

AGENCY FOR INTERNATIONAL DEVELOPMENT WASHINGTON, D. C. 20523 BIBLIOGRAPHIC INPUT SHEET	FOR AID USE ONLY <i>Batch 72</i>
---	--

1. SUBJECT CLASSIFICATION	A. PRIMARY Population	PC00-0000-0000
	B. SECONDARY Family planning	

2. TITLE AND SUBTITLE
Interaction between nutrition and family planning

3. AUTHOR(S)
Oelhaf, R.C.

4. DOCUMENT DATE 1971	5. NUMBER OF PAGES 57p.	6. ARC NUMBER ARC
--------------------------	----------------------------	----------------------

7. REFERENCE ORGANIZATION NAME AND ADDRESS
AID/TA/N

8. SUPPLEMENTARY NOTES (*Sponsoring Organization, Publishers, Availability*)

9. ABSTRACT

10. CONTROL NUMBER PN-RAB-723	11. PRICE OF DOCUMENT
----------------------------------	-----------------------

12. DESCRIPTORS Nutrition Interactions Development Population growth	13. PROJECT NUMBER
	14. CONTRACT NUMBER AID/TA/N
	15. TYPE OF DOCUMENT

INTERACTION BETWEEN
NUTRITION AND FAMILY PLANNING

by

Robert C. Oelhaf

Prepared for:

Office of Nutrition
Technical Assistance Bureau
Agency for International Development

under personal services contract with:

Nutrition Program
Center for Disease Control
Health Services and Mental Health Administration
U.S. Public Health Service, DHEW

8 January 1971

ACKNOWLEDGEMENT

The author would like to acknowledge the assistance of Dr. Gerald F. Combs and Dr. John I. McKigney of the Nutrition Program, HSMHA, in supplying documentation and literature, and also helpful suggestions. The constructive criticism of earlier versions of parts of this report by Prof. John W. Kendrick of George Washington University, and Dr. Douglas B. Wilson of the Bureau of the Budget are also gratefully acknowledged. Dr. K. Valassi contributed the descriptions of current research projects in Section 6.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS	ii
SUMMARY	v
1. INTRODUCTION	1
1.1 Model of Health and Nutrition Intervention	1
1.2 The Family Planning Decision and Population Growth	4
1.3 Contributors to a Family Planning Decision	6
1.4 Primary Mechanisms	9
2. NUTRITION AND ECONOMIC DEVELOPMENT	10
2.1 The Contribution of Nutrition	10
2.1.1. Quality of the Present Labor Force	10
2.1.2. Quality of the Future Labor Force	12
2.1.3. Efficiency of Other Investments	14
2.1.4. Social Benefits	16
2.1.5. The Question of Unemployment	17
2.2 Time-Series Studies	17
2.3. Cross-Sectional Studies	19
3. ECONOMIC DEVELOPMENT AND FERTILITY	22
3.1. Fertility Response to Changing Economic Status	22
3.2. Historical Evidence	23
3.3. Cross-Sectional Studies	25
3.4. Evidence for Specific Mechanisms	26
3.5. Summary and Policy Implications	27
4. HEALTH AND NUTRITION, INFANT AND CHILD MORTALITY, AND FAMILY PLANNING	29
4.1. Nutrition, Health and Mortality	29
4.2. Infant and Child Mortality and the Birth Rate	30

5. NUTRITION, HEALTH, AND FAMILY PLANNING PROGRAM EFFICIENCY	32
6. CURRENT RESEARCH	34
6.1. Field Study of Population Pressure in India	34
6.2. Population Study at Narangwal	37
6.3. Other Current Research	41
6.4. Evaluating Integrated Programs	42
REFERENCES	44

SUMMARY

There are three major mechanisms by which the nutritional status of a population influences family planning decisions: better nutrition increases overall economic development, decreases infant and child mortality rates, and enhances the effectiveness of associated family planning programs.

1) Nutrition contributes to overall economic development by increasing the quality of the present and future labor force (more energy, initiative, mobility, health, perhaps intelligence), by increasing the efficiency of other investments (in education, child rearing, health), and by bringing general social improvement more cheaply than other means (such as raising per capita income). Particularly in underdeveloped regions, monetary benefits appear to far outweigh the costs. (Underemployment and unemployment are more apparent than real and may be disregarded.)

Historically, economic development has been associated with declining fertility rates. Recent experience in underdeveloped countries indicates that generally the death rate falls first, then, 10 to 20 years later, the birth rate begins to turn down. Computer simulation indicates that excess population growth in the interim is unimportant in the long run. Fertility rates have also dropped, independently of the death rate, for groups whose aspirations moved upward sharply. Cross-sectional studies indicate that education and communication systems are the components of economic development most strongly associated with lower fertility. On the other hand,

per capita income, particularly its rate of growth, is often positively associated with fertility rates. This appears to be primarily a transient, dynamic effect, acting prior to adjustment to a new, higher, economic level. Nutrition programs would appear particularly useful, because they raise real income without affecting money income, and thus can perhaps change attitudes without the euphoria which apparently ends in more births. Family planning programs have been most successful when the mortality decline has already occurred and the desire for lower fertility is already present.

2) Infant and child mortality rates appear to have a direct effect on the desired number of children. Surviving sons are often important for ceremonial and social security reasons. Surveys and computer simulation confirm that couples are most likely to wish to control births when a family size and composition has been achieved which virtually assures a surviving son. Since a large percentage of infant and child deaths in underdeveloped countries is attributable to malnutrition, nutrition programs can bring dramatic change.

3) Family planning programs have been more efficient when linked with established health and/or nutrition programs, i.e., when concern for the family's welfare has already been demonstrated. Efficiency of both money and time argue for the establishment of integrated maternal/child health--nutrition--family planning programs.

Two large-scale research programs are underway to test the relation between nutrition and family planning, but completion lies four to five years in the future. In the meantime, the evidence summarized above is sufficient to justify the inclusion of a nutrition element in family planning programs. Integrated maternal/child health, nutrition and family planning programs can serve as vehicles for continuing research and evaluation.

1. INTRODUCTION

This report surveys current knowledge of the relationship between nutrition (and, to a limited extent, health) and aspects of family life which are related to family planning decisions in a development context. This section describes the mechanisms by which health and nutrition influence the birth rate. A model, consistent with the empirical evidence, is presented and used to show the dominant directions of causation and eliminate from further consideration effects which are comparatively small. The following sections present the empirical evidence for the important relations. Section 6 describes some relevant current research projects.

1.1. Model of Health and Nutrition Intervention

Out of the socio-economic system of an underdeveloped culture, we extract the family as the decision-making unit which governs the birth rate. Even in traditional societies, where the family is tightly embedded in a strong social structure, or if the decision may be viewed as in some sense irrational, it is nevertheless, still in privacy that the act of procreation takes place or is controlled. The motives are rational or irrational, depending, perhaps, on one's point of view, but a decision is still being made. Even in regions with very high birth rates, the rate is still well below the maximum rate possible. (It is not clear to what extent the generally-acknowledged under-reporting of births in underdeveloped areas would affect this assertion.)

Figure 1 is a schematic of the socio-economic model used in this report. All elements interact to some extent and form a system in which, specifically, nutrition (and health), economic development and population

