

ASIAN AND PACIFIC POPULATION FORUM

Population Growth, Economic Development, and Family Planning

by Andrew Mason

Population growth and economic development

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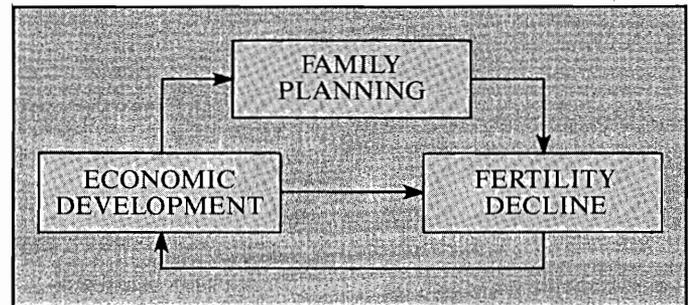
Governments in some of the less developed countries of Asia that face continued high rates of population growth (India and Bangladesh, for example) put faith and funds in vigorous family planning programs to reduce fertility, in the belief that this will stimulate economic growth. Are they—and aid agencies that help finance the programs—making the right decision?

Most research in this area has focussed on countries that have failed to achieve rapid economic growth. This article will examine the development success stories of Asia, based on research conducted to determine whether and how reduction in population growth rates contributed to the rapid economic growth of Indonesia, South Korea, Japan, and Thailand.

The five-year research project, jointly sponsored by the United Nations Fund for Population Activities, the Nihon University Population Research Institute, and the East-West Population Institute, concluded that both development and family planning programs contributed substantially to fertility decline in the countries studied, and that fertility decline stimulated the development process.

The researchers, who came from each country studied and from the East-West Population Institute, examined whether and how demographic change contributed to the rapid economic growth of Indonesia, Japan, South Korea, and Thailand. (UNFPA 1986.)

The project involved the construction of a standard development profile



showing the changes in the economy, population, labor force, and educational system that could be expected over the course of a century in a model country

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ASIAN AND PACIFIC POPULATION FORUM

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The *Asian and Pacific Population Forum* brings articles of potential value in policy formulation, program administration, and research to the notice of policymakers, professionals, and scholars concerned with population matters in the Asia-Pacific region.

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The EAST-WEST POPULATION INSTITUTE, a unit of the East-West Center, conducts research, training, and related activities in the field of population, with emphasis on economic, social, psychological, and environmental aspects of population problems in Asia, the Pacific, and the United States.

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To Our Readers

Welcome to the *Asian and Pacific Population Forum*. The final issue of the *Asian and Pacific Census Forum*, published in April this year, was Volume 12 No. 2 (November 1985). To avoid confusion among readers and librarians, we begin anew with Volume 1 Issue No. 1.

The *Population Forum* is not a totally different publication from its predecessor. The change in title reflects a change to broader coverage that will include economic, social, psychological, and environmental aspects of population problems in the region. However, population data collection and analysis — mainstay of the *Census Forum* and a continuing priority for many readers — will not be neglected.

Our aim is therefore to serve both regular readers of the *Census Forum* and new audiences of scholars, administrators, and professionals involved in setting population policies, administering population programs, or conducting research into population-related issues in the Asia-Pacific region. The editors hope that you will find the *Population Forum* interesting, informative, and useful.

Your response to the *Census Forum* readership survey, sent out in April, is most gratifying. The response rate is 20 percent and growing, as a steady stream of completed questionnaires continues to reach us. There is still time to dig the questionnaire out of your overburdened in-tray, complete it, and mail it back to us, if you have not already done so.

Thank you for your support.



Managing Editor

(Continued from page 1)

with fertility and mortality decline typical of today's developing countries. If fertility declines much more rapidly — at the rates observed in Japan, South Korea, or Thailand, for example — repeated simulation shows that as a consequence in 30 years per capita income is roughly 50 percent higher. Lower mortality rates, on the other hand, lead to more rapid population growth but have no adverse impact on per capita income.

To understand more precisely how demographic changes affect economic

growth, the project examined three factors that influence the long-term productive capacity and growth of the four East and Southeast Asian economies — savings, the size of the labor force, and the quality of labor as measured by educational achievement.

Savings

No clear consensus has existed among economists on the exact effects of population growth on household savings, but the new study provides

evidence that declines in population growth, particularly in countries with moderately or rapidly growing economies, do lead to higher rates of savings. Three of the east and Southeast Asian countries examined — Japan, South Korea, and Thailand — have achieved high rates of savings. A number of variables affected their savings rates, some positively and others negatively. When lower population growth was isolated as a variable, it was estimated to have increased the saving rate by 6.1 percentage points in Japan between 1950 and 1980, 8.5 percentage points in South Korea between 1960 and 1980, and 5.5 percentage points in Thailand between 1960 and 1975. Indonesia also experienced rapid economic growth in the 1970s, but because less demographic change occurred this variable contributed only 2.3 percentage points toward increasing the savings rate between 1971 and 1980.

What accounts for this strong positive contribution of population decline toward the growth of savings? Economists offer two basic explanations.

First, household savings vary with age of head of household. Those least likely to save include households with retirees living off past earnings or young households with heavy childbearing expenses. Slow-growing populations have relatively more households in the former category; rapidly growing populations have more in the latter. Countries with more moderately growing populations, as in most of the Asian countries cited here, have relatively more wage-earning households with fewer children.

Second, population growth affects savings because the ability or willingness of childrearing households to save

rises as fertility declines. Populations with high fertility must devote a larger share of resources to childrearing. Families also may rely more on their children for old-age support. These phenomena undermine the ability and the needs of parents to save for their retirement years.

Labor force

Except during periods of transition from a rapid to a slow rate of population growth, population and labor force grow at similar rates. Thus, for most developing countries the labor force, like the population, is growing at rates of 2 to 3 percent annually. This is a mixed blessing at best. Even in the most poorly endowed countries, additional workers probably add to total output. Economic development, however, requires increased worker productivity. To accomplish this, additional workers must be better equipped — with skills, capital, or land — than the existing labor force. If the labor force is growing rapidly, these other factors of development are spread more thinly, and productivity increases are difficult to achieve.

The four East and Southeast Asian countries examined here are in transition from high to low rates of population growth. During this transition, the labor force continues to grow for some years after fertility rates decline, causing the percentage of the population in the labor force to increase. Thus the decline in rates of population growth has contributed to development by enabling per capita income to rise as workers compose a larger share of the population. More of the available capital and technology can be devoted to each worker once the labor force growth rate also begins to decline.

Education

The quality of labor is more difficult to measure, but educational enrollments and expenditures provide rough indicators of the efforts being made in different societies. In Asia and the Pacific these indicators demonstrate an increasing public commitment to education. In the four East and Southeast Asian countries studied intensively, essentially all children now attend primary school, and secondary and college enrollment ratios are rising rapidly. Spending per pupil and educational expenditures as a percentage of GNP also are increasing as countries achieve higher levels of economic development.

To what extent are variations in enrollments and expenditures a product of demographic change? A decreasing proportion of the young in the total population allows a more intensive process of education for each child. The project's results show that the impact of rapid fertility decline on enrollments is most immediate at the secondary level. With lower fertility, secondary enrollment ratios are raised by a substantial margin. The impact on primary and college education is considerably less important, as the former has become nearly universal in any case and the latter is only indirectly influenced by demographic factors.

Although rapid fertility decline reduces the number of school-age children, increases in enrollment ratios and expenditures per student combine to raise expenditures on education. Available evidence thus indicates that rapid fertility decline does not reduce education's demand on public resources; rather, it helps achieve a higher quality of education with a somewhat greater fiscal burden.

Fertility decline: a consequence of economic growth or family planning?

If declining population growth positively affects economic growth, is it possible to hasten economic development by introducing or strengthening family planning programs? Or is fertility decline such an integral part of economic development that family planning policies are futile? The success stories in East and Southeast Asia shed light on this important question. Those who believe in "family planning" through development assert that rising incomes and other economic, social, and cultural changes associated with economic growth themselves alter the calculus of costs and benefits of having children and lead to fertility decline. Proponents of this argument maintain that large government programs to influence population policy directly are unnecessary. Other population experts, however, believe that family planning programs can reduce population growth more than would occur by relying on economic development alone and thus contribute positively to the development process.

Surveys conducted in a number of Asian developing countries show that many couples are making childbearing decisions fully cognizant of the personal, financial, social, and psychological implications (Bulatao 1979). Despite their intentions to delay or avoid childbearing, there are many women who are not using effective means of contraception, either because of lack of knowledge or because it is unavailable at a price they can afford.

It has been estimated that the unmet need for family planning — the percentage of fecund married women of

childbearing age who want no more children but who are not using contraceptives — ranges from approximately 10 percent to 16 percent in most Asian developing countries, a figure that increases to 22 percent in some countries if women using ineffective methods (such as rhythm or withdrawal) are included (see Table). A recent study for the World Bank concludes that the costs, both public and private, for meeting this need for contraception would increase from \$2.2 billion in 1985 in Asia to about \$3.9 billion by the year 2000 (Bulatao 1985). Is this expenditure necessary?

Proponents of both family planning through development and development through family planning can establish superficial cases for their positions based on casual observation of the rapidly developing East and southeast Asian countries. Development has undoubtedly contributed to fertility decline. At the same time countries such as Indonesia, South Korea, and Thailand have had active and, by all accounts, successful family planning programs. (Cho et al. 1983, Kamnuansilpa et al. 1982, Rosenfield et al. 1982.)

Project researchers extensively analyzed aggregate fertility trends to determine the extent to which rapid economic development was responsible for the observed decline in fertility in Japan, South Korea, Thailand, and Indonesia. In Indonesia, Japan, and South Korea, rapid economic growth made an important contribution to the decline in fertility, but substantial portions of the fertility decline in South Korea, in Japan between 1947 and 1960, and in Indonesia after 1976, are accounted for by other factors. In Thailand rapid development did not appear to contribute substantially to fertility decline because although per capita income grew rapidly, other

Magnitude of unmet contraceptive need (percent of currently married women)

Country	Using no method	Using no method or ineffective methods
Indonesia	7	8
Korea, South	16	22
Malaysia	10	15
Nepal	14	14
Pakistan	16	18
Philippines	10	22
Sri Lanka	12	20
Thailand	12	13

Source: Pebley et al. (1982).

socioeconomic changes usually accompanying development, such as shifts in mortality, education, and urbanization, were relatively small.

Additional analysis of survey data from Korea and Thailand confirmed that development factors by themselves explained no more than about half of the decline in fertility observed in these countries. These findings, in combination with studies of family planning, suggest that family planning programs, particularly in Thailand, South Korea, and Indonesia since 1976, have had an important impact on fertility and have been a major vehicle for achieving more rapid rates of economic development.

For a copy of the UNFPA report **Population Growth and Economic Development: Lessons from the Pacific Basin**, write to the Managing Editor, Asian and Pacific Population Forum, 1777 East-West Road, Honolulu, Hawaii 96848, U.S.A.

Box 1 Annual growth rate of total output: contribution of selected growth factors

Country/period	Growth factors					Growth rate of total output
	Domestic saving	Foreign saving	Number of workers	Quality of workers	Other	
<i>Indonesia</i>						
1960-70	1.0	0.8	0.8	0.2	1.0	3.8
1970-80	3.5	0.4	1.3	0.4	2.1	7.7
<i>Japan</i>						
1960-70	7.5	-0.1	0.8	0.1	2.2	10.5
1970-80	7.2	-0.1	0.5	0.1	-3.3	4.4
<i>Korea, South</i>						
1960-70	2.5	2.0	1.4	0.6	2.6	9.1
1970-80	4.3	1.5	1.9	0.4	0.1	8.2
<i>Thailand</i>						
1960-70	3.9	0.1	1.0	0.3	2.3	7.6
1970-80	4.3	0.4	1.6	0.3	0.6	7.2

Source: Andrew Mason et al., *Population Change and Economic Development in the Pacific Basin* (forthcoming).

The table provides a context for examining the relationship between fertility decline and economic development by quantifying the annual percentage growth in total output attributable to selected factors. For each of four countries the growth of total output is decomposed into five sources. Domestic saving is the contribution to capital expenditures financed from the internally generated saving of households, businesses, and government. Foreign saving is the contribution to capital expenditures financed from foreign sources, including foreign aid, and is negative if (as in Japan's case) the country is a net supplier of capital abroad. Number of workers measures the contribution of increments in the size of the labor force at a given level of educational attainment. Quality of workers measures the contribution traceable to improvements in the education of workers. The other category includes technological improvements not attributable to investment or improved education, changes in international economic conditions, and institutional and other factors peculiar to the country in question.

Several points are important in assessing the role of population growth in economic growth. (1) Saving or investment is a key determinant of growth. Increases in the savings rates of the four countries are an important element in their economic successes. (2) Additional workers are an important contribution to total output; on the other hand, the growth rate of the labor force exceeds the contribution of new workers to output, implying unemployment or reduced growth in output per worker. (3) Improvements in the quality of the labor force, although important, make a smaller direct contribution than other factors. (4) Factors other than the amount and quality of the factors of production also play an important role.

Population growth affects three of these factors directly: By changing the age structure of the population, it can affect savings. Labor force growth is obviously a function of population growth, and the quality of labor, as affected by educational efforts, is also influenced by prevailing mortality and childbearing patterns and indirectly affected by the extent to which population growth has influenced standards of living.

Box 2 Attitudes toward childbearing: perceptions of financial costs of children, 1975-76

Country	Percentage agreeing with ^a					
	Statement 1		Statement 2		Statement 3	
	Wives	Husbands	Wives	Husbands	Wives	Husbands
Indonesia	65	73	56	48	29	23
Korea, South	58	54	85	84	38	40
Philippines	78	74	54	41	20	23
Singapore	35	33	83	77	65	67
Taiwan	21	17	67	66	79	82
Thailand	74	73	80	74	23	19
United States	87	81	70	77	6	12

Source: Bulatao (1979).

a. Statement 1: Couples should have only as many children as they can afford.

Statement 2: Three children entails some financial burden.

Statement 3: Couples should have fewer children than they can afford.

The Population Institute's Value of Children studies, which report the results of surveys conducted in a number of developing countries, establish that Asian couples are aware of the benefits and costs of children. The table shows the responses of both wives and husbands to questions about the financial costs of having children.

It shows that couples have well-informed notions about the costs of children and that additional children are more likely to be regarded as a financial burden in more developed countries such as the United States, South Korea, and Singapore than in less developed ones such as Indonesia and the Philippines.

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Japan's Fertility: Effects of Contraception and Induced Abortion after World War II

by Noriko O. Tsuya

Japan was the first non-Western country to complete the transition from high fertility to low fertility. The pace of the fertility transition, moreover, was unprecedentedly quick compared with the Western predecessors. As shown in Table 1, from shortly after World War II to the late 1950s Japan's birth rate decreased dramatically. The crude birth rate (CBR) declined from 34.3 in 1947 to 17.3 in 1957 and the

total fertility rate (TFR) from 4.5 to 2.0 in the same period.

In other words, the birth rate was cut by half in the space of a decade. After the late 1950s, as Table 1 shows, the birth rate remained low and relatively stable with some fluctuations. CBR stayed in the range of 17.0 to 19.0 and TFR at the level of 2.0 to 2.1 (except for 1966, a Year of *Hinoeuma* according to the Chinese zodiacal calendar) until both started to decline further in 1973.¹ Figure 1 illustrates the changes in TFR since 1925. In the broader context of

fertility change in modern Japan, we can clearly see the steepness of the postwar decline and the relative stabilization thereafter.

Unlike many Western countries whose fertility declines were generally associated with an increase in material well-being (Weinstein 1976:104) the dramatic decline in Japanese fertility was initiated under serious socioeconomic difficulties. Many studies have documented the high unemployment, inflation, and severe shortages of energy, food, and housing faced by the country immediately after World War II (Yamamura 1967; Denison and Chung 1976; Nakamura 1981). By the time the Japanese economy recovered to its prewar productivity level in 1952 (Tsuneta Yano Memorial Society 1955:30), the fertility decline was already well underway. Moreover, socioeconomic development (as reflected in such indicators as increases in life expectancy, GNP per capita, percent population living in urban areas, and educational level, as well as decreases in infant mortality and agricultural population) continued after the dramatic fertility decline was over and the birth rate started to stabilize (Tsuya 1986:42-49). Therefore, it seems reasonable to suppose

Table 1 Crude birth rates and total fertility rates: Japan, 1947-80

Year	CBR	TFR	Year	CBR	TFR
1947	34.3	4.54	1964	17.8	2.05
1948	33.7	4.40	1965	18.7	2.14
1949	33.2	4.32	1966	13.8	1.58
1950	28.3	3.65	1967	19.4	2.23
1951	25.5	3.26	1968	18.6	2.13
1952	23.5	2.98	1969	18.5	2.13
1953	21.6	2.69	1970	18.8	2.13
1954	20.2	2.48	1971	19.2	2.16
1955	19.5	2.37	1972	19.3	2.14
1956	18.6	2.22	1973	19.4	2.14
1957	17.3	2.04	1974	18.6	2.05
1958	18.1	2.11	1975	17.1	1.91
1959	17.7	2.04	1976	16.3	1.85
1960	17.3	2.00	1977	15.5	1.80
1961	17.0	1.96	1978	14.9	1.79
1962	17.1	1.98	1979	14.2	1.77
1963	17.4	2.00	1980	13.6	1.75

Sources: United Nations, *Demographic Yearbook* 1953 (pp. 136-37), 1981 (p. 523); Ishikawa, Akira, "Population Re-production Rates for All Japan, 1982," *Journal of Population Problems* (Jinko Mondai Kenkyu) 169 (1984): 58.

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that Japan's postwar socioeconomic development was due at least partly to the dramatic drop in fertility.

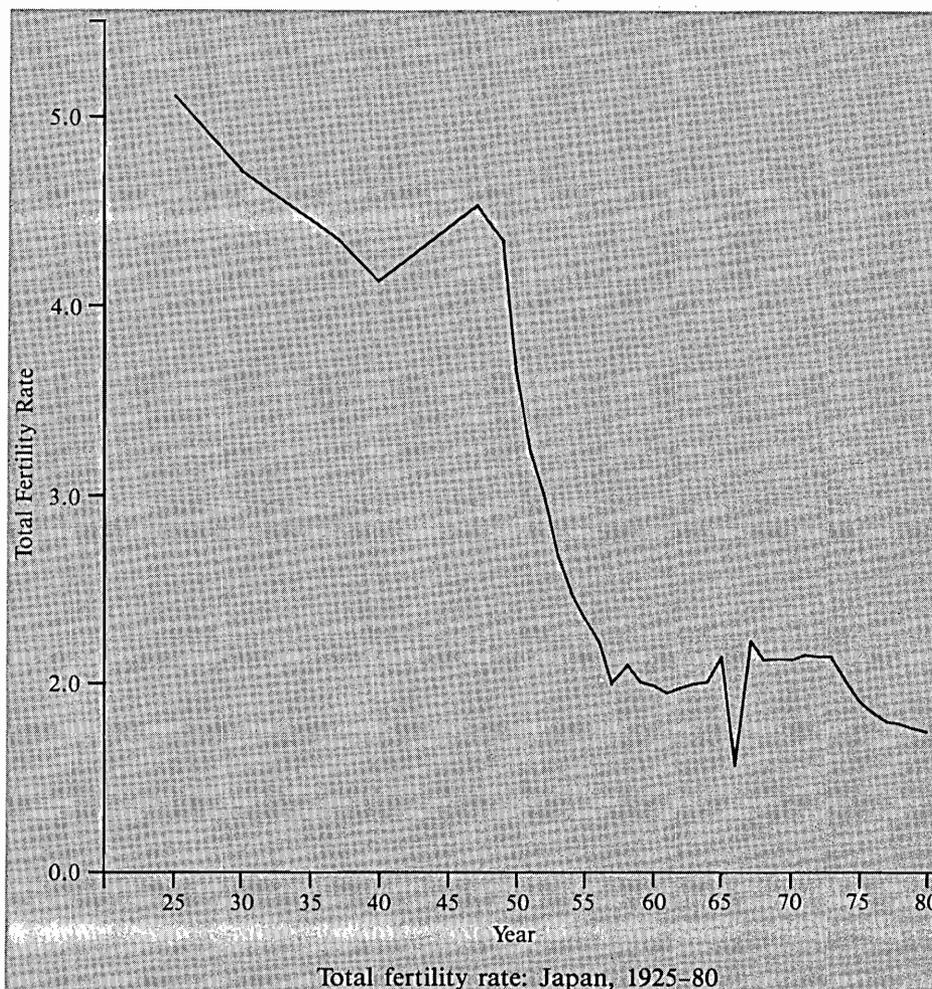
Proximate determinants

How did they do it? One way to answer the question is to identify behavioral and biological factors directly affecting fertility, called "proximate determinants."² Socioeconomic, cultural, and environmental variables influence fertility *through* the proximate determinants, and similar socioeconomic development can produce very different patterns of fertility change, according to which of the determinants the social and economic variables mainly work through to influence fertility.

In 1978, John Bongaarts presented a simple yet comprehensive framework for analyzing the effects of proximate determinants on fertility level. According to him, most of the variability in the level of fertility of a population over time (or among populations) is accounted for by four proximate determinants: *proportion married, contraception, induced abortion, and infecundability due to breastfeeding*.

Formally, Bongaarts' formulation expresses the total fertility rate (*TFR*) as the product of the total fecundity rate (*TF*), which is estimated to range in value mostly between 15.0 and 16.0, and the indexes measuring the fertility-reducing effects of proportion married among females (C_m), contraceptive use and effectiveness among currently married women (C_c), prevalence of induced abortion in the currently married female population (C_a), and duration of lactational infecundability (C_i).³ Algebraically, the relationship is expressed as:

$$TFR = C_m \times C_c \times C_a \times C_i \times TF.$$



The four indexes (C_m , C_c , C_a , and C_i) can vary in value from 0 to 1. A value of 0 for each index indicates that the corresponding proximate determinant has a complete fertility-inhibiting effect; no such effect if a value of each index is 1. Thus, the lower the value of each index, the stronger the fertility-reducing effect of the corresponding determinant. In other words, the complement of each index indicates the amount of reduction attributable to each determinant.

Applying to Bongaarts' framework data obtained from censuses, vital

statistics, and various surveys on fertility and family planning in postwar Japan, the set of figures presented in Table 2 was obtained.⁴ From the table, we can see that the index C_m decreased from 0.54 in 1950 to 0.42 in 1960. After 1960, C_m was stable until it declined again modestly in 1980. Therefore, since the complement of each index indicates the amount of reduction attributable to each determinant, the fertility-reducing effect of marriage (strictly speaking, delay of marriage) increased over the period 1950-80,

though the degree of increase does not seem to be large in general.

In contrast, the values of C_c indicate a greater and steady increase in the fertility-inhibiting effect of contraception. The degree of the increase from 1950–60 is especially notable. If all Japanese women of reproductive age in 1950 had practiced no contraception within marriage, other things being equal, the overall level of fertility would have been $(1-0.79) \times 100 = 21$ percent higher. The corresponding figure for 1960 is 42 percent.

The fertility-reducing effect of induced abortion (indicated by $(1 - C_a)$) increased considerably from 1950–60 and then declined substantially. Specifically, if all Japanese women of reproductive age in 1950 had no induced abortion within marriage, the level of fertility would have been 28 percent higher. The effect increased to 30 percent in 1960, and then it declined sharply thereafter.

The last column in Table 2 shows that the value of C_l increased continuously during 1950–70 and stabilized subsequently, indicating that during the first two postwar decades the fertility-reducing effect of breastfeeding steadily decreased until reaching its present low plateau in 1970. The table shows that the level of fertility could have been 22 percent higher in 1950 if Japanese women had not breastfed at all, while the corresponding figure for 1970 is merely 8 percent.

To summarize:

1. At the onset of the postwar fertility transition, while marriage had the strongest fertility effect, fertility within marriage was controlled most strongly by induced abortion and to a lesser but still considerable extent by lactation and contraception.

Table 2 Estimates of the indexes of proximate determinants of total fertility: Japan, 1950–80

Year	Proportion married (C_m)	Contraception (C_c)	Induced abortion (C_a)	Lactation (C_l)
1950	0.54	0.79	0.72	0.78
1955	0.45	0.65	0.65	0.81
1960	0.42	0.58	0.62	0.86
1965	0.42	0.48	0.77	0.90
1970	0.42	0.45	0.79	0.92
1975	0.41	0.39	0.86	0.92
1980	0.37	0.38	0.87	0.92

2. During the period of rapid fertility decline (1950–60), the effect of induced abortion and especially of contraception increased significantly. Meanwhile, the effect of lactation shrunk considerably while the effect of marriage increased only by a small extent.

3. During the period of stable low fertility (1960–80), the fertility-reducing effect of contraception continued to grow. In contrast, the effect of induced abortion decreased notably between 1960–65 and continued to decline. The effect of lactation also decreased between 1960–70 and became almost negligible in 1970 and thereafter. The effect of marriage, though sizable, stayed relatively constant.

We can therefore conclude that the rapid decline in Japanese fertility from the late 1940s to the late 1950s was brought about by increasing reliance on both contraception and induced abortion. While the extent of the increase in the effect of contraception was much higher than that of induced abortion, the effect of induced abortion was not insubstantial during this earlier phase of the postwar fertility transition. On the other hand, contraception was

the factor primarily responsible for the maintenance of the low fertility level since the late 1950s. We will now examine these two factors in greater detail.

Contraception and induced abortion in postwar Japan

In his study of induced abortion and fertility in developed as well as developing countries, Frejka (1985) indicates that only extremely high rates of induced abortion — three or more abortions per woman of childbearing age during her reproductive years — can rival contraception in terms of its fertility-reducing effect. This certainly seems true of Japan, where the total abortion rate was 2.9 per woman in 1950, 2.4 in 1955, and 2.2 in 1960.⁵ The rate declined sharply to 1.1 in 1965, 0.9 in 1970, 0.5 in 1975, and 0.4 in 1980 (Tsuya 1986: chapter 5.). Thus, although the fertility-inhibiting effect of contraception became larger over the postwar years, reliance on induced abortion as a means of fertility control was extensive during the rapid fertility decline, especially at its onset.

Induced abortion and infanticide were means of fertility control long practiced in premodern Japanese society. Infanticide was abandoned during the early industrialization (from the late 19th century to the early 20th century) because of increases in living standards and government policies denouncing the practice as barbaric, but induced abortion persisted. And as the above analysis shows, induced abortion was the means to which Japanese women resorted in order to limit their fertility when they faced overwhelming social and economic difficulties after World War II. Since the increase in use of induced abortion was coincident with the legalization of abortion in 1948 and the subsequent liberalization of the abortion laws in 1949 and 1952 (Aoki 1967; Muramatsu 1967), we can speculate that the increasing dependence on abortion may be due partly to these legal changes. However, the legalization and the subsequent amendments are believed to have been also aimed at providing a safe and inexpensive means of fertility control by monitoring and controlling the 'quality' of induced abortion performed, since the increasing incidence of illegal abortion had alarmed government policymakers (Muramatsu 1967). Whatever the case, it is apparent that the rapid fertility decline in postwar Japan resulted partly from Japanese couples' adjustment to social and economic forces that had pressed upon them fertility control through long-existing means.

On the other hand, the above analysis also shows that the rate of contraceptive use increased significantly over the postwar years. Findings from KAP (knowledge, attitude, practice) surveys, summarized in Table 3, show that the proportion of married women of reproductive age who never

Table 3 Percentage of married women by status of contraceptive use: Japan, 1950-79

Year	Currently practicing	Previously practiced	Never practiced	Other or no answer
1950	19.5	9.6	63.6	7.3
1952	26.3	13.8	54.9	5.0
1955	33.6	18.8	41.6	6.0
1957	39.2	17.3	38.3	5.2
1959	42.5	20.2	33.0	4.3
1961	42.3	26.1	28.5	3.1
1963	44.0	19.0	29.8	7.2
1965	55.5	16.5	26.8	1.2
1967	53.0	19.2	23.1	4.7
1969	52.1	19.1	19.3	9.6
1971	52.6	20.2	16.8	10.4
1973	59.3	22.0	15.1	3.6
1975	60.5	21.0	13.3	5.2
1977	60.4	19.4	13.3	7.0
1979	62.2	21.5	11.7	4.5

Sources: Japan Science Society, *Basic Surveys on Fertility and Family Planning in Japan* (Tokyo: Japan Science Society, 1979:14); Population Problems Research Council, *Summary of Seventeenth National Survey on Family Planning* (Tokyo: Mainichi Newspapers, 1984:86).

contracepted was 64 percent in 1950 and by 1979 had decreased to 12 percent. This notable spread of contraceptive practice is well reflected in the increasing estimated effect of contraception on fertility noted earlier.

Moreover, a simulation analysis of the reproductive process of Japanese women (Tsuya 1986: chapter 6) indicates that contraceptive efficacy also improved steadily over the postwar period studied. Monthly contraceptive efficacy for married fertility-controlling women was estimated to be 0.49 in 1950, 0.76 in 1960, 0.89 in 1970, and 0.96 in 1980. This increase is indeed significant since a monthly efficacy of 0.49 implies that almost all fecund women exposed to the risk of conception would become pregnant by the end of the sixth month of exposure, whereas monthly efficacy of 0.96 means that about 60 percent of

fecund women would avoid conception for twelve months.

Yet the startling fact is that the contraceptive method used most extensively throughout the postwar years by Japanese couples is the condom (or condom combined with rhythm). Condoms are not known for very high use-effectiveness. This becomes even more surprising considering that Japan is a highly urbanized and industrialized country known for its technological achievements.⁶

Moreover, the KAP surveys show (Table 4) that condom use has been increasing over the postwar period, whereas in many other countries it has declined as other methods have been introduced (Bulatao 1985). In the late 1970s, more than three-fourths of current contraceptive users in Japan employed the condom, making the country the highest condom user in the

world. (One estimate says that Japan consumes one fourth of the world's supply — Bulatao 1985.) Denmark and Finland are distant second with about 40 percent of all contraceptors relying on condoms (United Nations 1984:34).

In contrast, condom use in other Asian countries is generally very low, with an average of only 4 percent of the contraceptors in almost the entire continent employing condoms. (An exception is Singapore, in which about 30 percent of contraceptors employ condoms.) (United Nations 1984:52.) Furthermore, in many Asian countries the use of the pill, IUD and (female) sterilization is common and getting even commoner (United Nations 1984:42–43). These modern methods are also widely used in other parts of the world — and their use rate is generally increasing (United Nations 1984:30). In Japan their rate of use, though in general increasing, has been very low (see Table 4).

Change in the near future?

Ronald Freedman once pointed out to the writer that high dependence on induced abortion, high use of the condom, and very low use of modern contraceptives (the pill, IUD, and sterilization) are the three unique features of fertility-controlling behavior that distinguish Japan from other Asian and other developed countries. Our analysis indicates that while high dependence on induced abortion persisted during the early phase of the postwar fertility transition (due partly to the legalization of abortion, but probably more to the necessity to adjust to the pressure of overpopulation in the midst of social and economic difficulties) it decreased once the

Table 4 Percent distribution of contraceptive use, by method: Japan, 1950–79

Method	1950	1955	1959	1965	1969	1975	1979
Condom	39.9	60.1	60.9	65.4	70.8	77.8	82.1
Rhythm	30.7	46.7	48.1	38.8	35.2	29.9	23.4
Withdrawal	14.2	8.6	12.0	9.5	7.2	6.7	5.3
Foam tablet	15.9	9.2	7.5	6.5	8.1	3.8	2.3
Jelly	17.2	11.1	13.9	8.8	6.7	3.0	1.9
IUD	—	—	—	4.3	7.5	8.6	8.4
Sterilization	—	4.1	6.6	5.7	5.6	4.7	4.0
Diaphragm	8.7	6.6	7.7	5.7	4.5	2.4	1.1
Pill	—	—	—	—	1.8	3.0	3.2
Douche	5.5	3.6	2.2	1.2	1.0	1.3	1.6
Sponges	—	2.9	1.6	0.7	0.3	0.1	—
Other	4.8	2.4	1.1	—	1.8	3.7	1.2

Sources: Population Problems Research Council, *Summary of National Survey on Family Planning*, various years (Tokyo: Mainichi Newspapers); Japanese Organization for International Cooperation in Family Planning, *Fertility and Family Planning in Japan* (Tokyo: JOICFP, 1977:125).

Notes: Figures do not add to 100 percent because women using more than one method are shown under each method. Percentages were recalculated from the original data by excluding non-response category.

rapid fertility decline subsided and fertility stabilized at a low level. On the other hand, the Japanese have employed condoms extensively as the main contraceptive method and have made little use of modern contraceptives. Nevertheless, the fertility-reducing effect of contraception kept increasing during the rapid fertility decline and the subsequent stabilization at a low level.

So why do the Japanese use condoms so much and the modern methods so little? In his in-depth study of family planning practice in Japan, Coleman (1983), delineating intricate structural constraints posed by the economic and social organization of medical care and family planning systems, traced Japanese couples' reluctance to adopt modern contraceptives to the unavailability of the methods in the cultural context of embarrassment and passivity toward contraception, which in turn is caused by the low status of Japanese

women and the prevailing disregard for sexuality in Japanese marriage.

While contraceptive method choice is determined by many factors, some of which are on the side of the users and others on the providers (including physicians, policymakers, and manufacturers of contraceptives), the legal factor is clearly a major determinant of contraceptive choice. Japanese law has placed extremely strict restrictions on the provision of all modern contraceptive methods. Sterilization is allowed only for eugenic, medical, and health reasons.⁷ Even the IUD, which enjoys the least confined treatment under Japanese law (i.e., any physician may insert one), is under some restrictions in that only two kinds of ring-shaped IUD made of inert materials are legally allowed. Moreover, before 1974, IUDs could not be manufactured or imported, and physicians could insert them only for purposes of clinical research (Coleman 1983:35–36).

But legal restrictions are most severe in the case of oral contraceptives: they simply cannot be dispensed for contraceptive purposes.⁸ While the pill is used in around 150 countries all over the world, Japan is probably the last non-Catholic industrialized country in which the contraceptive pill has been prohibited (Anderson 1985). Besides possible moral considerations of "chastity, fidelity, and the integrity of the family," the principal reason for the ban is believed to be fear of possible side effects.

Recently, however, in the face of growing use of oral contraceptives under the pretext of medical need and the development of the low-dose pill (which is common in the United States and Europe), the Japanese government has made moves towards legalization of the contraceptive pill.⁹ Although there are obstacles, eventual legalization appears to be a distinct possibility. According to health professionals and policymakers, however, the process may take three to four years from now.

