators. This holds for the crude birth rate and the general fertility rate, for measures keyed to marital duration or interval since last birth, and so forth. All such measures are responsive, mutatis mutandis, to the strictures specified for the period total fertility rate and mean age of fertility when they are used to draw inferences about changes in cohort reproductive behavior.

Moreover, the applicability of the propositions presented here extends beyond fertility to other demographic processes, such as nuptiality, mortality, and migration, and indeed to all changes of state during the life cycle. In its most general form, an event of interest is identified as occurring at some interval of time after a preceding event, ordinarily selected because it signals in some way the beginning of exposure to risk of occurrence of the event of interest. Period measures are created by considering the distribution of the preceding event (the cohort-defining event) in relation to the succeeding event, with the temporal identification of the result the time of the succeeding event. Cohort measures are created by considering the distribution of the succeeding event in relation to the preceding event, with the temporal identification of the result the time of the preceding event. Thus two time series exist; ordinarily, the period series is available, but the cohort series is preferable. The above propositions apply in all such situations.

Two kinds of research suggestion flow from the above argument. First, because of the way changes in the tempo of cohort fertility and changes in its quantum interpenetrate the pattern of fertility from a period standpoint, much more knowledge is needed about the time distribution of reproductive behavior, and the processes which determine its shape. Second, the algebra of translation between cohort and period fertility functions requires further study. For example, it would be worthwhile to explore, perhaps through computer simulation, alternative translation formulae based on different models from those employed here, in part to discriminate between the essential and superficial aspects of the process. For another example, the formulae presented above apply solely to additive functions (like the total fertility rate), whereas most demographic processes are best described by risk functions, which are multiplicative (like the survival process represented in the conventional life table).

In conclusion, it is often the case that evidence about fertility comes in period form, whereas ideas about fertility come in cohort form. Although no formulae can be expected to resolve this problem fully, its recognition is essential to the integrity of our research procedures.

NOTES

1. Ward and Butz (1978) have developed an analysis of American fertility based on the distribution of cohort fertility over time. A similar approach was used in Ryder (1980; first published in 1951).
2. Unless otherwise specified, all sums in this account are over the span of reproductive ages.
3. In all of these formulae, the period in question is the period when the cohort for whom the parameters are calculated is at its mean age of fertility.

BIBLIOGRAPHY

Heuser, R. L. (1976) Fertility Tables for Birth Cohorts by Color: United States 1917-73. DHEW Publication No. (HRA)76-1152. Rockville, Md.: National Center for Health Statistics.

Lee, R. D. (1977) Target fertility, contraception and aggregate rates: Toward a formal synthesis. Demography 14:455-479.

Lee, R. D. (1980) Aiming at a moving target: Period fertility and changing reproductive goals. Population Studies 34:205-226.

Ryder, N. B. (1964a) Notes on the concept of a population. American Journal of Sociology 69:447-463.

Ryder, N. B. (1964b) The process of demographic translation. Demography 1:74-82.

Ryder, N. B. (1965) The cohort as a concept in the study of social change. American Sociological Review 30:843-861.

Ryder, N. B. (1975a) Notes on stationary populations. Population Index 41:3-28.

Ryder, N. B. (1975b) Fertility measurement through cross-sectional surveys. Social Forces 54:7-35.

Ryder, N. B. (1979a) Notes on Fertility in Colombia. Reproduced and distributed (in Spanish) by CCRP (Corporacion Centro Regional de Poblacion), Bogota, Colombia.

Ryder, N. B. (1979b) Components of temporal variations in American fertility. Pp. 15-54 in R. W. Hiorns, ed., Demographic Patterns in Developed Societies. London: Taylor and Francis.

Ryder, N. B. (1980) The Cohort Approach. New York: Arno Press.

Ward, M. P., and W. P. Butz (1978) Completed Fertility and its Timing: An Economic Analysis of U.S. Experience Since World War II. Report R-2285-NICHD. Santa Monica, Calif.: Rand Corporation.

Westoff, C. F., and N. B. Ryder (1977) The predictive validity of reproductive intentions. Demography 14:431-453.

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