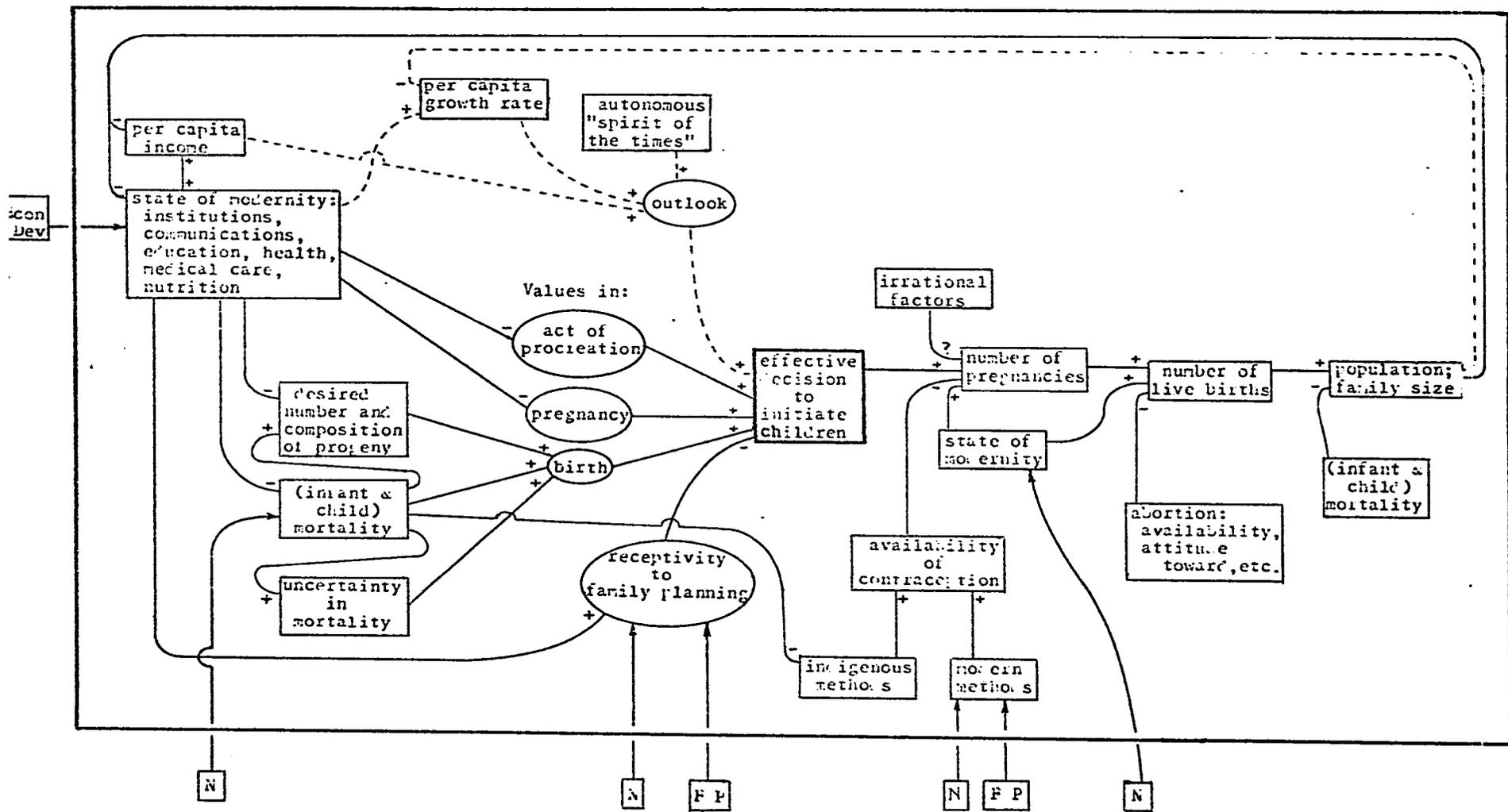


Figure 1. Schematic of Socio-economic Model of Underdeveloped Country Showing Effects of Nutrition and Family Planning Programs.

movements both influence and are influenced by each other.¹ Certain relations tend to be stronger, however, and these are emphasized in the figure.

The model is essentially a static one, with hypothesized causations reading from left to right, except for the "feedback loops" emanating from the box marked "population, family size." No attempt is made to separate macro and micro aspects; in the model macro quantities are simply aggregations of the relevant micro quantities.

The area inside the large box is the socio-economic system of an idealized underdeveloped country. Since the analysis here deals with family planning, the system has been distorted so that the family planning decision-maker, the couple, is the central element. All the major sectors of the economy are relegated to the box at the left, "State of Modernity," including government, private sectors of the economy, communication network, state of nutrition, health, and medical care, and other measures of the level of economic development of an economy. The solid lines indicate the hypothesized quasi-static causal relations, roughly from left to right. The dashed lines are for dynamic or impulse responses of the system. Intervention in the system comes from outside, indicated by arrows to the points of incidence. Whether the relation between cause and effect is direct or inverse is indicated by plus and minus signs, respectively. Thus, for example, if receptivity to family planning increases, less children will be initiated (negative correlation, negative sign). To avoid making a complex diagram even more complex, some elements are shown more than once, namely, State of Modernity, Family Planning (F.P.), Mortality, and Nutrition (N). This is only a schematic convenience, not meant to indicate more than one program or statistic.

Of the many interrelationships between nutrition and family planning, we now seek to isolate the most important ones with the largest effects. Some results of nutrition intervention will have an unfavorable effect on the birth rate. These effects must be shown to either be small, or counter-balanced by concomitant favorable effects.

1.2. The Family Planning Decision and Population Growth

In elaborating the mechanism by which nutrition (and other health services) can assist in lowering the birth rate, it will be convenient to begin with the decision-making unit, the couple, diagrammatically located in the center of Figure 1.

1.2.1. Number of Pregnancies

Passing to the right, the more child-initiating activity, the more pregnancies. The number of pregnancies will also be influenced by irrational factors, over which nutrition and health probably have little control, except to the extent that a more economically developed society will increase its rationality. This will have a favorable effect, since available evidence indicates that a nutrition program will, on balance, cause a rational decision-maker to limit fertility (Sections 2 and 4).

The availability of contraception will have a negative effect on pregnancies. The advantages of providing family planning, together with other health services, including nutrition, are discussed in Section 5.

Are the number of pregnancies successfully begun influenced by the standard of living, including, in particular, nutrition? The evidence, primarily from World War II European experiences, is that fecundity is lowered significantly only when starvation is approached,² although

certainly the desire for children would have been lowered under such circumstances. For levels of nutrition above starvation, including the range under consideration here, this effect will be negligible, and will not be considered further.

1.2.2. Number of Live Births

The more pregnancies, the more live births.

The availability of abortions will affect the number of live births negatively. The effect of nutrition and health on this variable would appear to be slight. Any effect would appear to be positive, such as changing attitudes, or increasing availability of medical care.

When the nutrition of the mother is poor, there is some evidence that there will be more miscarriages and stillbirths. During World War II, Great Britain instituted a preferential rationing system favoring pregnant women. Stillbirth rates dropped from a previously stable 38/1000 live births to 28/1000, despite the deterioration of the rest of the environment.³ On the other hand, there is an adverse effect on child birth weight, and probably child health (and, therefore, life expectancy). This would raise child mortality, tending to increase the desired number of children (see below). The two effects operate in the opposite direction; the net result is probably small. In addition, poor maternal nutrition may also adversely affect child intelligence, having negative economic effects, and reproductive efficiency is low when pre-natal death rates are high. On balance, the net influence of nutrition intervention on fertility via the number of live births is probably small and will be neglected hereafter.

1.2.3. Family Size; Population

The larger the birth rate, the larger the average family size and the larger its growth rate. The death rate acts in the opposite direction. As indicated in Figure 1, there is negative feedback from population into per capita growth rate, per capita income, and modernity. This is the Malthusian effect. An increment in per capita income or growth rate, resulting, for example, from economic development activity from outside the system (at the left) produces a brighter outlook and/or better living standards. This results in more children, which cancels out the original advance. An increase in modernity (with attendant nutrition and health features) results in lower mortality, with the same neutralizing results. The indications are, however, that this effect is of less significance than those results of modernity which tend to lower the birth rate. This is particularly so in the long run and in the presence of a strong government family planning policy. The evidence is discussed in Section 3 (also Section 4.1).

1.3. Contributors to a Family Planning Decision

We complete the description of the model by working backwards from the decision unit, the couple. Five characteristics may be identified as contributing to a family planning decision (Figure 1): outlook and level of living, receptivity to family planning, and three values which lead to pregnancy: value in the act of procreation, value in pregnancy, and value in children.

1.3.1. A Dynamic Effect: Outlook and Level of Living

The outlook or attitude toward the future and the level of living, measured by per capita income, have a positive effect on fertility. This

is the relationship emphasized by the neo-Malthusians; it appears to be most important in the short run. It will be argued in Section 2 that other effects of economic development, operating in the opposite direction through family planning and institutional and value changes, are stronger.

1.3.2. Receptivity to Family Planning

Family planning requires deliberate effort by couples. The necessary motivation change can perhaps be supplied by overall economic development (Section 3.4) and, specifically, by nutrition and other health services (Section 5).

1.3.3. Value in the Act of Procreation

There are three distinct values which would lead a couple to engage in sex leading to childbirth: value in the act itself, value in the state of pregnancy, and value in producing a child.

Value may attach to the act of procreation because of a conscious or unconscious desire to participate in the mystical powers of creation, influence the harvest, or demonstrate virility. It appears unlikely that nutrition or health programs will have much effect except indirectly through their contribution to economic development and a resultant shift in values and beliefs (Section 2).

1.3.4. Value in Pregnancy

Pregnancy is a public sign of good times and a demonstration of virility. Positive value may be attached to pregnancy for other reasons. A Philippino farmer, father of ten, is quoted as having said that "because of the new high-yielding [grains], he and his neighbors would now have enough food for all, and all could enjoy seeing their women in the condition

in which they were most beautiful--pregnant."⁴ Again, any influence of nutrition would be through overall economic development.

1.3.5. Value in the Birth of a Child

A combination of logic and field data indicate that there are three factors that enter into a rational decision to have a child: the desired number and composition of progeny, the mortality (infant and child) and the uncertainty in mortality. A correlation analysis of 75 municipalities in Puerto Rico indicated that these factors were associated with about half of the observed differences in birth rates.⁵

The desire for progeny is primarily a result of cultural factors, probably amenable to influence by economic development and institutional change. The evidence is reviewed in Section 3. Among the possible mechanisms, Heer⁶ suggests the following: Economic development brings education which means more communication (including birth control information and alternative ways to spend money) and more women in school. Institutional changes may cause the elderly to rely on government and business pensions rather than children. Social mobility may bring conspicuous consumption. (This apparently influenced the English nobility to lower their birth rate.⁷) Child labor laws shrink the benefits associated with children.

Economic development also brings lower mortality, particularly child and infant mortality, at least to some extent as the result of improved nutrition. A decreased infant mortality rate may be postulated as lowering the desire for progeny, since lessened probability of death will induce parents to invest more psychic energy in each child. For a limited amount of psychic energy, this means less children. For a given desired family size, the higher the infant mortality rate, the larger the number of births

required to reach that size. With lower mortality, it costs more to support a family at the same fertility level. Finally, if breast feeding is used, there will be larger space between children if the children live.