In discussing the impact of legalization on Japanese contraceptive behavior, Minoru Muramatsu, a leading medical expert in the field of family planning in Japan, told the writer that the prevailing contraceptive behavior — high condom use and low use of modern methods, including the pill — will not change dramatically unless the government not only legalizes but also actively promotes the pill use in order to dispel doubts concerning its safety and promotes a positive image of oral contraceptives. (The notion that the pill has harmful side effects seems widespread in Japan.) Japan is a hierarchical society and conformity and respect for authority are characteristics of its culture. As a result, the effects of governmental policy are powerful and pervasive. Thus, once the government (or anybody else) convinces

Japanese women of the safety and legitimacy of the pill, change could come swiftly.

A shift from traditional to modern methods of contraception is unlikely to alter the already low level of fertility in Japan. However, such a shift will have considerable social, medical, and economic impacts. Whether there will

be a shift from the condom to the pill, and if so what will be the impact on the prevalence of induced abortion (which has been decreasing but nevertheless persists as a backup for contraceptive failure) are important questions to which answers will need to be found in the near future.

NOTES

1. A Year of *Hinoeuma* (Fire Horse) occurs every 60 years according to the Chinese zodiacal calendar and is traditionally regarded as an unlucky year to give birth to girls since girls born in such a year are believed to be stubborn and thus difficult to find husbands for. The low TFR (1.6) for 1966 (a Year of *Hinoeuma*) clearly shows that such superstition was still prevalent in that year. The relatively high TFR (2.2) for the following year (1967) is thought to have resulted from postponement of childbearing from the previous year.

2. The systematic analysis of proximate determinants was pioneered by Davis and Blake (1956). Bongaarts (1978) collapsed the original set of determinants into a smaller number of variables and developed an analytic framework, utilized here as a model, to allow simple quantification.

3. For methodological details of the estimation of the four indexes, see Bongaarts (1978) or Tsuya (1986: chapter 3).

4. For the detailed process and results of the analysis, see Tsuya (1986: chapter 5).

5. The total abortion rate is equal to the average number of induced abortions a woman would have within marriage by the end of her reproductive years if induced abortion rates remained at prevailing levels throughout the reproductive period (excluding induced abortions to unmarried women).

6. For further discussion on the sociocultural context of condom use, see Coleman (1981, 1983).

7. The specific legal conditions for eligibility for sterilization are set out by the Eugenic Protection Law of 1948. The law refers to sterilization as "eugenic surgery," and legal eligibility is limited to married couples who suffer from hereditary illness, mental illness, leprosy, or danger to the mother's life or health caused by pregnancy (Aoki 1967).

8. Although physicians are not permitted to prescribe the pill for contraceptive use, they are allowed to do so for medical reasons, such as treatment of hormonal irregularities.

9. According to Japanese leading daily newspapers (Asahi Shimbun, 16 February 1986; Mainichi Shimbun, 3 March 1986), responding positively to requests from medical and family planning organizations such as the Japan Obstetrics and Gynaecology Society and the Japan Motherhood Protection Medical Association, the Ministry of Health and Welfare in March 1986 formed a committee to assess the medical feasibility of the legalization of the low-dose pill through clinical trials.

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Sir,

William Brass and Sheila Macrae's paper on "Childhood Mortality Estimated from Reports on Previous Births Given by Mothers at the Time of a Maternity: I. Preceding-Births Technique" (*Asian and Pacific Census Form* 11(2), November 1984) adds another ingenious method of obtaining child mortality estimates from easily obtainable and simple information on the survival status of previous births given by mothers when registering a current birth. It is my intention to bring out here a major source of bias, which the authors failed to acknowledge clearly in their paper, likely to affect their estimate seriously.

In countries where breastfeeding is widely practiced and its duration long, infant death foretells an early next birth. Curtailment of breastfeeding due to the death of an infant leads to early resumption of ovulation and hence a shorter prospective interval. Therefore,

among mothers who register a current birth, those with a shorter interval between the current birth and the one immediately preceding have a high probability of having lost their last-born child. Because of this selectivity, the assumption that the mean birth interval represents the exposure period is questionable.

Another, much more serious, selectivity problem is due to women's desire to replace the last deceased child. The probability that a woman will go for her next child is known to be higher among those who have lost their latest child than among those who have not. Therefore, women who register a current birth should have a higher probability that their last child was dead than the general population. This selectivity will tend to overestimate the childhood mortality obtained by the procedure described by Brass and Macrae. Though the trend in

Letter to the Editor

childhood mortality may not be vitiated, it is certain that their technique will overestimate the level of childhood mortality.

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by Alice D. Harris

Pakistani Women: A Socioeconomic and Demographic Profile. Edited by Nasra M. Shah, with a Foreword by Syed Nawab Haider Naqvi. Islamabad: Pakistan Institute of Development Economics, and Honolulu: East-West Population Institute, 1986. xlv + 412 pp. US\$15 (hardcover); \$12 (paper). ISBN 0-86638-053-1

The role of women in national development has been a growing topic of interest in the last two decades. Many developing countries, to widely varying degree, are trying to make a place for women in development, but they are often hampered both by a shortage of reliable information on the current socioeconomic and demographic situation of women, and by disagreement as to just what women's roles should be.

Pakistan does have an explicit policy about integrating women into the development process, but suffers from a lack of data on female socioeconomic characteristics, as well as any guidelines for how to define women's appropriate roles. This volume addresses both issues. The editor, Dr. Nasra Shah, is a former Fellow at the East-West Population Institute currently employed as a consultant to the Kuwait Ministry of Public Health. Dr. Shah has a degree

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in population dynamics from John Hopkins University and has published numerous works dealing with female labor participation, family planning, and migration in Pakistan.

This book provides a comprehensive analysis of the demographic and socioeconomic status of Pakistani women over their life cycle. Marriage, fertility, mortality, and migration are the topics covered in Chapters 2-4. Socioeconomic status in terms of health, education, employment, and contraceptive use are subjects of Chapters 5-8. Succeeding chapters analyze the demographic and socioeconomic situation of Pakistani women with the help of census and survey data. An effort is then made to identify some of the cultural constraints on the role redefinition of Pakistani women. The book concludes with some suggestions and cautions for initiating programs to improve women's status. *Pakistani Women* is the result of collaborative analysis by Pakistani researchers working at home and abroad. A brief overview of Pakistan's geographical and political situation is given in an introductory chapter. A later section discusses some of the historical events that have had a deep-rooted effect on the current status of Pakistani women and examines the religious and ethical issues that lie at the heart of any redefinition of women's status. It further offers guidelines for formulating effective programs for improving their lives.

Shah and her collaborators have drawn upon a wide variety of existing data sets to provide the tables and figures presented in the book. There are references at the end of each section and additional references in an appendix. This is a thoroughly

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researched study, and should be useful to researchers and planners. It clearly shows the confusion that has developed in regard to the status of women, and the difference between the true value accorded to women by Islam, and the existing and deep-rooted un-Islamic attitudes which place a low value on females. According to Shah, there are three groups of people whose attitudes need to be changed: men, women and policymakers. If their attitudes cannot be changed, programs for incorporating women into development are not likely to be very successful.

The book can be ordered from the Pakistan Institute of Development Economics, P.O. Box 1091, Islamabad, Pakistan; or from the Sales and Distribution Unit, East-West Center, 1777 East-West Road, Honolulu, Hawaii 96848, U.S.A.

The Bicentennial Census: New Directions for Methodology in 1990. Edited by Constance F. Citro and Michael L. Cohen. Washington, D.C.: National Academy Press, 1985. xvi + 404 pp. US\$27.00. ISBN 0-309-03626-7.

In 1982, at the request of the U.S. Bureau of the Census, the National Research Council's Committee on National Statistics established a panel of experts to suggest research and experiments, recommend improved methods, and guide the Bureau on appraising contending methods of the decennial census.

The resulting Panel on Decennial Census Methodology was charged with investigating three major technical issues:

(1) Adjustment of census counts and characteristics, including exploration of formal criteria to evaluate measures

of undercount and alternative adjustment procedures;

(2) Uses of sampling in the decennial census, specifically investigation of whether sampling for coverage improvement and of nonrespondents for follow up can improve accuracy at a given cost; and

(3) Uses of administrative records, including investigation of the possible utility of various types of records for improving the accuracy of census counts and the efficiency of census operations.

The Bicentennial Census begins with an introduction and overview of the panel's recommendations. This is followed by three background chapters on purposes and uses of the decennial census, methodology of prior census and current 1990 census testing plans, and past experience with coverage evaluation. The book offers general and specific planning recommendations in five areas: (1) overall strategy for planning the 1990 census; (2) procedures for coverage improvement as part of the census; (3) uses of sampling and administrative records in taking the census; (4) adjustment of census counts and characteristics; and (5) measuring the completeness of the 1990 census.

The panel's major conclusion is that the Census Bureau should strive to achieve a balance between efforts to achieve a complete enumeration and efforts to improve the accuracy of census figures through adjustment procedures. "We believe that adjustment cannot be viewed as an alternative to obtaining as complete a count as possible through cost-effective means" (preface p. xiii).

The report is well-organized, lucid, balanced in approach, and timely, since planning for the 1990 census has already begun. The U.S. census is not only the basis for political representation in Congress but also the means by which entitlement programs distribute funds; therefore its accuracy is important.

Given the limited amount of available funds for research today, the panel has suggested those most appropriate for improving the 1990 census. Anyone involved with censuses and statistical information will want to read this book. It can be ordered from the National Academy Press, 2101 Constitution Avenue, N.W., Washington, D.C. 20418. □

Michael S. Teitelbaum and Jay M. Winter. *The Fear of Population Decline*. Orlando, FL: Academic Press, 1985. xiii + 200 pp. US\$34.00. ISBN 0-12-685190-5.

In the 1930s many demographers began to worry about declining populations, particularly in Europe and the Pacific. Their fears were laid to rest with the baby boom of 1945-1967. Indeed, high birth rates during those years led to widespread concern about rapid population growth on a worldwide basis. This concern was translated into books warning of an impending crisis in natural resources, into family planning research and population policies, and particularly into studies of the effects of population pressures on developing countries. When the baby boom proved to be of short duration in Western countries, the spectre of population decline began to haunt statisticians again. The countries of Eastern Europe, France, and Russia have become pronatalist again, often

with such vigor that individual rights are being threatened.

This excellent book by two demographers takes a retrospective look at the fear of population decline in the modern period from 1870 to the present. Their aim is to put to rest the fear of population decline and to discuss the changes that will occur as the West goes through a period of slow or even no growth. After an introductory chapter on the demographic analysis of population decline, the authors look back to the internal and international aspects of Western population dynamics from 1875 to 1945, 1945 to 1964, and from 1965 until today. Of particular interest is chapter six, which discusses the policy responses to slow population growth, particularly in France and Germany. These range from limiting access to fertility control, increasing fertility through economic incentives, and encouraging migration, to adapting to demographic change by positive policies allowing for fluctuating cohort sizes. The concluding chapter summarizes the beliefs and sentiments that have been expressed about population decline, discusses plausible population projections, and looks at the policy alternatives to deal with a declining population should it occur over the next generation.

The authors' balanced approach offers much to allay undue concern over the problem of population decline. Numerous tables support their findings and appendices contain statements on the population situation by Western leaders. The book has an excellent bibliography and is recommended to demographers, social scientists, and to any readers with an interest in the less-publicized side of

the population problem. The book can be ordered from Academic Press Inc., Orlando, Florida 32887; or from the London Office of Academic Press, 24–28 Oval Road, London NW1 7DX.

Donald J. Hernandez. *Success or Failure? Family Planning Programs in the Third World*. Westport, CT: Greenwood Press, 1984. 161 pp. US\$29.95. ISBN 0–313–24401–4.

The author, Chief of the Marriage and Family Statistics Branch of the U.S. Bureau of the Census and Senior Research Scholar at the Center for Population Research, Georgetown University, takes a realistic look at the performance record of family planning programs in Third World countries. Hernandez acknowledges that there are conflicting opinions among social scientists as to the value of family planning programs versus development strategies designed to lower fertility through improving social and economic conditions.

Hernandez begins by asking two fundamental questions: "Have family planning programs succeeded in generating fertility decline that are independent of the fertility declines that would have occurred in their absence because of indigenous socioeconomic conditions and ongoing socioeconomic changes? Or have family planning programs been a failure as an independent policy initiative because socioeconomic conditions and change are responsible for the fertility declines that have occurred?" (p. 14).

Reviewing family planning program results from the mid-1960s to the mid-1970s — a time of program implementation that preceded incentives, disincentives, and political pressures — the author estimates the program efforts in specific countries where strong programs existed and in the Third

World as a whole through crossnational analyses. He concludes that while family planning programs played an important role in facilitating fertility declines in many countries during the late 1960s and early 1970s, "these programs experienced little success and considerable failure in initiating fertility reductions independently of socioeconomic and other indigenous factors in these countries" (p. 138). He suggests that a combination of major new initiatives by Third World countries toward fertility reduction and corresponding changes in the international policies of the developed countries is needed to ensure that future fertility reduction programs will work.

Not everyone will agree with Hernandez, but those involved in population policy may wish to be aware of the provocative views presented in this well-written book.

Available through book dealers or by writing to Greenwood Press, 88 Post Road West, Westport, Connecticut 06881.

Richard A. Easterlin and Eileen M. Crimmins. *The Fertility Revolution: A Supply–Demand Analysis*. Chicago: University of Chicago Press, 1985. xix + 209 pp. US\$24.95. ISBN 0–226–18029–8.

During the last decade or so, attempts to explain persistent high fertility in some countries of the Third World as well as the reasons for long-term fertility decline in other countries have led some social scientists to formulate a "supply–demand" theory of fertility behavior. At the forefront of this research is economist Richard Easterlin, who has many articles and books on the subject to his credit.

The supply-demand theory was used as an organizing concept in the two-

volume National Academy of Sciences' *Determinants of Fertility in Developing Countries* (1983). Briefly, the theory states that a couple's use of fertility control varies directly with the excess of their supply of children over demand, and inversely with the perceived costs of regulating fertility. Easterlin and co-author Crimmins test this theory with data obtained from the World Fertility Surveys in Columbia, Sri Lanka, Taiwan, and India.

The book begins with a review of the fertility revolution and the theories it has engendered. The authors next present findings that support the supply-demand theory. As parents have more children than they want — due partly to declining infant and child mortality, and partly to the modernization process — they are motivated to accept contraception as a means to limit births. The findings suggest that policymakers in the less developed countries might be well advised to initiate socioeconomic development programs earlier than they do family planning programs, because the increased motivation for smaller families that comes with socioeconomic progress will increase the likelihood of family planning program success at less cost to the providers. Since this may be contrary to the views of those who promote family planning as the first line of attack on overpopulation, the book may prove highly controversial.

The book is written in lucid style with a minimum of technical jargon, and the authors back up their conclusions with evidence. Figures, a bibliography, and an index are provided.

The Fertility Revolution should be available through your local book dealer or by writing directly to the University of Chicago Press, 11030 S. Langley Ave., Chicago IL 60628.

ASIAN AND PACIFIC POPULATION FORUM

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Fertility Trends in Pakistan —The Decline That Wasn't

by Robert D. Retherford
G. Mujtaba Mirza
Mohammad Irfan
Iqbal Alam

This article takes a fresh look at fertility decline in Pakistan in the 1960s and 70s. It reaches the startling conclusion that there was none. This despite a 20-year history of programs designed to lower fertility, outlined on page 2 by Jack Reynolds. Reynolds notes that the Government's Sixth Plan calls for a birth rate of 36 per thousand by 1988. He suggests that this ambitious goal will require "information to assist policymakers, planners, and program administrators in charting an effective course of action, monitoring progress, and identifying ways to improve program performance." The following article addresses an important element of this need.

Total fertility in Pakistan fell by about 12 percent between 1960 and 1975, according to findings from the 1975 Pakistan Fertility Survey. It was estimated to be steady at about 7.1 children per woman dur-

ing 1960-70, falling to about 6.3 in 1975. Analysis of this trend showed that most of the decline was due to rising age at marriage (Alam 1984). These results were based on fertility estimates derived from birth histories from the survey's individual sample of ever-married women aged 15-49. A subsequent application of the own-children method of fertility estimation (see p. 10) to the survey's household sample indicated an even steeper decline in total fertility (Retherford and Alam 1985).

A quite different picture emerges, however, when fertility trends estimated from other data sources are juxtaposed with the trends estimated from the Pakistan Fertility Survey. The present analysis juxtaposes

(Continued on page 3)

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Status and Potential of Family Planning in Pakistan

by Jack Reynolds

"The Pakistan population program has been a series of optimistic visions and disappointing realities" (Oot and Sinding 1985). Between 1960 and the present, Pakistan has tried a number of strategies to bring down the birth rate. They all seemed appropriate at the time, but none were as effective as had been hoped.

1. *The target-oriented approach* (1965-69) was characterized by an elaborate administrative infrastructure at the federal, provincial, and district levels. It concentrated on promoting IUDs and using indigenous midwives (*dais*) as the basic field workers. Although this program resulted in much information dissemination, the 1968-69 National Impact Survey showed that contraceptive use was a disappointing 6 percent (Pakistan Planning Commission 1984).

2. *The continuous motivation system* (1970-73) employed male-female teams to visit eligible couples quarterly, deliver contraceptives, and encourage family planning. Evaluation

showed that the program was not as effective as expected due to inadequate selection, training, and supervision of the field workers, and inadequate supplies of contraceptives (Pakistan Planning Commission 1984; Oot and Sinding 1985).

3. *The contraceptive inundation scheme* (1971-77) provided widespread access to oral pills and conventional contraceptive devices through a network of shopkeepers, local agents, hospitals, clinics, and field workers. However, the Pakistan Fertility Survey showed that only 22 percent of eligible women knew of the sources of information and services. The program then entered a hiatus for almost three years as the inundation scheme stopped, the continuous motivation system was closed down, and U.S. assistance was suspended.

(Continued on page 22)

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(Continued from page 1)

and compares own-children estimates of fertility trends derived from four successive household surveys: the 1973 Housing, Economic and Demographic (HED) Survey, which was a reinterview (with a longer questionnaire) of a large subsample from the 1972 Census; the 1975 Pakistan Fertility Survey (PFS), which was part of the World Fertility Survey; the 1979 Population, Labour Force and Migration (PLM) Survey; and the 1981 Census.¹

Results from four surveys

Own-children estimates of the trend in the total fertility rate (TFR), derived alternatively from each of the four surveys, are shown in Figure 1 and Table 1. Each data source individually points to large fertility oscillations 8–15 years before the survey, a sharp decline during the next six years, and a slight upturn in the year just before the survey.

Any one of the four data sources by itself might therefore lead one to conclude that a fertility decline was well underway by the time of the survey. But the *juxtaposition* of the four trends indicates that fertility actually changed very little. Figure 1 shows very clearly that the four trends all began at approximately the same higher level and ended at approximately the same lower level, with a characteristic pattern of distortion in between. Thus the trend pattern repeats from one survey to the next, being simply displaced by the time interval between successive surveys. Figure 1 is split into four panels, each showing a pair-wise

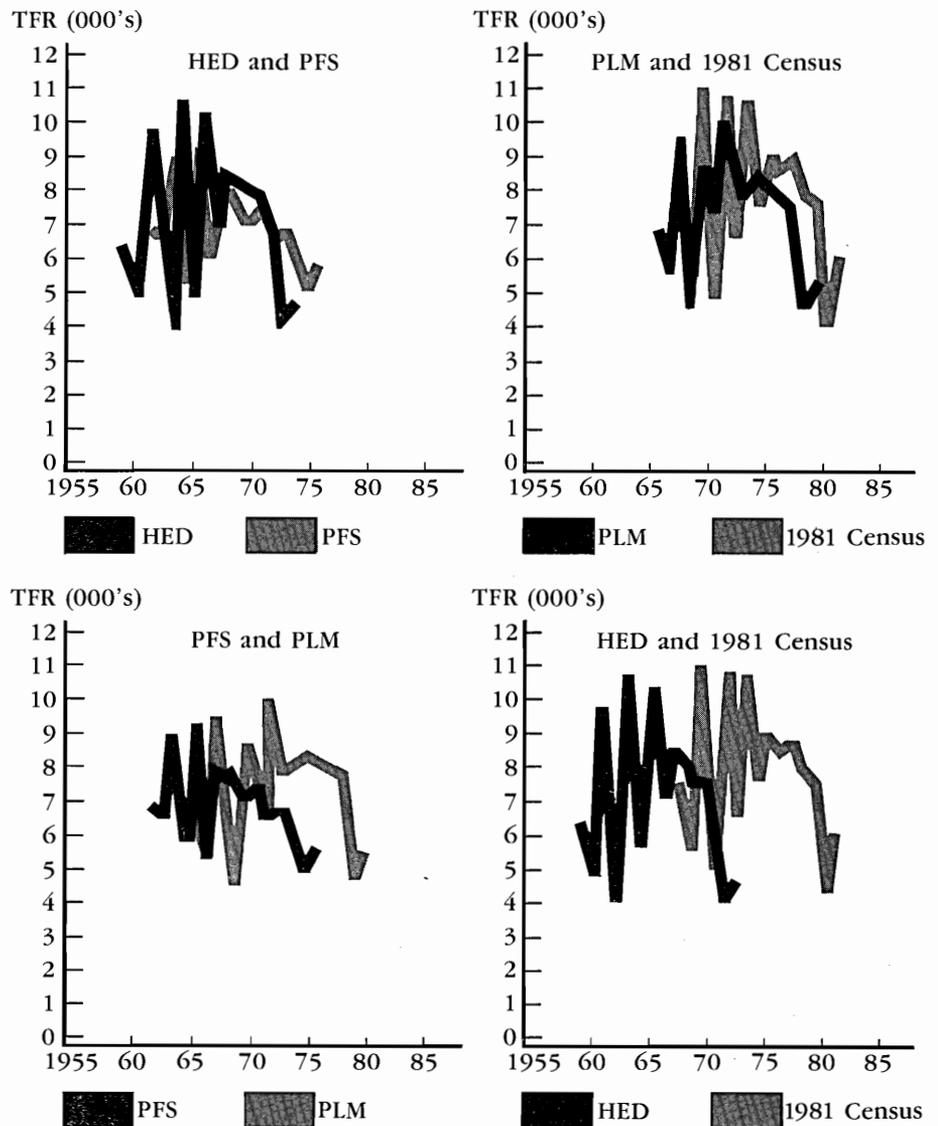


Figure 1 Comparisons of trends in total fertility rates estimated by applying the own-children method to four successive household surveys (rates per thousand). Pakistan, 1959–1981

Source: Table 1.

comparison, so that the repeated pattern can be seen more clearly.

The first panel suggests that fertility may have increased between the HED and PFS surveys, since the end

point of the trend estimated from the PFS is higher than that from the HED survey. But closer examination reveals that fertility peaks tend to be uniformly higher and fertility

Table 1 Own-children estimates of total fertility rates (per thousand) for Pakistan, 1959-81

Year	1973 HED	1975 PFS	1979 PLM	1981 Census
1959	6250			
1960	4794			
1961	9741	6859		
1962	3877	6396		
1963	10651	9007		
1964	5210	5751		
1965	10243	9230	6802	
1966	7017	6068	5472	
1967	8479	8024	9503	7529
1968	8150	7809	4430	5510
1969	7538	6888	8755	11038
1970	7344	7521	7264	4832
1971	6603	6463	9926	10772
1972	3883	6814	7825	6263
1973	4600	5862	8007	10818
1974		4856	8248	7278
1975		5691	7903	8911
1976			7694	8297
1977			7296	8652
1978			4624	7749
1979			5241	7507
1980				4084
1981				6030
Total	6899	6816	7239	7604

Source: Unpublished tabulations derived from the 1973 Housing, Economic and Demographic Survey (HED), the 1975 Pakistan Fertility Survey (PFS), the 1979 Population, Labour Force and Migration Survey (PLM), and the 1981 Census.

Notes: The TFRs in the "total" row were not calculated as simple averages of single-year TFRs. The age-specific birth rates from which these TFRs were calculated were obtained by appropriately aggregating numerators and denominators of single-year rates and then dividing the aggregated numerator by the aggregated denominator; see Retherford and Cho (1978). For a discussion of the mortality estimates used to compute reverse-survival ratios in each of the four own-children applications, see Note 5.

troughs uniformly lower in the HED-derived trend than in the PFS-derived trend. These peaks and troughs are due mainly to age heaping. Heaping on age 10, for example, causes an estimated fertility peak in the 11th year before the

survey and adjacent fertility troughs in the 10th and 12th years before the survey. Our interpretation of the larger oscillations in the HED survey is that age misreporting in the form of age heaping was more severe in the HED survey than in the

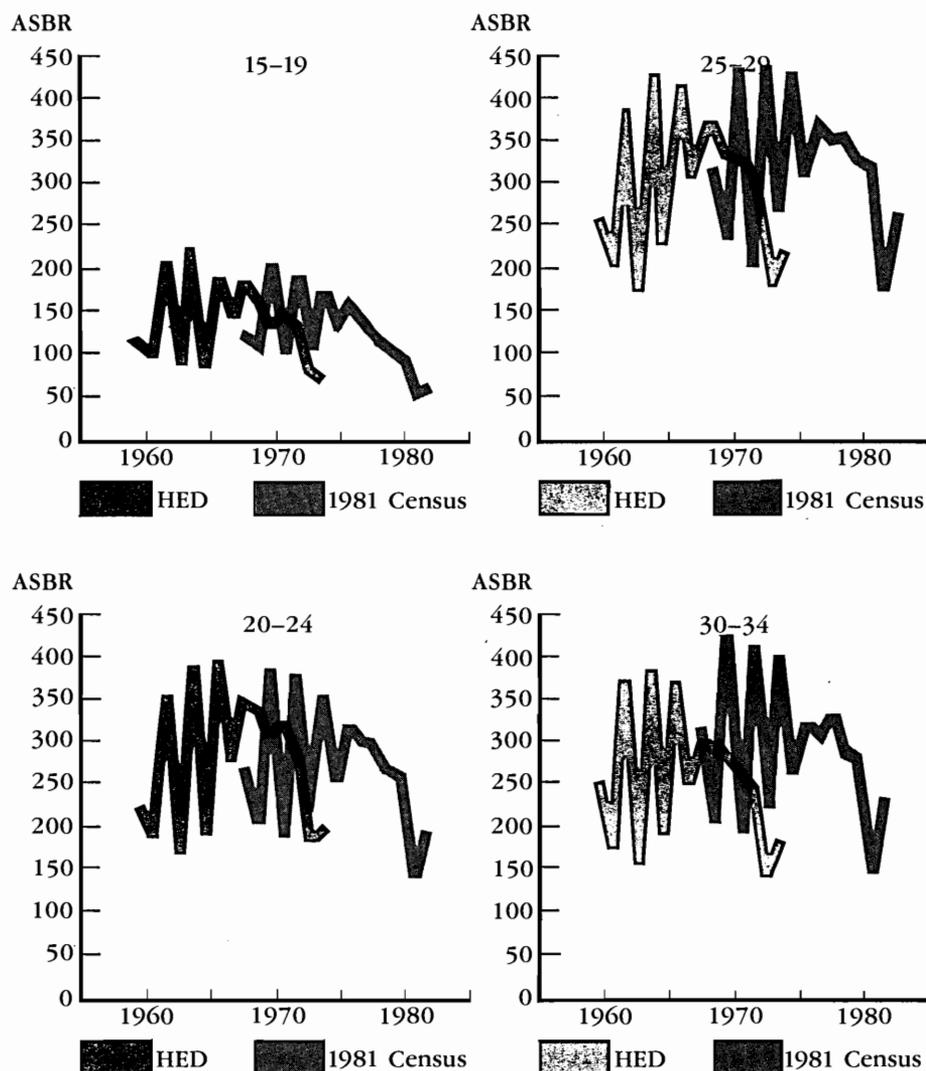


Figure 2 Own-children estimates of trends in age-specific birth rates (rates per

Source: Unpublished tabulations derived from the 1973 HED survey and the 1981 census.

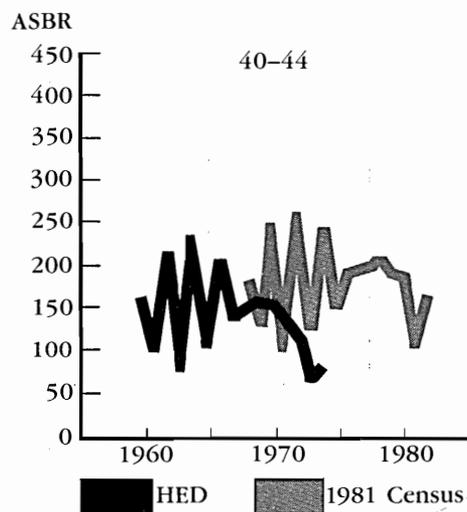
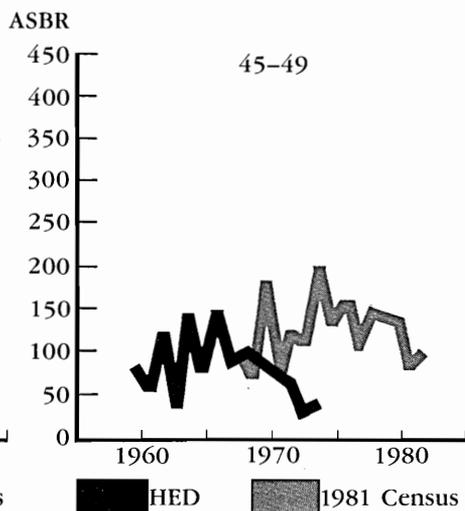
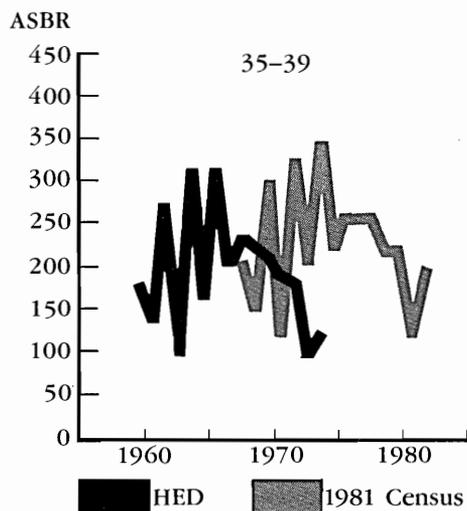
PFS, which seems plausible because much more effort was made in the PFS than in the HED survey to obtain accurate age data. Single-year age pyramids for the HED survey and the PFS (not shown) confirm that age heaping was worse in the

former survey than in the latter.

Similarly, in the lower left panel of Figure 1, age heaping seems more severe in the PLM survey than in the PFS, and in the upper right panel, it seems more severe in the 1981 Census than in the PLM sur-

vey. The lower right panel completes the circle by comparing the trend estimated from the HED survey, the first of the series, with the trend estimated from the 1981 Census, the last of the series. The comparison indicates two trends of about the same level and pattern, merely displaced in time. Thus the comparisons indicate that in reality fertility changed virtually not at all.

A clearer idea about how the TFR has been changing can be gained by aggregating the fertility data over calendar years. The more the data are aggregated, the greater the tendency for errors from age misreporting to cancel one another out. Our strategy was to obtain an estimate of the TFR for the entire 15-year estimation period previous to each survey. (Groupings based on shorter time periods were tried but not used, because trends based on them are strongly influenced by the choice of cutting dates for the start and end of each time period, as a consequence of major peaks and troughs in the single-year estimates. See Retherford and Mirza 1982.) Results are shown in the last row of Table 1 and in Table 2. The TFRs aggregated over 15-year time periods are all in the neighborhood of seven children per woman. Not only is there no evidence of *any* fertility decline; fertility appears actually to have increased, both in rural and urban areas and in the country as a whole. Rural fertility tends slightly to exceed urban fertility, especially for estimates derived from the later surveys, as shown in Table 2. The widening rural-urban difference reflects fertility increases that are larger in rural than in urban areas. It is worth noting that a period of fertility increase, occur-



thousand). Pakistan, 1959-81

Table 2 Own-children estimates of total fertility rates: aggregated results by urban-rural residence (rates per thousand). Pakistan, 1959-81

Survey and time period	Rural	Urban	Total
HED 1959-73	6940	6727	6899
PFS 1961-75	6810	6827	6816
PLM 1965-79	7360	6932	7239
1981 Census 1967-81	7778	7305	7604

Source: Unpublished tabulations.

ring just before the onset of fertility transition, has often been observed in other countries, with likely causes being declines in widowhood and breastfeeding (Dyson and Murphy 1985). Thus the occurrence of fertility increase in Pakistan is by no means extraordinary.

Note, however, that the increases in the aggregated TFRs between the PLM survey and the 1981 Census in Table 2 are implausibly large, since the consecutive 15-year time periods (1965-79 and 1967-81) largely overlap, differing in time location by only two years. The results are therefore not very consistent, despite the high level of aggregation.

Figure 2 is similar to Figure 1, except that trends in age-specific birth rates (ASBRs) are graphed instead of TFRs. For brevity, only the trends derived from the 1973 HED survey and the 1981 Census are shown. In each case, the pattern of large fertility oscillations 8-15 years before the survey, a sharp fertility decline during the next six years, and a

slight upturn in the year just before the survey, is found in every age group.² The pattern of distortion in the trend of each age-specific rate is therefore basically the same as the pattern of distortion in the trend of the total fertility rate in Figure 1. In each age group in Figure 2, the two trends begin at about the same higher level and end at about the same lower level and are only displaced in time, again indicating that fertility actually changed very little. When the trends from the two surveys are compared in each panel, there is a hint that fertility may have fallen slightly at the younger reproductive ages (perhaps because of rising age at marriage) and risen slightly at the older reproductive ages (perhaps because of falling mortality, less widowhood, or rising marital fertility), but the apparent changes are very small.

Fertility by Education

Table 3 shows similarly aggregated results by education in three categories: none, some primary, and more than primary. Fertility appears to have increased for those with no education, remained about the same or increased for some primary, and possibly decreased for more than primary. Again, however, the changes are somewhat erratic despite the high degree of aggregation. Nevertheless, the finding that whatever fertility decline has occurred has been confined to the comparatively small group with more than primary education is consistent with the typical pattern of fertility transition observed in other developing countries, where fertility decline invariably has begun among more educated persons. In these data, however, the fertility

Table 3 Own-children estimates of total fertility rates: aggregated results by education (rates per thousand). Pakistan, 1959-81

Survey and time period	Education		
	None	Some primary	More than primary
HED 1959-1973	6999	5854	5767
PFS 1961-1975	6953	7220	5180
PLM 1965-1979	7346	7318	5646
1981 Census 1967-1981	7808	7326	5033

Source: Unpublished tabulations.

increase among those with less education outweighs the slight fertility decline among those with more than a primary education.

Discussion

Figures 1 and 2 show, for the trend estimated from each survey, a spurious pattern of fertility change that consists of large fertility oscillations 8-15 years before the survey, a substantial fertility decline during the next six years, and a slight fertility upturn in the year just before the survey. In Asia, this pattern has been found in own-children fertility estimates not only for Pakistan but also for Nepal and Indonesia (Retherford and Alam 1985). We suspect that it also characterizes India and Bangladesh, but we do not have the detailed own-children fertility estimates that would be necessary to test this prediction.

Explanation of the pattern of trend distortion

Retherford and Alam (1985) have advanced the hypothesis that the large oscillations during the period approximately 8–15 years before the survey reflect severe heaping on ages 8, 10, and 12, corresponding to births in the 9th, 11th, and 13th years before the survey. They have further hypothesized that the comparatively low fertility estimates during the five years or so immediately preceding the survey are due mainly to age exaggeration from upward rounding of children's ages. For example, at true age 0 (corresponding to births during the first year before the survey), it is possible that many children of 11 months (and perhaps younger ages) are reported at age 1, resulting in a deficit of children reported at age 0 and a corresponding underestimate of births during the first year before the survey. At true age 1, corresponding to births during the second year before the survey, substantial rounding to two years may occur not only at 23 months of age but also at 22 and 21 months and perhaps even younger ages. Thus the tendency to round upward from age 1 to age 2 may be substantially greater than the tendency to round upward from age 0 to age 1, resulting in an especially large deficit of children reported at age 1. Upward rounding that is substantially more pronounced for 1-year-olds than for 0-year-olds may explain the frequent and usually spurious finding that fertility is lower in the second year before the survey than in the first year. At true ages 2, 3, ..., 8, it is plausible that the rate at which upward rounding increases with age

diminishes with age, so that estimated fertility increases as one moves backward in time. At childhood ages beyond 8 (corresponding to births nine or more years before the survey), heaping on ages 8, 10, and 12 predominates, resulting in sharp peaks in the TFR and in ASBRs during the 9th, 11th, and 13th years before the survey.

It is likely that undercount of very young children, especially 0-year-olds, also helps to explain the very low fertility estimates during the years immediately preceding the survey. However, it is unlikely that 1-year-olds would be undercounted more than 0-year-olds. Thus the slight upswing in estimated fertility in the year just before the survey is not plausibly explained by undercount. Age misreporting of the sort described in the previous paragraph seems a more likely explanation of this particular pattern of distortion in the fertility estimates.

Retherford and Alam based their conclusions about the role of age misreporting on within-survey comparisons of patterns of fertility trend distortion. They lacked a series of overlapping trends, estimated from successive surveys in the same country, that would provide a more conclusive test of their hypothesis. In such a test, the overlapping trends should coincide during the period of overlap if the estimates are accurate. If the overlap is poor, with a characteristic pattern of distortion in each trend, it seems likely that age misreporting is a major part of the explanation. Age-selective underenumeration may also be implicated.

Figures 1 and 2 provide this test, and they show a very poor overlap of the trend estimates for Pakistan.

Potter's hypothesis about the causes of trend distortion

The results and analysis presented here bear on the well-known "Potter hypothesis," originally advanced to explain spurious fertility trends derived from birth histories (Potter 1977). This hypothesis also applies to spurious fertility trends derived from data on own children, for reasons that will become clear shortly. Potter's hypothesis emphasizes that event misplacement in birth histories can lead to overestimating declines in age-specific birth rates and total fertility rates. According to the hypothesis, recent births are remembered and reported fairly accurately in birth histories, whereas more distant births are misplaced toward the date of interview. The result is an artifactual bunching of births five to ten years before the survey that results in an estimated fertility decline during the ten years or so previous to the survey that is spuriously large. Fertility estimates for the five years or so immediately preceding the survey are hypothesized to be reasonably accurate. Fertility estimates for the period 5–10 years or so before the survey are hypothesized to be too high.

Potter's hypothesis also applies to fertility trends estimated from data on own children, because event misplacement and misreporting of the ages of own children are, to a considerable extent, two sides of the same coin. Indeed, when the ages of a woman's own children are converted to birth dates, a set of own-children data can be regarded

as a set of incomplete birth histories, where the births of children who have died or moved out of the household are missing. Viewed from this perspective, the own-children method can be regarded as fertility estimation from incomplete birth histories. It is then natural to expect that fertility trends derived from birth histories and fertility trends derived from own-children data will show similar patterns of distortion resulting from the associated phenomena of event misplacement and misreporting of children's ages. Fertility trends estimated alternatively from birth histories and own children, using the same data set, have indeed been found to show similar patterns of distortion in many, though not all, cases. Pakistan is among the cases where the distortions are similar, although less pronounced in the trends derived from birth histories than in the trends derived from own children. Distortions tend to be less pronounced in the trends derived from birth histories because of the greater care with which age data are collected in birth histories as compared with simple population counts (Retherford and Alam 1985).

But Potter's hypothesis about the direction of event misplacement appears to be the reverse of what actually occurs in Pakistan. The evidence reviewed here suggests that births are misplaced away from the survey date rather than toward it, because of a pattern of exaggeration of children's ages that increases with age. The result is that fertility is underestimated, rather than accurately estimated as hypothesized by Potter, for the 5-year period immediately preceding the survey.

Figure 1 and Table 1 illustrate this underestimation, and show that the estimated TFR fell below five children per woman during the first two years before each survey, as estimated from that survey, whereas in actuality the TFR appears to have been roughly constant or slightly increasing at values near seven children per woman. Overall, fertility appears to be severely underestimated during the 5-year period immediately preceding each survey, a conclusion supported by close agreement between the aggregated own-children TFR estimates of about seven children per woman in Table 2 and a mean value of 7.0 children ever born for women aged 45-49 in the 1975 PFS (Population Council of Pakistan 1976, table 1.4, p. A-I-6, and table 2.3.4, p. A-II-30). Fertility estimates derived from birth histories from the 1975 PFS also seem too low during the 5-year period immediately preceding the survey (Retherford and Alam 1985). The conclusion that fertility is underestimated in the five years preceding each survey is further reinforced by recent work by Blacker (1985), who also estimates a TFR of about seven for Pakistan, and by Blacker and Brass (1979), who also found evidence that recent dates of birth obtained from birth histories often tend to be misplaced backward from rather than toward the survey date.

Independent data on contraceptive use also suggest that fertility has remained high and fairly constant in Pakistan, at least up to the end of the 1970s. Contraceptive use rates in 1975 were very low, in the neighborhood of 5 percent of currently married women of reproduc-

tive age, and may actually have decreased to about 3 percent during the late 1970s (Shah 1979; Soomro and Ali 1985).

Recent estimates of the TFR derived by applying Rele's method to the 1981 Census of Pakistan suggest a TFR of about 6.5, which is about one-half child lower than our estimate of about seven (Pakistan, Population Census Organization 1984). But the estimate of 6.5 is too low, because it is effectively based on a child-woman ratio of children aged 0-9 to women aged 15-54, which is underestimated because of upward rounding of children's ages to age 10.

It is also noteworthy that fertility trends estimated from birth histories in the PFS and PLM surveys show essentially the same pattern of poor overlap as do fertility trends estimated from own-children data in these surveys, for the same hypothesized reasons having to do with age misreporting. The birth histories yield two declining fertility trends that start at about the same higher level and end at about the same lower level, the trends differing only in being displaced in time by the interval between the two surveys (Shah, Pullum, and Irfan 1986). Again the conclusion is that in reality fertility did not decline at all.

Conclusion

Each of the four demographic surveys examined here indicates a substantial fertility decline during the seven years or so preceding enumeration. However, when the four estimated trends are analyzed together, it becomes clear that the

individually estimated declines are spurious, and that in reality fertility did not decline at all during the two decades or so preceding the 1981 Census. On the contrary, the results indicate that the total fertility rate actually increased, from somewhat below seven children per woman to somewhat above seven children per woman.

The analysis shows additionally how treacherous an enterprise demographic analysis can be when age misreporting is severe. But it also shows that when several data sources are analyzed together and the results compared in appropriate ways, surprisingly firm conclusions can be reached. They can be reached, moreover, from analysis of simple census-type counts, without reliance on detailed birth histories, which are expensive to collect.

NOTES

1. The 1973 HED survey included approximately 2 percent of rural households and 5 percent of urban households, comprising almost 1.5 million persons. The sample was weighted and its age-sex distribution adjusted to agree with that of the 1972 Census count before the own-children method of fertility estimation was applied to it (Retherford and Mirza 1982). The 1975 PFS was a much smaller survey, its household portion including about 30,000 persons (Booth and Shah 1984). The 1979 PLM survey had several modules, including a fertility module and a migration module. Household data, which are required by the own-children method, were not available from the fertility module but were available from the migration module. The PLM household sample from the migration module, to which the own-children method was applied, was about twice the size of the PFS household sample. The 1981 Census sample was a 2 percent systematic sample of census blocks from the 100 percent count. It was selected as a 20 percent systematic sample from an existing 10 percent systematic sample.

2. The results in Figure 2 suggest that Retherford and Mirza's (1982) earlier interpretation of how systematic age exaggeration affects own-children estimates of fertility trends in Pakistan, based on an analysis of HED survey data, is in need of some revision. Retherford and Mirza hypothesized that in Pakistan a pattern of age exaggeration that increases with age, not only for children but also for adults, could explain a pattern of estimated fertility change whereby fertility declined substantially at the older reproductive ages and increased substantially at most younger ages during a period when other evidence suggests that in fact very little fertility change of any kind actually occurred. In this earlier analysis, which was based only on the HED survey, fertility estimates for the first two years were omitted from consideration, on the grounds that they were probably severely biased by undercount of very young children, and estimates were aggregated for two 5-year time periods covering the 3rd through 7th and 8th through 12th years before the survey. Apparently this choice of grouping of calendar years influenced the results, because the HED-derived ASBR trends for single calendar years in Figure 2 of the present paper (as well as parallel trends derived from the other three surveys) do not show the pattern of fertility increase at the younger ages and fertility decline at the older ages observed by Retherford and Mirza in the aggregated results. Instead, the ASBR trends show a rather similar pattern of distortion for every age group, consisting of large fertility oscillations 8-15 years before the survey, a substantial fertility decline during the next six years, and a slight upturn in the year just before the survey. It still seems, however, that systematic age exaggeration is present, as discussed later.

3. The own-children method requires life tables to compute reverse-survival ratios. The application to the HED and PFS surveys utilized life tables by sex from the 1962-65 Population Growth Estimation (PGE) Experiment (Afzal 1974), under the assumption of constant mortality over time. The application to the PLM survey matched estimates of l_5 (life table proportion surviving to age 5) for females, taken from Alam and Cléland (1984), to Coale-Demeny Model West life tables (Coale and Demeny 1966) for females, yielding life tables by sex, urban-rural residence, and mother's education (none, some). In the application to the 1981 Census it was assumed that life expectancy rose from 47.5 years in 1967 to 55 years in 1981, with complete life tables specified by the Coale-Demeny Model South pattern. The same life

table was used for both sexes. This time, however, allowance was made for changing mortality.

The mortality estimates used in the four applications do not constitute a consistent sequence over time. The reason is that the four applications were done over a period of almost a decade, during which we revised our assessments of mortality levels and trends as new mortality data appeared. The inconsistencies in the assumed mortality trends are, however, slight. For our purposes here, they are of little import, because mortality estimation errors of the magnitudes likely to be involved are known to produce small errors in the own-children fertility estimates (Retherford, Chamrathirong, and Wanglee 1980). Moreover, in Pakistan, bias in the fertility estimates due to age misreporting is vastly greater than bias due to mortality estimation errors, and it is the former bias that is of particular concern here. Note in particular that because the estimated mortality trends are monotonic, mortality estimation errors cannot account for jaggedness in the estimated fertility trends. For these reasons, and because of cost considerations, it was not considered worthwhile to rerun the four analyses with a uniformly consistent set of mortality trends.

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The Own-Children Method of Fertility Estimation

The own-children method of fertility estimation is a reverse-survival technique for estimating age-specific birth rates for years previous to a census or household survey. Enumerated children are first matched to mothers within households, usually on the basis of answers to questions on age, sex, marital status, number of children still living, and relation to head of household. These matched (i.e., own) children, classified by own age and mother's age, are reverse-survived to estimate numbers of births by age of mother in previous years. Reverse-survival is also used to estimate numbers of women by age in previous years. After adjustments are made for unmatched (non-own) children, age-specific birth rates are calculated by dividing the number of births by the number of women. Estimates are computed for each previous year or group of years back to 15 years before the survey (Cho, Retherford, and Choe 1986).

The Missing Ages: Adjusting for Digit Preference

by Alan Gray

The more things change, it has been said, the more they stay the same. Over the past three decades tremendous resources have been thrown into the development of techniques for estimating population statistics, and impressive results have been obtained. Nonetheless, most demographers would probably agree that, today as in the past, no single piece of information is more important or more useful than the population age distribution.

Age is important in some societies and not in others. Where it is not important, people tend not to know their age very precisely and to report a "round number" when asked. These round numbers tend to be multiples of five, resulting in population age distributions with large numbers of persons at these ages and few persons at the in-between ages. Such age distributions are found all over the world, including such countries as India, Pakistan, Bangladesh, and Indonesia.

In this article Alan Gray presents a new method for adjusting age distributions to remove the effects of digit preference, a method that overcomes a bias inherent in one approach to the problem. Digit preference is not the only error that afflicts age distribution data, but it is an important one, and the ability to ameliorate it advances our ability to make demographic estimates from age distributions.

Introduction

There are many established techniques for evaluating and adjusting for the effects of age misstatement in population counts. Some of these techniques are of very long standing and have wide acceptance, reflecting the

fact that deficiencies in age distribution data have long been a problem in demographic analysis. This paper is a fresh examination of what it is possible to achieve in removing the effects of one common type of age misstatement, namely preference for ages ending in certain digits.

In stating or recording age, preference for ages ending in the digits 0 and 5 has existed, apparently, for much of human history. For example, Gini (1933) refers to marked digit preference in data from Egypt before and after the beginning of the Christian era. In some developed countries, age misstatement of this type has gradually decreased until it has become negligible in recent decades, but modern census data from many countries still suffer in a gross way from its effects. The analysis in this paper will concentrate on three examples: the Bangladesh census of 1974, showing extreme digit preference; the Libyan census of 1973, an interesting example of marked digit preference with idiosyncratic features; and the Australian Aboriginal population as enumerated in the Australian census of 1981, showing some digit preference at higher ages.

Apart from digit preference, there are a large number of reasons why a census age distribution may be inaccurate. Some of these reasons are: differential rates of enumeration by age, particularly for infants and young children; non-statement of age for reasons of ignorance of true age, or oversight; inaccurate imputation of true age in case of non-response; other errors in reporting, recording, or processing responses; a tendency of older people to exaggerate their longevity; overstatement to pension age; misstatement around the age of legal majority; aversion to certain numbers; a tendency of middle-aged women to

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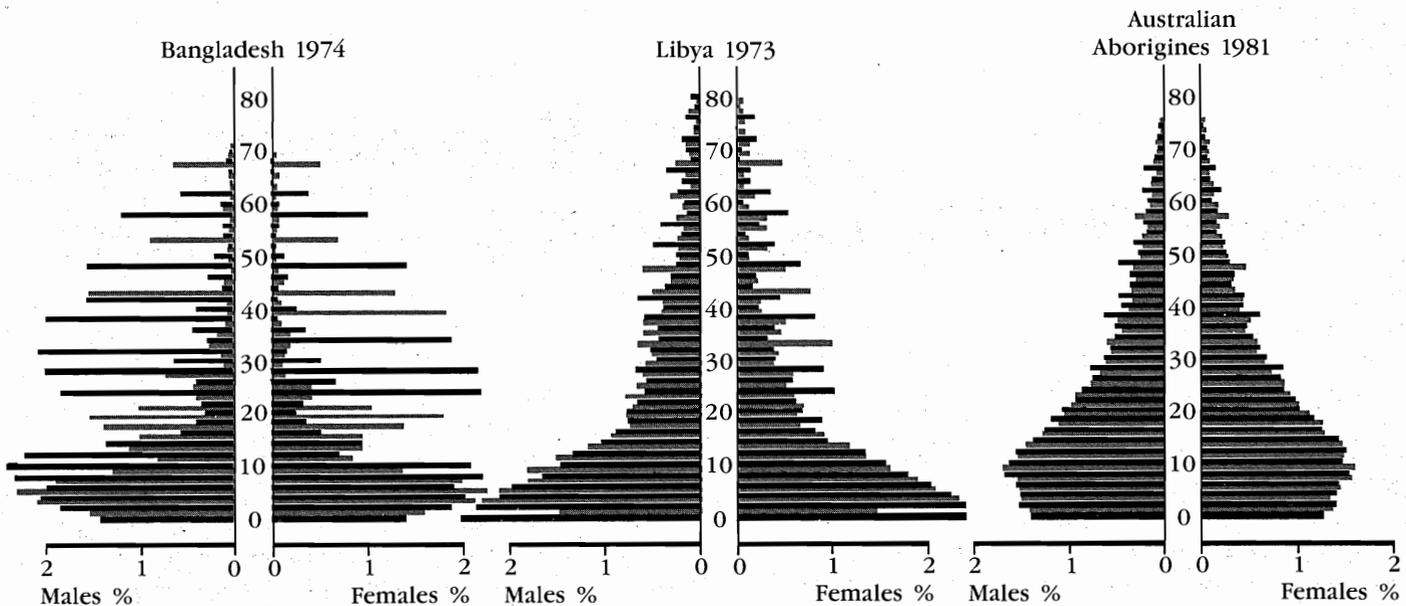


Figure 1 Census age pyramids

Source: Conde and others (1980) except Australian Aboriginal data from Australian Bureau of Statistics, unpublished 1981 Census data.

understate their ages; unwillingness to declare the true age of girls who have been married under the legal age or, in some cultures, of pubescent girls who are unmarried; unwillingness to declare the true age of youths near the age of military conscription; use of non-standard methods of reckoning age in one or more of the cultural groups within a single country; and preference for a rounded year of birth, for example 1900, rather than a rounded age (Myers 1940, Bachi 1951, You 1959, Spiegelman 1968, United Nations 1973).

These influences may be superimposed on a pattern of digit preference. Digit preference itself is likely to be caused partly by ignorance of true age leading to approximation by the respondent, who may or may not be the person whose age is being estimated, or by the enumerator. Given the possible existence of all these other influences, it remains indisputable that in many countries digit preference is by far the most obvious factor complicating the interpretation of age distribution data. The examples of Bangladesh, Libya, and Australian Aborigines shown in figure 1 illustrate the point.

The data for Bangladesh show an extreme example of a typical pattern. Ages ending with the digits 0 and 5 are

heavily favored, while there are subsidiary clusters at ages ending in the digits 2 and 8. At the base of the pyramid, there is also undercutting due (apparently) to differential underenumeration of infants and young children. The case of Libya shows different patterns of digit preference for each sex. In the case of males, the more marked preference is for ages ending in the digits 4 and 9, with subsidiary clustering at 5 and 0, while in the case of females the pattern of preference is reversed. The data also show marked avoidance of age 1. The case of Australian Aborigines shows some clustering at ages ending in the digits 0 and 5 from about age 30, and undercutting at the base of the pyramid due mainly to a genuine fertility decline.

Review of existing analytical techniques

Existing analytical techniques to evaluate and adjust for digit preference are of several types. The first category consists of indices of preference for each digit. Examples of such measures were known in the second decade of

this century (see, for example, Knibbs 1917). Myers (1940) proposed the measure still most frequently used, while Bachi (1951) and the United Nations (1961) presented variants of Myers's approach.

The second category of measures consists of summary indices of digit preference or undifferentiated age misstatement. A simple measure was proposed by Young (1904). Marten (1924) made use of the index known as the Whipple index. Myers (1940) put forward a summary index derived from his indices of preference for each digit. A simple index of all types of age misstatement was proposed by the United Nations (1955), and a variant by Das-Gupta (1955).

There is no need to discuss the method of calculation of measures in these first two categories: see Shryock and Siegel (1971) for an exposition of methods in current use and Wolfenden (1954) for a discussion of earlier measures. A problem with all these indices is that they summarize a large amount of information but do not necessarily reveal the particular pattern of age misstatement in a population. Barclay (1968:69) observes that the demographic analyst is not really interested in an index of digit preference for the entire age distribution, because the parts are likely to be of more interest than the whole. An age pyramid drawn from raw census data, it might be added, is an entirely effective index in itself—an analogue index rather than a digital one. Furthermore, measures of digit preference or of general age misstatement are mostly useless for adjusting the base data. The qualification "mostly" is only there because measures of the Myers-Bachi type can be employed in selecting appropriate age groupings for graduating age distribution data.

Techniques for smoothing age distribution data by graduating five- or ten-year groupings and interpolating for single ages constitute the third category of existing analytical techniques. Selection of five-year age groupings from the possible series (0-4 and 5-9, 1-5 and 6-0, 2-6 and 7-1, 3-7 and 8-2, 4-8 and 9-3) can be based on achieving, as closely as possible, an exact 50-50 split of the group sums of indices of preference for each digit (Myers 1940). Once appropriate age groups have been selected, the analyst can choose from among many established techniques for graduating the results and interpolating single-age values (Bachi 1951, Jaffe 1951, Wolfenden 1954, Carrier and Farrag 1959, Shryock

and Siegel 1971:209-10). Wolfenden (1954:49-50) comments that such methods are "open to the objection that no graduated series can properly be assumed to be a representation of the numbers which should have been recorded, in the sense that the differences between it and the ungraduated series are only misstatements of age; furthermore, different methods of graduation vary greatly in their smoothing power, and hence may produce very different estimates of errors." The reason is that graduation techniques do not have a basis in any statistical model of age misstatement. Graduation is, nevertheless, a legitimate technique of actuarial analysis, where the ultimate aim is to present a smooth progression of estimated mortality probabilities from realized values of death and population data, both containing possible age misstatement. Whether graduation techniques have a place in general demographic analysis is an open question.

There are also established techniques for adjusting grouped age data using two or more censuses. These techniques are set out by Demeny and Shorter (1968) and a number of variants are discussed by Lee (1982). They are of little interest to the current discussion because they ultimately rely on graduation to reconstitute the single-age distribution.

Zelnik (1961) proposed another approach to removing the effects of digit preference, aiming to estimate the actual number at each age under an assumption that the true age distribution is locally linear. A simplified version of Zelnik's procedure is often cited (Shryock and Siegel 1971:209). Zelnik's version is a modification of an 11-term moving average system. As such, it is likely to shave off local protuberances in a pyramid of true ages, and fill in local indentations. For example, the hips on the Australian Aboriginal age pyramid shown in diagram 1 can be shown to be corseted in by approximately 5 percent at the widest point after smoothing by the Zelnik procedure. Such distortion of the actual underlying distribution is a disincentive to the use of Zelnik's procedure whenever actual nonlinearity is expected.

An attractive feature of Zelnik's procedure is its use of a model of the shape of an age pyramid, and it is a model which may well apply to many sets of data. It may seem strange that Zelnik's method represents the extent of attempts to produce nongraduated estimates of single-age distributions. The main motivation towards designing a better method must surely stem from the observation that the periodic digit preference in age distributions is exactly parallel to the periodic disturbances that are

called seasonal patterns in many time series of social and economic data — and in the case of time series, there exist highly developed methods for removing the effects of seasonality.¹ Feeney (1979) proposes a model of age misstatement which implicitly recognizes this duality, although Feeney ultimately used his model only to produce estimates of the size of standard five-year age groups. The method is similar to seasonal adjustment in that the model of age misstatement is used to derive multiplicative age overstatement factors for ages centered at multiples of five. The overstatement is redistributed and the procedure repeated until convergence occurs.

It would obviously be possible to modify a monthly (period 12) seasonal adjustment procedure to the single-age (period 10) case and obtain a sound method of adjustment for digit preference. While the discussion in this paper is based on this premise, the procedure derived is in fact different in three ways. First, the procedure is based on a clear specification of the patterns of age misstatement and the shape of age distributions. Second, the iterative refinements usually employed with seasonal adjustment have been regarded as superfluous, given the careful model specification. Third, the procedure discussed here does not attempt to identify “irregular” values, that is, disturbance to the age distribution with causes other than digit preference. The latter issue is one which can be addressed in further development.

A method of estimation

It was noted above that Zelnik's procedure is based on a modified 11-term moving average. Using a model of age misstatement in which realized population data add, over any ten consecutive single ages, to totals that are approximately correct, then a better basis would have been a 2×10 -term moving average. A 2×10 -term moving average is the average of two overlapping 10-term moving averages, or an 11-term moving average with weights of $1/20$ at the two extremes and $1/10$ for the other terms. Some of Zelnik's modifications to the simple 11-term moving average were designed to reduce bias induced by this inappropriate choice. Using a 2×10 -term moving average would still require that the base data be locally linear. There is, however, a modification of a 2×10 -term moving average which can be used to replace the assumption of local linearity with an assumption that the underlying smooth age distribution curve can have up to two local turning points.

Clearly such a correction can be used to widen the scope of confident application of procedures of the Zelnik type. Since the correction does not appear to have been documented in the literature, much of this section is devoted to its description and an examination of its properties.

Let P_x^* be the enumerated number of people of one sex at age x within the population being analysed, and P_x the true number if age misstatement is corrected. Age misstatement may then be assumed to follow the following model:

$$P_x^* = P_x + e_x \quad (1)$$

$$E\left(\sum_{i=-5}^4 e_{x+i}\right) = E\left(\sum_{i=-4}^5 e_{x+i}\right) = 0 \quad (2)$$

where E means expected or average, value.

A basic assumption in any smoothing procedure is that the true population figures should, in fact, form an approximately smooth curve. In the Zelnik model, this smooth curve is a straight line. Suppose we replace this very restrictive assumption with the assumption that for some fixed age x_0 there exists a polynomial of order w such that for any integer i

$$P_{x_0+i} = P_{x_0} + \sum_{n=1}^w a_n i^n \quad (3)$$

For reasons which will become clear, a local limit of 3 for w results in an unbiased estimation method. Here, “local” essentially means within a span of ten or 20 consecutive ages.

In what follows, a 2×10 -term moving average will be

$$S(P_x) = \left(\sum_{i=-5}^4 P_{x+i} + \sum_{i=-4}^5 P_{x+i} \right) / 20$$

It can be verified using equation (3) that

$$S(P_x) = P_x + k_x \quad (4)$$

where $x = x_0 + j$ and

$$k_x = \sum_{n=1}^w a_n k_{n,x_0+j} / 20$$

$$k_{n,x_0+j} = \sum_{i=-5}^4 [(j+i)^n - j^n] + \sum_{i=-4}^5 [(j+i)^n - j^n]$$

Effectively, k_x is the bias introduced by applying the linear operator S . The aim is therefore to find a modification to S which does not have this bias term.

The construction of the required modification relies on the result, which may be verified algebraically, that if w is less than four then

$$S(k_x) = k_x \quad (5)$$

This is not true of higher-order polynomial realizations of equation (3), and is the source of the restriction of the method to be outlined to the assumption that the underlying age distribution may have no more than two local turning points.

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The following identity may now be confirmed:²

$$\begin{aligned}
 & 2S(P_x^*) - S^2(P_x^*) \\
 &= 2S(P_x + e_x) - S^2(P_x + e_x) \quad (\text{equation 1}) \\
 &= 2S(P_x) - S^2(P_x) + 2S(e_x) - S^2(e_x) \\
 &= 2(P_x + k_x) - S(P_x + k_x) + 2S(e_x) - S^2(e_x) \quad (\text{equation 4}) \\
 &= 2P_x + 2k_x - S(P_x) - S(k_x) + 2S(e_x) - S^2(e_x) \quad (\text{equations 4 \& 5}) \\
 &= 2P_x + 2k_x - (P_x + k_x) - k_x + 2S(e_x) - S^2(e_x) \\
 &= P_x + 2S(e_x) - S^2(e_x)
 \end{aligned}$$

Now, it follows from equation (2) that

$$E(S(e_x)) = 0$$

and it then follows further that

$$E(2S(e_x) - S^2(e_x)) = 0$$

In this way, it has now been shown that under the assumptions of equations (1) to (3),

$$\begin{aligned}
 & E(2S(P_x^*) - S^2(P_x^*)) \\
 &= E(P_x + 2S(e_x) - S^2(e_x)) \quad (6) \\
 &= P_x
 \end{aligned}$$

(as long as w is less than four). This is another way of saying that the linear operator $2S - S^2$ produces unbiased estimates of P_x from the enumerated values P_x^* .

It can now be seen that a moving average (linear operator) system can be refined considerably by replacing the base moving average linear operator S , which produces estimates biased by the term k_x , with the linear operator $2S - S^2$, which produces unbiased estimates under the model of age misstatement and age pyramid shape which has been assumed here. It can be verified in similar fashion that any linear operator of the form

$$Q_k = (k+1)S^k - kS^{k+1}$$

can be substituted for $2S - S^2$ in equation (6) if k is greater than zero. What is more, the set $\{Q_k : k > 0\}$ constitutes a basis for a vector space of linear operators, any one of which is an unbiased estimator of P_x if its weights add to one. A simple example is $S + S^2 - S^3$, which is $(Q_1 + Q_2)/2$.

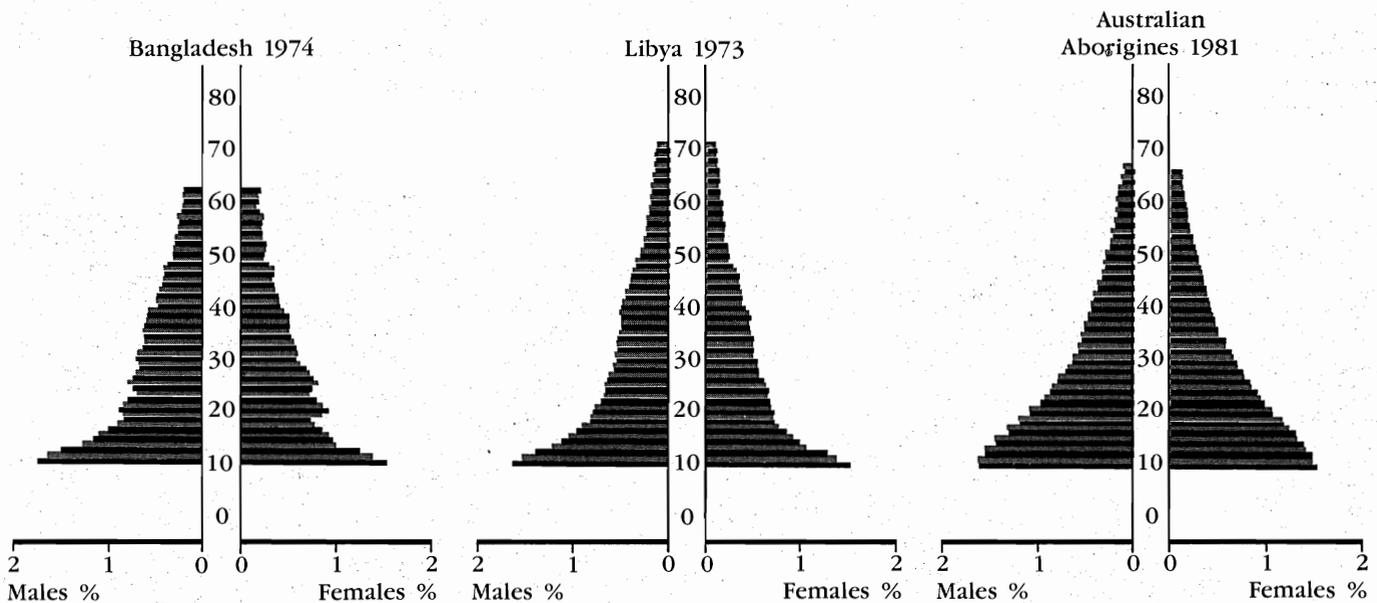


Figure 2 Census age pyramids adjusted by Q_1

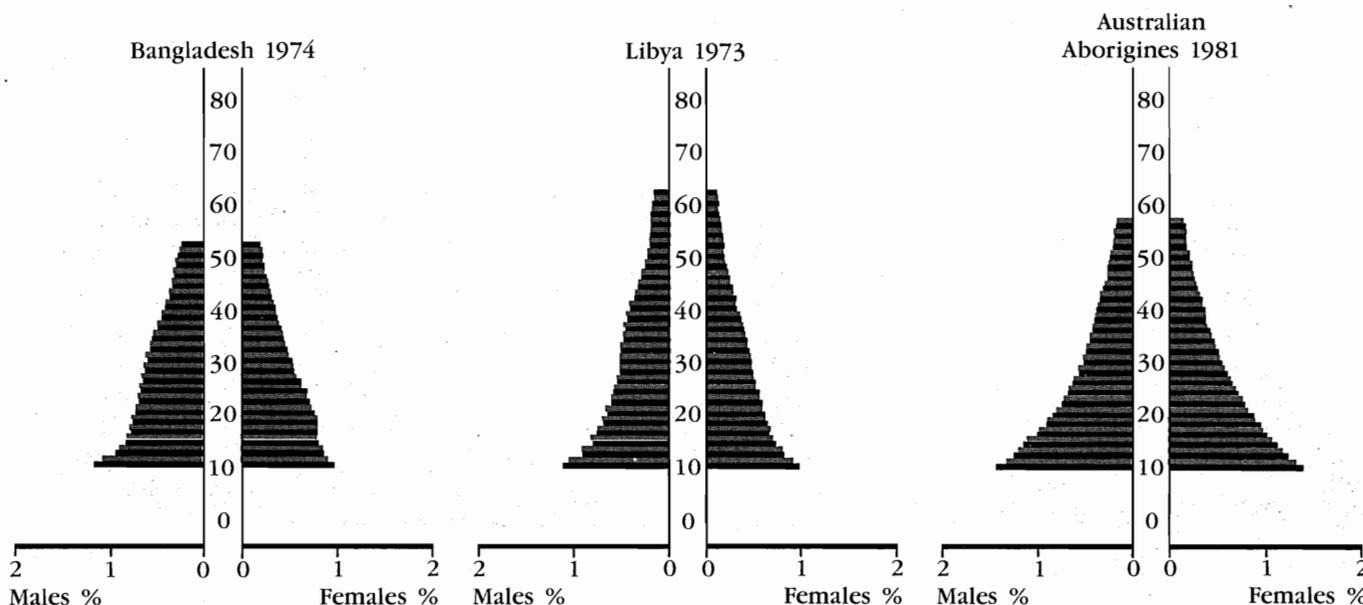


Figure 3 Census age pyramids adjusted by Q_2

It is now worthwhile to examine the practical application of this theory. Attention will be restricted to the linear operators Q_1 and Q_2 , shown in tabular form in Table 1 (page 20).