The contribution of nutrition to development is reviewed in Section 2; infant and child mortality, one area in which nutrition and health programs can have a large effect on family planning decisions, is singled out for special treatment in Section 4.

The third factor in a rational desire for progeny is uncertainty in infant and child mortality. People are, on the whole, risk-averse. Thus, under conditions of uncertainty, they will have more children than would be needed on the average to achieve the desired family size. A child either dies or he doesn't. The only way to reduce uncertainty is to reduce mortality.

1.4. Primary Mechanisms

The primary mechanisms by which nutrition and other health services may influence family planning decisions and the birth rate have been identified:

1. Nutrition intervention will have the effect of lowering the birth rate via its influence on economic development. There is also a tendency for economic development to raise the birth rate (Sections 2 and 3).

2. Nutrition intervention will lower the birth rate directly through its effect on infant and child mortality and, thus, on the required number of children to achieve the desired family size (Section 4).

3. Nutrition programs may have positive interactions with concurrent family planning programs (Section 5).

2. NUTRITION AND ECONOMIC DEVELOPMENT⁸

The first mechanism by which nutrition and health can influence fertility is via their effect on economic development. In this section the effect of nutrition on economic development will be surveyed. The following section will cover the relationship between economic development and fertility. Estimates of costs and benefits of a number of health programs have been made by Mushkin.⁹ This section will be confined for the most part to nutrition.

In Section 2.1. the rationale for an economic development effect of nutrition will be outlined, together with supporting studies. Time series and cross-sectional data, discussed in the following sub-sections, confirm the general positive relationship between nutrition (and health) and development.

2.1. The Contribution of Nutrition

Better nutrition contributes directly to economic development by: increasing the productivity of the present labor force; (probably) increasing the productivity of the future labor force; and increasing the efficiency of (return on) other investments, particularly rearing costs and education. Better nutrition also raises the general quality of life. (Indirect effects, via lowering mortality, fertility and population, are discussed in Section 4.)

2.1.1. The Quality of the Present Labor Force

During the last two decades, the effects of gross calorie malnutrition in adults have begun to be documented.¹⁰ Calorie malnutrition is associated with physical and mental apathy and lowered resistance to disease

and accidents.¹¹ Reduced muscular strength and cardio-vascular performance is observed. However, particularly when the calorie intake is low, there has been a marked increase in output when food consumption increased. The costs of the nutrition programs are often made up many times by increased worker output.¹² For example, stone moved per worker quadrupled in three years in an experiment in Costa Rica after a better diet was introduced by a subsidized worker cafeteria.¹³ The minimum caloric intake per day per man is on the order of 1600 kcal. These are the fixed costs of merely keeping a man alive. Thus, at the poverty level, a small percentage increase in calories produces a large percentage increase in energy available for productive activity.¹⁴ Of course, as dietary levels rise, diminishing returns set in. The caloric requirements for various occupations have been established.¹⁵

Increased nutrition also reduces absenteeism and increases motivation, training ability, enterprise, and mobility, all of which contribute to overall productivity. Nutrition can thus help to break the cycle of immobility, unemployability and apathy.

Motivation has both physiological and psychological dimensions. Because of its clearly visible results, nutrition programs can contribute psychologically to a positive, confident attitude, a feeling that life can be changed by human initiative. Thus the willingness to break with the past and accept new ways is enhanced. This was the experience of the Tufts-Delta Health Center in Mount Bayou, Mississippi, where popular response to the Center reportedly resulted in markedly increased utilization of economic resources.¹⁶

It is well known that specific dietary deficiencies can result in various debilities. Lack of vitamins D and A cause rickets and blindness,

respectively. The need for protein has been demonstrated for heavy muscle work, but there are those who believe that less protein intake increases productivity.¹⁷ The economic cost of one nutritional deficiency, beri beri, has been estimated by the Philippine Government, from production losses, manpower losses, and costs of medical care and burial. The total came to \$11 million per year. The elimination of beri beri is a simple matter of grain enrichment.¹⁸

2.1.2. The Quality of the Future Labor Force

Evidence linking infant malnutrition and mental retardation has received considerable publicity. Both proteins and calories appear to be critical. However, while nutrition may be the most important factor, there are probably a number of others that contribute as much or more to mental retardation in the lower socio-economic groups.¹⁹ Some of the evidence has relied on animal studies, which are in some ways not applicable to the human case.²⁰ For example, maximum brain growth in the rat occurs after birth, in humans, immediately prior to birth.²¹ There is no measure of possible effects of long-term sub-clinical malnutrition.

Stoch and Smyth have followed a group of grossly malnourished infants and controls in South Africa since 1955.²² The malnourished infants scored significantly lower on IQ and other intelligence tests. They exhibited lower initiative and motivation, more aggression, and less affection. However, the malnourished generally had other environmental handicaps, some of which are known to lead to similar results and which may well have contributed to the malnutrition. A similar study, using better control, has recently been reported in the United States.²³ The possibility of organic disease was eliminated by using only children which had been examined,

at birth. The test results were similar in community relations, family relations and economic functioning. Mental impairment was observed and was most severe when malnutrition had lasted more than four months. (The Development Quotient of the children experiencing four to 24 months malnutrition was 70 compared to 95 to 99 for the controls. The longer the malnutrition, the lower the DQ.) Three children who subsequently moved to foster homes after the malnutrition attack experienced rapid weight gain, but the DQ's remained low.

There are indications that intra-uterine nutrition also may have an effect on mental capacity. In a study of identical twins, the twin with the lower birth weight usually had lower IQ (by about 5%) when school age had been reached. The interpretation is that a lower birth weight implies a lower level of intra-uterine nutrition.²⁴ Another study matched twins with single-birth children, and found the latter scoring consistently higher on Bayley developmental scores at eight months of age and also on a revised Binet IQ at four years.²⁵ And a study of children of mothers receiving supplements during pregnancy found IQ's 4 to 8% higher at age four than controls.²⁶

Various attempts have been made to use physical growth as a proxy for intellectual capacity. There appears to be a correlation between malnutrition and permanently stunted physical growth. There also seems to be a correlation between this physical growth and low intelligence test levels.²⁷ In some cases, mental performance has improved with diet, however.

If irreversible mental damage does take place, the critical period appears to be from birth to age six months or perhaps up to two years.²⁸ Thus, together with the maternal nutrition pre-birth studies cited above,

a critical period of from sometime during pregnancy up to about two years is indicated. This is confirmed by recently reported experimental work on brain cells. In a study of 200 human brains, division of glial cells was observed from 30 weeks of gestation to 18 months post-natal age.²⁹

Some studies have attempted to use head size as a proxy for intelligence.³⁰ Since head circumference is also an index of scalp size, temporal muscle, bony skull, and body height and weight, all of which are smaller for malnourished children, these studies are not conclusive. A study of autopsies of growth-impaired children found brain weights normal for their age.³¹

In summary, the evidence for irreversible neural damage due to malnutrition is not entirely conclusive, yet not easily dismissed. The economic effects of irreversible mental retardation on labor quality and economic development are clear. Lower overall mental capacity may not stand out in a backward economy, but rapid development must depend on the educability of the future labor force.

The economic effects of physical retardation are not as clear-cut. However, permanent physical damage due to specific childhood dietary deficiencies can severely alter a worker's productivity. For example, there are over one million blind in India as a result of vitamin A deficiency in childhood.³²

2.1.3. The Efficiency of Other Investments

In addition to direct effects on the quality of the labor force, investments in nutrition can make an impact on the efficiency of investments, particularly medical, educational, and rearing costs.

Improved nutrition should reduce medical expenses, both short- and long-term. A healthier population means less disease and a lighter incidence when it occurs.

A child who is mentally crippled and apathetic due to infant malnutrition requires special educational facilities to make him a productive member of the labor force. Such facilities are expensive and have a low productivity.

Whatever the state of a child when he enters school, his ability to learn can probably be affected by the level of nutrition during the school years. Not unexpectedly, the effects of malnutrition in a school child are much the same as described above in a worker: lethargy, apathy, absenteeism, increased incidence of disease. There are many testimonies to the dramatic improvement in attentiveness and learning ability which follow the introduction of school lunches, morning snacks, and/or breakfasts. Since a comprehensive nutrition program was introduced into the school system of a low-income community in Texas, attendance rates have risen to 95%, school drop-out rates are below 10%, discipline problems and vandalism have all but disappeared, and 50% of the high school graduates go on to college.³³

Resources spent in rearing and training people whose contribution to the economy either never materializes, or is cut short by death or incapacity, are largely wasted. A nutrition program which lowers infant and child mortality and raises life expectancy will lower this loss. There is also a waste in rearing a person who does not reach his maximum productive potential. A nutrition program increases the return on the initial investment (in the child), if he becomes a more productive member of the labor force.

Cross-national evidence supports these assertions. In one study, the degree to which investments contributed to economic growth correlated best with health variables, particularly per capita caloric consumption. Other factors of lesser significance were education, housing and social security.³⁴

The few estimates of the magnitude of the economic loss involved in resources wasted in child rearing are staggering. For example, it is estimated that in pre-independence India, 22.5% of the national income was spent rearing children who died prior to making any economic contribution.³⁵ A more recent analysis, for the "Commonwealth Caribbean" (all former British colonies in the region), produced a figure of over \$1 million per year at a minimum.³⁶ Only hospital and rearing costs were included in the total costs. The cost of treatment of cases of clinical malnutrition came to about \$800,000 per year and the rearing costs of children dying due to malnutrition came to \$250,000 (estimated per child at \$5 per birth, \$5 for furniture, \$2 for burial and wake, and \$55 per year for food).