To use any one of these linear operators, the raw census data for ages surrounding the selected age x are aligned with the weights shown in Table 1 and the weighted sum of the values is calculated. It will be immediately obvious that these sequences of weights cannot be applied to the first and last ten single ages when Q_1 is used, nor the first and last 15 single ages when Q_2 is used. Some practical ways to overcome this deficiency are discussed in the next section, while Table 2 (page 21) shows an example of calculation.

Figures 2 and 3 show the results of using the linear operators Q_1 and Q_2 to transform the population pyramids of Figure 1 into the estimated true age pyramids. The missing segments at the top and bottom of the pyramids correspond to the single ages for which the transformation cannot be calculated. A comparison of the results appears to favour use of Q_2 rather than Q_1 , although there is virtually no difference in the case of the Australian Aboriginal data, which had least irregularity in the beginning. A close examination of the Q_1 smoothing for Bangladesh shows that it has tended to create a step pyramid resembling

data grouped into standard five-year age groups. The reason for this is that a step-pyramid shape is, more or less, a realization of a cubic curve within spans of ten consecutive single ages. With the use of Q_2 , the underlying cubic curve is fitted to a span of ages weighted towards twenty consecutive single ages.

The results of this practical demonstration show that slightly irregular data may be adjusted adequately with the Q_1 operator, but greater irregularity requires use of Q_2 to obtain an adequate result. It has also been found that Q_3 produces results very similar to Q_2 's, and there would probably be few cases where resort to its greater smoothing power would be necessary. Users might well find that the operator $(Q_1 + Q_2)/2$, results for which can be obtained by averaging the Q_1 and Q_2 results, could be adequate in cases where digit preference is moderate but Q_1 does not seem quite powerful enough.

Restoration of the top and bottom of the age pyramid

When the census data being adjusted have a complete single-age distribution, there is of course no need to

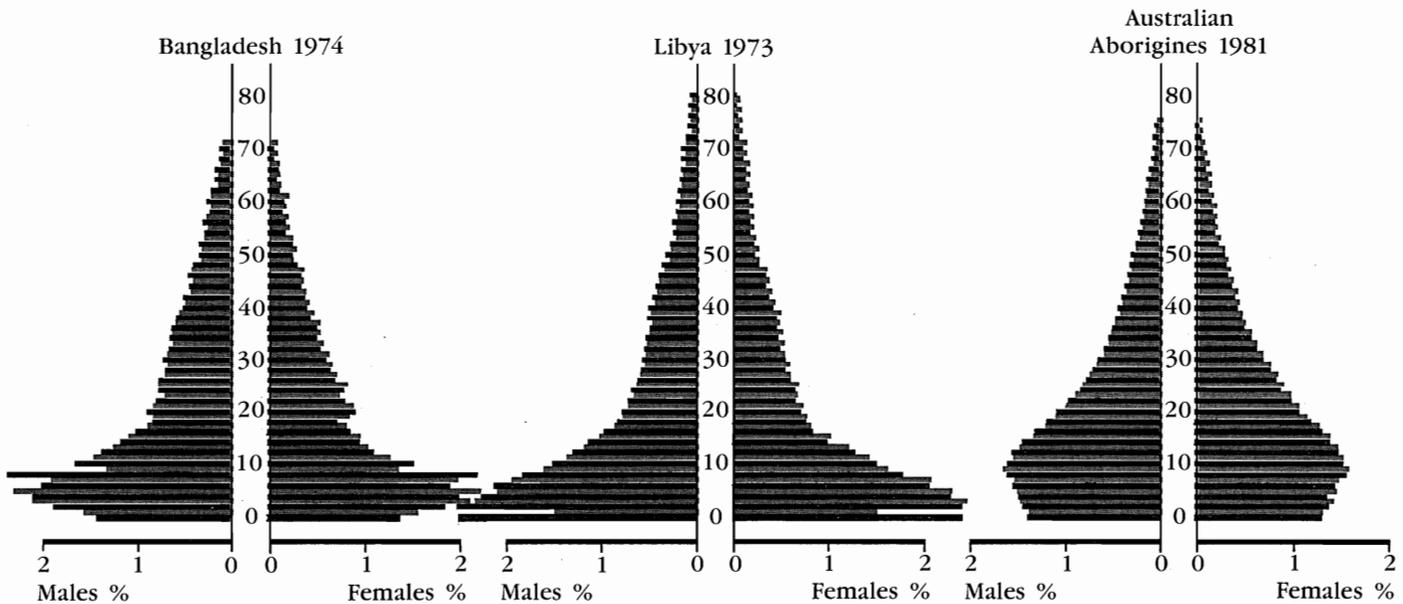


Figure 4 Census age pyramids adjusted by Q_1 (extremities restored)

truncate the top of the age pyramid after use of Q_1 or Q_2 . In that case, a string of zero figures for ages above the highest age achieved in the population can simply be added on to the single age distribution. If, as is frequently the case with published census data, ages are grouped into a single category above a certain age, it is desirable to split this category into estimated single ages with the same pattern of digit preference. This adjustment should be done before applying the linear operators. A simple way to do this (satisfactory in practice) is to take

$$P_x^* = P_{x-1}^* + P_{x-10}^* - P_{x-11}^*$$

at each age x above the last single age shown in the base data, resetting negative results to zero and then post-adjusting the series to add to the actual size of the final age group.

The bottom end of the age pyramid is a different matter. In theory, what is required is a series of values for negative ages corresponding to the number of infants aged zero in future years. In practice, the disturbances to the age distribution at the bottom of the age pyramid are caused much less by digit preference than by differential under-

enumeration of infants and young children and by culture-associated systematic errors in reporting the ages of young children. Estimates of the crude birth and death rates and infant mortality rate can be used to construct a series of negative age values, but the results are hardly worth the considerable effort required. It will be found that differential underenumeration of young children causes problems in controlling the size of the transformed population, and simplistic approaches to adjustment at the lower end of the age range produce even less satisfactory results. The methods of seasonal adjustment do not help here. In seasonal adjustment, transformation of values at the end of the time sequence is done by assuming a continuation of established seasonal patterns, but digit preference patterns at the bottom of the age pyramid are manifestly dissimilar to those at higher ages.

The most satisfactory approach at the bottom of the age pyramid is to perform no adjustment at all for ages 0 to 9 and to perform a Q_1 adjustment for ages 10 to 14, even when Q_2 is being used for higher ages. This approach recognizes that digit preference is not a major factor in age misstatement for children and at the same time avoids spreading differential underenumeration of young children around too far. Even so, it should be noted that

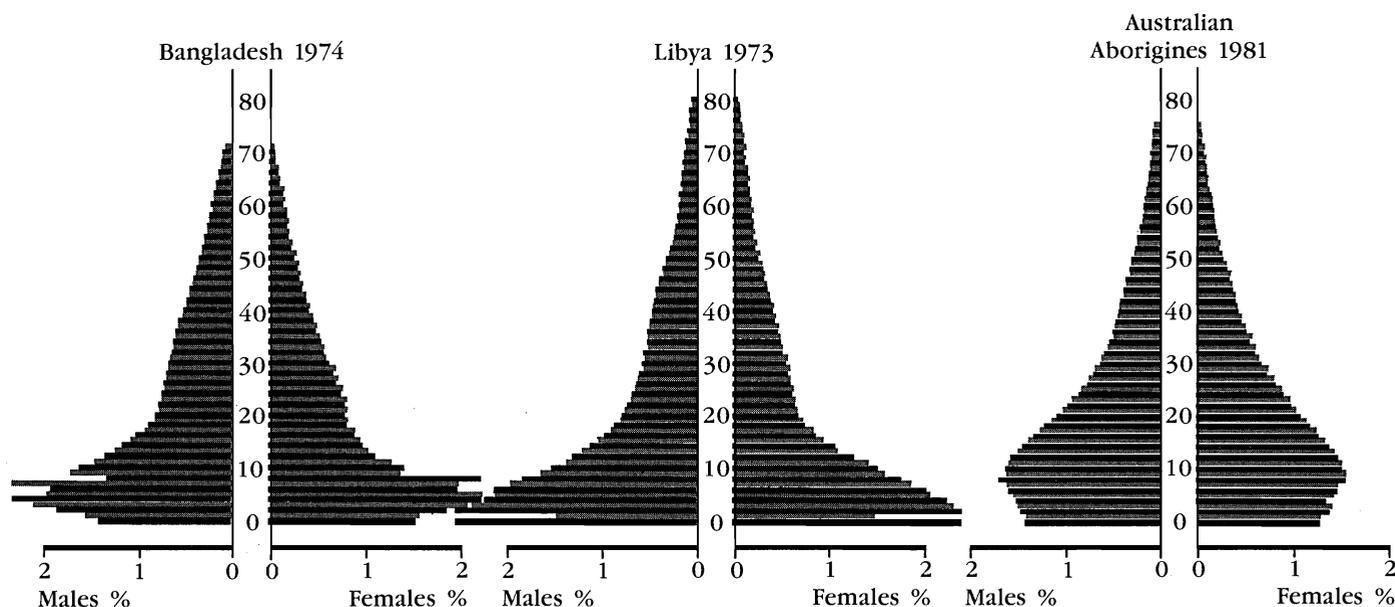


Figure 5 Census age pyramids adjusted by Q_2 (extremities restored)

any differential underenumeration is transferred to other ages whenever the linear operators' weighting factors are applied to single ages where underenumeration is suspected.

The approach suggested here for the top and bottom of the age pyramid produces the transformed age distributions shown in Figures 4 and 5 when applied to the data for Bangladesh, Libya, and Australian Aborigines. The transformed distributions do not necessarily add to exactly the same totals as the original data, although the largest absolute difference from the original population total was only 0.33 percent, in the case of the Q_1 transformation for Bangladesh. It is not strictly valid to adjust the transformed data proportionately to make the total correct, because the transformed estimates for single ages are themselves unbiased. Of course, their sum is not necessarily a better estimate of the population total than the original total. These observations are relevant to use of these methods with data from successive censuses in order to construct survival ratios.

Discussion

The methods which have been presented in this paper are clearly powerful tools for identifying the underlying age

distribution in raw data which may be grossly distorted by digit preference. They are easy to use, they are superior to graduation methods in that they are based on a specific model of age misstatement and age pyramid shape, and they are superior to the Zelnik approach in that the pattern of age misstatement is more clearly specified and the methods are unbiased in less restricted conditions than is the Zelnik method. The specific model of age misstatement in these new methods is, however, itself a simplification: in assuming that the sum of any ten enumerated values for single ages is approximately correct and unbiased, there is no attempt to provide a model of the source of increments and decrements to the single-age values.

It should also be noted that the linear operators Q_1 and Q_2 can also be derived as maximum likelihood estimators from the equations of the model.³ Some success has been achieved with augmenting the maximum likelihood model to include an irregular component, but this creates considerably greater complexity. Details of this refinement are available from the author.

A computer program in FORTRAN that transforms data by Q_1 , Q_2 , and Q_3 is also available from the author.

NOTES

1. Shishkin, Young, and Musgrave (1967) give a description of a frequently used method of seasonal adjustment, the "X-11" method. A clear demonstration that this method is basically a linear operator system, or moving average, is given by Wallis (1974), and the same source

also discusses statistical properties of seasonal adjustment procedures.

2. S is a linear operator and so are all powers of S , where the power S^k is defined to be the operator S performed k times over. Linear operators can be manipulated and factored as if they are quantities. Thus, for example,

$$(2S - S^2)(f_x) = 2S(f_x) - S(S(f_x))$$

OR

$$S(f_x + g_x) = S(f_x) + S(g_x)$$

3. Interested readers may use the model to construct the maximum likelihood estimation system

$$e_x = (1 - Q_i)P_x^* + Q_i(e_x),$$

where $Q_i(e_x)$ has zero mean, and to observe that assuming age-invariant variance size is likely to be more justifiable with Q_2 than with Q_1 because of the greater smoothing power of the former.

Table 1 Linear operators for use in deriving unbiased estimates of single-age distributions

Age	S	S^2	S^3	Q_1	Q_2
x-15			.000125		-.00025
x-14			.00075		-.0015
x-13			.00225		-.0045
x-12			.00475		-.0095
x-11			.00825		-.0165
x-10		.0025	.01275	-.0025	-.018
x-9		.01	.01825	-.01	-.0065
x-8		.02	.02475	-.02	.0105
x-7		.03	.03225	-.03	.0255
x-6		.04	.04075	-.04	.0385
x-5	.05	.05	.049875	.05	.05025
x-4	.1	.06	.0585	.14	.063
x-3	.1	.07	.0655	.13	.079
x-2	.1	.08	.0705	.12	.099
x-1	.1	.09	.0735	.11	.123
x	.1	.095	.0745	.105	.136
x+1	.1	.09	.0735	.11	.123
x+2	.1	.08	.0705	.12	.099
x+3	.1	.07	.0655	.13	.079
x+4	.1	.06	.0585	.14	.063
x+5	.05	.05	.049875	.05	.05025
x+6		.04	.04075	-.04	.0385
x+7		.03	.03225	-.03	.0255
x+8		.02	.02475	-.02	.0105
x+9		.01	.01825	-.01	-.0065
x+10		.0025	.01275	-.0025	-.018
x+11			.00825		-.0165
x+12			.00475		-.0095
x+13			.00225		-.0045
x+14			.00075		-.0015
x+15			.000125		-.00025

Notes:

S , S^2 and S^3 will not in general produce unbiased estimates.

$Q_1 = 2S - S^2$ and $Q_2 = 3S^2 - 2S^3$.

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Table 2 Application of Q_1 and Q_2 linear operators, Bangladesh Census, 1 March 1974 — Males

Age	Census	Q_1	Q_2	Age	Census	Q_1	Q_2
0	941,307			40	1,331,036	362,520	361,289
1	1,041,335			41	48,995	327,180	348,796
2	1,237,034			42	251,153	322,889	334,849
3	1,411,359			43	58,393	318,215	321,901
4	1,383,853			44	54,995	316,334	310,028
5	1,541,942			45	1,033,812	296,278	298,308
6	1,321,576			46	68,792	276,958	286,242
7	1,285,877			47	72,766	275,057	274,796
8	1,563,448			48	175,943	272,350	263,983
9	886,705			49	28,254	279,354	253,143
10	1,623,998	1,151,172		50	1,038,747	244,466	242,464
11	562,924	1,077,888		51	32,894	209,374	232,007
12	1,485,173	982,103		52	136,179	214,178	221,636
13	543,216	891,354		53	37,667	210,162	211,372
14	771,219	828,173		54	38,230	208,499	200,807
15	903,496	762,583	769,826	55	596,049	191,717	191,057
16	686,431	718,528	711,733	56	52,602	173,916	183,573
17	370,007	649,206	663,995	57	36,493	173,882	176,971
18	942,999	579,004	623,069	58	74,106	172,936	170,539
19	250,820	535,521	584,797	59	16,759	176,417	164,776
20	1,023,667	552,769	552,352	60	790,643	158,124	
21	200,131	572,789	530,538	61	20,596	138,487	
22	688,640	543,715	515,578	62	70,109	141,009	
23	222,011	504,766	505,073	63	18,044	142,779	
24	281,738	456,185	497,808	64	19,891	145,479	
25	1,239,965	484,627	489,977	65	357,491		
26	288,363	516,545	479,740	66	15,253		
27	263,326	487,585	469,326	67	17,489		
28	483,143	458,525	460,446	68	31,057		
29	78,635	437,117	454,699	69	8,481		
30	1,349,886	442,480	449,240	70	429,816		
31	68,438	456,052	439,744	71	7,951		
32	415,127	440,706	429,856	72	35,583		
33	101,596	415,651	422,980	73	8,612		
34	100,758	400,515	419,200	74	6,589		
35	1,392,434	403,565	414,487	75+	454,645		
36	178,633	409,668	403,537				
37	126,351	402,329	389,871	Total	37,070,672		
38	286,520	391,982	378,716				
39	50,836	392,801	370,274				

Examples of calculation: Q_1 transformation for age 20 —

$$\begin{aligned}
 & - .0025 \times 1623998 - .01 \times 562924 - .02 \times 1485173 - .03 \times 543216 - .04 \times 771219 + .05 \times 903496 + \\
 & .14 \times 686431 + .13 \times 370007 + .12 \times 942999 + .11 \times 250820 + .105 \times 1023667 + .11 \times 200131 + \\
 & .12 \times 688640 + .13 \times 222011 + .14 \times 281738 + .05 \times 1239965 - .04 \times 288363 - .03 \times 263226 - \\
 & .02 \times 483143 - .01 \times 78635 - .0025 \times 1349886 = 552769
 \end{aligned}$$

(Continued from page 2)

4. *The multisector approach* (1980–83) placed the population planning program under the umbrella of the Ministry of Planning and Development, and family planning was to be made available through health outlets of government and nongovernment organizations (NGOs) as well as family welfare centers. Women from local communities were enlisted to promote family planning.

In 1983 the Government initiated the latest national population welfare program, which seeks to continue the multisector approach and to provide services through a network of family welfare centers, reproductive health units (for surgical sterilization), contraceptive distribution agents

(shopkeepers, pharmacists, etc.), and a social marketing scheme.

Pakistan's need for family planning is evident from the demographic statistics, which have not changed much over the past 25 years. As of July 1983, the crude birth rate was still high at 40.3, the total fertility rate was high at 5.9 (and perhaps considerably higher—see lead article), and the growth rate was also high at 2.9 (Pakistan Planning Commission 1984:8). Contraceptive prevalence is only 7–10 percent of married women of reproductive age (Crowley et al. 1984:7). Yet the government's Sixth Plan calls for a CBR of 36.2, a growth rate of 2.6, a TFR of 5.4, and contraceptive prevalence of 18.6 by 1988 (Pakistan Planning Commission 1984:7–8). These ambitious goals will require not only adequate

resources and an extensive service delivery system, but also appropriate information to assist policymakers, planners, and program administrators in charting an effective course of action, monitoring progress, and identifying ways to improve program performance.

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Book Reviews

Graeme Hugo. "Population aging in Australia: Implications for social and economic policy." *Papers of the East-West Population Institute*, No. 98, Honolulu: East-West Center, April 1986. vii + 47 pp. US\$3.00. ISBN 0-86638-078-7

This is a useful monograph, as have been many others in this series. The situation analysed is that of Australia

but there are strong similarities to other OECD countries. The analysis is clearly written around judiciously chosen tables and statistics.

Australia's current proportion of population over 65 years of age is only about 10 percent, the level reached by much of Western Europe nearly half a century ago or the United States a decade ago. In the early 1950s Australia and the United States exhibited the same proportion (8 percent), but America's baby boom collapsed earlier. Indeed, Australia's marked fertility decline did not occur until after 1971, and only then did the aged proportion begin to rise significantly.

Yet the analysis shows clearly that in Australia, as elsewhere in industrialized countries, the economic burden of the aged is far from being solely a demographic phenomenon. In 15 years from 1969 to 1984 the proportion of persons 60–64 in the work force fell from 46 to 27 percent. In 1971, 72 percent of 60–64-year-old males worked full-time, but by 1982 only 41 percent did so. At the same time legislative changes were making government social service pensions almost universally available, at least from 65 years of age: Between 1971 and 1983 the proportion of those 65–69 receiving the pension rose from 55 to 77 percent, while among those over 70 years it climbed from 77 to 97 percent. Income-related superannuation schemes, usually financed by both employees and employers, were becoming more important, being the main source of income for those over 65 years in 11 percent of the population in 1981/82 compared with only 15 percent three years earlier, but 80 percent relied chiefly on Australia's flat-rate government pensions.

Those who want to retire early overwhelmingly do so because they intend to devote themselves to leisure activities in what is rapidly becoming the second half of their adult lives. By 1981, 43 percent of the population over 55 years of age were residing in a different place than they were five years earlier. Many went to the sub-tropical and tropical areas of the northern part of Australia's east coast—Australia's equivalent of Florida—but, curiously, none went to the inland deserts—Australia's equivalent of Arizona.

As yet Australia has not found this burden overwhelming, partly because the lower birth rate has meant reduced expenditure on children and partly because of a rise in the proportion of women in the work force. Indeed, we may reach a position where both spouses work most of the time in early life so that both can spend their final decades boating in coral seas (or, more commonly, drinking beer while living in the metropolitan areas and watching football on TV). This has so far been perfectly acceptable to governments because the surplus manpower which cannot be absorbed by a slowly growing economy is less visible and distressing in retirement than as youthful or mid-career unemployment. But the low fertility levels since 1971 will mean such small cohorts entering the work force after 1990 that unemployment may well decline irrespective of technological change. If this proves to be the case, and if more Australians aspire to retire at 60, or even at 55 or 50 as the report implies, then governments may have to dispense with mandatory retirement ages and even offer additional inducements to those who wish to stay on the job.

—John Caldwell

Population Redistribution and Development in South Asia. Edited by Leszek A. Kosinski and K. Maudood Elahi. Dordrecht, Holland: D. Reidel Pub. Co., 1985. 243 pp. US \$44.00. ISBN 90-277-1938-1.

In recent years the International Geophysical Union has devoted a great deal of attention to the relationship between population redistribution and

economic and social development. One of several meetings on this topic was held in Karachi in 1980 for participants from five South Asian countries—Bangladesh, India, Nepal, Pakistan, and Sri Lanka. The present volume is an outcome of that meeting, offering a selection not only of the original papers (revised and edited) but also of other papers written specifically for this book.

Three of the book's fourteen chapters deal with overall patterns of population change in South Asia; the rest deal with individual countries of the region. Flood-related migration, tribal populations and refugee resettlement, and other specific problems are covered by Indian authors. A general chapter on population trends in Nepal is followed by a detailed explanation of government resettlement policies. There are three complementary contributions for Sri Lanka dealing with general trends, population policies, and the urbanization process. An overview of trends in Pakistan precedes a case study on the North West Frontier Province. A final chapter discusses refugee questions for Bangladesh. Maps, tables, diagrams, and bibliographical references are included in each paper.

South Asia contains one-fifth of the world's population and plays an important role on the world demographic stage. A need for outlets for its surplus labor is at odds with the shrinking number of countries that want immigrants or even temporary laborers. Up to now, migration has taken place primarily within the subcontinent, but mounting population pressure could stimulate greater intercontinental migration. This will depend upon home governments' population distribution policies, as well as on the countries of potential destination. Since there is evidence that international migration from South Asia

will not become significant given the current political situation, scholars, researcher, planners, and politicians need to focus upon the region's internal migration—planned or spontaneous, desirable or detrimental—for years to come.

Population Redistribution and Development in South Asia is available from Kluwer Academic Publishers Group, P.O. Box 322, 3300 AH Dordrecht, Holland; and in the U.S. and Canada from Kluwer Academic Publishers, 190 Old Derby Street, Hingham, MA 02043.

—Alice Harris

Rural Migration in Developing Nations: Comparative Studies of Korea, Sri Lanka and Mali. Edited by Calvin Goldscheider. Boulder, Co., and London, England: Westview Press, 1984. xxvii + 313 pp. US\$25.00. ISBN 0-86531-832-8.

This volume marks the culmination as of July 1984 of a research project on urbanization, migration, and development in less developed countries that was initiated at Brown University's Population Studies and Training Center in 1972-1973. The research, funded through a grant from the Ford Foundation, involved several graduate students at the Center in a series of comparative field studies during the period 1973-77 to study migrant adjustment in urban areas. Four of the studies were written up in the series' first volume, *Urban Migrants in Developing Nations: Patterns and Problems* (Boulder: Westview, 1983). Although their earlier work supplied valuable material on migrant behavior in urban settings, it did not assess migration from the perspective of the sending areas, usually rural villages. Neither did it answer important questions such as: What is the relationship between

migration and rural social structure? How does selective movement out of rural areas affect the economic and social conditions of migrants, their families, and their places of origin?

During 1977 and 1978 two further field studies that attempted to answer these questions were conducted as part of Brown's Comparative Urbanization Project. One took place in southern Korea, where three local surveys were analyzed to assess the effects of return migration. The other study was an analysis of the resettlement programs attempted in Sri Lanka. These, along with a related research project on interrelations between the rural socioeconomic structure and migration in Mali, are reported in this monograph edited by Calvin Goldscheider, Professor of Sociology at Brown University.

The case studies are by Jin Ho Choi, Dayalal S.D.J. Abeysekera and Robert E. Mazur. Each contains its own bibliography and illustrated matter. Goldscheider contributed the introductory chapter on migration and social structure and a concluding commentary on the comparative perspective offered by the three studies. He points out the need for further research on the interrelationships between rural migration and development.

This monograph approaches migration from a different viewpoint than other migration literature and would be a useful addition to any demographic library. It can be obtained through book dealers or directly from Westview Press, 5500 Central Avenue, Boulder, CO 80301.

—Alice Harris

Free Computer Software

EASWESPOP-FERTILITY, the first module of the East-West Population Institute's EASWESPOP microcomputer library, contains the following indirect methods of fertility estimation on a single 5 1/4 inch floppy diskette:

- Palmore regression method
- Relé method
- P/F ratio method from United Nations Manual X
- Own-children method by Cho et al.
- Cohort parities of two surveys from United Nations Manual X

The programs are designed for interactive use by population professionals with little computer knowledge. Future modules will include EASWESPOP-DATA ENTER and EASWESPOP-PARITY PROGRESSION PROJECTIONS.

Minimum system requirements are IBM compatibility, MS-DOS 2.1 or higher, 256K RAM main memory, and one diskette drive. A single copy of EASWESPOP-FERTILITY software and documentation is offered free to institutions in the Asia-Pacific region. The program is not copyrighted and may be freely copied. Individuals, and institutions outside Asia and the Pacific, are asked to send US\$10.00 with their order.

Write or call the Data Analysis Officer, East-West Population Institute, 1777 East-West Road, Honolulu, Hawaii 96848, U.S.A. Tel.: (808)944-7420.

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Female Education and Fertility in Bangladesh

by Linda G. Martin

Slowing the growth of the 100-million-plus population of Bangladesh remains a major challenge. Fertility and mortality declined only slightly, if at all, during the 1970s, and the population continues to grow at an annual rate of over 2.5 percent, implying a doubling time of about 25 years (Robinson 1984). The 1983 Contraceptive Prevalence Survey shows some evidence of fertility decline in recent years at least in part attributable to the increased use of modern family planning methods (Mitra and Kamal 1985), and the Matlab project of the International Center for Diarrhoeal Disease Research, Bangladesh (ICDDR) has demonstrated that successful family planning programs are possible in Bangladesh (Phillips, Koenig, and Chakraborty 1986). Nevertheless, given the gravity of the situation, other approaches to lowering fertility and the population growth rate are being explored.

In particular, the United States Agency for International Development (USAID) in recent years has supported among its many activities two pilot

projects to reduce fertility by providing secondary-education scholarships to girls in Bangladesh. The short-term goals of the projects are to encourage young women to continue from primary to secondary school and to reduce dropout rates at the secondary level. It is hoped that, as a result of increased education, these women in the long run will have fewer children by delaying marriage and by increasing their use of contraception.

This article briefly reviews the theoretical link between education and fertility, the educational situation in Bangladesh, and the projects' design and their effects as evaluated by a USAID/International Science and Technology Institute team upon whose report (Martin, Flanagan, and Klenicki 1986) this article is based.

Education and fertility

The negative effect of female education is frequently cited in the analysis of the determinants of fertility, but there are a variety of channels through which education may exert its influence (Cochrane 1979). Among the possibilities are by increasing women's status; by changing women's attitudes about marriage and desired

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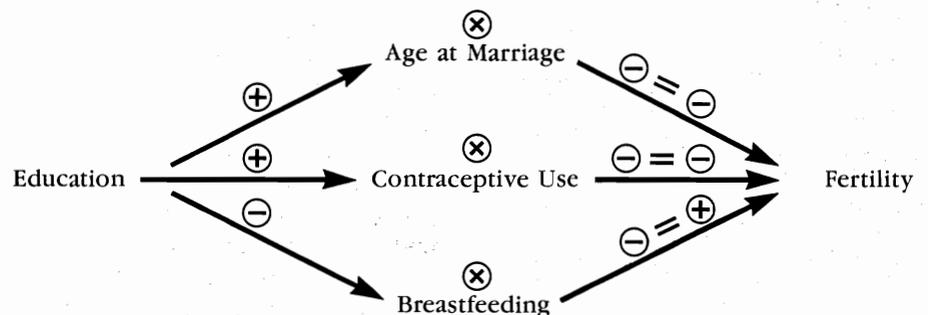
family size; by exposing women to new ideas that may increase willingness and ability to obtain and use contraceptives; by providing an alternative to early marriage; and by making women more valuable in the work force and thereby increasing the so-called opportunity cost of raising children. However, to understand operationally how education affects fertility, it is helpful to think about how education affects the more proximate determinants of fertility, such as age at marriage, contraceptive use, and breastfeeding.

A simple model that can be used to trace the influence of education on fertility through some of the proximate determinants of fertility is shown in Figure 1. Generally, education is thought to increase age at marriage and contraceptive use, thus contributing to fertility decline since each has a negative effect on fertility. On the other hand, increased education is usually associated with decreased breastfeeding, and breastfeeding is negatively associated with

fertility, so through this channel education would have a positive effect on fertility (negative times negative is positive).

In Bangladesh, there is some evidence on these links between education and fertility. Nearly all women are married by age 25 in Bangladesh, but more-educated women do marry later than the less educated. Data from the 1975 Bangladesh Fertility Survey (Ministry of Health and Population Control 1978) indicate that among ever-married women of ages 20 to 49, those with no schooling married on average at age 12.8 years, those with some primary schooling at 13.6 years, and those with more than primary at 14.7 years. Unpublished census data from 1974 show that among females of ages 15 to 19, 81.0 percent of those with no schooling and 70.5 percent of those with some primary education had already married, but only 36.5 percent of those with some secondary education had married (Ahmed and Chaudhury 1981).

Figure 1 Simple Model of Female Education's Effect on Proximate Determinants of Fertility





LINDA G. MARTIN

There is a strong relation between education and contraceptive use in Bangladesh, as documented in the 1983 Contraceptive Prevalence Survey, as well as in the 1975 Bangladesh Fertility Survey. In 1983, 42.1 percent of women with more than primary education used contraception, as opposed to only 21.0 percent of those with some primary education and 16.0 percent of those with none.

Evidence on education and breastfeeding is more limited. Small-area studies have found a negative association (Khuda and Chowdhury 1982

and Khatun 1984), plus an ICDDRB study found that highly educated women were more likely to give liquid supplements (Huffman, Ford, Allen, and Streble 1985).

Of course, this simple proximate-determinants model does not completely capture the complexity of the relation between female education and fertility. An ideal analysis would also take into consideration the effects of husband's education, income, nutrition, and child mortality. Unfortunately, with the limited data available on Bangladesh such analysis is not

possible. One of the best multivariate analyses (Chaudhury 1984) tries to explain fertility using mother's age, her age at marriage, her education, her work experience, and a proxy for standard of living. Data from the 1975 Bangladesh Fertility Survey are divided into rural and urban subsamples, and it is found that in the rural subsample education has no effect on fertility. The fertility of urban women with no schooling is the same as that of those with primary schooling, but those with higher education do have lower fertility. In both samples, however, age at marriage has the greatest effect of all the variables on children ever born. Thus, given the association between age at marriage and education, it could be argued that education does indeed affect fertility.

Education in Bangladesh

Illiteracy is a problem in 85-percent-rural Bangladesh for both men and women, but according to the 1981 census 25.8 percent of males are literate, as opposed to only 13.2 percent of females (Rabbani and Associates 1984). In 1984, girls comprised 41 percent of primary-school enrollment and only 32 percent of secondary. Poverty, of course, is a major reason for both sexes to drop out or never attend. At the primary-school level, there is no tuition charge, but families must provide uniforms, supplies, and some books, plus forgo the value of children's labor at home. At the secondary-school level, children's labor may be even more valuable, plus most of the schools are privately operated and fees must be paid.

Beyond poverty, the observance of purdah or female seclusion also plays an important role in female illiteracy. Reasons frequently given by girls and

their families for nonattendance include the lack of separate facilities for females, distance between home and school, too few or no female teachers, and the lack of female attendants or ayahs. Also important are early marriage and general questioning of the value of education for girls.

Female secondary scholarship project

In 1982, USAID began funding a pilot project by the Bangladesh Association for Community Education (BACE) to provide secondary-school scholarships for girls in Shahrasti Upazilla, Chandpur District, and in 1984 began funding a similar project by the Southern Gonounnayan Samity (SGS) in Gopalganj Upazilla, Gopalganj District.¹ As stated earlier, the immediate objectives are to encourage girls to enter and continue in secondary school, while the longer-term goals are to

lower fertility by delaying marriage and increasing contraceptive use.

Scholarships are awarded *solely* on the basis of residence in the project areas, and in 1985 were given to over six thousand girls. The stipends cover about one-half of a girl's annual total educational costs, which include tuition, textbooks, supplies, uniforms, and transportation during the rainy season. Each girl is assigned a bank account, and in the BACE project where most of the recipients live relatively close to banks, a significant by-product of the scholarship program has been to give girls the opportunity to learn how to use the banking system.

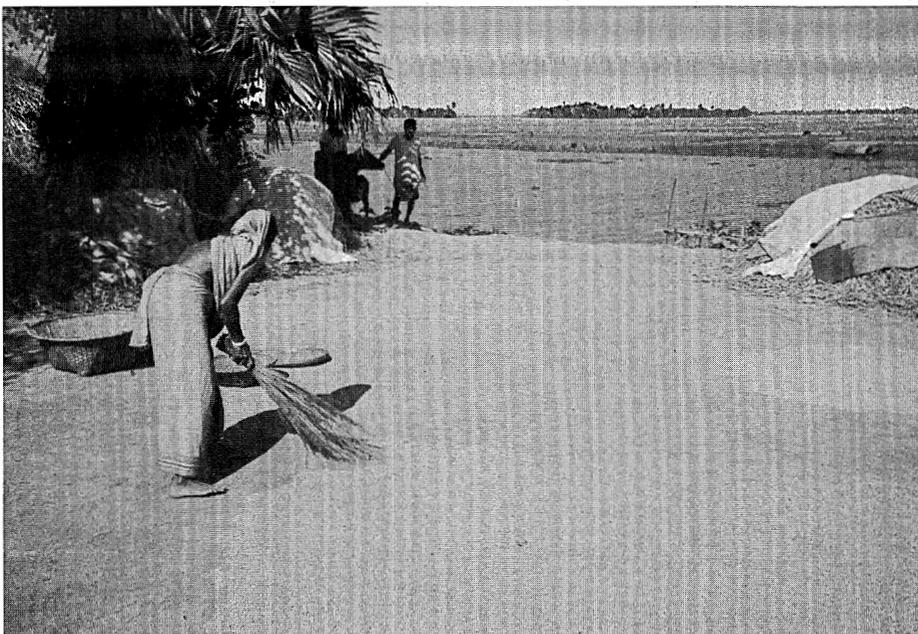
Schools whose female students receive scholarships are requested to improve facilities, especially, but not only, for girls. Many have responded by building tube wells and employing female attendants. Less progress has

been made in hiring female teachers and providing separate toilets for girls.

Nevertheless, the provision of scholarships seems to have begun to meet the short-term goals of the projects. For example, in the BACE project area in 1981 before the project was implemented, 27.3 percent of secondary students were female. In 1984, the percentage had risen to 43.5 percent (Ather 1984). Female dropout rates also declined from 23.3 percent in 1981 to less than 5 percent in 1984 (Ather 1983 and Ather 1984). The primary reason for scholarship students dropping out is marriage. Money is apparently not an issue (Ather 1985). Given the limited history of the SGS project, such figures are not available, but one indication of the project's effect is the fact that 3,100 female students showed up for secondary school in 1985, when only 2,600 were expected.

An attempt has also been made to assess the progress of the longer-running BACE project in meeting the demographic goals of the projects. A USAID-sponsored survey in 1985 (Ather 1985) solicited data on marriage and fertility attitudes and behavior from four different groups of girls: 383 scholarship recipients who had completed secondary school, 58 recipients who had dropped out, 200 nonrecipients who had completed primary school only, and 200 girls with no schooling. Married and unmarried females ranging in age from 16 to 20 years were included. Each educational group was matched by age; on average the entire sample was 17.2 years old.

As shown in the fourth row of Table 1, only 30 percent of the secondary-school completers had married



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Table 1 Fertility and marriage indicators by education group

	Secondary-school scholarship recipients		Nonrecipients	
	Completers	Dropouts	Primary- school completers	No school
1. N	383	58	200	200
2. Average age (years)	17.2	17.1	17.4	17.2
3. Number married	114	44	154	125
4. Percentage married	30	76	77	62
5. Mean age at marriage (years)	16.5	15.8	14.6	14.7
6. Mean marital duration (years)	1.5	1.6	3.9	3.7
7. Percentage of married females currently using contraception	53	48	12	14
8. Average number of births per married female	0.3	0.4	1.8	1.6
9. Interval between marriage and first birth (months)	16.4	16.2	20.2	18.5
10. Interval between first and second births (months)	20.4	22.0	23.3	21.7
11. Average number of births for all females (row 4 x row 8)/100	0.09	0.30	1.39	.99

Sources: Ather 1985; Martin, Flanagan, and Klenicki 1986.

by the time of the survey, in comparison to 76 percent of the secondary dropouts, 77 percent of the primary-school completers, and 62 percent of those with no school. Of those who had married, their average ages at marriage were 16.5, 15.8, 14.6, and 14.7 years respectively (row 5).

Awareness of the national population problem and knowledge about family planning varied with education among both the married and unmarried girls. The married secondary-school completers and dropouts were also more likely to be currently using family planning than their less-educated counterparts (row 7). Only 12 percent of the primary school completers and 14 percent of those

with no schooling were using family planning versus 53 percent of the secondary-school completers and 48 percent of the secondary dropouts. For the two more-educated groups, husband's resistance and desire for a baby were the most common reasons for not using, whereas the two less-educated groups cited lack of knowledge and religious reasons, as well as desire for a birth in the near future.

Variation of actual fertility by education group is less clear, because only a few years of experience have been documented. Table 1 shows for each education group the average number of births per married woman (row 8) and the interval lengths between marriage and subsequent births

(rows 9 and 10). The two more-educated groups have fewer births on average, but they have been married for shorter periods. In fact, the married women in the two more-educated groups have shorter intervals between marriage and first and second births than do women in the two less-educated groups. Of course, these figures are based on the experience of only those women who have already married and have had a child, so they do not necessarily reflect the ultimate experience of the different educational groups. Those in the two upper groups who have already given birth are probably among the most fecund of these groups, because overall the groups have had a shorter period of exposure to the risk of pregnancy than the other two educational groups (row 6).

If the average number of births per married female (row 8) is multiplied by the proportion who are married (row 4), the result is the average number of children for each education group, including both married and unmarried respondents (row 11). Given that each group is of approximately the same average age, one can conclude that keeping a girl in school from primary graduation to secondary graduation would avert on average 1.3 births (1.39 minus .09). Of course, this result represents experience only up to age 17.2, the average age at the time of the survey, and there is some hope that additional births would be averted later in each woman's child-bearing experience as a result of her higher education. On the other hand, it should also be emphasized that some girls would have continued with their schooling without the scholarship program, so not all of the births averted can be directly attributed to the project.²

Using the above very rough estimate and information on project and governmental education expenditures, one can attempt to calculate the cost per birth averted. Annual project costs per girl are \$41.71 and annual government expenditures per girl are \$2.72, giving a total of \$44.43 per year or \$222.15 for the five years of secondary schooling. Thus, the estimated cost per birth averted to age 17.2 years is \$170.88. This figure is significantly higher than the cost per birth averted as a result of the family planning service delivery program, which is roughly between \$50 and \$60 (Martin, Flanagan, and Klenicki 1986).

There has been no attempt here to quantify the nondemographic benefits of education, which are no doubt substantial. Furthermore, there might be additional indirect demographic benefits, such as a second-generation effect in which educated mothers

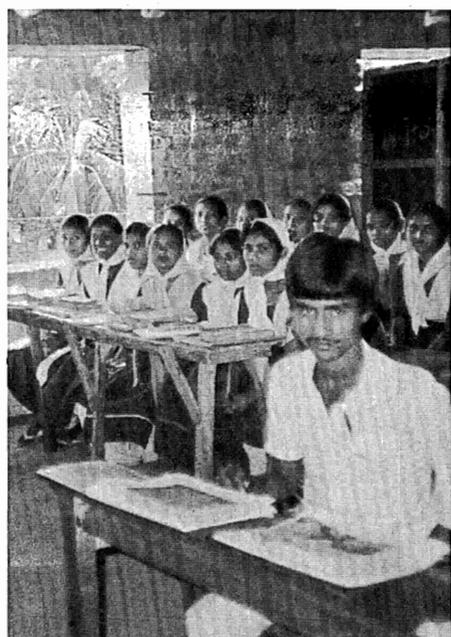
would be expected to have higher educational aspirations for their daughters.

It should be emphasized that the secondary-scholarship project is not the only type of educational project (let alone population project) that might be supported in order to reduce fertility. Even though women with primary schooling have as many or more children as women with no schooling, increased primary-school attendance would eventually increase the demand for secondary education. The Government of Bangladesh has given high priority in its Second and Third Five-Year Plans (1980-85 and 1985-90) to the development of primary education with the goal of achieving universal primary education by the year 2000—what is most likely an overly optimistic, but certainly laudable, goal.

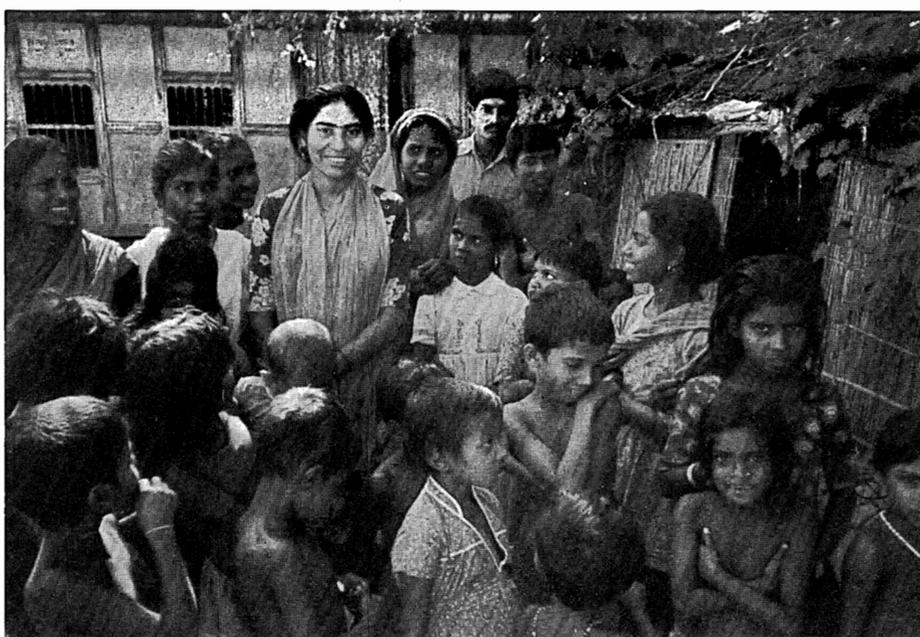
Other possibilities include adult literacy campaigns and programs

designed to change male attitudes about family planning and desired family size. In discussions with some of the scholarship students in the SGS project, the girls were adamant about limiting the number of children to two and did not show a strong preference for male children. The boys in the school were not so convinced. One boy indicated that he would continue trying to have a male child, even if his wife had already given birth to ten girls, and his male friends appeared to think this position eminently reasonable.

Clearly, there is much to be done in reducing population pressure and raising the standard of living in Bangladesh, and raising the status of women through education could be a valuable component in such efforts. Given limited resources, the challenge is to find the most cost-effective methods of accomplishing these tasks.



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NOTES

1. Funding for and monitoring of both projects has been implemented by USAID through the Asia Foundation since 1984.
2. The point that some girls would have continued school without scholarships is similar to the caveat that some family planning program acceptors would use contraception even without the family planning program. The magnitudes of these two phenomena may be quite different, though, and additional data would have to be collected to make an accurate comparison.

ACKNOWLEDGMENTS

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Estimating Census and Death Registration Completeness

by Kenneth Hill

Population censuses and vital registration systems are subject to omissions. A well-conducted census taken under not too unfavorable conditions will enumerate all but a few percent of the population, and it is rare for a census to enumerate less than 90 percent of the target population. The completeness of death registration, in contrast, varies widely, with many systems in developing countries registering less than half of all the deaths that occur in the population.

Where substantial omissions are known or suspected, it is essential to assess the completeness of coverage of the census and death registration data and to make some adjustment for omission. Various methods are available for this purpose. This article presents a new method for estimating the relative completeness of two census enumerations and of intercensal registered deaths. The method applies to any two censuses, no matter what the intercensal interval, and is simple to apply.

Background

The Growth Balance Equation was developed by Brass (1975) to estimate the completeness of death registration (or any distribution of deaths by age) relative to the completeness of enumeration of a census (or any other population age distribution). The method assumed (i) that the population was closed to migration; (ii) that the population was demographically stable, that is, that the population growth rate r was constant at, or above, any age a ; (iii) that the completeness of death recording, which for consistency with what follows we will denote by k_3 , was constant at all ages a after early childhood; and (iv) that the completeness of census coverage, k_1 , was constant at all ages a . The basic relationship proposed was that

$$\frac{N(a)}{N(a+)} = r + \frac{D(a+)}{N(a+)} \quad (1)$$

where $N(a)$ is the true density of population at exact age a , $N(a+)$ is the true total population above age a , r is the stable population growth rate, and $D(a+)$ is the true total deaths at ages a and over. Since in a closed population $N(a)/N(a+)$ is the rate of entry into the population aged $a+$, and $D(a+)$ is the loss rate of the population aged $a+$, equation (1) can be seen as a special case of the demographic tautology that, for any population, the entry rate equals the sum of the loss rate and the growth rate.

The estimation procedure was as follows. Given the error patterns specified by assumptions (iii) and (iv) above, and denoting observed quantities by the superscript o , equation (1) can be re-written as

$$\frac{N^o(a)}{N^o(a+)} = r + \frac{k_1}{k_3} \frac{D^o(a+)}{N^o(a+)} \quad (2)$$

Equation (2) indicates that there should exist a straight line relationship of intercept r and slope k_1/k_3 between $N^o(a)/N^o(a+)$ and $D^o(a+)/N^o(a+)$. Fitting a straight line to points for a series of ages a should thus estimate the stable growth rate r and the correction factor k_1/k_3 necessary to adjust for the coverage difference between deaths and the population, making possible the calculation of adjusted age-specific mortality rates and thence of any other mortality measures.

Around 1980, three methods were proposed for using similar information for any closed population, relaxing the assumption of stability. Martin (1980) noted that equation (1) could be thus generalized by allowing r to be age specific, that is, represented as $r(a+)$, if such age segment

growth rates could be estimated from two successive censuses. No explicit allowance was made, however, for the possibility that the two censuses might be of different completeness of enumeration. Preston and Hill (1980) and Brass (1979) proposed methods that sought specifically to estimate the relative coverage of two census enumerations and the completeness of recording of deaths relative to one census or the other. Though the methods of comparison differed, both methods essentially compared deaths for cohorts defined by age at the first census as recorded by vital registration with deaths for the same cohorts as indicated by change in cohort size from the first census to the second. This comparison, age by age, provided estimates of relative census coverage and completeness of death registration relative to one census or the other. The Preston-Hill method was found in practice to be most unstable because the cohort deaths obtained from the two age distributions were seriously distorted by age misreporting errors, particularly the increasing exaggeration of age as age increases. Luther (1983) uses a modification of the procedure to estimate relative census coverage, noting that such estimates are robust to typical age errors even though the estimates of death registration completeness are not. This problem of age exaggeration also affects the Brass method, though to a lesser extent because of the way the comparison is made with registered cohort deaths. The generalized Growth Balance Equation formulation of Martin is explicit in the Brass method. It may also be noted that both the Preston-Hill and the Brass methods are inconvenient to apply if the intercensal interval is not an exact multiple of the width, usually five years, of the age groups by which the basic data are tabulated.

Derivation of the Method

The method presented here can be seen either as an extension of Martin's formulation to allow explicitly for changes in census coverage or as a modification of Brass's method to use deaths by age group rather than deaths by cohort, preferable on the grounds that age group comparisons will be less distorted by age misreporting than cohort comparisons if the patterns of age misreporting are similar for two successive censuses. The starting point for the derivation of the new method is Martin's general equation for any closed population, that

$$\frac{N(a)}{N(a+)} = r(a+) + \frac{D(a+)}{N(a+)} \quad (3)$$

Rewriting this as

$$\frac{N(a)}{N(a+)} - r(a+) = \frac{D(a+)}{N(a+)}$$

we see that it may be regarded as giving two ways of calculating the death rate of the population over age a . The obvious and direct method is to divide deaths over age a by person years lived over age a , represented by the right side of the above equation. An alternative, indirect method is to calculate the difference between the "birth rate" and the growth rate of the population over age a , represented by the left side of the equation. If all the data involved are precisely accurate, the results of these two calculations will be identical. If numbers of registered deaths are too small due to underregistration, the death rate calculated directly from the right side of the equation will be too low. The death rate calculated indirectly from the left side will be accurate, however, so long as the population numbers are accurate. By comparing the two sets of rates we can estimate the completeness of the death registration data. This is the general idea of the method, but it turns out that with some further development we can estimate not only the completeness of death registration, but also the relative completeness of enumeration of the two censuses.

Let us assume that we have two census age distributions separated by t years and intercensal deaths by age group, that the first census was k_1 complete, the second census k_2 complete, and the deaths k_3 complete, and that k_1 , k_2 and k_3 are all constant with age. We can then express the true populations and deaths in terms of the observed populations and deaths and the completeness factors k . If $N1^0$ and $N2^0$ denote populations (of unspecific age or age range) from the first and second censuses respectively, and D^0 denotes intercensal deaths,

$$N1 = N1^0/k_1 \quad (4a)$$

$$N2 = N2^0/k_2 \quad (4b)$$

$$D = D^0/k_3 \quad (4c)$$

Turning to the specific elements of equation (3), let us define $r(a+)$ as the exponential growth rate of the population aged $a+$, that is,

$$r(a+) = \frac{1}{t} \log \frac{N2(a+)}{N1(a+)} \quad (5)$$

Substituting (4a) and (4b) into (5) and rearranging gives

$$r(a+) = r^0(a+) + \frac{1}{t} \log \frac{k_1}{k_2} \quad (5a)$$

where $r^0(a+)$ is the growth rate calculated from the observed population numbers,

$$r^0(a+) = \frac{1}{t} \log \frac{N2^0(a+)}{N1^0(a+)} \quad (5b)$$

The person years lived by the population age a and over can be calculated as the geometric mean of the initial and final populations age a and over multiplied by the intercensal interval t :

$$N(a+) = t[N1(a+)N2(a+)]^{1/2} \quad (6)$$

Substituting (4a) and (4b) in this expression gives

$$N(a+) = \frac{1}{[k_1 k_2]^{1/2}} N^0(a+) \quad (6a)$$

where $N^0(a+)$ is calculated from the observed values as

$$N^0(a+) = t[N1^0(a+)N2^0(a+)]^{1/2} \quad (6b)$$

Strictly speaking, there is an inconsistency between the geometric calculation of $N(a+)$ and the exponential calculation of $r(a+)$. The geometric calculation is necessary to the derivation, however, and as discussed in the Appendix, the discrepancy is inconsequential for small $r(a+)$ values.

$N(a)$ represents the entries to the population aged a and over during the intercensal period, that is, the number of people having a -th birthdays during the interval. The arithmetically simple way to estimate this number is by first estimating the person years lived in the five year intervals up to and from age a , as the geometric means of the corresponding initial and final populations, each mean being multiplied by t , and then taking the geometric mean of the two person years lived, divided by 5 as the age group width, as the number of intercensal birthdays. Thus

if $PYL[a, a+5]$ denotes the intercensal person years lived by the age group $[a, a+5]$, and $N1[a, b]$ and $N2[a, b]$ the numbers aged a to b at the first and second censuses, respectively,

$$PYL[a-5, a] = t\{N1[a-5, a]N2[a-5, a]\}^{1/2}$$

and

$$PYL[a, a+5] = t\{N1[a, a+5]N2[a, a+5]\}^{1/2}$$

and

$$N(a) = \frac{t}{5} \{N1[a-5, a]N2[a-5, a]N1[a, a+5]N2[a, a+5]\}^{1/4} \quad (7)$$

Substituting (4a) and (4b) in this expression gives

$$N(a) = \frac{1}{(k_1 k_2)^{1/2}} N^0(a) \quad (7a)$$

where $N^0(a)$ is calculated from the observed values by

$$N^0(a) = \frac{t}{5} \{N1^0[a-5, a]N2^0[a-5, a]N1^0[a, a+5]N2^0[a, a+5]\}^{1/4} \quad (7b)$$

This expression for $N(a)$ imposes substantial smoothing on the age distributions by taking geometric means around age a . Such smoothing is likely to be beneficial if irregularities in the age distribution arise mainly from age misreporting such as digit preference. However, if such irregularities mainly reflect true differences in cohort size, with little impact from age misreporting, they will still be smoothed away, with a consequent loss of accuracy. Under such circumstances, it is preferable to estimate the initial and final sizes of the cohort that passes through age a during the intercensal interval (for an interval t , this cohort is aged $(a-t, a)$ at the first census and $(a, a+t)$ at the second census). This estimation might be made by fitting polynomials of the necessary order to the two cumulated populations around age a , integrating the polynomials and evaluating them over the necessary age ranges. $N(a)$ can then be estimated as the geometric mean of the initial and final cohort sizes multiplied by t . The resulting expression

for $N(a)$ in terms of observed values k_1 and k_2 would be the same as that in (7) except that the right hand side of (7b) would be the square root of the product of the initial and final cohort populations.

The intercensal deaths $D(a+)$ are obtained by cumulating recorded deaths by age group across the entire interval to obtain $D^O(a+)$ values. However, the important feature of the $D^O(a+)$ series is its age pattern, since level should be adjusted for by the factor k_3 , so $D^O(a+)$ could be obtained by estimating average annual intercensal deaths and multiplying by the interval between the two censuses. Average annual intercensal deaths might be estimated by averaging recorded deaths for, say, the first, central, and last years of the intercensal period, or by using annual deaths for a year near the middle of the interval, depending on data availability. However $D^O(a+)$ is obtained, the corresponding true deaths are given by

$$D(a+) = D^O(a+)/k_3 \quad (8)$$

Formulas (5-8) express the various elements of the basic equation (3) in terms of observed values and the coverage factors k . Re-arranging and canceling where possible gives our final estimation equation:

$$\frac{N^O(a)}{N^O(a+)} - r^O(a+) = \frac{1}{t} \log \frac{k_1}{k_2} + \frac{(k_1 k_2)^{1/2}}{k_3} \frac{D^O(a+)}{N^O(a+)} \quad (9)$$

This equation is of the form $Y = A + BX$, where Y is the left hand side, X is the $D+/N+$ term, the intercept A estimates $[\log(k_1/k_2)]/t$, and the slope B estimates $(k_1 k_2)^{1/2}/k_3$. Using some fitting procedure to fit a straight line to the points (X,Y) for different ages thus provides estimates of relative enumeration completeness and of the completeness of death registration relative to the average enumeration completeness. Given any one factor k , we can estimate the other two. For instance in developed countries with complete death registration, k_3 could be set equal to unity and k_1 and k_2 could be estimated. More typically, our interest is in estimating mortality by obtaining consistent denominators and numerators for central age-specific mortality rates. For this purpose, we can arbitrarily set k_1 or k_2 equal to unity, and estimate the remaining two factors relative to k_1 or k_2 .

Illustrative Application

Table 1 and Figure 1 show the results of an application of the new method to the female population of South Korea between 1970 and 1975. In this case the intercensal interval is exactly five years, but the calculations would have been similarly simple regardless of the length of the interval. This application was chosen because the same data were used by Bennett and Horiuchi (1981) to illustrate their pioneering procedure for using age-specific growth rates to assess the completeness of death registration. For the sake of clarity Table 1 has many columns, but the simplicity with which the method can be applied and its freedom from inconvenient assumptions about the open interval or the distribution of deaths within age groups are evident.

The plot of the two death rate measures, that based on the age distributions, $N^O(a)/N^O(a+) - r^O(a+)$, and that based on recorded deaths, $D^O(a+)/N^O(a+)$, is shown in Figure 1. There is clearly a close linear association, especially for younger women. However, the points for older women, especially for ages 75+ and 70+, tail off quite sharply to the right; this effect probably arises from exaggeration of the age at death of the elderly. Close inspection suggests that this pattern starts above age 60, so estimates have been obtained by fitting a line to the points up to and including 60+; it may be noted in passing that Bennett and Horiuchi in their analysis also used an open age group of 60+. A least squares line fitted to the points from 5+ to 60+ has an intercept of -0.0009 and a slope of 1.600, with an R^2 of 0.994. A simple robust fitting procedure, of dividing the points into two equal groups according to their ordinate values and finding the line that passes through the average point of each group, gives a slightly larger slope and slightly smaller intercept. The closeness of fit of the lines to the points suggests that the assumptions of the method are approximately met at least up to age 60.

Accepting the parameters of the least squares line, we have from the estimation equation (9),

$$[\log(k_1/k_2)]/t = A = -0.0009$$

and

$$[(k_1 k_2)^{1/2}]/k_3 = B = 1.600$$

Solving the first of these equations for the ratio k_1/k_2 , we obtain

$$k_1/k_2 = \exp\{tA\} = \exp\{5 \cdot -0.0009\} = 0.9955$$

Arbitrarily setting k_1 equal to unity, thus expressing other factors relative to the coverage of the first census, gives

$$k_2 = 1/0.9955 = 1.0045$$

The 1975 census was thus some 0.45 percent more completely enumerated than the 1970 census.

The second equation is solved for k_3 as $k_3 = [(k_1 k_2)^{1/2}] / B$. Putting $k_1 = 1$, we obtain $k_3 = 0.626$ and so estimate the registration of deaths to have been 62.6 percent

Table 1 Illustrative application of generalized growth balance method: Female population of South Korea, 1970-75

Age group	Population		Deaths 1971-75	$N1^0(a+)$	$N2^0(a+)$	$D^0(a+)$	$N^0(a)$	$N^0(a+)$	$r^0(a+)$	Y	X
	10/1/70 (1)	10/1/75 (2)									
0-4	2087	2038	28533	15653	17236	373.9	*	82127	.0193	*	*
5-9	2183	2151	16381	13566	15198	345.4	2114	71794	.0227	.0067	.0048
10-14	2119	2179	12141	11383	13047	329.0	2158	60933	.0273	.0081	.0054
15-19	1515	2023	14223	9264	10868	316.9	1940	50170	.0319	.0067	.0063
20-24	1224	1511	14284	7749	8845	302.7	1543	41394	.0265	.0108	.0073
25-29	1107	1236	13003	6525	7334	288.4	1261	34588	.0234	.0131	.0083
30-34	1084	1093	12958	5418	6098	275.4	1128	28740	.0236	.0156	.0096
35-39	939	1078	13095	4334	5005	262.4	1046	23287	.0288	.0161	.0113
40-44	771	915	14435	3395	3927	249.3	919.3	18257	.0291	.0212	.0137
45-49	656	749	16006	2624	3012	234.9	767.3	14057	.0276	.0270	.0167
50-54	518	621	18915	1968	2263	218.9	630.5	10552	.0279	.0318	.0207
55-59	447	490	21247	1450	1642	200.0	515.2	7915	.0249	.0419	.0259
60-64	363	403	26530	1003	1152	178.7	423.1	5375	.0277	.0510	.0333
65-69	253	313	29325	640	749	152.2	328.1	3462	.0315	.0633	.0440
70-74	195	202	31823	387	436	122.9	236.3	2054	.0238	.0912	.0598
75-79	114	136	31403	192	234	91.0	157.2	1060	.0396	.1088	.0859
80-84	57	65	29555	78	98	59.6	87.06	437	.0457	.1535	.1364
85+	21	33	30072	21	33	30.1	*	132	.0904	*	*

Notes

1. The population figures in columns (1) and (2) are from the United Nations *Demographic Yearbook*, 1978, *Historical Supplement*, table 3. Numbers in thousands. The female deaths in column (3) are from Coale, Cho, and Goldman (1980), table 6. Columns (4), (5), and (6) cumulated from columns (1), (2), and (3) respectively (all in thousands).

2. The $N^0(a)$ values in column (7) are calculated from formula (7b), $N^0(a) = \frac{t}{5} \{N1^0[a-5, a]N2^0[a-5, a]N1^0[a, a+5]N2^0[a, a+5]\}^{1/4}$.

3. The $N^0(a+)$ values in column 8 are calculated from formula 6(b), $N^0(a+)t = [N1^0(a+)N2^0(a+)]^{1/2}$.

4. The $r^0(a+)$ values in column (9) are calculated from formula (5b), $r^0(a+) = [\log(N2^0(a+)/N1^0(a+))]/t$.

5. The estimation equation is
$$\frac{N^0(a+)}{N^0(a)} - r^0(a+) = \frac{1}{t} \log \frac{k_1}{k_2} + \frac{(k_1 k_2)^{1/2}}{k_3} \frac{D^0(a+)}{N^0(a+)}$$

This has the form $Y = A + BX$, where $Y = [N^0(a+)/N^0(a)] - r^0(a+)$, $X = D^0(a+)/N^0(a+)$, $A = [\log(k_1/k_2)]/t$, and $B = [(k_1 k_2)^{1/2}]/k_3$. The values of Y and X are given in columns (10) and (11) respectively. The least squares line fitted to these (X, Y) values has intercept $A = -0.0009$ and slope $B = 1.600$. From this we deduce (a) that $k_1/k_2 = 0.9955$, indicating that females were 0.45 percent more completely enumerated in the 1975 census than they were in the 1970 census; and that (b) putting $k_1 = 1$, gives $k_3 = 0.626$, indicating a completeness of death registration, relative to the 1970 census, of 62.6 percent.

complete relative to the first census. Bennett and Horiuchi arrive at an estimate of death registration completeness of approximately 65 percent using the same data. The difference between the two estimates is in the expected direction. Higher enumeration completeness at the second census will inflate age-specific growth rates $r^0(a+)$. In the Bennett-Horiuchi formulation, this exaggeration of growth rates will increase the population of each age a calculated from deaths and growth rates over age a , and so make registered deaths appear to be less incomplete than they actually are.

Given the positive growth rates over each age a , any bias in the current method's estimate of k_1/k_2 is likely to

be in the direction of overestimating this ratio (see Appendix), so in this application the estimate of coverage differential should be regarded as a minimum. If the parameters of the least squares line are accepted, adjusted age-specific mortality rates for the age range 5 to 60 can be obtained by adjusting one of the populations and the intercensal deaths so that both are consistent with the other population. For example, to be consistent with the first census, the population of each age group from the second census should be multiplied by 0.9955, and intercensal deaths for each age group should be divided by 0.626. A life table above age 60 could then be obtained by fitting a suitable model to the age-specific mortality rates for ages 5 to 60. Estimates of infant and child mortality will generally have to be obtained independently, since the registration of deaths under age 5 is generally less complete than that of deaths above age 5.

Conclusion

Even quite small changes in coverage from one census to the next can have large effects on demographic estimates derived from comparisons of two censuses. This paper proposes a simple method for estimating simultaneously the relative coverage of the two censuses and the completeness of registration of intercensal deaths. The key assumptions of the method are that the population is closed to migration and that all the coverage factors involved are invariant with age, at least for the age range studied. Initial applications of the new method are reasonably encouraging, though further applications are required to assess the general applicability of the method. Analysis of the sensitivity of the estimates to the assumptions and further work on extending the method to open populations would also be useful.

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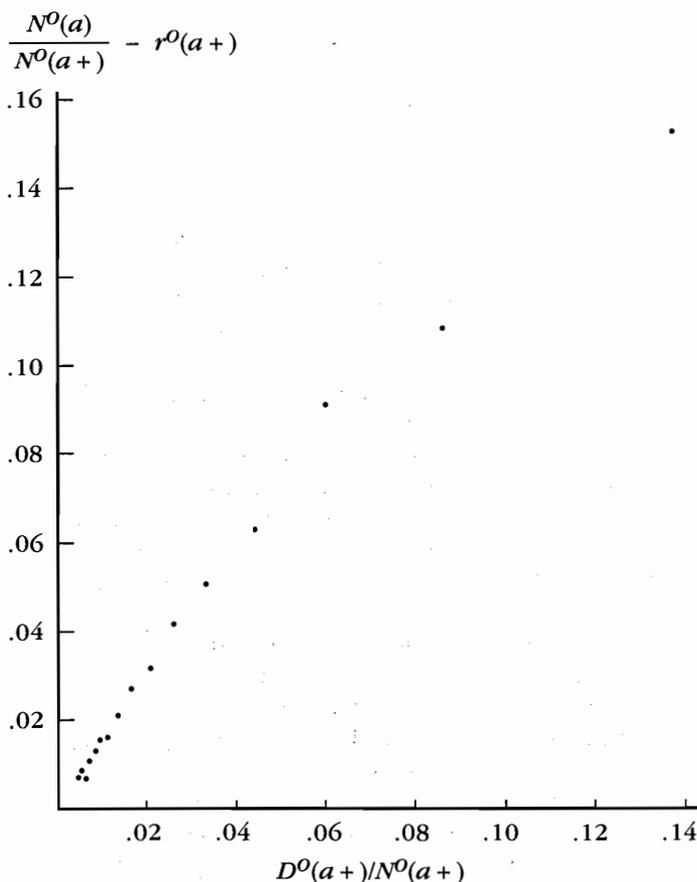


Figure 1 Illustrative application of generalized growth balance method: Female population of South Korea, 1970-75

(continued on page 23)

Escape Route to Dependency? Female Migration from Sri Lanka to the Middle East

by Grete Brochmann

A significant feature of the world economy during the 1970s was the expanding international trade in labor. For many developing countries, remittances from citizens temporarily working abroad became a major source of foreign exchange and contributed to the reduction of trade deficits.

Labor migration has also become a major *social* issue, as large numbers of people leave home and family for lengthy stays in strange lands. A dramatic event for the individual migrant, it affects also the culture, organization of production, and pattern of consumption in the migrants' local communities.

It is a worldwide and an old phenomenon, and it offers a wide range of aspects for study. Studies of today's more common kind of migration, temporary contract circulation, have mostly been confined to male migration. The man gets a short-term work contract in another country, leaving the rest of his family behind. The role of the woman in this context is to maintain the household and possibly undertake agricultural production or other economic activities while the man is away. Although women are therefore a part of the

whole system of migration, they are seldom regarded as active participants in it.

This article looks at labor migration with the sex component turned upside down, where the *woman* leaves hearth and home in search of work in distant lands. The sending country is Sri Lanka, and the women migrate as maids to Arab households in the Gulf area.

International division of labor

Labor migration is a dynamic social process and can be analyzed on different levels. At the lowest level is the individual migrant, and at the highest is international society, with numerous gradations of family and society in between.

The aggregated movements of the individuals affect the other levels, and at the same time societal structures create and maintain forces that act upon the individual migrants but lie outside their spheres of influence. The interplay between these elements determines the nature and extent of migration.

Labor is a resource for the developing country in more or less the same way as raw materials and a favorable infrastructure can be. Sri Lanka has advertised itself internationally as

having the "cheapest labor in Asia." Cheapest of all is female labor, increasingly utilized as wage labor within Sri Lanka's tourist sector, free-trade zones and, not least, labor-export sector.

Labor migration must be understood in the context of the economic and social development that has made migration possible, or rather *pushed it forward*. The internationally founded relations are central. On the one hand there is the Lankan adoption of an *export-oriented strategy of industrialization*, with the change of government in 1977. This strategy included a liberal import policy that contributed to raising the population's expectations about its living standard and consumption. On the other hand we find the oil boom in the Middle East in the beginning of the seventies, which led to an increased need for labor power.