2.1.4. Social Benefits

Social benefits can have an intrinsic productivity effect. They are also important because an alternate route to the same level of happiness might be more costly, such as raising per capita income to a level at which people obtained equivalent benefits.

Any program which lowers the death rate or raises the living standards of the poor has obvious social benefits. While government-supplied or -fortified food programs have been opposed on the grounds that they interfere with a man's freedom and dignity, this has little relevance at the poverty level, where men are locked in the cycle of malnutrition, apathy and poverty.

A food program should be designed to break the cycle with a minimum sacrifice of pride, viewing food as a basic human right.

A nutrition program might produce less dissatisfaction with society and government among the poor. The opposite could also result, however. In a study of experimental starvation, the subjects became increasingly submissive and less rational as the starvation progressed. During rehabilitation, however, a mood of rebelliousness and hostility developed.³⁷ Besides humanitarian reasons, the starvation state is incompatible with economic development; clearly the preferable mode is a well-fed populace which does not need rehabilitation!

2.1.5. The Question of Unemployment

The classical theory of underdevelopment held that unemployment and underemployment are at high levels. In economic terms, the marginal product of labor is zero. If this were the case, raising productivity would simply create more unemployment and underemployment and therefore more misery. Thus it can be argued that there are social and political benefits of spreading the work around. The classical theory has now been demolished, however. A survey in India found less than 5% unemployment or underemployment, perhaps approaching 0%.³⁹ In fact, there are many circumstances where unemployment is only apparent. For example, cultivatable land may be unused because of disease, or a disease may strike regularly at harvest time (including hunger-produced listlessness).⁴⁰ It appears that we may safely disregard the classical argument.

2.2. Time-series-Studies

In his studies of growth rates in Northwest Europe and the United States, Denison does not give health a detailed treatment.⁴¹ The effects

of health on death, inability to hold a job, and time lost from work are implicitly included in measures of labor input. Levels of health are sufficiently high in these developed countries that he feels justified in neglecting any impairment of performance on the job due to ill health. Nutrition is specifically discounted as a factor in economic growth, although Denison believes that it probably was a factor in the growth rate in Italy during the 1950's.⁴²

Correa has estimated the effects of health and nutrition on the growth rate of underdeveloped, as well as developed, countries.⁴³ He used mortality and morbidity rates to estimate the effect of health levels on economic growth. The measure of the nutritional level was average calorie intake as a percentage of calorie requirements for 100 percent efficiency. Calorie requirements were initially adjusted for occupational distribution, sex structure, and average temperature; in more recent work, adjustments were also made for age and differential intake between occupations. The refined estimates indicate that, in the late 1950's, working capacity as a percentage of full capacity ranged from 46% and 51% for El Salvador and India, respectively, to 100% for the U.S. and northwestern Europe. Because nutrition also has some influence on the health measures (mortality and morbidity), some double counting is involved in considering these factors separately. Nevertheless, Correa's estimate of the influence of health and nutrition on U.S. growth of income per capita between 1950 and 1962 was 0.02 percent per year or only 0.6 percent of the total growth rate. In western Europe, these factors contributed less than 5 percent of the growth rate for the countries analysed. In Latin America, however, nutrition accounted for up to 10 percent of the growth rate. Correa

estimates that 61% of the increase in agricultural production in Taiwan between 1935 and 1960 may be attributed to increased nutrition.

In the predominantly underdeveloped countries, the contribution of nutrition to economic growth is generally at least as large as that of education; in the developed countries on the other hand, education is much more important than nutrition. In looking at recent development policy, it would seem that a bias in favor of education has been transferred from the developed to the underdeveloped countries.

One drawback to the use of gross food intake as a measure of the contribution of nutrition to productivity, is the fact that as food consumption goes up, productivity may actually drop. This is particularly true in the advanced countries, where, for example, there appears to be a causal relation between over-eating and consumption of refined foods and cardio-vascular disorders. In underdeveloped countries, people may "buy up" to nutritionally inferior food if increased consumption is a result of overall economic advance in the absence of, or instead of, a nutritionally-sound government program.

2.3. Cross-sectional Studies

In a study of 22 underdeveloped countries, Malenbaum⁴⁴ found a significant positive correlation between health variables, infant mortality and population per physician, and increase in agricultural production. The independent variables "explained" 62% of the output variation, and 80% of this was attributable to the health variables. Inter-regional studies within selected underdeveloped countries produced similar results, except for some exceptional cases. However the increase in output may in fact be responsible for the low infant mortality, rather than vice versa. The

conclusion that health contributes to economic growth does not appear warranted in this case.

Another cross-sectional study of underdeveloped countries used per capita GNP as the dependent variable. Underdeveloped countries were divided into three categories: those with growth rates greater than 2 percent (with improvement in certain institutions), less than 1 percent, and in between. A wide variety of factors, including health, was tested against the classification to see which correlated best. The results indicated that 97 percent of the growth rate could be successfully accounted for by four factors: extent of modernization of outlook, rate of improvement of financial institutions, extent of leadership commitment to development, and degree of improvement of agricultural productivity (or rate of improvement of physical overhead capital).⁴⁵ The lack of significance of the health variable is disconcerting. To some extent health may be represented in the modernization of outlook and the agricultural productivity variables.

One reason health variables may not show significant correlations with development in cross-sectional studies is due to probable lags in the effects of health programs.⁴⁶ To some extent this is overcome in some comparative studies of regional development. In a study of the productivity of English agriculture from 1850 to 1914, Hunt showed that the backward regions had nutrition levels that were too low for efficient work.⁴⁷ Hansen has surveyed the French regional development experience.⁴⁸ He concludes that the mobility of French agricultural workers has been closely related to the educational level in the region. The highest transfer rate to industry in the 19th century was from regions which were

technically the most advanced; outmigration did not take place from the poor farming regions. Both theory and the French experience argue for emphasizing human resource investment in lagging regions--from both national and regional viewpoints of cost-effectiveness. Public investment in economic overhead capital (roads, bridges, electric power) is not indicated in underdeveloped regions, but rather for more advanced regions where the prerequisite for development is present--human capital.⁴⁹

3. ECONOMIC DEVELOPMENT AND FERTILITY

Empirical evidence can be marshalled in favor of both a positive and a negative relationship between economic development and fertility. On the whole, however, indications are that the long-term result of economic development is lower fertility. Since mortality appears to drop as development progresses, independently of the presence of health programs, the significant question becomes: How far will a drop in the birth rate lag behind?

Section 3.1. will indicate the main support for the neo-Malthusian view, the positive relationship between development and birth rate. The following section will present the time-series data, which heavily support a non-Malthusian relation. Then cross-sectional data will be examined. These data point toward a reconciliation of the two views and support the model outlined in Section 1.

3.1. Fertility Response to Changing Economic Status

The data linking higher birth rates with better economic circumstances have been summarized by Heer.⁵⁰ There are a number of local studies plus some historical data. For example, fertility closely follows the business cycles: fertility rises as the economy expands and declines as the economy contracts. In the U.S., the birth rate dropped to very low levels during the depression and rose following World War II. In the Punjab, in the late 1950's, the failure of family planning was attributed to rising expectations and the resulting feeling that it was no longer necessary to limit family size.⁵¹ The same feeling was echoed by the Philippino farmer quoted earlier. A case of increased fertility with economic development has been

reported.⁵² Economic development may also contribute to higher fertility by breaking down traditional restraints on intercourse, e.g., a prohibition of intercourse during lactation.⁵³

The common denominator in the above data is change. There is a higher income level or a rising income. There is a dynamic situation. In each case, a full adjustment had not been made to the new circumstances. This will be confirmed by the cross-sectional data. Exactly the opposite picture is obtained from the long-term historical record.

3.2. Historical Evidence

The historical evidence is virtually unanimous in indicating a drop in fertility following economic development. This is the general experience in all Western countries. First the death rate falls. Then, some time later, the birth rate also falls.⁵⁴ Fredrickson⁵⁵ has shown that this has also been the experience of Japan and other lesser developed countries which have had drops in birth rates since World War II, such as Ceylon, Mauritius, Costa Rica and Chile. The drop in mortality is not generally attributable to modern medicine and public health techniques, even in the recent examples. Because of this lack of correlation, the fall in the death rate is attributed to overall improvements in the environment, including better nutrition, housing, sanitation, and also education.⁵⁶ A lag of about 15 to 20 years between the drop in death rate and the drop in birth rate has been the recent experience.⁵⁷ This is significant in that the size of the total population will be little affected by changes in the death rate over this period.⁵⁸ Thus mortality declines should not be feared, but welcomed as a sign of advancement and precursor of a future fertility decline. The latter can hopefully be assured and hastened by a family planning program.

Fredrickson sees a causal connection between the mortality decline and the fertility decline. He notes that inter-regional studies also show this consistent lag, with the largest drop in the birth rate where the population growth had been greatest.⁵⁹ The causal sequence begins with a mortality decline resulting in a population increase. Since family size can now be obtained with less children, a fertility decline follows.⁶⁰ However, with the possible exception of nutrition, Fredrickson's conclusion that health programs are useful in speeding economic development and demographic transition does not appear to be entirely warranted. Fredrickson's data indicate that the mortality drop takes place independently of health programs. And the drop in fertility could well be a concomitant of the same process which originally caused the drop in mortality. Temporal association does not mean causality. Fredrickson and others provide additional evidence for a link between mortality and fertility; this will be discussed in Section 4.2.