The export of labor from Sri Lanka started on a large scale after 1977. The liberal economic policy of the new leadership allowed huge amounts of imported goods to flow into the country (radios, television sets, refrigerators, furniture, canned food, etc.). This policy created deficiency of foreign revenue, a heavy rate of inflation, and a gap between real incomes and new expectations of a higher level of consumption.

For the Lankan state the new policy meant an increased need for foreign currency; for the families the situation made it hardly possible to maintain a household on the traditional source of income.

Because labor needs in the Middle East region could not be satisfied nationally, males were imported from abroad in large numbers to work in the comprehensive development projects. After some time, demand for female labor for housework was created by the increasing prosperity of Arab families. Since this sort of work was not considered appropriate for Arab women, foreign female labor also had to be imported.

Sri Lankan women have been widely used in this sector because they are the cheapest and because other labor-exporting countries in the region (India, Bangladesh, Pakistan, and Indonesia) have placed restrictions on the export of female labor.

Escape route for the government

The increased demand for labor in the Gulf also gave the Sri Lankan government a means to remedy its economic problems, at least in the short run, by supplying the country with hard currency, alleviating domestic unemployment, and partially fulfilling the people's increased expectations.

Today, the export of labor is the second biggest source of foreign earnings of the state (Ministry of Plan Implementation, 1985) and females constitute the largest single group of labor migrants. The number of women who travel every year is difficult to ascertain, but there is little doubt that it has been increasing sharply since the commuting started.

The migration to the Middle East is usually based on a labor contract arranged through recruiting agencies located more or less throughout Sri Lanka. Fewer than half of the agencies are registered with the authorities (Ministry of Plan Implementation 1985), and illegal recruiting activities flourish. A significant number of women arrange Gulf jobs through friends and relatives who are already there.

In spite of the burdensome labor situation the women expect to face overseas, the fact that they keep lining up in steady streams at the recruiting agencies perhaps reflects the seriousness of the social and economic problems they face at home.

Female migration and gender relations in the communities

Having (in very broad terms) set the international and domestic scene, I now turn to the social and economic processes acting at the household and community levels when the women leave. Specifically:

- What are the impacts of female migration on social mobility? If upward mobility is taking place, how lasting is this phenomenon when the woman stops migrating? How are migration and social strata correlated in the first place, and what is the impact of migration on patterns of differentiation? Does it reemphasize an already existing mode of differentiation, or does it contribute to leveling out differences?

- How do the remittances from abroad affect the local economy? Are there other groups beside the migrants' households that benefit from the petro-dollars?

- On the social and cultural side, how does the Middle East migration affect the lives of the women themselves? How are they looked upon by the community and by society in general? What impact does their experience of a different world have on their environment? How does the exodus of the women affect family life, division of labor, and relations within the household?

Many of these questions are difficult if not impossible to answer, at least in the near term. Nevertheless, they form part of a problem complex that might be investigated further in the future.

The findings presented here—tentatively and in brief—are based on qualitative and quantitative data obtained from observation, from semi-structured and structured interviews with female migrants and their families, from other key informants, and from documentary studies. Samples were selected from areas of Colombo that have substantial numbers of migrants, and also from the district of Hambantota in the south of the country. Most of the women from Colombo who migrate are married Sinhalese, and Buddhist. They live in shanty areas of the city. Hambantota was selected to provide a sample of migrants from a very different context. Most of the women who migrate from that area are married, Muslim, and live in rural villages or fishing communities.

A village of "mobile maids"

Whether one walks around the slums of Colombo or in the back streets of a fishing village in the south, visual signs of the Gulf traffic are prolific. It seems as though every other house is

a newly-built (or half-finished) brick house, sometimes with a showy entrance and maybe a TV antenna on the roof, all in striking contrast with the palm leaf hut in the back yard that was the family seat. Inside, one's eye is usually drawn at once to a disproportionately large glass showcase in a strategic spot in the living room, its shelves loaded with status symbols—sophisticated toys, glassware, and electric kitchen gadgets (irrespective of whether the house has an electricity supply). The women themselves often bear signs of their recent stay abroad: gold jewelry and significantly better clothing than their nonmigrating sisters. In the very hot Hambantota area they wear the long-sleeved heavy frocks they were used to wearing in the Gulf.

There is certainly variation to this typical migrant community, but in general the materialism is striking. It is also a most powerful and effective stimulus for migration. Everybody wants a share of the bounty.

Survival strategy

There is one clear aspect of female migration: it is almost without exception the poorest strata of society that send their women to the Gulf as housemaids. The reasons for this must be sought in both the economic and the sociocultural fields.

Salaries in the Arab countries are high compared to the remuneration for equivalent work in Sri Lanka—usually 8–10 times as high. They are also high compared to the general wage level for unskilled labor (male or female) in Sri Lanka. However, three factors tend to reduce the value of wages earned in the Middle East:

First, for a majority of the migrants there are high social costs involved. It is not out of a sense of adventure that

young mothers leave behind their small children for periods of two years in exchange for uncertain prospects in a strange country. Second, there are high transaction costs just to obtain a Gulf job. The agencies that recruit women often charge a fee amounting to 7,000 rupees—about 3 months' salary from the Middle East. This might imply that the poorest people could not afford to go, but trailing in the wake of the recruiters are moneylenders with instant loans. In these cases the additional cost of interest is considerable. Third, sociocultural aspects also have an impact insofar as performing paid housework tends to be regarded as a low-status occupation and is therefore less attractive to households that have alternative means of income.

The main driving force behind the female exodus is the need for sup-

plementary income, or sometimes any income at all. There are hardly any local possibilities of employment for these poor, unskilled women. It is characteristic of their households that only the combined efforts of the whole family make subsistence possible. A common feature of these households is that *no one* has any stable income whatsoever. For them, Middle East employment has thus become the prime means of family maintenance.

Target savers

One category of migrants (male or female)—often called “target savers”—is motivated to migrate primarily by the chance to accumulate quickly some targeted amount of savings. The wage differential between the home country and the host country clearly caters to this, though there are some



Sri Lankan village now has a video shop as a result of Middle Eastern money.

asymmetrical effects on the standards of living of different income groups.

There are variations in the propensity to save and invest in lasting assets. Building or extending the house is almost invariably given high priority, and most of the migrant households seem to spend at least some money on this. If any other member of the household besides the migrant has a permanent income, however small, the likelihood that some saving and economic planning takes place is significantly higher. The number of dependents, of course, also has an impact. But where, as is often the case, there is hardly any other source of income, most or all of the migrant's income is spent on daily consumption and maintenance of the family. In such cases, one contract in the Gulf may not solve the household's basic problems. Almost on the contrary: having become used to a fairly high, regular monthly income, the family faces difficulties when the contract is terminated. Consequently, repeat migration is common. The poorest families have sent their women abroad 3 or 4 times already.

The more fortunate families invest in some lasting goods: a better house, furniture, electricity, or TV set, cassette player, jewelry, and so on, but hardly anyone invests in income-generating activities to get off the ground and independent of future migration.¹ Unmarried women who save for their dowries *do* invest in their future, in a sense, as do parents who spend money on their children's education. However, so far this kind of investment does not seem very prevalent.

As for economic repercussions on the migrants' communities, some local demand is definitely generated. For example, daily-paid housebuilding

jobs are created for the men. Much more significant is the mushrooming of moneylenders who sometimes seem to be the real beneficiaries of the migration. The heavy demand for instant cash to pay the (illegal) agent fees creates a seller's market. The interest rate is commonly 20% per *month*.

Exposed to the world

Interviewing the "Dubai women," as they are sometimes known, opens doors to many dramas of daily life. Watching them walk with their few belongings toward a Boeing 747 and a completely strange destination is a poignant experience. This striking challenge to structural and traditional limitations is likely to have a significant impact on the lives of these women, as well as on their society.

The traffic has certainly changed the economic role of the woman in the family social context. When she is abroad she becomes the main, if not the sole, breadwinner. Having daughters has now become an asset: more daughters mean more potential migrants; before they were mainly an expense—someone to be supplied with a dowry. Domestic work has become a skill that can be sold on the international labor market. The "invisible training" that takes place within the household is valuable all of a sudden.

There are some indications that the status of the woman in her household and her local community is also changing. Educated and well-off people seem to look down upon the Middle East maids because of the very low status accorded to housework, in Sri Lanka and elsewhere. Some middle-class men told me that they would never consider sending

"their women" to another man's house. On the other hand, within the sending communities migration means access to the status symbols so ostentatiously displayed.

Resentment from the middle classes could also reflect envy of the easy money made by the lower classes in the Middle East. The middle classes themselves face an uphill struggle to maintain their standard of living. Members of the lower-middle class find themselves confronted with a dilemma: whether to accept a substantial squeeze on their standard of living by staying at home, or whether to alleviate their problems through migration (Mohamed Adel-Fadil 1985). Their status is threatened by the vast groups within the lower classes who achieve some improvement in their living standards through the petrodollars.

The question of status within the migrating communities needs some qualification. The economic aspect may be predominant, but role conflicts arise in the wake of the females' going abroad.

The inclination of women to participate in income-generating activities depends largely on their ability to manage multiple roles; i.e., their economic activities are inclined to be compatible with their reproductive role, particularly child rearing. Often the income-generating activity is a direct extension of their domestic responsibilities, as for example within the so-called informal sector. In the context of Middle East migration this picture applies only to a certain extent. The work in the Arab households is certainly compatible with the traditional sphere of female work. It is *reproductive* work, although it is for a wage. At the same time the women are geographically removed

from their own reproductive chores, which means that they cannot comply with their daily sex role within Sri Lankan society. They cannot raise their own children, take care of the other household members, or keep up the house.

Though the Middle East work is compatible with their traditional sex role in terms of the kind of work they are undertaking, the fact of their leaving represents a threat in that their men folk are deprived of daily control over them. Living in a stranger's house can lead to suspicion, which may lead in turn to a bad reputation in the women's local community. People within the migrating communities say they suspect that "there is a lot of prostitution going on over there among the Sri Lankan women." (This probably reflects attitudes more than reality.) The "Dubai women" (and their households) may achieve higher status, but perhaps at the expense of their reputation in society. And it is questionable how lasting will be their change in status when the jobs abroad dry up.

Cultural diffusion

Not only are the migrant women themselves exposed to a very different society (the Sinhalese more so than the Muslims), with different values and ways of living but also the whole community at home gets a concept of "abroad." On streetcorners close to the slum pockets of Colombo, streetsellers offer passport application forms alongside their regular wares; in the villages of Hambantota the postman carrying a bunch of airmail envelopes under his arm now is a common sight; and "Dubai" cartoons appear regularly in the newspapers.



A nonmigrant household in southern Muslim village of Sri Lanka.

The Dubai Syndrome

Throughout the whole South Asian region the term "Dubai Syndrome" refers to a sense of disorientation resulting from harsh working conditions, social isolation, culture shock, and psychosomatic disorders. However, data on this are hard to collect in the short term, and lack of data prohibits a full examination and analysis of the syndrome. It is also difficult to isolate the effects of migration from other factors.²

Nevertheless, many of the married migrant women leave behind small babies, some as young as two months old. Doubtless this causes stress both for the woman and the child. Interviews with school principals also indicate changes in behavior among the "Middle East children."

Female migration and the state

Turning to the overall effects of this phenomenon of migration on society as a whole, I would like to focus briefly on the list of pros and cons from the point of view of the sending governments, and see how some of them relate to *female* migration.

One adverse effect of migration for the state that does not apply to the migrating maid is the brain drain or skill drain. The maids seldom have had a paid job in Sri Lanka prior to their departure and have not had any expensive training. Not counting possible long-term social costs, Sri Lanka so far has probably had a net economic gain from female labor exports. And the women do not expect to seek employment upon their return to Sri Lanka, as the men do. With these two important exceptions, most of the adverse economic effects such

as inflation and dependence on migration as a source of foreign income are similar for both male and female migration.

On the other hand, the gains to society could be more substantial. First, the salaries are significantly higher, which means that the foreign income per person is also higher. Consequently the ability of saving and possibly investing should be better. Second, the skills obtained in the Middle East could also have some benefit to Sri Lankan society after the women return.

The majority of the migrants are now female and their share is increasing. The prospects for continued male migration are fairly low—indeed, the government fears that it will come to an end in the not-too-distant future. However, the government expects growth in the female contingent in the years to come; therefore the importance of female migration will increase: a relative example of “the comparative advantage of women’s disadvantages” (Charlton 1984).

Dilemmas for development

From the state’s point of view, there are strategic dilemmas attached to labor migration. It may merely postpone or temporarily displace internal structural problems in the economy, unless the society has the productive capacity to absorb the exported labor upon repatriation. And the consequences may be different at the individual and the aggregated levels: the individual migrant may experience improved living conditions, but at a cost to the state of greater dependen-

Transitory income—future dependency?

In a southern agricultural district in Sri Lanka some miles inland and dominated by fairly well-to-do Singhalese rice farmers is a small Muslim village surrounded by Singhalese landholders. The village main street is flanked by rows of attractive four- or five-room middle-class houses—many of them only half finished—with wooden window frames and tiled roofs. All but two of the 50 households have at least one woman working in the Middle East.

Before the first woman left the village in 1980, the houses were all palmleaf huts. The village was poor, since no one had land nor any other permanent source of income. The men earned some money as daily-paid labor in the Singhalese paddy fields, and most households received government support in the form of food stamps.

Soon after the first contingent of maids returned from the Middle East, the house projects started. The bright new prospects encouraged the pioneers to build big, nice houses, setting the standard for the whole village. In this particular village, everything left over from daily living expenses is invested in housing. Not a single chair or cassette player is to be seen inside the houses. Hardly any of the houses are completed: the standard was evidently set too high.

After the exodus had begun, the men stopped

whatever work they used to do and instead began supervising their own housebuilding or helping to build neighbors’ houses.

The households spend an increasing portion of the Middle East money on daily consumption. Most households told me that they had increased spending on food and daily living because of the external money. At present the village is almost completely dependent on this source of income. But there is no land to be bought and there are no prospects for employment in the neighborhood.

For these households the Middle East offers an escape route from pure poverty. But it could be a serious trap. When the day comes that the women have to stay home (for whatever reason), the households will most probably be back to square one, or worse. The population will have increased on the fixed amount of land and the investment in housing will have been so substantial that moving out of the village will appear impossible.

There are many places in Sri Lanka like this little Muslim village, although perhaps not as extreme. Even though the escape route to the Middle East provides badly-needed supplementary income today, it may prove to offer only a fleeting and costly glimpse of Mecca.

cy on migration, or the other way around.

The prospects for Sri Lanka are uncertain. The government expects the contingent of female migrants to grow, though against this is the fact that Sri Lanka now faces stronger competition in female labor exports from other countries in Asia—notably the Philippines and India. Sri Lankan maids are considered “cheap,” but in a double sense: they are paid less, but the quality of work is alleged to be commensurate and there have been complaints about their poor educational standard.³

Changes within the Arab economies may also influence the propensity to employ foreign female labor in the future. The demand is influenced by the general prosperity and by the domestic labor market in the Gulf countries. In addition, signals coming

from some of the Arab receiving countries lately indicate concern about the undermining of Muslim culture by the influence of large groups of workers from other ethnic and cultural backgrounds. This applies particularly to those housemaids whose duties include raising Arab children. A consequence of this is that *Muslim* Sri Lankan women are presently in relatively high demand in the Gulf.

Given these dilemmas and uncertainties, the labor export business seems to create vulnerabilities both for the Sri Lankan state and for the migrants' households.

NOTES

1. This description of conspicuous consumption is a common feature of studies of migrating communities in developing countries and often has moral connotations. What is

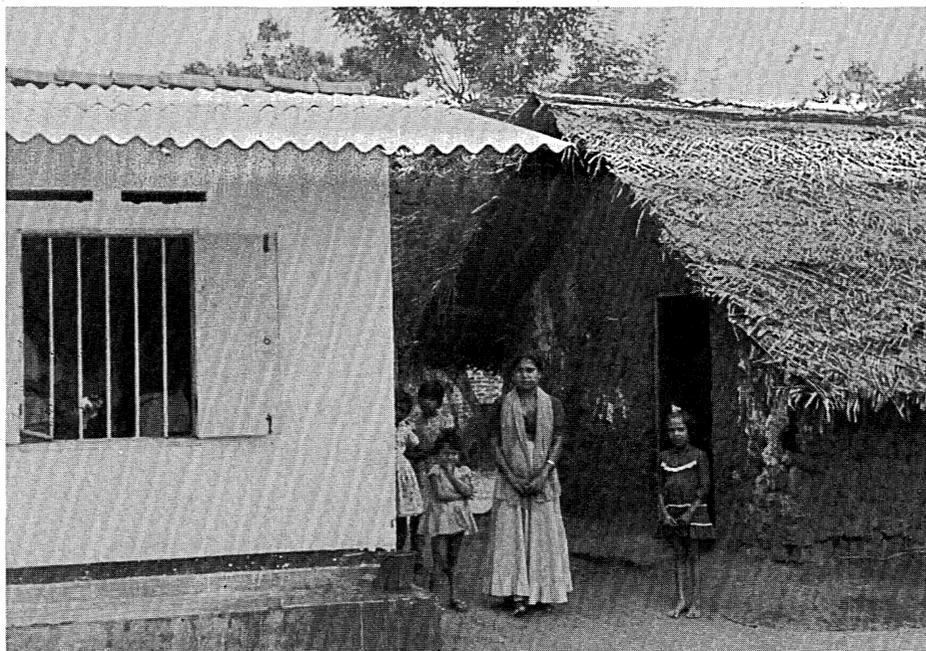
important is to ask what are the *alternatives* to the prevalent pattern of expenditure; whether any “rational investment avenues” are available. Riad Tabbarah (Tabbarah:1985) observes that the expenditure of migrants' families is generally similar to that of other families at their new and higher income levels, and the differences (e.g., higher proportions spent on housing construction and repayment of debts) reflect their recent, more modest origins. He also stresses that in conditions of underdevelopment, increased consumption, particularly in education, nutrition, and housing, often has a long-term effect, as productive investments in human capital.

2. The data available in this field are usually not longitudinal and are not able to indicate whether a situation might have occurred without external migration. Differentials between migrant- and nonmigrant households may be indicative but do not provide conclusions about the causal relationship between labor migration and social changes (Shah and Arnold 1985).

3. Information from Sri Lanka, Ministry of Labour, February 1986.

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GRETE BROCHMANN

With earnings from Dubai, migrants are able to upgrade their Sri Lankan homes.

by Alice D. Harris

Migration and Settlement: A Multiregional Comparative Study, edited by Andrei Rogers and Frans J. Willekens. Dordrecht, Boston: D. Reidel Pub. Co., 1986. xix, 496 pp. US \$54.00 ISBN 90-277-2119-X.

The population problem in most regions of the world has two dimensions: growth (both positive and negative) and spatial distribution. Concern about population growth has led to studies of fertility and the effectiveness of family planning programs. The issue of population distribution has just begun to receive attention as countries attempt to stem rural-to-urban migration and regulate population movement to new economic areas. To understand better the mechanisms behind population movements, the International Institute for Applied Systems Analysis (IIASA) in Laxemburg, Austria, undertook in 1976 a multinational study of internal migration and population distribution patterns in the countries of its member organizations. The study, in which scholars from 17 member organizations participated, incorporated recently-developed techniques of multiregional demographic analysis as its framework. It was concluded in 1982, and its principal products of six research reports and 17 national case studies are available from IIASA in a three-volume boxed set. The theory, applications, and the data reported therein form the basis of this book.

Part 1 describes the Migration and Settlement Study, summarizes the

contents of the work, and considers details related to the study's data base. It explains and contrasts the two accounting frameworks used in the case studies: movement accounts, which focus on migrations as recurrent events, and transition accounts, which focus on migrants and their places of residence at different times.

Part 2 is a report of the attempt to use age-specific fertility, mortality, and migration data for 139 regions in 17 countries to make regional comparisons.

Part 3 indicates that most of the IIASA countries have levels of reproduction below replacement. Population aging and spatial redistribution are the focus of chapters in this section.

Part 4 is devoted to a brief exposition of multiregional mathematical demography and to the methodological advances generated by the Migration and Settlement Study in life table construction and in stable population theory. Chapter 10 presents the crux of the life table construction problem: the estimation of age-specific survival probability transition matrices using data on interregional moves or on interregional transitions. It demonstrates that a stable population across ages and regions is implicit in any multiregional population projection matrix, although it may be subject to short-run fluctuations.

The concluding chapter sums up the accomplishments of the study in spatial population dynamics, measurement and analysis of migration patterns, and formal demographic methods for modeling

transitions between states other than regions.

This work presents in a single source much of the research reported earlier in numerous IIASA working papers, reports, and reprints. Some of the mathematical demography in part 3 may be hard going for general readers. For those who just want to understand the significance of the study itself, it would be better to read parts 1 and 2 and the conclusion. Executive Report No. 9 from IIASA provides a brief overview of the study and is suitable for those without time to read the entire book. Copies of *Migration and Settlement* can be ordered directly from Kluwer Academic Publishers, 190 Old Derby St., Hingham, MA 02043, USA.

Fertility in Developing Countries: An Economic Perspective on Research and Policy Issues, edited and introduced by Ghazi M. Farooq and George B. Simmons. New York: St. Martin's Press, 1985. xxiv, 523 pp. US \$37.50. ISBN 0-312-28752-6.

In 1972 the International Labour Organisation (ILO) began receiving generous financial support from the United Nations Fund for Population Activities to conduct a program of research and publication on the interrelationships among population growth, economic development, and labor mobility. Within the last ten years the program has produced a prodigious quantity of working papers and monographs on topics ranging from household economics to community-level and individual

fertility variables in family size. The dominant theme in nearly all the research has been fertility. The present book, *Fertility in Developing Countries*, reports the conclusions drawn from many of the earlier publications as well as new ideas on the integration of demographic and economic factors prevalent in academic circles today.

Edited by Ghazi M. Farooq of the ILO and George Simmons of the Center of Population Planning, University of Michigan, the volume contains an overview of the more important theories of fertility and a thorough discussion of general problems encountered when applying economic models of fertility. Part 1 describes the theories of fertility and their limitations, suggests ways of making the theories more policy relevant and theoretically adequate, and looks at the implications of fertility research for policy and action. Part 2, consisting of six chapters, discusses methodological issues, including the definition and measurement of fertility and key explanatory variables, and such empirical questions as time-series versus cross-sectional and pooling techniques, aggregation and specification problems, simulation and econometric approaches, and the use of anthropological techniques to supplement econometric approaches. The final section, consisting of seven chapters, presents seven empirical case studies from Kenya, Nigeria, India, Turkey, Yugoslavia, Mexico, and Costa Rica. The last chapter deals with the effect of income distribution on fertility, using cross-sectional data for a sample of developing countries.

Most of the papers indicate the need to go beyond the family plan-

ning approach to reduce fertility. They suggest more comprehensive population and development programs and improvement in the status of women as effective means to lower fertility. Even the design and implementation of family planning programs may be strengthened by an awareness of the context in which fertility and contraceptive decisions are taken. That is why this volume should be particularly useful to researchers and data collectors in developing countries who are responsible for conducting fertility research that can provide guidelines to policymakers and program planners. The volume should also be of interest to students of population economics and to government officials, especially economic planners. It contains numerous tables and graphs, a bibliography and index, and notes on the contributors. At US \$37.50, it is moderately expensive but contains a wealth of detail and is a worthy addition to any demographic or family planning library. For information, write: St. Martin's Press, Inc., 175 Fifth Avenue, New York, NY 10010, USA.

Urbanization and Migration in ASEAN Development, edited by Philip M. Hauser, Daniel B. Suits, and Naohiro Ogawa. Tokyo: National Institute for Research Advancement, 1985. Distributed outside Japan by the University of Hawaii Press. xiv, 373 pp. US \$25.00. ISBN 0-8248-0996-3.

This volume contains the papers from an international conference held in Tokyo in 1982 for the purpose of examining the problems of

migration in relation to economic development in the ASEAN countries. The conference was sponsored jointly by the Population Institute of Nihon University and the National Institute for Research Advancement.

ASEAN, the Association for Southeast Asian Nations (the Philippines, Indonesia, Malaysia, Singapore, and Thailand), was established in 1967; in 1976 its cooperative agenda was extended to cover population problems in the region. Except for Singapore, its member countries are predominantly rural, but they are experiencing urbanization and internal migration along with a change from agrarian to industrialized economies.

Philip Hauser presents an overview of the transformation process. His chapter is followed by several kinds of regional analysis, ranging from a review of ASEAN agriculture by James to an assessment of urbanization and migration trends by Ogawa, a study of labor migration by Stahl, and a paper suggesting areas for further research on migration and development in ASEAN countries by Jones.

Subsequent sections focus on the individual countries of Indonesia, Malaysia, the Philippines, and Thailand, presenting several papers on each. The contributions illustrate problems common to all countries as well as those that may be unique to a given country. Each selection contains illustrations and bibliographical references. The authors have presented their own perceptions of government policies and suggested programs to remedy the problems associated with urban growth and out-migration from rural areas. One conclusion that

emerges from these papers is that it is impossible to apply generalizations about all developing countries to the ASEAN context.

Because each contributor was free to develop his material without a stated framework for comparability, as in the World Fertility Survey, the volume does not present a holistic

view of the ASEAN region. The papers do indicate what progress has been made in the last two decades in an important region of Asia, however. It would be useful to see a compilation of this kind for other regions as well. The volume provides a good beginning for a study of the ASEAN population

situation and as such would be a worthwhile addition to general academic collections having an Asian focus as well as to more specialized population libraries. The book is distributed outside of Japan by the University of Hawaii Press, 2840 Kolowalu Street, Honolulu, Hawaii 96822, USA.

Estimating Census . . .

(continued from page 13)

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Appendix

The use of an exponentially defined growth rate r when person years lived are being defined geometrically introduces a bias that depends primarily on the growth rate and is scarcely influenced by the ratio k_1/k_2 , at least for values of this ratio that are likely to be encountered in practice, in the range 0.75 to 1.35. Simulations were carried out for this range of values to establish this conclusion. The bias overestimates k_1/k_2 for positive growth rates, and underestimates it for negative growth rates. The size of the bias in k_1/k_2 may be as much as three per thousand for growth rates of plus or minus 4 percent, but is very small indeed for growth rates smaller than plus or minus 2 percent.

The bias can be largely eliminated by defining the growth rate in geometric terms as the intercensal popula-

tion change, $N2(a+) - N1(a+)$, divided by geometrically estimated person years lived. If we call this growth rate $R(a+)$, its observed value $R^O(a+)$, and the difference between the two $\Delta R(a+)$,

$$R(a+) = \frac{N2(a+) - N1(a+)}{N(a+)} \quad (A1)$$

and

$$R^O(a+) = \frac{N2^O(a+) - N1^O(a+)}{N^O(a+)} \quad (A2)$$

$R(a+)$ can be written in terms of observed quantities and completeness factors as

$$\begin{aligned} R(a+) &= \frac{(k_1 k_2)^{1/2} [N2^O(a+)/k_2 - N1^O(a+)/k_1]}{N^O(a+)} \\ &= \frac{[N2^O(a+)(k_1/k_2)^{1/2}] - [N1^O(a+)(k_2/k_1)^{1/2}]}{N^O(a+)} \quad (A3) \end{aligned}$$

Thus

$$\begin{aligned} \Delta R(a+) &= R(a+) - R^O(a+) \\ &= \frac{N2^O(a+)[(k_1/k_2)^{1/2} - 1] + N1^O(a+)[1 - (k_2/k_1)^{1/2}]}{N^O(a+)} \quad (A4) \end{aligned}$$

For values of k_1 and k_2 that are approximately equal,¹

$$N2^O(a+)[(k_1/k_2)^{1/2} - 1] + N1^O(a+)[1 - (k_2/k_1)^{1/2}] \\ \cong [N2^O(a+) + N1^O(a+)] [(k_1^{1/2} - k_2^{1/2}) / (k_1^{1/2} k_2^{1/2})^{1/2}] \quad (A5)$$

Thus

$$R(a+) \\ \cong \frac{[N2^O(a+) + N1^O(a+)] [(k_1^{1/2} - k_2^{1/2}) / (k_1^{1/2} k_2^{1/2})^{1/2}]}{N^O(a+)} \quad (A6)$$

We now rederive equation (9), beginning with equation (3) and using

$$R(a+) = R^O(a+) + \Delta R(a+) \quad (A7)$$

for $r(a+)$ in (3), rather than the exponential expression (5a). This gives, in place of (9), the estimation equation

$$\frac{t[N2^O(a)N1^O(a)]^{1/2} + N1^O(a+) - N2^O(a+)}{N1^O(a+) + N2^O(a+)} = \\ = [(k_1^{1/2} - k_2^{1/2}) / (k_1^{1/2} k_2^{1/2})^{1/2}] \\ + \frac{(k_1 k_2)^{1/2}}{k_3} \frac{D^O(a+)}{[N1^O(a+) + N2^O(a+)]} \quad (A8)$$

Thus using a growth rate with geometrically calculated person years lived in the denominator maintains a linear relationship, subject to the approximation (A5), with the same slope but a different intercept.

If a fitted line estimates this intercept as I , the fourth root of the ratio k_1/k_2 can be found by solving the quadratic equation

$$(k_1/k_2)^{1/2} - I(k_1/k_2)^{1/4} - 1 = 0 \quad (A9)$$

Two solutions symmetrical around unity will be found. The correct value can be identified by inspection since a

positive I implies $k_2 < k_1$, whereas a negative I implies $k_1 < k_2$.

This approach is much less convenient to apply, but it does eliminate growth rate dependent bias at the cost of bias if k_1 and k_2 are very different. This latter bias is very small for k_1/k_2 ratios between 0.75 and 1.35, for which range simulations were made, but could be reduced if necessary by applying the method once, adjusting one census count on the basis of the first estimate of k_1/k_2 , and then reapplying the method under conditions in which k_1 and k_2 would be approximately equal.

NOTE

1. This approximation can be seen as follows. We can re-write the left hand side of equation (A5) as

$$N2^O(a+) \frac{k_1^{1/2} - k_2^{1/2}}{k_2^{1/2}} + N1^O(a+) \frac{k_1^{1/2} - k_2^{1/2}}{k_1^{1/2}}$$

Both terms in k have the same numerator. The denominators are also similar if k_1 and k_2 are approximately equal, and both can be replaced approximately by their geometric mean, $[k_1^{1/2} k_2^{1/2}]^{1/2}$, making the left hand side of equation (A5) approximately equal to

$$[N2^O(a+) + N1^O(a+)] [(k_1^{1/2} - k_2^{1/2}) / (k_1^{1/2} k_2^{1/2})^{1/2}]$$

Note to Readers

This issue of the *Forum* is the last under the capable stewardship of Griffith Feeney and David Ellis. Editor Feeney has taken a sabbatical leave from the institute to pursue his own research at the University of California at Berkeley, and Managing Editor Ellis has left the institute to pursue a master's degree in communication at Ball State University. Analysis of the *Forum* reader survey David organized last year will be a major part of his master's work. Dr. Linda G. Martin has agreed to assume editorial responsibility for the *Forum* beginning with the August issue, and a new managing editor is being recruited.

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Economic Aspects of Singapore's Selective Family Planning Policy

by David B. Evans

IN THE MID-1980s, Singapore followed a selective family planning policy. Poorly educated women were encouraged to practice family planning, while university graduates were discouraged from doing so. The first issue of public debate this raised was whether the offspring of university-educated mothers were more likely to attend universities than other children. The second was whether university graduates would economically benefit society more than would uneducated people.

This article, which focuses on the economic issue rather than on the eugenic rationale for the policy, attempts to show that a selective program based on the expected higher

productivity of a particular group may not be economically viable. Training costs and the delays before the extra production takes place can, under a variety of reasonable assumptions, outweigh the gains in production.

■ Context of Singapore's policy

In the decade before independence in 1959, Singapore's population grew at an extremely high annual rate of 4.4 percent. This rapid growth led to serious social and economic problems in a country where population density was already high by world standards. Unemployment and pressures on housing, health, and education were particularly severe (Saw 1980). To alleviate these problems, the newly independent government introduced policies designed to increase the rate of economic growth, to restrict immigration, and to reduce the population's rate of natural increase.

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Efforts to reduce birth rates initially involved official support for the Singapore Family Planning Association. After partition from Malaysia in 1965, however, a statutory board, the Singapore Family Planning and Population Board, was constituted with the long-term aim of reducing fertility to replacement levels. Various incentives and disincentives aimed at encouraging small families were introduced progressively, culminating in the legalization of abortion in 1970 and legalized abortion on demand in 1974. These policies, described in Saw (1980, 1984) are well known, but it is important to note that they were not aimed at particular groups. All Singapore women were encouraged to have no more than two children.

The rate of population growth declined from 3.2 percent per annum at independence to 1.1 percent in 1984. Over the same period, the crude birth rate fell from close to 40 to less than 17 per thousand. As a result, the gross reproduction rate fell, and it has been below replacement levels since 1975.

Accompanying these changes was an impressive economic performance. Singapore's real gross domestic product grew at the compound rate of 12.7 percent annually from 1965 to 1973. Although it grew less dramatically over the next four years, it recovered to average more than 8.5 percent annually during 1977-83 (estimates derived from Lee 1984). Unemployment, which had risen during the 1960s, peaked at 10.1 percent in 1970 and fell to less than 3 percent of the work force in the early 1980s (Shantakumar 1984).

Meanwhile significant improvements were made to social and economic infrastructure, in particular to housing and health and educational facilities. Thus by late 1983 it appeared that the problems that had beset Singapore at independence were no longer paramount. New problems, requiring new policies, were emerging.

One problem of concern to the government was the unbalanced pattern of procreation that had emerged under the original Family Planning Program. Educated women were postponing or forgoing marriage. Those who did marry generally chose to pursue their careers, and had few children. Uneducated women were not postponing marriage and were less likely to limit the size of their families.



Young, educated Singaporean couple expecting their first child.

The government believed that this pattern was not consistent with its attempts to restructure the economy toward more skill-intensive industries and would not produce future leaders of the caliber necessary to govern the country effectively. Accordingly, Singapore's population program was altered substantially toward the end of 1983.¹

The new policy was selective, dependent on the prospective mother's educational qualifications. Women with little education were still encouraged to have small families, but women who were university graduates were encouraged both to marry and to have larger families.

Incentives and disincentives were introduced for both target groups (*Far Eastern Economic Review [FEER]*, 21 June 1984, p. 31). For example, a S \$10,000 grant, payable to an account with the centralized superannuation fund, was offered to women who agreed to be sterilized after the birth of their first or second child. Only women from low-income families who had fewer than two O-level passes (scores on the public examination administered after ten years of schooling) were eligible. For a time graduates—that is, more-educated women—were offered priority enrollment for their children in the choice primary schools. This preferential treatment was discontinued in response to public pressure, though the minister of education claimed that it was cancelled because it had not induced the graduates to have more children (*Straits Times*, 26 March, 1985).

The new policy was based on two assumptions. The first was that children were more likely to pro-

ceed to a university education if their mothers were university graduates than if their mothers were not. The second was that the production of graduate offspring would benefit Singapore more than the production of uneducated offspring.

This article does not consider the validity of the eugenic assumption. It examines instead the benefits the government expected from its selective policy, focusing on the economic factors, which featured prominently in the official justification (*FEER*, 8 September 1983, p. 84). Specifically, my purpose is to evaluate the economic costs and benefits of a family planning program that prevents the birth of a person who will receive little education and to compare them with those of a program that would prevent the birth of a university graduate.

If the analysis reveals that it is profitable for a society to prevent the birth of the uneducated and to promote the birth of the educated, this finding would lend support to a selective policy of the type practiced in Singapore. In that case, the next step would be to consider noneconomic implications of the policy and to debate the government's theory of eugenics. The economic analysis, however, may not provide support for the selective policy. In that event, unless there are compelling social or political reasons for its introduction, the debate about eugenics is not particularly relevant.

Although the selective policy was revoked late in 1986—the official reason was fear of eventual shortages of skilled and unskilled labor²—the economic assumptions of this type of program are still

worthy of analysis because educated people are generally perceived to be economically more productive than the uneducated, and thus selective programs have some intuitive appeal.

■ Cost-benefit analysis

The economic impact of family planning programs can be examined by using either the growth model or the human investment approach. Growth models were first applied to family planning programs by Coale and Hoover (1958) and were refined by Enke and Zind (1969). They involve estimating a production function for an economy as a whole of the general form

$$Y = Y(K, L, T),$$

where Y = national income,
 K = capital stock,
 L = labor inputs,
and T = level of technology.

Once the parameters have been estimated, national income or income per head can be projected into the future under a variety of assumptions.

For example, income per head can be estimated for some future date on the assumptions, first, that current fertility patterns do not alter, and second, that fertility declines at a particular rate owing to a family planning program. Income per head under the latter assumption will usually be higher than that under the former. The difference, the increase in the average standard of living, is an economic benefit of the program.

Growth models can be used only where it is possible to estimate the equation. This cannot be done in Singapore because time-series data

on the stock of capital are not available (Toh 1985), and therefore the human investment approach is used here. Enke (1960a, 1960b) was the first to use this approach to examine the economic impact of family planning programs, and it was subsequently extended by Zaidan (1971) and Chao and Allen (1984), among others. It measures the net economic returns to society from investing in a family planning project. The project is defined as preventing a specific number of births, often 1,000, at a particular time. The costs and benefits to society from the project extend over the potential life span of the prevented births, and thus a cost-benefit framework is applied.

On the one hand, the direct costs of the project are the costs of preventing the births through the provision of family planning services. In addition, by preventing a birth, society loses the output the person would have produced over his or her lifetime. Thus the yearly value of this output, the marginal value product of labor, is another project cost. It begins from the time the person would have found employment and continues to the end of the project life.

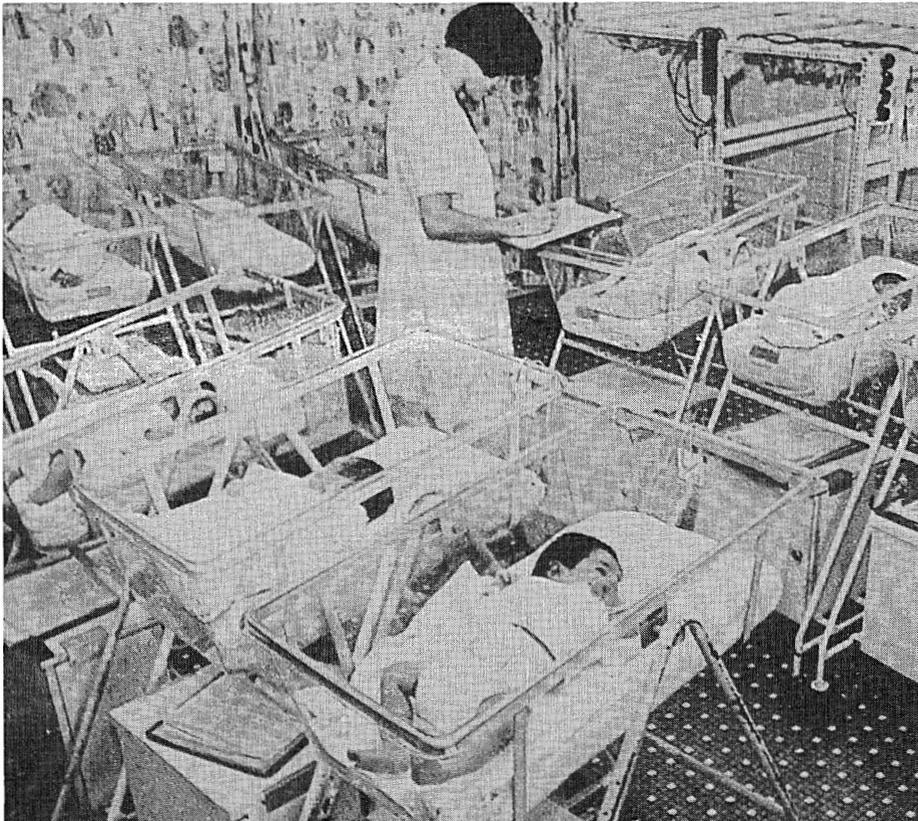
On the other hand, people consume real resources over their lifetimes as well. By preventing the births, society saves the value of this consumption, and thus yearly savings in private consumption are

considered to be a project benefit. Because people consume even during years in which they are unproductive, these savings accrue from the first year of the project.

Another benefit of preventing the births is that it saves government expenditure, which can then be used in other ways. Most important are government subsidies for education and health. Sometimes government savings in such areas as housing and social services have been included in the analysis as well (Chao and Allen 1984). They are excluded here because it is debatable if public housing in Singapore contains a subsidy element and the social service sector is very small.

To determine if the project is economically viable, it is necessary to compare costs and benefits, but the difference in their timing must be accounted for. To do this, it is customary to discount the anticipated future costs and benefits to obtain their values to society at the time the project begins.

Discounting is based on the principle that one dollar today is worth more than one dollar expected at some time in the future, even in the absence of inflation and uncertainty. The reason is that a dollar invested today would yield a return in excess of a dollar in the future. For example, it would be worth \$1.05 after one year if the rate of return on investment were 5 percent per annum. In this case, \$1.05 payable in one year would be worth \$1.00 today. The future sum is discounted back to its value today, which is called its present value. The discount rate in this case is 5 percent.



Newborns in Singapore.

(A concise description of the reasons for discounting and the techniques that are used is found in Drummond 1980. The present value of $\$X$ payable in n years with a discount rate of r percent is $\$X/(1 + r)^n$.)

To determine the economic viability of the project as a whole, the projected costs are subtracted from the projected benefits for each year of the project life separately. These yearly net benefits are then discounted back to their present values, again for each year separately. The sum of the yearly present values is known as the net present value of the project. If it is positive, the value of the expected benefits exceeds the value of the costs, and the project is viable.

Two practical problems must be confronted in any cost-benefit analysis.

The first involves the choice of the appropriate discount rate. This is a controversial topic, but most studies assume a real rate of between 5 and 10 percent. The former rate is commonly used in the analysis of health projects (Drummond, Stoddart, and Torrance 1987, p. 52). At these rates, payments after 30 to 35 years become insignificant, and most studies impose finite time horizons of 30 years on their analyses. For example, \$1,000 payable in 35 years with a 10 percent discount rate has a present value of less than \$36.

The second problem concerns the treatment of inflation. Two approaches can be used. The first requires future costs and benefits to be increased by the expected rate of inflation and the use of a higher, inflation-adjusted discount rate. The second does not inflate any future

costs and benefits and uses a lower discount rate that does not allow for inflation. The former method measures costs and benefits in what are known as nominal prices as opposed to the constant (inflation-free) prices used in the latter. The higher discount rate is called the nominal rate, whereas the inflation-free rate is known as the real rate. (See Drummond, Stoddart, and Torrance 1987, p. 52, for details of the relationship between the two rates.)

Using reasonable assumptions, one can show that the two approaches give consistent answers (Drummond, Stoddart, and Torrance 1987). For example, if the net present value is positive in one, it will be positive in the other. The second method is simpler to apply and is used more commonly. It is also used here.

Cost-benefit analysis must be applied in a slightly different way to family planning programs than to other projects. The net present value must be modified to allow for the fact that some of the children whose births were prevented would not have survived to the end of the project life. Accordingly, the yearly discounted net benefits are multiplied by the probability that a person of a given age would be alive at the end of the year.

The probabilities used in this article were taken from life tables for Singapore. The sum of these adjusted net benefits is called the expected net present value here, in the same way that any value multiplied by the probability of its occurrence is called the expected value in statistics.

Cost-benefit analysis can be used to determine if a single project is justified on economic grounds.

Sometimes there will be insufficient funds to complete all the viable projects, and in such cases the approach can be used to rank the alternatives. The one with the highest net present value should take precedence.

The advantages and disadvantages of applying this approach to family planning programs have been widely reported (Pitchford 1974; Haveman 1976). They are not discussed here at length, but two factors are important for the present study.

First, the approach relies on the assumption that any changes in fertility patterns as a result of the family planning program are marginal and will not affect other macroeconomic variables. The assumption is unlikely to have applied to Singapore at independence, when there was the potential to make large reductions in fertility rates. But it is appropriate to the analysis of current family planning programs in Singapore now that fertility is so low.

Second, Zaidan (1971) argues that the approach is biased toward showing that investment in family planning programs is viable in all societies at all times. This is because consumption streams begin at birth, whereas production is delayed for a considerable period. With realistic discount rates, the present value of the consumption savings would be expected to outweigh the present value of the foregone production.

This will certainly be true for most developing countries where the marginal value product of labor is low. At the extreme, if the marginal value product is zero, the only cost of the project is the initial cost of the family planning program. In

all subsequent years, only benefits accrue and the net present value is bound to be positive. In Singapore, however, it is not certain that the net present value would be positive because labor is relatively productive and private consumption as a proportion of gross domestic product is low (Asian Development Bank 1984). The costs in forgone production could well outweigh the benefits of savings in consumption.

Most studies have applied the human investment approach to the analysis of family planning programs in low-income developing countries (e.g., Chao and Allen 1984; Osteria 1976). These studies have considered family planning programs in general. Doing so requires the assumption that all the prevented births would have been of average people, who would have attended school for an average length of time and had average marginal value product and average marginal consumption. This assumption cannot be applied to the analysis of a selective family planning program.

The standard approach is therefore modified here. Instead of considering one project that prevents the birth of a set number of average children, let us consider two hypothetical projects. The first is a project to prevent the births of 1,000 persons who would have been university graduates. To allow the widest possible contrast, the second project is to prevent the births of 1,000 persons who would have received only primary education. The more usual case of children entering the work force after secondary education would fall somewhere between the two extremes discussed here.



What does her educational future hold?

RANDALL WONG

The standard approach is also modified here in a second way. Previous studies have made no provision for real increases in labor productivity or consumption levels over time—that is, increases beyond those resulting from general inflation.³ For comparative purposes, the results of this type of static analysis are presented. Dynamic considerations, however, are also introduced that are based upon several assumptions about likely changes in the real values of costs and benefits.

■ The assumptions and the data

Details of the assumptions made here and the Singapore data are provided in the Appendix. Only in-

formation essential to interpreting the results is included in this section.

A time horizon of 30 years and a 10 percent discount rate are used, although the sensitivity of the results to these assumptions is considered. The base year is taken as 1977–78 because the only recent data on private consumption were found in the Household Expenditure Survey of that year (Singapore, Department of Statistics 1979).

The marginal value product of labor is estimated on the assumption that a competitive labor market exists. In this case, the cost to the employer of hiring labor equals the marginal value product. For consistency, pretax income figures are also taken from the Household Expenditure Survey. These data are adjusted for the employer's contributions to the central superannuation fund and payroll tax to obtain the cost of hiring labor.⁴

Once the base-year estimates of costs and benefits are made, they have to be projected over the life of the project. Constant prices are used. The static analysis is conducted assuming zero real growth of all costs and benefits. I call this the zero-growth scenario. Singapore, however, has generally had high real growth rates since independence, so that an outcome of no real growth over an extended period is not very likely. The assumption is made in order to determine a lower bound of possible outcomes.

As an upper bound, the real growth rates observed between 1972–73 and 1982–83 are used. This period includes the five years before and after the base year, when growth rates were significantly higher than earlier. Current indi-

cations are that similar growth is unlikely to be sustained continuously over the next 30 years, and therefore I call this the high-growth scenario.

For the high-growth calculations, separate growth rates are estimated for each cost and benefit. Details of the base-year values of each variable and the annual growth rates observed between 1972-73 and 1982-83 are found in the Appendix Table. Shadow prices are not used in the analysis because markets in Singapore are relatively free from imperfections and the adjustments would have been minor.

■ Results of the analysis

The expected net present values of preventing 1,000 births of both university and primary school graduates, using a 30-year time horizon and a 10 percent discount rate, are reported in Table 1. The sensitivity of the values to these assumptions is also included.

The results are quite robust. The expected net present value for university graduates is almost always positive, implying that the benefits of preventing their birth outweigh the costs. On the other hand, the expected net present value for primary school leavers is often negative, suggesting that preventing the birth of children who will not progress as far academically could cost society more than it gains.

Moreover, for any given set of assumptions the expected net present value for preventing the birth of university graduates is significantly above that for preventing the birth of primary school graduates. This result is not important if we assume a 30-year time horizon, 5 percent discount rate, and high real economic growth, when neither family planning program should be pursued. But in the other cases it implies that society should first prevent the birth of the educated before considering the uneducated.

In fact, two cases support preventing the birth of university graduates while encouraging the birth of primary school graduates.

Two factors explain these results. First, the cost of university education is considerably higher than the cost of primary school education. Second, the timing of the flow of benefits differs between the two groups. University graduates are more productive than uneducated people in Singapore, but the uneducated begin contributing much earlier. At reasonable discount rates, the earlier contribution of the uneducated outweighs the greater contribution of the educated.

Clearly, the economic justification for a selective family planning program cannot rely simply on the greater potential productivity of one group of people. The costs of training them and the delay before they start producing must also be considered. Table 1 shows that under several reasonable assumptions these factors outweigh the effect of high productivity, to the point that it could make more sense to discourage than to encourage the birth of potentially productive people.

The question therefore arises whether there is any possible combination of assumptions that produces results favorable to Singapore's former selective policy. Consider the case of the 30-year time horizon and 5 percent discount rate in Table 1. The project to prevent the birth of university graduates is not justified if their productivity is assumed to grow at the high rate (expected net present value = S \$-8.38 million). If at the same time the productivity of primary school graduates stagnated, the project to prevent the birth of

Table 1. Expected net present value of preventing 1,000 births (in S \$ million)

Time horizon	Assumption		Expected net present value ^a	
	Discount rate	Real growth	University	Primary
30 years	10	High	26.66	-3.45
		Zero	29.86	7.00
30 years	5	High	-8.38	-30.78
		Zero	25.37	1.25
35 years	10	High	14.79	-6.80
		Zero	26.96	6.27

^aDetailed calculations are available from the author upon request. Results have been rounded to two decimal places.

primary-educated children would be viable (expected net present value = S \$1.25 million).

This result is not very robust, however. For example, the table shows that the relative attractiveness of the two projects is reversed when a 10 percent discount rate is used. In addition, the result is critically dependent on high growth in graduate labor productivity combined with zero growth in the productivity of primary school leavers. Moderate growth, say at 2 percent per year, in the productivity of both groups also reverses the relative attractiveness of the two projects (results not shown).

On economic grounds cost-benefit analysis suggests that a society may benefit more by preventing the birth of a potential university student than by preventing the birth of a potential primary school graduate.

In fact, the combination of growth rates required to support the selective program does not seem to be realistic. The productivity of unskilled labor in Singapore has never exhibited zero real growth for an extended period in the past, and the current economic downturn suggests that it would be difficult to sustain the high rate of growth in graduate labor productivity. The analysis therefore suggests that the selective family planning program was unlikely to result in major economic benefits of the type considered in this article.

■ Conclusions

This result should be interpreted in the light of several qualifications.

The first is that the economic analysis was of necessity incomplete. For example, it is possible that educated people contribute more to technical change, and hence to increasing the standard of living, than others. This assumption might increase the attractiveness of encouraging the birth of potential graduates, although it might also imply that an increase in the number of university graduates would raise the productivity of unskilled labor.

Little evidence of this type of relationship exists, however, and therefore I did not incorporate it into the analysis. But it would be a useful avenue for further research and would also help to determine whether graduate labor productivity could grow rapidly while the productivity of the less educated stagnated. These were the only conditions under which Singapore's selective family planning policy appeared to be viable.

A second qualification is that the analysis has not considered the economic implications of the availability of labor from other Asian countries. Virtually unlimited supplies of unskilled people can be imported into Singapore without their dependents. These people arrive when they are productive and are expatriated when they become unproductive. The costs of their unproductive years are not met by Singapore. This may not be a feasible option with university graduates because there is more competition on the international market for their skills. Thus there may be economic reasons for encouraging the

birth of Singaporean university graduates while relying on imported unskilled labor.

The third qualification of the results is that they depend on the quality of the data. Although higher-quality data may alter the values of the estimated expected net present values, it is unlikely that the relative attractiveness of the two projects would change. The reason is that the results are robust to changes in assumptions.

In any case, the analysis shows that a selective birth control program based purely on the potential high productivity of the offspring of a particular group need not necessarily be viable economically. Training costs, and differences in the timing of benefits, are vital to the analysis. I have attempted to show that, under a variety of reasonable assumptions, these factors could outweigh future gains in productivity. Indeed, under some assumptions and given the constraints of this type of analysis, a selective family planning program with the opposite characteristics of Singapore's might be warranted on purely economic grounds.

Finally, the analysis has focused on the economic benefits that might be expected from a selective family planning program. There may of course be other reasons for preferring the more educated to the less educated. However, further research is needed to establish that such benefits could be realized in practice because the lesson of this exercise is that benefits that seem feasible intuitively may not be attainable. □

(Appendix begins on page 21.)

A Simplified Robust Estimate of the Birth Rate

by K. Venkatacharya and Tesfay Teklu

The following article shows Coale's robust birth rate estimate to be equivalent to the birth rate estimate obtainable by the well-known reverse-survival method. The authors suggest a simplified birth rate estimate that does not require reference to model stable populations or model life tables.

In a technical note appearing in the *Asian and Pacific Census Forum*, Ansley J. Coale suggested a simple method of estimating the birth rate for a population that experiences changes in fertility and mortality (Coale 1981). For a population that satisfies stability conditions, the birth rate is taken as that of a stable population selected by matching certain statistics of the observed population with those of model stable populations, such as the Coale-Demeny models (Coale and Demeny 1966). When these stable populations become destabilized, the stable birth rate will not necessarily give a good birth rate estimate. Many authors had previously attempted to adjust the stable birth rate to take into account the nonstable situation (Abou Gamrah 1976; United Nations 1983, pp. 166-172).

Coale (1981) suggested a method of adjustment for the stable birth rate based on the reported proportion of the population under age 15 (for both sexes) and l_5 obtained by a Brass type of indirect estimation of mortality. Coale's method is very robust and works well in many situations.

The purpose of this article is to show that other estimates of the birth rate can be derived from Coale's robust estimate. Coale's estimate is nearly equal to the

birth rate obtainable from reverse survival or reverse projection of the proportion of a population under age 15 (both sexes), or $C(15)$, using a life table corresponding to l_5 . As a sequel to this, we obtain a birth rate estimate that does not require reference to stable population models and results in computational economy and ease.

Moreover, taking advantage of the strong linear relation between l_5 and ${}_{15}L_0$, we derive a simple robust estimate of the birth rate that does not depend upon model stable populations or model life tables. After briefly presenting these methods, we illustrate their use with data from several Asian and African countries.

■ Coale's method

Coale (1981) suggested using the observed $C(15)$ for both sexes and l_5 to locate an appropriate stable population from a family of stable models to represent the observed population and to use its birth rate as an estimate of the population under study. The estimate of l_5 can be obtained by any of the indirect methods like the Brass method. Coale observed that such methods yield birth rates that are not much affected even when the populations are not stable. He also suggested an adjustment for the stable birth rate for nonstability:

$$b_C = b_s \cdot \text{Exp}[7.5(r - r_s)] \quad (1)$$

where b_C is the birth rate adjusted by Coale's method, b_s is the stable birth rate corresponding to $C(15)$ and l_5 , and r_s and r are the rates of increase in the stable and the study populations respectively.

Coale explained the logic behind this adjustment by treating the estimation of the stable birth rate from $C(15)$ and l_5 as a form of reverse survival that yields an estimate of the average birth rate during the 15 years preceding the census. The persons under age 15, when

reverse-survived by life table survival ratios corresponding to the estimated l_5 , represent the births during the 15 years preceding the census.

To obtain the birth rate one needs the denominator, namely, the number of person-years lived. This is obtained by using the rate of increase, r , which differs for a stable and a nonstable or observed population. For example, the number of person-years lived in the stable population is approximated as $15 P_0 \cdot \text{Exp}[-7.5 r_s]$ and for the nonstable (observed) population as $15 P_0 \cdot \text{Exp}[-7.5 r]$. The value 7.5 is the number of years before the census where the midpoint occurs and P_0 is the total current population. Thus the number of person-years in the stable situation and hence the stable birth rate can be adjusted by the factor $\text{Exp}[7.5(r - r_s)]$ to take into account the nonstable situation. (For details see Coale 1981 or United Nations 1983:166-172.)

Various methods can be used to obtain the time reference of the mortality estimate, l_5 , by providing years prior to the survey or census to which the l_5 estimate is applicable (United Nations 1983:77-78; Feeney 1981). Our calculations for the countries under study indicate that l_5 refers to about seven years prior to the survey. Since b_C is the average value for 15 years prior to the most recent census data, t , and l_5 refers to the time of about seven years prior to t , b_C should be considered to refer to the time $(t - 7.5)$.

■ Reverse survival method

The use of the l_5 derived by the Brass type of indirect estimation depicts mortality of the time around $(t - 7.5)$, midway between $(t - 15, t)$, where t is taken as the current time or the time of the latest census or survey. In the following calculations we use ${}_{15}L_0(t - 7.5)$ to represent the values from the life table corresponding to the mortality level of l_5 . We use the Coale-Demeny North family life tables for African countries and South family life tables for Asian countries.

By reverse-surviving the population under age 15, $C(15)$, and using the survival ratio ${}_{15}L_0(t - 7.5)/15 \cdot l_0$, we obtain births during the 15-year period $(t - 15, t)$. Assuming that births are uniformly distributed during the 15-year period, we can obtain the annual number of births by dividing the total number of births by 15 and assuming these births are centered at $(t - 7.5)$. To complete the calculation for the birth rate at $(t - 7.5)$, we need to know the number of person-years lived at $(t - 7.5)$, which can be obtained by reverse-projecting

the total population at time t and using the population rate of increase r around the period $(t - 7.5)$. Usually r is computed from two censuses. This leads us to the birth rate, obtained by the following reverse-survival method:

$$b_R = \frac{C(15)}{{}_{15}L_0(t - 7.5) \cdot e^{-7.5r}} \quad (2)$$

where the radix of the life table l_0 is taken as unity.

Equations (1) and (2) in the present form do not appear identical, although the logic behind them is the same. It can be shown easily that the two equations are identical for a certain order of approximation. Since we have obtained r_s and b_s by matching observed $C(15)$ and l_5 or ${}_{15}L_0(t - 7.5)$, we have the following identity:

$$C(15) = b_s \cdot \int_0^{15} e^{-x r_s} p(x) dx$$

Two numerical approximations can be applied to the above integral, namely:

$$C(15) \approx b_s [e^{-2.5r} \cdot {}_5L_0 + e^{-7.5r} \cdot {}_5L_5 + e^{-12.5r} \cdot {}_5L_{10}] \quad (3A)$$

or a simpler and less accurate one:

$$C(15) \approx b_s \cdot e^{-7.5r} \cdot {}_{15}L_0 \quad (3B)$$

Equation (3B) can be written as:

$$\frac{C(15)}{{}_{15}L_0(t - 7.5)} \approx b_s \cdot e^{-7.5r_s} \quad (4)$$

Multiplying both sides of equation (4) by $e^{7.5r}$ leads to

$$b_R = b_C$$

indicating that Coale's adjusted birth rate is approximately equal to that obtainable by the reverse-survival method. In the following discussion we briefly examine the relationship between b_C and b_R .

1. The approximate equality of Coale's estimation equation and that of the reverse-survival method rests on equation (3B). In analysis not shown here, we find that using equation (3B) to compute $C(15)$ slightly understates the true values, whereas using equation (3A) almost reproduces the true value. As a consequence, b_R tends to be slightly higher than b_C . For most practical considerations, however, this difference can be ignored.

2. In equations (1) and (2) the basic data used, namely, $C(15)$, l_5 , and r , are the same. Both equations also

use the reverse-survival technique. In obtaining equation (2), we make the implicit assumption that the reverse-survival rate is not affected by differences in the age distributions of the study and the stationary populations under age 15. In the case of equation (1) we make the assumption that differences in the age distributions of the study and the stable populations under age 15 do not affect the reverse-survival rate. Calculations show that the effect of the differences in these assumptions on the estimated birth rates is very small.

3. While discussing equation (1), Coale (1981) made the interesting observation that estimates of b_C are not much affected by the choice of a particular family from among the four tabulated models in the Coale-Demeny model life tables. Our computations show that even in the case of the new UN models and the OECD models, the same pattern is observed. This can be easily understood from equation (2), which we have shown to be nearly equal to b_C , and it illustrates that the change in the mortality pattern enters the calculation through ${}_{15}L_0$. Thus variations in b_C by the choice of a particular model family are a function of ${}_{15}L_0$. Calculations have shown that once l_5 is fixed, ${}_{15}L_0$ changes marginally from one family to another.

4. Another interesting feature of equation (2), compared with equation (1), is that it does not require the estimation of the stable parameters. The absence of b_s and r_s in equation (2) leads to some saving in computations.

5. Equation (2), however, still needs a life table for the study population at time $(t - 7.5)$, from which ${}_{15}L_0$ can be obtained. As life tables are rare in the developing countries, one must depend upon model life tables, such as the Coale-Demeny models. It is possible to simplify equation (2) further by exploiting the strong linear relationship between l_5 and ${}_{15}L_0$. Thus if we express

$${}_{15}L_0 = u + v \cdot l_5$$

we reduce equation (2) to

$$b_V = \frac{C(15) \cdot e^{7.5r}}{(u + v \cdot l_5)} \quad (5)$$

Equation (5) reduces the birth rate estimate to an explicit function of $C(15)$, r , and l_5 . The constants u and v are determined by the pattern of mortality assumed for the study population.

Table 1 presents the values of u and v obtained by fitting the linear function mentioned above to the Coale-Demeny (1966), the UN (1983), and the OECD (Clairin et al. 1980) life table families. Though one expects a linear relationship between l_5 and ${}_{15}L_0$, in view of the linear assumption made in the computation of L_x values, the observed close relationship seen in Table 1 is quite encouraging. A minor point of interest is that $(u + v)$ is nearly equal to 15; $(u + v)$ should be 15 for $l_5 = 1$ in the limiting case.

Though the constants u and v vary from one family to another, the resultant ${}_{15}L_0$ for a given l_5 does not vary much. Thus if one is aware of the appropriate mortality pattern of a particular country, one can use equation (5) with the specific set of the values of u and v from Table 1. Our computations have shown that the values of u and v derived for the Coale-Demeny West family gave a minimum percentage of error in the

Table 1. The values of u and v for various model life table patterns, assuming a linear relationship between ${}_{15}L_0$ and l_5

Model life table family	u	v	R^2
Coale-Demeny model life tables			
West	.365	14.599	.99997
North	.145	14.809	.99988
East	.309	14.663	.99998
South	.553	14.415	.99995
New UN model life tables			
Latin American	.302	14.691	.99999
Chilean	.284	14.712	.99999
South Asian	.511	14.475	.99999
Far Eastern	.024	15.018	.99999
General	.147	14.851	.99999
OECD model life tables			
Region A	.871	14.061	.99981
Region B	.708	14.246	.99996
Region C	.749	14.197	.99990
Region D	.512	14.451	.99997
Region E	.618	14.340	.99994

estimated birth rates. Thus one can use the values of u and v of the West family to obtain birth rates under all mortality conditions without making any significant error in the birth rate. Hence, the following equation can be used to obtain a robust estimate of the birth rate:

$$b'_v = \frac{C(15) \cdot e^{7.5r}}{(.365 + 14.6 l_s)} \quad (6)$$

Equation (6), while retaining the robustness of the original Coale estimate, does away with the need to use either model stable populations or model life tables.

■ Applications to Asian and African data

To illustrate the four adjusted birth rates b_C , b_R , b_V , and b'_V , we have selected nine African and four Asian countries having age-sex data for two censuses. The African data are believed to have larger errors than the Asian data, and thus the 13 countries represent a range of data quality. Table 2 shows some characteristics of

the selected populations: estimated values of l_s that refer to about seven years prior to the more recent census date, $C(15)$ for the censuses, the intercensal rates of growth, and the interpolated stable parameters. The result of applying equations (1), (2), (5), and (6) are shown in Table 3.

The birth rates estimated by b_C and b_R are expected to be nearly equal. We notice that the figures under b_R are marginally higher than those under b_C , but, as we have already noted, for all practical considerations the difference is negligible.

A look at the values of birth rates obtained by using b_V and b'_V shows that they give almost identical results. In computing birth rates by b_V , we have used the Coale-Demeny South model life tables for the Asian countries and the North model life tables for the African countries. In the case of b'_V , we have used the

(continued on page 23)

Table 2. Selected indices of mortality, age distribution, and growth between censuses for selected Asian and African countries

Region and country	Period	l_s	First census, C(15)	Second census, C(15)	r	Stable parameters	
						r_s	b_s
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Asia							
Japan	1970-80	.991	24.0	23.6	1.12	.55	17.74
Hong Kong	1971-81	.948	35.8	25.5	2.36	.93	19.33
Sri Lanka	1971-81	.898	39.0	36.9	1.57	2.33	32.36
India	1971-81	.773	42.0	39.2	2.24	2.20	39.30
Africa							
Ghana	1960-70	.792	47.1	48.2	2.88	3.30	51.3
Liberia	1962-74	.777	37.8	41.8	3.07	2.29	42.3
Sierra Leone	1963-74	.621	37.1	41.0	1.87	1.46	48.6
Kenya	1969-79	.839	48.4	48.4	3.46	3.51	49.4
Malawi	1966-77	.679	43.9	44.7	2.70	2.28	51.5
Tanzania	1967-78	.781	43.8	46.2	3.18	3.01	49.2
Lesotho	1966-76	.839	38.1	39.9	2.26	2.29	37.5
Swaziland	1966-76	.792	45.4	45.9	2.91	2.97	47.8
Libya	1964-73	.803	44.1	51.4	3.48	3.83	55.9

Note: Figures in columns (4) to (7) are percentages.

How Censuses Aid Policymakers

by Bryant Robey

MEASURING literacy, estimating fertility and mortality, and studying the elderly population are among the uses of census data in Asia and the Pacific.

Meeting last February in Sydney and Canberra, Australia, census directors and population experts from more than a dozen Asian and Pacific countries, Canada, and the United States discussed their experiences conducting the mid-decade round of censuses and their plans for the 1990 round. Discussion focused on the value of census data for analyzing social policy issues.

The Eleventh Asian and Pacific Population Census Conference was sponsored by the East-West Population Institute and hosted by the Australian Bureau of Statistics.

"It is only in the 1980s that censuses have been conducted throughout the world not only to count the numbers of people but also to discover the information about how they live and work that is required to support effective national poli-

cies for economic and social development," Australian Statistician Ian Castles said in his welcome to conference participants. He urged statistical agencies to take further steps to analyze and interpret census data.

■ Measuring Literacy

In the Philippines, population censuses are the traditional means of determining literacy rates. A decline in the literacy rate measured by the 1980 census, however, after decades of improvement in the rate, led officials there to question the validity of census data for this purpose, according to Louisa T. Engracia of the Philippines' National Census and Statistics Office. Between 1960 and 1970, the literacy rate rose 11 percentage points, but it dropped from 83.4 percent to 82.7 percent between 1970 and 1980.

Surprised by this finding, Philippine officials formed a committee to explore an alternative method of measuring literacy. But when the new method was compared with the census-based method in a sample survey of households, the differences in results using the two methods proved insignificant. "For the entire pilot area, the difference was less than one percentage point," Engracia reported.

"If the definition of literacy is confined to the possession of minimum reading and writing skills,

then the census can adequately answer the basic needs for literacy statistics," she concluded.

■ Estimating Fertility and Mortality

Census data are also becoming more valuable in estimating fertility as fertility surveys that contain birth or pregnancy histories become more expensive to conduct, reported Lee-Jay Cho, East-West Population Institute director.

Henry Pardoko, member of the expert staff of Indonesia's National Family Planning Coordinating Board, said developing countries need to improve indicators of health and well-being, including strengthening vital registration systems. An ESCAP working group has recommended that fertility and mortality topics be included in the census in countries with poor vital registration systems and no alternative sources of reliable demographic estimates, Laurence H. Lewis, ESCAP regional adviser on population censuses and surveys, reported to the conference.

V. S. Verma, registrar general of India, observed that low literacy levels, a rural population, and inaccessible terrain make it difficult to collect reliable vital statistics in India, despite a system that in some areas is well organized and efficient. The population census is an alternative.

Bryant Robey is Assistant to the President of the East-West Center and Adjunct Population Specialist in the Population Institute. He participated in the Eleventh Asian and Pacific Population Census Conference.