As a matter of fact, fertility declines have taken place independently of mortality declines. Gloss cites the cases of certain British and French groups which experienced declining fertility, apparently associated with rising aspirations.⁶¹ In contrast to the business cycle and other data cited in the previous section, this appears to be a long-term adjustment to changing long-term possibilities and aspirations. Gloss postulates that fertility declines when there exists a conflict between the existing level of living and aspirations which is large enough to be socially visible and institutionalized. The implication is that government policy should be geared to raising aspirations, breaking family dependence, and guaranteeing equality of opportunity.

Perhaps more than one mechanism is at work. At any rate, the historical evidence points toward declining fertility with economic development.

3.3. Cross-sectional Data

Cross-sectional studies support the hypothesis that economic development is associated with decreasing fertility. However, the rate of economic growth and the income per capita are associated with an opposite, though smaller, effect.

In a study of 318 local areas in 18 Latin American nations, Heer found fertility inversely related to economic development proxies (percent urban, percent literate, and percent of labor force employed outside of agriculture). However, fertility was higher than average where the advance had been the fastest.⁶² In a study of 37 nations at all stages of development, Adelman found fertility positively correlated with per capita income, but negatively correlated with the education level, population density and percent labor force outside agriculture. However, of the four independent variables, education and density were most strongly associated with fertility, income less, and labor force outside agriculture, the least.⁶³ A significant drawback to this study, for our purposes, was that the data for the developed nations were given weights four times those for the undeveloped nations. Weintraub also obtained positive cross-national correlations between birth rate and per capita income (correlation coefficient of 0.25).⁶⁴

Using United Nations data, Heer obtained correlations between fertility and a variety of independent variables, tabulated in Table 1:⁶⁵

<u>Correlation Coefficient</u>	<u>Independent Variable</u>	<u>Proxy for</u>
-0.44	Net National Product per capita	Economic level
-0.69	Newspaper circulation	Education
0.71	Infant mortality	
-0.38	Density	
0.55	Percent increase in per capita energy consumption	Economic growth

Table 1: Zero Order Correlation Coefficients Between Independent Variable and Fertility. (Additive model, similar to results for multiplicative model. Partial correlation coefficients are also similar.) (Heer, 1966, Table 2, p. 434)

Note the striking difference between the correlation of economic level with fertility, which is negative, and that of economic growth, which is positive. This supports the hypothesis that adjustment to higher economic levels produces a drop in fertility, although changes in economic level bring increases in fertility. Heer argues that the above associations with fertility are causative, with fertility the effect and the independent variable the cause. This is true either because the reverse effect is in the opposite direction (density and percent increase in per capita energy consumption) or because it should be small.

3.4. Evidence for Specific Mechanisms

In the preceding correlation studies, education played a prominent role in fertility decline. Also significant was newspaper circulation, which can be taken as a proxy for communication as well as education.

An influence on fertility directly from the increased standard of living can be inferred from some KAP (Knowledge-Attitude-Practice) studies. When aspirations for children rose, confronted with limited budgets for clothes, food, and education, the desire for limiting family size also rose.⁶⁶

The experience gained to date in family planning programs also supports a direct effect of overall economic development on receptivity to birth control. According to Robinson, family planning programs have generally been successful where much progress toward modernity already has occurred. Death rates are low (10 per 1000 or under), female literacy high (50 percent or more) and education, occupational change, and urbanization rather advanced. Studies also indicate that not infrequently the populations concerned were already beginning to practice family planning. Fertility was already declining and family planning helped along an already-existing trend. Without modernity, family planning has had little success.⁶⁷ When life is hopeless, there is little incentive to plan. Where development is only starting, it would be best to emphasize health and nutrition programs to lower mortality.

On the other hand, MacCorquodale found a high correlation between the effectiveness of family planning programs and the smallness of the municipality (0.72). There was a low correlation with urbanization (0.28) and a negative correlation with literacy (-0.55).⁶⁸ These results appear to be in conflict, and more research appears to be in order.

3.5. Summary and Policy Implications

There appear to be only two stable demographic modes for a society: both birth and death rates high, or else both birth and death rates low.

The former state is incompatible with humanitarian ideals and economic efficiency. Historically the presence or absence of health programs does not appear to make a significant difference in the mortality decline. The transition from high rates to low appears to be a natural result of overall economic development, with the decline in birth rates lagging the mortality decline by perhaps 15 to 20 years. The rapidity with which development takes place, particularly as reflected in personal spending power (per capita national product or income), appears to act in the opposite direction on fertility, i.e., to raise it. Family planning programs have been most successful when the mortality decline has already occurred and the desire for lower fertility is already present.

What are the policy implications? First of all health programs cannot be praised or blamed for falling mortality; historically the fall would have occurred anyway, in the presence of basic sanitary reforms and improved nutrition. Specific health and nutrition programs aimed at lowering infant and child mortality may be useful, however, and this will be discussed in the following section. Because of the positive correlation between per capita income (or produce) and fertility, raising national income by itself is not an efficient means of limiting births. Direct nutrition and health programs can raise real income without stimulating the euphoria which apparently leads to higher birth rates. The capital resources involved are minimal compared to those required to raise national income.

Family planning programs should be viewed as shortening the lag time of the drop in fertility after the drop in mortality, which has already occurred and continues.⁶⁹ Such programs should be introduced where concern for the welfare of the people has already been established. Health and nutrition programs may thus be useful vehicles for introducing family planning.⁷⁰

4. HEALTH AND NUTRITION, INFANT AND CHILD MORTALITY, AND FAMILY PLANNING

Health and nutrition programs specifically geared to lowering infant and child mortality have been suggested as direct means of influencing family planning decisions. For this reason, this mechanism has been lifted out of those results of overall economic development discussed in Section 3. However, it should be kept in mind that the mortality statistics for any underdeveloped country are heavily weighted by infant and child mortality figures. Therefore, a significant reduction of overall mortality is equivalent to a significant reduction in infant and child mortality. (Certain traditions often leave the infants and children low in the mealtime pecking order.) Specific programs geared to infant and child mortality should be recognized as important mainly for their visibility and as vehicles for family planning (Section 5).

4.1. Nutrition, Health and Mortality

Malnutrition lowers resistance to infection and disease and makes the incidence of illness far more severe than it otherwise would be. Likewise, onset of illness will often precipitate severe malnutrition. This synergism between malnutrition and infection has been thoroughly documented by Scrimshaw.⁷¹ For example, in a study of four Guatemalan village in 1956-57, one third of the deaths of children between 1 and 4 years was due to kwashiorkor which had been preceded and precipitated by infectious disease. Almost one third more of these deaths were due to acute diarrhea, usually not fatal in well-nourished children. Most of the rest of the deaths were associated with respiratory diseases, complications of common childhood illnesses (e.g., measles), again, not fatal without the presence of malnutrition. Another survey,⁷² in the Punjab, found 30% of the deaths in the

first month of life to be from tetanus, which is readily preventable by inoculation. From age 29 days to 11 months, 40% of the deaths were related to malnutrition (diarrhea or pneumonia).

There seems to be little doubt that the combination of simple health programs (sanitation and immunization) with nutrition could substantially lower the infant and child mortality rates. Better maternal nutrition and health would also lower the child death rates because the children would be stronger. An experimental program to test the relationship was conducted in three Guatemalan villages over a five-year period.⁷³ With well under 50 percent participation of the young children, the mortality in the 1 to 4 year age bracket was reduced 56 percent in the village with a nutrition program. This compared with a 31 percent decrease in a similar village in which a public health and medical program was conducted. However, a control village with no program experienced a 38 percent drop in mortality! Unfortunately, the results are clouded by the outbreak of communicable disease in the public health experimental village soon after the program began. Still, the results lend some support to nutrition intervention as a means of lowering the death rate.

4.2. Infant and Child Mortality and the Birth Rate

Mortality figures are more than statistics to mothers. In underdeveloped countries, most women have experienced the loss of one or more children. In one survey, half the women over 45 years old had lost three or more living children; only 1/7 had lost none.⁷⁴

Evidence is accumulating that large families in underdeveloped countries are not the result of caprice, but of more or less conscious decision. Surveys have shown that most parents have a desired number of children, after which they become more interested in family planning.

According to a computer simulation, using current death rates in India, a couple must bear 6.3 children to be 95% sure that one son will be living at the father's 65th birthday. The closeness of this number to the average number of births in India of 6.5 appears suspicious.⁷⁵ However, it is not clear what is the importance of the 95% certainty (rather than, say, 99%). It is well-known that surviving sons are needed in India for ceremonial as well as social security reasons.

Clearly a lower infant and child mortality will allow the attainment of a desired family size and/or desired number of sons with a smaller number of births.

Are mortality rates perceived? If perceived, is there an effect on receptivity to family planning? The answer to both questions is "yes," although documentation is scanty. Hawley and Prachuabmoh⁷⁶ found that 4/5 of a 25% random sample of a rural Thailand village (population 70,000) perceived that a decline in the death rate reduced the required number of births to realize a given number of children. Hassan, in a survey of Egyptian women in Cairo, found that experience of childhood mortality raised actual and desired family size, irrespective of socio-economic status.⁷⁷ Evidence from a baseline survey, part of the population study at Narangwal described in Section 6, also supports a positive influence of child survival on family planning acceptance.⁷⁸ May and Heer found that birth control acceptors generally have four or five children and one living son.⁷⁹ A recent USAID memorandum indicates that those accepting family planning are characterized by being literate, low income, and having at least four living children, of which at least two are sons.⁸⁰

5. NUTRITION, HEALTH AND FAMILY PLANNING PROGRAM EFFICIENCY

Historically, the rapid extension of population control programs was coupled with cutbacks in American funding of health and nutrition programs, generating a considerable amount of negative feeling toward family planning in some regions.⁸¹ On the other hand, family planning programs have been most successful when introduced in conjunction with a well-established health and nutrition clinic at least 20 years old. There has been a poor reception when family planning programs have been introduced by themselves: verbal acceptance, but no effect on the birth rate.⁸² The poor showing of birth control programs in India is associated with a low percentage of the population having Maternal Child Health services (only 15%).⁸³ It thus appears that health and nutrition programs can significantly influence a couple's receptivity to family planning. There are reasons why this makes sense. People are more likely to listen to those who help visibly. Few results are more visible than a deathly-sick child who has dramatically recovered from, e.g., kwashiorkor. Nutrition and health programs demonstrate concern for the family as a whole. Confidence that children will live should rise. This is supported by a study of 20 health centers in Guatemala in 1967. The effectiveness of family planning programs was highly correlated with the effectiveness of other public health programs.⁸⁴ Furthermore, there is reason to believe that medical and paramedical personnel resist bare family planning programs.

Efficiency of both money and time also argues for joining family planning with other health programs. Generally the most nutritionally deficient groups are pregnant mothers and mothers of pre-school children,

the same groups who should be the target of a family planning program. A new mother may have enhanced receptivity to family planning. A joint program requires less effort by the recipient: a single trip to only one clinic.⁸⁵ Further, the new contraceptive devices generally require health services on a continuing basis.⁸⁶ Do nutrition supplements passed out at family planning centers increase attendance? There are no data on this at present, but a pilot project is in progress.⁸⁷

6. CURRENT RESEARCH

6.1. Field Study of Population Pressure in India⁸⁸

The study is supported by U.S. National Institutes of Health; Project Director is Roger Revelle, Ph.D., Professor, Center for Population Studies, Harvard University. The collaborating institution is the Indian Council of Medical Research, New Delhi, India. The study began in January 1970.

The research objectives of the field study are to determine how to change the birth rate of a selected rural Indian population. It is a fundamental study in the development of a method of decreasing population pressure.

The investigators propose to test the following general hypothesis in their field study:

That Indian social units will reduce their birth rate after three conditions are fulfilled:

- a) Demonstration that the children of the social unit have an increased probability for survival.
- b) Demonstration to members of the social unit the consequences and implications of their own rapidly increasing numbers.
- c) Provision of acceptable and effective contraceptives.

The test of the hypothesis rests on two activities:

1. Stimulation of village people to learn about their past, present and potential future population growth and to consider the implications of these events on their community.
2. Improvement of the survival rate of live-born children.

These two activities are intended to influence the villagers' views on how many children they want in the coming years, then propose to make available modern methods of birth control.

The site of the study is India in the region of Andhra Pradesh, in the District of Medak.

A design of the study is presented in Table 6.1. Four populations, Groups A, B, C and D, will be studied with 8,000 persons each. Populations E_1 and E_2 composed of a total of 1,000 persons in two separate villages will be used for a preliminary study.

Finalization of details for populations A, B, C and D will depend on the evidence from the exploratory and pilot studies of expected changes in birth rates and death rates. Their expected magnitude and standard error will determine the minimal population size and duration of observations for the definitive study.

The reconnaissance studies lasted from 1966-1968 and the definitive studies are expected to last for about six years, beginning January 1970. In the first two years any observable decline in death rate of preschool children is expected to be small. Later a larger decline in deaths of preschool children may be the result of the motivation to practice family planning. At least four years in this phase are considered necessary by the investigators to establish a change in birth rates.

The final analysis of reporting of results will take approximately two years in Boston. During the study analysis and dissemination of results to interested agencies in India and elsewhere will be undertaken. However, the final analysis and interpretation will take approximately two years. In Population D, as it is indicated in Table 6.1, activities will carry community preventive health services.

Activities for test of Hypothesis	Population A 8,000 people	Population B 8,000 people	Population C 8,000 people	Population D 8,000 people	Population E ₁ and E ₂ 1,000 people
Annual census. Record of vital events every two weeks.	Yes	Yes	Yes	Yes	Methods to be tested. Training
Each month skilled advice and methods of birth control will be available by a physician		Yes	Yes	Yes	Methods to be tested. Training
Community education in the consequences and implications of population change and its determinants			Yes	Yes	Methods to be tested. Training
Community preventive health service expressly designed to reduce illness and deaths among preschool children				Yes	Methods to be tested. Training

Table 6.1. Field Study of Population Pressure in India: Study Activities in the Four Population Groups.

At least two outstanding contributions would seem to result from a study of this magnitude. One is the study of a method which can be adapted in the Indian villages for decreasing death rates. If effective, it may have wide application in Asia and elsewhere. The investigators state that the main burden of this aspect of the health service would fall on women of relatively modest education. They feel, however, that the numbers of women needed to perform such services in the community eliminate the possibility of using more highly trained personnel or of developing a complete health service as the first target.

The other significant contribution from this study will be the motivational techniques which are to be used. Such techniques had been used with success in industry and it will be of great interest to test their effectiveness at the village level in increasing motivation to adopt family planning practices.

The development of common operating definitions, and common systems of recording of analysis of data, will be additional contributions from the study.

6.2. Population Study at Narangwal⁸⁹

The study has been undertaken by Johns Hopkins University with Carl E. Taylor, Ph.D., Department of International Health, as the Project Director. The study is supported by the U.S. Public Health Service and Agency for International Development. The period is 1965 to present.

The primary objective of this study is to answer the question of whether young women of low parity effectively practice family planning if they are assured their children already born can be healthy and survive to adulthood.

The secondary objectives will be:

1. To find out the knowledge, attitudes and practice (KAP) of family planning in rural Punjab.
2. To study the effectiveness of means of providing family planning information and of motivating women to accept family planning and to identify channels of communication.

The stated hypothesis is:

That acceptance of family planning will improve as village people can be led to believe that their children have an improved chance of survival.

The research design of this project was set up to compare the relative impact of child and maternal care on the acceptance of family planning practices.

Twenty-two villages are used in all, with a total population of 23,000. Sixteen of these villages are used in the definitive study. Table 6.2 indicates the research design in connection with the activities which are carried out.

The Family Planning Service

The education of the public concerning family planning is undertaken through clinics, home visits, group meetings, use of posters, films, distribution of literature and through local practitioners, dais, local leaders, and satisfied users.

The services include instruction on various types of contraceptives. Women can make their choice.

A follow-up program will evaluate use and experience with contraceptives and care for complications.

	Group I Four Villages	Group II Four Villages	Group III Four Villages	Group IV Four Villages
Activities Relating to Test of Hypothesis	Child Care Maternal Care Family Planning	Maternal Care Family Planning	Child Care	Family Planning
Important Considerations	All three approaches used. Efforts made to use healthy child to convince mother that spacing is desirable means of maintaining the health of present children.	The approach involves making adaptations of urban post-partum programs to the rural setting. Indigenous dais are used.	Observations made to see what impact child care alone has on spontaneously increasing the use of existing family planning services.	This group serves as a control. Baseline information only obtained from primary health centers. Only family planning is introduced.
Other projects underway			A study of nutrition and infection in weaning age children.	A functional analysis of primary health centers.

Table 6.2. Population Study at Narangwal: Research Design

The Maternal Care Service .

Efforts are made to initiate post-partum care in the rural areas. The approach is a combination of clinic and domiciliary activities.

The range of activities include prenatal and postnatal care in clinics, home visits, natal services by dais, gynecological examinations, referrals, and medical care for mild and easily treatable gynecological conditions.

The Child Care Service

The training of auxiliary-nurse-midwives (ANMs) was started in the U.S. in order to fulfill the need of primary health centers and sub-centers for maternal care by individuals with little background in pediatrics. They need continuous professional support. This is done by written instructions and standing orders and they are getting regular supervisors from the LHV/PHN and physician.

The ANM is the first person to examine patients. On the basis of standing orders she will give treatment for a specific period and if there is no improvement during that period, she refers the patient to the physician on his weekly visit. Patients are referred to the physician only after screening by an ANM except in cases of obvious emergency.

The following activities are covered by the ANM in providing child care: provision for sick children up to 13 years of age, control of communicable diseases by active immunization (smallpox, DPT, tetanus toxoid, measles), health education, collection of vital statistics, and maintaining records up to date; also participation in school health services, identification of all pregnant women in the village, health education related to growth and development, and nutrition; nutritional

supplements to children who fail to gain. The most important planned activity of the auxiliary-nurse-midwife (ANM) includes home visits. Her activities there include examination of newborn, verification of births and deaths, advice for immunization, follow-up of sick children, and health education. She also provides a complete record of home visits and children attending clinics.

Ancillary Studies

1. Channels of Communication:

A study is undertaken to identify channels of communication among women in the rural areas of Punjab. The investigators feel that the findings from this study will help the family planning program.

2. Functions of Nursing Midwifery Personnel in Child Care and Family Planning Services:

A pilot study is undertaken to see the quality and quantity of the services by the auxiliary-nurse-midwives and the health visitors in connection with the population study in one or two villages. Accordingly, methods of collecting and analyzing data will be developed by the nursing and medical staff of the project.

They feel that this study is important because these two groups are the key people in delivery of MCH and family planning services.

6.3 Other Current Research

Among other relevant research in progress is a project under the direction of Dr. Abdel R. Omran, Carolina Population Center, University of North Carolina at Chapel Hill, which will include a study of childhood mortality experiences on fertility (desired family size and actual size

will be measured).⁹⁰ Studies at the Rand Corporation, supported by AID, continue in the areas of population, reproductive behavior, economic activity, household income and regional migration.⁹¹

6.4 Evaluating Integrated Programs

The two field studies will not provide conclusive answers for four to five years from now. In the meantime, there is sufficient evidence, outlined in this report, to justify integrated maternal/child health, nutrition and family planning programs right now. Such programs are ready vehicles for ongoing research and evaluation. Depending on the local circumstances, they can be funded as expanded support of current integrated programs, in conjunction with the integration of presently fragmented services, or as a new program. Specific suggestions are contained in a recent memorandum by McKigney.⁹²

Evaluation of these programs should provide information regarding the effectiveness of various implementation methods on 1) reducing infant and child mortality, 2) the use of family planning measures, and 3) the rate of population increase. Also any lags should be documented.

Evaluation components can be developed along the guidelines suggested by the Joint FAO/WHO Report on "Methods of Planning and Evaluation in Applied Nutrition Programs."⁹³ The evaluation as indicated in this report "must derive from the analysis of data collected before, during and after the execution of the program or project and must be based on criteria and indicators agreed upon in advance." Briefly such components to be included are:

1. Baseline information, including percentages of existing mortality and morbidity and causes.

- 2) Specific objectives to be achieved, developed in relation to existing conditions. These should be timely and realistic.
- 3) The target population. (What are the target groups? What percentages are presently reached?)
- 4) Criteria and indicators. (What changes should be looked for?)
- 5) Methods and tools necessary, including methods of recording, with available personnel and level of training, and methods of measuring changes.

Since conditions and resources vary greatly in the developing countries, evaluation techniques will have to be adapted to local situations.

REFERENCES

1. Carl E. Taylor and Marie-Francoise Hall, "Health, Population and Economic Development," Science 157 (11 August 1967), pp. 651-657.
2. Earl Siegal and Naomi Morris, "The Epidemiology of Human Reproductive Casualties, with Emphasis on the Role of Nutrition," c. 2 in Maternal Nutrition and the Course of Pregnancy, National Research Council (Washington, D.C.: National Academy of Sciences, 1970), pp. 5-40; Grace Goldsmith, Journal of Nutrition Education (Summer 1969), p. 20.
3. Siegal and Morris, op. cit., pp. 20f; "Relation of Nutrition to Fetal Growth and Development," c. 5 in Maternal Nutrition and the Course of Pregnancy (Washington, D.C.: National Academy of Sciences, 1970), pp. 110-138.
4. Translation of a Philippino farmer's story by Dr. Dioscoro Lopez Umali, Philippine Undersecretary for Agriculture, recorded by William Paddock, "How Green is the Green Revolution?" BioScience 20 (No. 16, August 1970), pp. 897-902, reprinted in Church and Society, Nov-Dec 1970, 61, No. 2, pp. 37-50.
5. T. Paul Schultz, "A Family Planning Hypothesis: Some Empirical Evidence from Puerto Rico." Rand Corporation Memorandum RM-5405-RC/AID, December 1967, p. v.
6. D. M. Heer, "Economic Development and Fertility," Demography 3 (1966), pp. 423-444.
7. David Glass, "Population Policy," in M. Sheps and J. C. Ridley, ed., Public Health and Population Change. (Pittsburgh: University of Pittsburgh Press, 1966) p. 22.
8. Most of this section is taken from Robert C. Oelhaf, "Nutrition and Productivity Advance: A Review and Some Policy Recommendations." Unpublished paper. January 1970.
9. Selma J. Mushkin, "Health as an Investment," The Jour. Pol. Econ. 70 (5) Part 2 (Supplement: October 1962), pp. 129-157.
10. "The Economics of Malnutrition," Nutrition Reviews 27 (2), February 1969, pp. 39-41.
11. Aaron M. Altschul, "Strategy for New Protein Supplies," International Agricultural Development, May 1967, No. 31. International Agricultural Development Service, USDA, pp. 1-5.

12. F. W. Lowenstein (WHO Secretary, Accra/Ghana), "Nutrition and Working Efficiency (with Special Reference to the Tropics)," Joint FAO/WHO/OAU (STRC) Regional Food and Nutrition Commission for Africa. Special Paper No. 3, May 1968, pp. 6-7.
13. Harry T. Oshima, "Food Consumption, Nutrition, and Economic Development in Asian Countries," Economic Development and Cultural Change 15, No. 4 (July 1967).
14. Ibid., p. 392.
15. Hector Correa, The Economics of Human Resources (Amsterdam: North Holland Publishing Company, 1963).
16. H. Jack Geiger, "Progress Report of the Tufts-Delta Health Center," (mimeographed), October 1968; also Wall Street Journal, 14 January 1969, referenced in Wilfred Malenbaum, "Health and Productivity in Poor Areas," in Herbert E. Klarman, ed., Empirical Studies in Health Economics. Proceedings of the Second Conference on the Economics of Health (Baltimore: The Johns Hopkins Press, 1970), pp. 31-54.
17. Lowenstein, op. cit., pp. 6-7.
18. Alan D. Berg, "Malnutrition and National Development," Foreign Affairs 46 (1) October 1967, pp. 126-136.
19. Fernando Monckeberg, "The Effect of Malnutrition and Environment on Mental Development," in Proceedings of the Western Hemisphere Nutrition Congress II, August 26-29, 1968, San Juan, Puerto Rico (Chicago: American Medical Association, 1969), pp. 216-221.
20. Rose E. Frisch, "Present Status of the Supposition that Malnutrition Causes Permanent Mental Retardation," The American Journal of Clinical Nutrition 23 (February 1970), pp. 189-195.
21. "Relation of Nutrition to Fetal Growth," p. 117.
22. M. B. Stoch and P. M. Smyth, "Does Undernutrition During Infancy Inhibit Brain Growth and Subsequent Intellectual Development?" Archives of Disease in Childhood 38 (December 1963), pp. 546-552; M. B. Stoch and P. M. Smyth, "The Effect of Undernutrition During Infancy on Subsequent Brain Growth and Intellectual Development," South African Medical Journal 41 (28 October 1967), pp. 1027-1030.
23. Peter H. Chase and Harold P. Martin, "Undernutrition and Child Development," The New England Journal of Medicine 282 (23 April 1970), pp. 933-939.
24. L. Willerman and J. A. Churchill, "Intelligence and Birth Weight in Identical Twins," Child Development 38 (1967) p. 623, referenced in Hector Correa and Gaylord Cummins, "Contribution of Nutrition to Economic Growth," The American Journal of Clinical Nutrition 23 (May 1970), pp. 560-565.

25. W. L. Holley and J. A. Churchill, "Physical and Mental Deficits of Twinning," paper submitted to the Special Session on Perinatal Factors Affecting Human Development, Eighth Meeting of the Pan American Health Organization Advisory Committee on Medical Research, World Health Organization, 15 May 1969 (Abstract). Other papers at the same conference indicated adverse effects on child intelligence from maternal diabetes, hypertension and other complications.
26. R. F. Harrell, E. Woodyard and A. I. Gates, "The Effects of Mothers' Diets on the Intelligence of Offspring," New York: Bureau of Publications of Teachers College, Columbia University, 1955, referenced in Hector Correa and Gaylord Cummins, "Contribution of Nutrition to Economic Growth," The American Journal of Clinical Nutrition 23 (May 1970), pp. 560-565.
27. Monckeberg, op. cit.
28. Joaquin Cravioto, "Malnutrition and Behavioral Development in the Pre-School Child," in Pre-School Child Malnutrition: Primary Determinant to Human Progress. An International Conference on Prevention of Malnutrition in the Pre-School Child, Washington, D.C. December 7-11, 1964. National Academy of Sciences - National Research Council Publication 1282: Washington, D.C., 1966, pp. 74-84.
29. "1970 Symposium of the Group of European Nutritionists, Chianciano Terme, Italy, 13-21 May 1970" FAO Nutrition Newsletter 8 (No. 2, April-June 1970), p. 65f.
30. Frisch, op. cit., p. 192.
31. M. Robinow, "Field Measurement of Growth and Development," in Malnutrition, Learning and Behavior, ed. N. S. Scrimshaw and J. E. Gordon (Cambridge: MIT, 1968), p. 409, referenced in Frisch, op. cit., p. 192.
32. Berg, op. cit.
33. Earl P. Schubert, "Nutrition Education: How Much Can or Should our Schools Do?" Journal of Nutrition Education (Summer, 1970); cf. also Charles Remsberg, "School Without Lunch," Everyman's Guide to Programs, Impact Reports 1, No. 1 (1969), 3ff; "Hunger in our Midst," OEO, April 1969 (reprinted from the Charlotte Observer).
34. W. Galenson and G. Pyatt, "The Quality of Labour and Economic Development in Certain Countries," (Geneva: International Labour Office, 1964), referenced in Taylor and Hall, op. cit., p. 654.
35. E. Ghosh, "Pressure of Population and Economic Efficiency in India," (Madras: Indian Council of World Affairs and Oxford University Press, 1946), p. 22, referenced in Alan Berg, "Priority of Nutrition in National Development," paper presented to International Conference on Amino Acid Fortification of Protein Foods, MIT, Sept. 16, 1969.

36. R. Cook, "The Financial Cost of Malnutrition in the 'Commonwealth Caribbean,'" Journal of Tropical Pediatrics 14 (June 1968), pp. 60-65, summarized in "The Economics of Malnutrition."
37. "The World Food Problem, A Report of the President's Science Advisory Committee," (United States Government Printing Office, May 1967).
38. Cf. Berg, 1969.
39. Taylor and Hall, op. cit., p. 653.
40. Rashi Fein, "Health Programs and Economic Development," in The Economics of Health and Medical Care, Proceedings of the Conference, May 10-12, 1962 (Ann Arbor: University of Michigan, 1964), pp. 271-282.
41. Edward F. Denison, The Sources of Economic Growth in the United States and the Alternatives Before Us, CED Supplementary Paper No. 13, 1962.
42. Edward F. Denison, Why Growth Rates Differ, The Brookings Institution, Washington, 1967.
43. Correa, 1963; Hector Correa, "Nutrition, Working Capacity, Productivity and Economic Growth," in Proceedings of the Western Hemisphere Nutrition Congress II, August 26-29, 1968, San Juan, Puerto Rico (Chicago: American Medical Association, 1969), pp. 188-192; Correa and Cummins, 1970.
44. Malenbaum, op. cit.
45. Irma Adelman and Cynthia Taft Morris, "Performance Criteria for Evaluating Economic Development Potential: An Operational Approach," Quart. Jour. Econ. 82 (2) May 1968, pp. 260-280.
46. Malenbaum, op. cit.
47. E. H. Hunt, "Labor Productivity in English Agriculture, 1850-1914," Econ. Hist. Rev. 20 (2) Aug. 1967, pp. 280-292, in Jour. Econ. Abstracts 6 (1) March 1968, p. 914.
48. Niles M. Hansen, "Human Resources and Regional Development: Some Lessons from the French Experience," Southern Economic Journal 34 (July 1967), pp. 123-132.
49. Niles M. Hansen, "Regional Planning in a Mixed Economy," Southern Economic Journal 32 (2) October 1965, pp. 176-190; Niles M. Hansen, "Some Neglected Factors in American Regional Development Policy: The Case of Appalachia," Land Economics 24 (February 1966), pp. 199.
50. Heer, op. cit., pp. 424ff.
51. Carl E. Taylor, "Health and Population," Foreign Affairs 43 (April 1965), pp. 482f.

52. A. O. Zarate, "Differential Fertility in Monterrey, Mexico," The Milbank Memorial Fund Quarterly 45 (1967), pp. 93-108, referenced in Roy E. Brown, "Fertility, Malnutrition and Mortality," unpublished thesis, University of North Carolina School of Public Health.
53. Taylor, op. cit., p. 481.
54. Cf. Ansley J. Coale and E. M. Hoover, Population Growth and Economic Development in Low Income Countries (Princeton: Princeton University Press, 1958), pp. 12ff, quoted in Warren C. Robinson, "Population Control and Development Strategy," The Journal of Development Studies 5 (No. 2, January 1969), p. 106.
55. Harald Fredrickson, "Feedbacks in Economic and Demographic Transition," Science 166 (14 Nov. 1969), pp. 840f.
56. Robinson, op. cit., pp. 106f; Taylor, op. cit., p. 475.
57. Fredrickson, op. cit.
58. Michael V. E. Rulison, "Report on Topical Investigation and Analysis of Nutritional Supplements in Family Planning Programs in India and Pakistan," Research Triangle Institute, Research Triangle Park, N.C. Work order 509, October 1970, p. xvif.
59. Harald Fredrickson, "Determinants and Consequences of Mortality and Fertility Trends," Public Health Reports 81 (1966), pp. 718ff.
60. Fredrickson, 1969, p. 842; cf. also Fredrickson, 1966.
61. Glass, op. cit.
62. Heer, op. cit., p. 426.
63. Irma Adelman, "An Econometric Analysis of Population Growth," The American Economic Review 53 (#3, June 1963), pp. 314-339, referenced in Heer, op. cit., p. 427.
64. Robert Weintraub, "The Birth Rate and Economic Development: An Empirical Study," Econometrica 40 (October 1962), pp. 812-817.
65. Heer, op. cit., p. 434.
66. J.M. Stycos, "The Outlook for World Population," Science 146 (1964), pp. 1435-1440, referenced in Brown, op. cit., p. 104.
67. Warren C. Robinson, "Family Planning in Pakistan's Third Five Year Plan," Pakistan Development Review 6 (No. 2, Summer 1966), pp. 274f, quoted in Robinson, 1969, p. 108.
68. Donald MacCorquodale, "Analysis of a Family Planning Program in Guatemala," Public Health Reports 85 (No. 7, July 1970), pp. 570-574.

69. Goran Ohlin, Population Control and Economic Development (Paris: OECD, 1967), p. 9; Fredrickson, 1969, pp. 845f.
70. Cf. Taylor, op. cit., p. 478.
71. Nevin Scrimshaw, et al., "Interactions of Nutrition and Infection," WHO Monogram Series 57 (1968), pp. 3-329.
72. John B. Wyon, "Causes of Death at Different Ages by Sex, and by Season, in a Rural Population of the Punjab, 1957-1969: A Field Study," Indian J. of Medical Research 53 (No. 9, Sept. 1965), pp. 906-917; John E. Gordon, John B. Wyon and Werner Ascoli, "The Second Year Death Rate in Less Developed Countries," American J. of Medical Science 254 (Sept. 1967), pp. 357-380.
73. Nevin S. Scrimshaw, Moises Behar, Miguel A. Guzman and John E. Gordon, "Nutrition and Infection Field Study in Guatemalan Villages, 1959-1964," Archives of Environmental Health 18 (Jan. 1969), pp. 51-62, summarized in "Experimental Epidemiology: Nutrition and Infection," Nutrition Reviews 27 (Nov. 1969), pp. 306-311.
74. J. E. Gordon and J. B. Wyon, Families and Population Problems in Rural North India: The Khanna Study, unpublished manuscript, 1969, Chapter 7, pp. 70-73, referenced in Alan Berg, "Toward Survival: Nutrition and the Population Dilemma," Population Review (1969), p. 5.
75. D. A. May and D. M. Heer, "Son Survivorship Motivation and Family Size in India: A Computer Simulation," Population Studies 22 (2), 1968, pp. 199-210; also May and Heer, "Son Survivorship Motivation and Family Size in India, A Computer Simulation," unpublished manuscript, 1967, referenced in Berg, "Toward Survival."
76. A. H. Hawley and V. Prachuabmoh, "Family Growth and Family Planning Responses to a Family-Planning Action Program in a Rural District of Thailand," Demography 3 (1966) p. 328.
77. Shafick S. Hassan, "Influence of Child Mortality on Fertility," paper presented to the Annual Meeting of the Population Association of America, New York, April, 1966, referenced in Rulison, op. cit., p. 18.
78. "Progress Report on the Population Study at Narangwal," Johns Hopkins University, Department of International Health, November, 1968 (unpublished manuscript); Carl E. Taylor, personal communication, 17 December 1970.
79. May and Heer, 1968; also cf. Alan D. Berg, "The Role of Nutrition in National Development," Technology Review (February, 1970), pp. 45-51.
80. "Family Planning," Children 16 (No. 5, Sept.-Oct., 1969), p. 204, referenced in Rulison, op. cit., p. 15.
81. Berg, "Toward Survival."

82. Taylor, op. cit., p. 479; D. C. Williams, "Maternal and Child Health Services in Developing Countries," Lancet 1 (1964), p. 345.
83. C. D. Williams, "Nutrition and Population," Newsletter of the Caribbean Food and Nutrition Institute (No. 7, Feb., 1969), pp. 3-11.
84. MacCorquodale, op. cit.
85. J. I. McKigney, "Statement Regarding the Necessity for AID to Support a Comprehensive Approach to Family Planning--Maternal/Child Health--Nutrition Services," unpublished memorandum, Sept. 1970 (Draft).
86. Taylor, op. cit., p. 479.
87. Rulison, op. cit., p. 34.
88. Documented in the Research Plan of the proposal to PHS-NIH, "Field Study of Population Pressure in India," Dr. Roger Revelle Project Officer, revision of PHS application No. 43-51 dated 5/21/68.
89. "Progress Report on the Population Study at Narangwal."
90. Rulison, op. cit., p. 25.
91. Schultz, op. cit., p. iii.
92. McKigney, op. cit.
93. "On Methods of Planning and Evaluation in Applied Nutrition Programs" (Geneva: FAO/WHO, 1966).