"It has to be borne in mind that indirect estimation techniques cannot be considered a substitute for a good civil registration system. However, in the interim period there may be very few options left," Verma said.

The 1981 census of India collected data on children ever born and children surviving, by sex, and tabulations were prepared by the age of mother, according to K. S. Natarajan, assistant registrar general. From these data, analysts prepared estimates of child mortality at the district level. The census is the only source of such estimates, he said.

■ Studying the Elderly

The number of people over age 65 will double in most Asian countries between 1980 and 2000, when Asia will be home to nearly half of the world's elderly. Census data can play a valuable role in providing information to policymakers attempting to accommodate growing elderly populations, East-West Population Institute research associate Linda Martin reported to the conference.

Most censuses in the region provide adequate population counts of the elderly population but could do a better job of providing information on older people's living conditions and economic status, according to Martin. "Censuses can provide a regular, reliable flow of information that will be a foundation for designing programs for the growing elderly populations of Asia and the Pacific," she said.

■ Toward 1990

Many of the countries represented at the conference are completing the tabulation and publication of



Barry Keeley (right), Assistant Director (Clerical Operations) of the 1986 Census Data Transcription Centre, Australia, shows conferees Linda G. Martin, Raja Bertram Maligaspe Korale, and Bryant Robey how responses to the questions on industry of employment are coded.

statistics from their mid-decade censuses. All are preparing for the 1990 round. Australia, New Zealand, and the United States are pursuing greater use of automation to conduct and tabulate the next census, the participants from these countries reported.

The conference included a tour of the Australia Data Transcription Center in Sydney, where hundreds of staff members are using innovative computer-based methods to process data from Australia's 1986 census. Later, participants observed a demonstration of computer-

assisted coding in New Zealand, via interactive computer link between Canberra and Wellington, New Zealand.

Hong Kong Assistant Commissioner Benjamin Mok of the Census and Statistics Department reported that the 1986 Hong Kong census employed a new computer-assisted method of classifying households.

Enumerators coded all household members by relationship with the household head, and those codes facilitated the tabulation of different types of households. The system appears complicated, he noted, but census enumerators were able to understand it, and the error rate was less than 1 percent.

Teik-Huat Khoo, chief statistician

of Malaysia, said planning for his country's 1990 census centered on improving coverage, reducing costs, and releasing data on a more timely basis. Other representatives of census offices agreed that streamlining census procedures, obtaining a more accurate count, and making better use of data for policymaking were high priorities. □

Papers and Presentations at Eleventh Asian and Pacific Population Census Conference and Conference Participants

A Summary Report of the conference, containing abstracts of the papers and presentations, is available from the East-West Population Institute. Readers wishing to obtain copies of the papers (those titles designated with an asterisk) should direct requests to the authors.

PAPERS AND PRESENTATIONS

*Speech of Welcome, by Ian Castles

Reports on mid-decade censuses

*Country Report on the 1985 Population and Housing Census in the Republic of Korea, by Myong-Hyun Sohn

*1985 Population Census of Japan—Backgrounds and Some of the Measures Taken, by Senichi Obayashi

*Brief Accounts of 1% Population Survey in China, by Jingxin Sun

*The Hong Kong 1986 By-Census, presented by Benjamin Mok

*The Australian Census of Population and Housing, 1986, presented by John Cornish

*Mid-Decade Census in New Zealand, by Population Census Division, Department of Statistics (presented by Michael A. Moore)

*Findings of the Indonesian Intercensal Population Survey 1985, by Central Bureau of Statistics (presented by Azwar Rasjid)

Mid-Decade Census in Fiji, presentation by Naibuka B. Navunisaravi

*The 1986 Census of Canada: Current Status Report, by Statistics Canada (presented by Benoit Laroche)

Measurement problems

*Measuring Unemployment and Underemployment in Thailand, by Phensri Suwan-singha

*Use of Census and Survey Data for Analysis and Projection of Labor Supply, by John Bauer and Andrew Mason

*A New Method of Classifying Household Composition by Computer, presented by Benjamin Mok

*Census Data for Studying the Elderly Populations of Asia and the Pacific, by Linda G. Martin

*Use of the Population Census for Measuring Literacy, by Luisa T. Engracia

*Urban-Rural Classification in the Indonesian Censuses of 1961, 1971 and 1980, by Azwar Rasjid

Census automation

*Issues Related to Data Processing System of Population Census, by Tadatoshi Sakai

*Automation in the 1990 U.S. Census of Population and Housing, by Peter A. Bounpane

*Report on Investigations Being Made by Australia into Automation of Data Transcription, by John Cornish

*Computer-Assisted Coding (CAC)—Reference Paper, by Roy Wilson

*Processing the 1986 Census of Population and Dwellings in New Zealand, by Population Census Division, Department of Statistics (presented by Michael A. Moore and Brett M. Martin)

Demonstration of New Zealand's System of Computer-Assisted Coding, via Satellite Hookup to Christchurch, New Zealand, presented by Michael A. Moore and Brett M. Martin

Policy uses of census data

*Census and Survey Data Needed for Family Planning and Health Programs, with Refer-

ence to Developing Countries, by R. Henry Pardoko

Enumerating minorities

Enumerating Minorities in China, by Weiqun Du

*Census of Population Statistics on Minorities in Sri Lanka, by Raja Bertram Maligaspe Korale

*Enumerating Minorities in the United States: Where a Statistical Society Meets a Litigious Society, by Bryant Robey

*Enumeration of the Aboriginal and Torres Strait Islander Population, by John Paice and D. W. Black

*Census Questions Used to Enumerate Minority Groups in Canada, presented by D. Bruce Petrie

Fertility and Mortality

*Recent Developments in Vital Statistics in India, by Office of the Registrar General (presented by V. S. Verma)

*Districtwise Estimates of Child Mortality in Rajasthan—1981 Census Analysis, by K. S. Natarajan

*Infant Mortality Trends and Differentials in Nepal, by Bbakta Gubbaju, Minja Kim Choe, Robert D. Retherford, and Shyam Thapa

*Reconstruction of Birth Histories from Census and Household Survey Data, by Norman Y. Luther and Lee-Jay Cho

Planning for the 1990 round of censuses

*Planning for the 1991 Census of Population in Nepal: Some Reflections, presented by K. R. Sharma

Improved Strategies for Disseminating Population Census Data in Canada, *presentation by D. Bruce Petrie*

*Post 1980 Census Activities and Planning for the 1990 Census in Malaysia, *by Department of Statistics (presented by Teik-Huat Khoo)*

*Problems Encountered in the 1980 Census of Population and Improvements over the 1970 Census [of Singapore], *by Bee-Geok Leow*

*New Directions in Census-Taking, *by Jack Keane (presented by Peter A. Bounpane)*

*Planning Considerations for the Next Population and Housing Census of Pakistan, *by G. Mujtaba Mirza*

*The 1990 U.S. Census of Population and Housing: Test Census Results and 1990 Plans, *by Peter A. Bounpane*

*Recommendations of the ESCAP Regional Working Group on the 1990 World Population and Housing Census Programme, *by Laurence H. Lewis*

Asian and Pacific Population Forum

New Directions for the *Forum*, *presentation by Linda G. Martin*

*EASWESPOP-FERTILITY [microcomputer fertility estimation software available from the East-West Population Institute], *by Robert D. Retherford*

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Book Reviews

Pacific Bridges: The New Immigration from Asia and the Pacific Islands edited by James T. Fawcett and Benjamin V. Carino. Staten Island: Center for Migration Studies, 1987. Published in association with the East-West Population Institute, East-West Center, Honolulu, Hawaii. xii, 489 pp. Cloth, US \$17.50, ISBN 0-934733-10-4; paper, US \$12.95, ISBN 0-934733-09-01. Available from Center for Migration Studies, 209 Flagg Place, Staten Island, N.Y. 10304, U.S.A.

In recent years the focus of demography, which has been primarily on fertility behavior, has expanded to include extensive work on international migration. The movements of political refugees, immigrants, temporary workers, students, tourists, and others crossing national boundaries have stimulated the interest of researchers and government planners. Global interest in the fate of these people has led to an ever-growing body of literature on international migration.

It is therefore surprising to find, as editors Fawcett and Carino note in their preface, that heretofore no publication has been available that "assesses comprehensively contemporary immigration flows in the Asian and Pacific region." This book is designed to fill that gap.

Pacific Bridges is one of the products of a larger program in international migration at the East-West Population Institute. That program has as its goals the development of a comprehensive data base, the conduct of original research, and the dissemination of relevant findings to interested scholars and policymakers. An international Con-

ference on Asia-Pacific Migration to the United States was convened in September 1984. About half of the papers from that conference were revised and edited for this book.

The significance of international migration to the Pacific Basin is summarized by the editors in an introductory chapter. Part I, Factors Influencing International Migration Flows, provides a general framework for succeeding chapters.

Of particular importance is Chapter 2 by Mary M. Kritz, whose analysis of international migration flows worldwide since 1960 shows important shifts in permanent migration. Only a few countries still admit significant numbers of permanent immigrants, and the United States is the largest of these. Kritz identifies three factors shaping contemporary migration—temporary migration, interdependence among nations, and social networks linking sending and receiving areas. She rejects the view that economic inequalities between areas explain migration flows, and she sets forth the components of a new migration paradigm.

This theme is carried forward in Chapter 3 by Alejandro Portes, who also looks at explanations for migration in four areas—the origin of flows, the causes of their stability, the uses of immigrant labor, and migrant adaptations in a host society.

In Chapter 4 Michael S. Teitelbaum discusses the international relations of migration: the effect of foreign policy on migration, the effect of migration on foreign policy,

and migration as an instrument of foreign policy. He uses such examples from recent Asian history as the refugee exodus prompted by U.S. policy in Indochina and the impact of the "Taiwanese lobby" on U.S. foreign policy.

Chapter 5 by Astri Suhrke and Frank Klink reminds us that understanding refugee flows is not a simple task. Through comparison of Vietnamese and Afghan cases, they show that the direction and size of refugee flows are influenced by policies in receiving countries.

Part II, Immigration Trends and Policies, looks at immigrant and refugee flows from the perspective of four major receiving countries—the United States, Australia, New Zealand, and Canada. The four countries have in common many factors related to Asian migration that are revealed in an examination of the historical development of their current immigration policies.

Chapter 6 by Fred Arnold, Urmil Minocha, and James T. Fawcett delineates the relationship between U.S. immigration policies and the number of immigrants from specific countries. Similar parallels are drawn by Charles A. Price for Australia in Chapter 8, Andrew D. Trlin for New Zealand in Chapter 9, and Daniel Kubat for Canada in Chapter 10.

Part III of *Pacific Bridges* provides a detailed look at Asian immigration to the United States. Recent U.S. census data and statistical sources are analyzed to present an Asian American socioeconomic

profile and to project the future growth of the Asian American population.

Chapter 11 by Peter S. Xenos and his colleagues compares Asian Americans with other major immigrant groups—blacks, Hispanics, and non-Hispanic whites. This chapter confirms the success story of Asian Americans while revealing differences within the group.

Leon F. Bouvier and Anthony J. Agresta project a sixfold increase in the Asian American population, from 3.5 million in 1980 to 20 million, by 2030. The cultural implications of this increase are pointed out by the authors in a discussion of an emerging multicultural society.

Part IV, *Sending Country Perspectives*, looks at explanations for the new Asian immigration as well as the impact of emigration on the home countries. The Philippine situation is the focus of Chapter 13 by Carino, and its colonial ties to the United States explain why it is the largest current source of Asian immigrants. In Chapter 14 on South Korea and East Asia, Ilsoo Kim suggests that a multiplicity of reasons has led South Koreans to emigrate to the United States. Urmil Minocha pulls together in Chapter 15 what little is known of Indian and Pakistani migrants, and in Chapter 16 John Connell surveys the situation in the Pacific Island nations.

The last part of the book, *Research Issues*, suggests gaps in knowledge and priorities for future research in both the sending and the receiving countries. In the final chapter Fawcett and Arnold note that the wide diversity in Asian and Pacific immigration poses a challenge to immigration theorists. They

propose a broad migration-systems paradigm. Their paradigm "requires the use of macro- and microdata, it presupposes a knowledge of history as well as of contemporary conditions at the origin and at alternative destinations, it seeks to explain both stability and different forms of mobility, it pays particular attention to the linkages between places, and it recognizes that the parts of a migration system are dynamically interconnected" (p. 471).

This well-written and comprehensive monograph contains references in each chapter, a list of contributors, and an index. It is worthwhile for all population collections, especially those with an Asian or Pacific focus. □

—Alice D. Harris

Asia-Pacific Population Journal. Published by the United Nations, Economic and Social Commission for Asia and the Far East. Bangkok: United Nations, 1986-. Quarterly, free. Available from: Population Division, United Nations ESCAP, Bangkok 10200, Thailand.

This new population journal is aimed at providing the countries of Asia and the Pacific with informational articles by population experts to assist government officials, planners, and scholars involved in population programs and policymaking within the region. The contents are a mixture of theory, methodology, and details of operation in the field of population and family planning in Asia and the Pacific. Individual issues are small and attractively designed so that they catch the reader's eye.

The editors invite contributions from anyone knowledgeable about the region. Articles discuss population problems and strategies for their solution—whether successful

or not—from which others may benefit. Examples from the first four issues are "Population and Urbanization" by Rafael M. Salas, late executive director of the United Nations Fund for Population Activities; "Population Growth and Economic Development" by Samuel H. Preston and Peter Donaldson; "Community-based Incentives: Increasing Contraceptive Prevalence and Economic Opportunity" by Donald Weeden et al.; and "An Overview of South Pacific Population Problems" by Penny Kane and David Lucas. The journal has a Book Review Section and a Demographer's Notebook containing brief statistical notes.

Asia-Pacific Population Journal is a welcome addition to regional population literature and should be in all population libraries both within and outside the region. □

—Alice D. Harris

The State of Population Theory: Forward from Malthus edited by David Coleman and Roger Schofield. Oxford and New York: Basil Blackwell, 1986. 310 pp. US \$45.00. ISBN 0-631-13975-3. Available from Basil Blackwell, 108 Cowley Road, Oxford OX41JF, England, U.K., and 432 Park Avenue South, Suite 1505, New York, N.Y. 10016, U.S.A.

The basic premise of this collection of papers is that population theory—despite the vast amount of available literature on population dynamics—has not advanced appreciably since the time of Robert Thomas Malthus. In their introductory chapter, the editors quote from a 1984 paper by Nathan Keyfitz, who states that demography has "withdrawn from its own frontiers, and left a no-man's land which other disciplines have infiltrated."

Coleman and Schofield cite the emergence of such models as the "child survival hypothesis" and the "minority status hypothesis" as beginnings but argue that much more needs to be done to put these into a theoretical framework that can support demographic research and methodology. Since their opinion may run counter to that of other population specialists, this book should provoke theoretical discussion.

The question of what has happened to population theory since Malthus's time was the topic of a conference organized by the British Society for Population Studies in 1984. Most of the papers in the volume are from this conference, Forward from Malthus: The State of Population Theory in 1984. The papers relate population processes to present-day realities and to questions of scale and coherence in modern population theory. Among the questions raised are, how can large-scale populations be related to individual actions and perceptions, and can these perceptions be generalized across societies of different levels of complexity?

Following an introductory chapter by the editors are three chapters by Richard Stone, G. N. Von Tunzelmann, and Ronald Demos Lee that are devoted to an assessment of Malthus and his theory. Von Tunzelmann explores the dynamic properties of Malthus's demographic-economic theory, whereas Lee contrasts the approaches of Malthus and Boserup to population growth, showing how the relations between population, technology, and the standard of living predicted by both economists can be synthesized into a joint theory of considerable

power and scope.

Philip Kreager also discusses the relationship between population, economic development, and cultural systems, as do several of the remaining contributors. Nancy Howell shows how small, sparse, but stable populations of the hunter-gatherer societies were the result of undernourishment and hence low fertility, which prevented exponential growth. By contrast, R. M. Smith demonstrates how familial relations must be taken into account when modeling the relations between population and economy in preindustrial England.

The work contained in this volume indicates that after decades of concentration on the "internal" mathematical theory of demography, much greater attention is now being paid to the "external" theory

of initial conditions imposed by the social, economic, and moral context. This new approach has both methodological and substantive advantages. Theories derived from several disciplines such as economics, sociology, and history enhance the logical rigor of internal demographic theory.

Resulting hypotheses can then be subjected to the scientific procedures of scientific inference. "In this way demographers may hope to put their house in order and avoid the charge recently levelled by Wunsch that a substantial proportion of their research has lacked an adequate theoretical orientation" (p.11).

Each selection is accompanied by references, and the book contains an index and notes on the contributors. This is a scholarly, though

New Software Package

EASWESPOP—DATA ENTER, the second module of the East-West Population Institute's EASWESPOP microcomputer library, is a software package for accurate and consistent entry of population data. Its features include record definition, record verification, checks for range and data type, generation of constant data, and automatic increment and automatic fill of data items. Minimum system requirements of the program, which is copyrighted but not copy-protected, are IBM PC compatibility, MS-DOS 3.0 or higher, 256k RAM memory, and two disk or diskette drives.

A single copy of EASWESPOP—DATA ENTER software and documentation is available without charge to institutions engaged in population work in Asia or the Pacific. Institutions outside the Asia-Pacific region and individuals may purchase the package for US \$10.00 per copy. (Please send check or international money order only; do not send cash.) Address requests and orders to: Data Analysis Officer, East-West Population Institute, 1777 East-West Road, Honolulu, Hawaii 96848, U.S.A.

A future module will include EASWESPOP—PARITY PROGRESSION PROJECTIONS.

perhaps controversial, book. It should certainly stimulate further work on population theory. Unfortunately, as with most books these days, the price of a copy is high and may be beyond the means of any but the biggest demographic or academic libraries. That is a shame because it is certainly worthwhile reading. □

—Alice D. Harris

Population Growth and Economic Development: Policy Questions by the Working Group on Population Growth and Economic Development, National Research Council. Washington, D.C.: National Academy Press, 1986. xii, 108 pp. US \$5.00. ISBN 0-309-03641-0. Available from National Academy Press, 2101 Constitution Avenue, N.W., Washington, D.C. 20418, U.S.A.

This report is the most recent in a series of publications issued by the U.S. National Academy of Sciences on the relationship between population growth and economic development. The first report, appearing in 1963 as *Growth of World Population*, expressed the concerns of social scientists of that time about the implications of long-term population increase. The report was followed in 1971 by the two-volume report *Rapid Population Growth: Consequences and Policy Implications*.

By that time, the peak of the rate of growth of the world's population had passed. The more developed countries now have annual rates of increase below 1 percent, and there has been a dramatic decline in the birth rates of most developing countries.

The present work should be of considerable interest to population

and family planning specialists. Its conclusions fall midway between the prophets of doom and those who support rapid population growth on the grounds that it is good for economic development.

The report revises earlier NRC analyses casting population growth as one of the chief villains behind world social, environmental, and economic problems. The view now is that many of the detrimental effects of population increase can be overcome by the remarkable ability of individuals, government institutions, and markets to adapt to changing pressures. In particular the adaptability of the marketplace has been recognized as a positive factor in this report. The optimism of the new assessment is in keeping with recent United Nations prognostications on the future of world population.

The report covers eight policy areas: exhaustible resources, renewable resources, pollution, worker productivity, economies of scale and technological innovation, education, income distribution, and urban growth. Although slower population growth would alleviate some of the concerns in most of these areas, the Working Group suggests that other factors, such as government policies in those areas, might be more important. The group also places family planning programs within the framework of broader economic development programs and supports them on the basis of their contribution to individual health and welfare.

As with other National Research Council reports, this one is brief, well-organized, and inexpensive. Tables, references, and an index enhance its usefulness. A bargain at

\$5.00, it deserves to be on every population specialist's reading list. □

—Alice D. Harris

Aging in the Western Pacific: A Four-Country Study by Gary R. Andrews, Adrian J. Esterman, Annette J. Braunack-Mayer, and Cam M. Rungie. Manila: World Health Organization Regional Office for the Western Pacific, 1986. xii, 155 pp. Swiss francs 25. Available from World Health Organization, Publications Department, P.O. Box 2932, Manila, Philippines.

Population aging is occurring rapidly as fertility falls in many of the less developed countries of Asia. Although the proportions of elderly in their populations are small compared with those in the more developed countries, the absolute numbers of elderly will double in the next twenty years. Accordingly, there is increasing interest in learning more about the elderly of Asia.

The World Health Organization-sponsored surveys of Fiji, South Korea, Peninsular Malaysia, and the Tagalog Region of the Philippines are an important part of the international effort to assess the needs and the resources of the elderly. The surveys, which were based on a common questionnaire, obtained data from elderly respondents on their demographic characteristics, economic resources, health, activities of daily living, smoking and drinking habits, social activities, housing, and mental state. They also elicited assessments from key informants and the interviewers.

In Fiji and Malaysia a small sample of the respondents was reinterviewed at a later date, and the comparison of responses provides

valuable insight into the reliability of different types of questions. Not surprisingly, income questions had rather poor reliability in both countries, as did questions on education and work experience in Fiji.

Aging in the Western Pacific, which is essentially a first report, provides basic tabulations of variables by country, sex, and age of respondent and only a few cross-tabulations otherwise. The authors are cautious about cross-country comparisons of variables that involve subjective assessments, since they tend to be influenced by culture. For example, Filipinos reported higher levels of satisfaction with their health than respondents from other countries, but they also had more health problems, such as acci-

dents, injuries, or chronic illnesses.

Further analysis, in progress, will try to answer many interesting questions raised by the basic tabulations. One surprising finding is that urban elderly are more likely to live with their children than rural elderly in South Korea, Malaysia, and the Philippines. The authors offer as one possible explanation the migration of young people to cities, but multivariate analysis that controls for other socioeconomic variables is needed.

The final chapter on policy and program implications is essentially the standard laundry list of possible efforts to be made for the elderly. Given the book's preliminary nature, this chapter could have been easily omitted, but no doubt the

authors were under some obligation to make policy recommendations. Nevertheless, the book provides valuable baseline information to researchers and policymakers who will be involved in further development of the research agenda and ultimately in policy formulation for these countries.

It should also be valuable to researchers from other countries, since it points out pitfalls of trying to translate standard elderly survey techniques from Western to Eastern cultures. The authors and their colleagues on the survey project are to be congratulated for the speedy publication of a very useful volume. □

—Linda G. Martin

ECONOMIC ASPECTS . . .

(continued from page 8)

APPENDIX: Data Sources and Method of Calculation

■ Data sources

Singapore Department of Statistics (DOS), *Census Release No. 2* (1981): life tables for Singapore.

Singapore, DOS, *Report of the Household Expenditure Survey 1977/78* (September 1979): private consumption expenditure per household, by educational status of head, income per household by education of head, average household size by education, average number of income earners per household.

Singapore, DOS, *Yearbook of Statistics* (1983-84 and 1977-78): annual data on government expenditure and enrollment in educational institutions, government expenditure on health, population estimates, nominal average weekly earnings, gross domestic product deflator, con-

sumer price index.

Singapore Family Planning and Population Board (SFPPB), *Annual Report* (1975-82): cost of family planning services in Singapore.

SFPPB, private correspondence: estimates of the number of births prevented by its program during 1975-82.

■ The calculations

Direct Costs of Family Planning.

The SFPPB provided estimates of the number of births prevented by its program during the eight years 1975-82. The board's yearly costs were converted into real costs with 1977-78 as the base. Then the yearly real costs were divided by the annual estimates of the number of births prevented. Because it is sometimes difficult to allocate births prevented to a given year's expenditure, the average cost per birth prevented over the eight years was taken as the

direct project cost. The same figure was used for both university and primary-school graduates.

There are two possible sources of bias. The cost per birth prevented could be correlated with the mother's education. No information on mother's education was available. The costs of the SFPPB do not include some family planning activities, such as some abortions that are performed in government hospitals. The estimated costs therefore underestimate actual costs somewhat.

Labor Productivity. Primary education lasts six years and is compulsory, secondary education is for four years, preuniversity is for two years, and university education lasts three years. The Household Expenditure Survey gives average household income by the educational status of the head, but no details of the number of income earners per household by education are avail-

able. The average for the whole survey, 2.5, was therefore used to calculate income per earner for each group. The way this was converted to estimate marginal value product is described in the text. The marginal value product for years 12–15 inclusive is assumed to be a quarter of the adult marginal value product, but clearly this applied only to primary school leavers.

Growth rates in marginal value product are not available from the Household Expenditure Survey. Accordingly, I have assumed that real marginal value product in the period denoted in the Appendix Table would grow at the same rate as real average weekly earnings (deflated by the consumer price index).

Possibilities of error exist in using these data. One is the implicit assumption that the education of secondary income earners in the household is correlated with the education of the head. As explained in the text, however, no other assumption was possible given the available data.

Private Consumption per Head. Private consumption per head for the two educational groups is taken directly from the survey. Although this probably overestimates marginal consumption, the use of average figures is standard for want of better data.

The growth rate is based on the assumed rate of growth of marginal value product. An average of 44 percent of any increase in marginal value product has to be paid to the central superannuation fund. Two percent is payroll tax, and personal income tax is assumed to be between 5 and 10 percent on average. Allowing for a marginal propensity to consume from the remaining income of 0.8, real consumption would increase by about 1.4 percent when marginal value product rises by 4 percent.

Age-specific consumption and income data are not available, so that apart from the adjustment in marginal value product for years 12–15, a constant stream over the project life has been assumed. Both private consumption and

marginal value product will therefore be overestimated in the early years and underestimated in the later years.

Government Savings. Observed recurrent government expenditures on health per capita and education per pupil are used as estimators of marginal government savings. Capital expenditures are omitted to counteract the upward bias of using average rather than marginal expenditures.

This estimate of expenditure on education does not represent the full cost of education estimated elsewhere (Asher 1984). Full costs include a private component already incorporated into private consumption expenditure. Real growth rates have been estimated by deflating actual expenditure by the gross domestic product deflator.

Base-year values of all the variables and the growth rates used in the calculations of the high-growth scenario are reported in the Appendix Table.

NOTES

The first draft of this article was written while I was on the faculty of the Department of Economics and Statistics, National University of Singapore. Ms. S. C. Goh helped to collect some of the data. The comments of two anonymous referees are appreciated.

1. Reasons for the policy change are summarized in the *Far Eastern Economic Review* (FEER, 8 September 1983, p. 23).

2. Accordingly, all women are now encouraged to have at least two children, and more if they can afford to (*Asia Yearbook 1987*, FEER, p. 235).

3. Let us assume that the value of the production of a worker (price times quantity of output) has risen by 10 percent. If all prices in the economy have also risen by 10 percent, the observed increase in production would have been due simply to inflation. However, if prices have risen by only 5 percent, some of the increase in the value of production would be due to an increase in the worker's physical output. In this case *real* production would be said to have increased, whereas only *nominal* production would have increased in the first case. The

Appendix Table. **Base-year estimates (\$) and growth rates (%): Singapore**

	Base year (\$)	Annual growth rate (%) 1972–73 to 1982–83
Costs and benefits		
Costs		
Family planning services per birth prevented	56.00	—
Marginal value product		
Primary school education	5,265	4
Tertiary (university) education	17,849	
Benefits		
Savings in private consumption per head		
Primary school education	1,578.24	1.4
Tertiary (university) education	4,360.80	
Savings in government health expenditure per head	66.71	6
Savings in government education expenditure per pupil		
Primary	453.18	11
Secondary	579.17	14
Tertiary (university)	4,820.80	10

Terms "real" and "nominal" can be applied to any variable that is measured in money terms.

4. Information on wages is also available from monthly surveys conducted by the Department of Labor. I have not used it because the surveys do not employ the same sampling methodology as the Household Expenditure Survey. Income data from the former source are not consistent with the only available expenditure data, which came from the latter source.

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A Simplified Estimate . . .

(continued from page 12)

West model for all countries. A comparison of b'_V with b_R and b_C indicates that they are very close to one another. It is heartening to find such close agreement between the various birth rate estimates even when we have not adjusted the reported data for possible errors.

We conclude that the simplified robust estimate of the birth rate given in equation (6), which is close to Coale's method, offers two advantages. First, it simplifies the computational work by not requiring reference to model stable populations or model life tables. Second, it avoids marginal errors due to approximations that are inevitable in numerical work dealing with stable population models and model life tables. □

Table 3. Estimates of adjusted birth rates based on the four methods

Region and country	Estimated birth rates			
	b_r	b_C	b_V	b'_V
Asia				
Japan	17.4	17.0	17.3	17.3
Hong Kong	21.5	21.5	21.4	21.5
Sri Lanka	30.7	30.6	30.7	30.8
India	39.7	39.4	39.6	39.8
Africa				
Ghana	50.5	49.7	50.4	50.0
Liberia	45.2	44.8	45.2	44.9
Sierra Leone	50.6	50.2	50.5	50.1
Kenya	49.9	49.2	49.9	49.7
Malawi	53.8	53.2	53.7	53.3
Tanzania	50.6	49.9	50.1	50.0
Lesotho	37.1	36.9	37.6	37.0
Swaziland	48.4	47.4	48.1	47.7
Libya	55.6	54.5	55.4	55.3

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We are very grateful to Professor Ansley J. Coale for his valuable comments on an earlier draft of this article. We also wish to thank the anonymous reviewers. The views expressed here are our own and do not necessarily reflect those of the United Nations or the Regional Institute for Population Studies.

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To Our Readers

This issue marks several personnel changes. Mr. P. Padmanabha, former Registrar General of India and Executive Director of the Family Planning Foundation of India, has resigned as associate editor of the *Forum*. His advice and support have been valuable and will be missed. Replacing David Ellis as managing editor is Ms. Sandra E. Ward, East-West Population Institute Senior Editor. She brings to her assignment eighteen years of editorial experience and expertise in the field of population.

ASIAN AND PACIFIC POPULATION FORUM

Volume 1 Number 5

November 1987

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18 **Reviews**

Breastfeeding Women and Family Planning Programs: Special Needs and Opportunities

by Nancy E. Williamson

OVER THE PAST DECADE it has become clear that breastfeeding makes a major contribution to fertility control and child spacing in many developing countries, although biological scientists are still exploring the endocrinological pathways by which breastfeeding delays the return of fecundity. Fertility surveys such as the World Fertility Surveys, the Contraceptive Prevalence Surveys, and the breastfeeding surveys of the World Health Organisation have documented the strong association between breastfeeding duration and length of postpartum amenorrhea

(e.g., Goldman, Westoff, and Paul 1987; Habicht et al. 1985; World Health Organisation 1981; World Fertility Survey 1984).

Despite the demonstrated effect that breastfeeding has on child spacing in less developed countries, the implications of this finding are not widely recognized among family planning managers, workers, and clinicians. Health programs typically focus on the very important nutritional and anti-infective contributions of breastfeeding, but not on its contraceptive effect.

This article examines the evidence of breastfeeding's effect on child spacing, considers why family planning programs in developing countries have overlooked this effect, and suggests how programs can help lactating women get the maximum contraceptive effect from breastfeeding while also helping them to adopt family planning methods at the appropriate time.

Nancy E. Williamson is Director of the Program Evaluation Division at Family Health International, Research Triangle Park, North Carolina.

ASIAN AND PACIFIC POPULATION FORUM

Editor Linda G. Martin,
Associate Fred Arnold
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Editor

The *Asian and Pacific Population Forum*, published quarterly, brings articles of potential value in policy formulation, program administration, and research to the notice of professionals concerned with population matters, particularly in Asia, the Pacific, and the United States.

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■ Demographic evidence

The demographic effect of breastfeeding on child spacing varies throughout the world. It is more important in some Asian countries and particularly in Africa than in developed countries and in Latin America, where contraception is more common and the breastfeeding period is shorter (Thapa, Short, and Potts 1987).

Many investigators have tried to quantify the additional amount of contraceptive protection (or "waiting time" until the next conception) conveyed by an additional month of breastfeeding for women using no contraception. For example, Goldman, Westoff, and Paul (1987) found in 20 surveys that each additional month of breastfeeding resulted in 0.76 to 0.80 months of waiting time. Other studies using slightly different approaches have put this figure at 0.40 months (Jain and Bongaarts 1981; Jain and Sun 1972), 0.56 months (Corsini 1979), and 0.70 months (Bongaarts and Potter 1983).

Various methodological problems are associated with assessing the contribution of breastfeeding to postpartum infecundity (see, e.g., Corsini 1979; Habicht et al. 1985; Santow 1987). However, for non-contracepting populations in many developing countries, "variations in breastfeeding duration appear to account for most of the observed variation in birth interval length" (Goldman, Westoff, and Paul 1987:134).

Of course, the fact that a woman is breastfeeding does not automatically mean she has contraceptive protection, and a few women become pregnant while still amenorrheic. In the developing countries cited in Table 1, from 1.5 to 7.5 percent of breastfeeding women who were using no contraceptive method became pregnant before their menses resumed. This range is sometimes rounded off to between 5 and 10 percent to be on the conservative side.

These percentages are neither life table failure rates nor Pearl

To Our Readers

Yes, this is Number 5 of Volume 1. We have decided to include five issues in this first volume in order to put the *Asian and Pacific Population Forum* on a calendar-year schedule. Volume 2, Number 1, will appear in February 1988.

The following persons generously reviewed manuscripts for the *Population Forum* over the past year. The editors are grateful for their advice and suggestions.

Fred Arnold
John Bauer
Ansley J. Coale
David Ellis

Griffith Feeney
Indra Gajayanake
Victoria T. Ho
Andrew Mason

Jane Menken
James A. Palmore
Robert D. Retherford
Shyam Thapa

pregnancy rates, since the duration and type of breastfeeding vary across the populations listed here. Nor do they take into account possibly overlapping effects of breastfeeding and postpartum sexual abstinence or reduced sexual activity. Nevertheless, they are suggestive of breastfeeding's contraceptive effect and are remarkably consistent for the developing countries listed.

A further refinement in the analysis of breastfeeding has been to distinguish between full breastfeeding (un-supplemented by other

foods) and partial breastfeeding. A number of studies have found that full breastfeeding postpones fecundity longer than supplemented breastfeeding (e.g., Diaz et al. 1982; Gray et al. 1986; Howie and McNeilly 1982; Rivera et al. 1985, 1987).

Although it has proven difficult to predict precisely the time ovulation returns for breastfeeding women, it appears that duration of breastfeeding, breastfeeding intensity (frequency and duration day and night), and supplementation patterns are important predictors of the duration of postpartum infecundity. A woman who breastfeeds intensively (on demand, frequently, and at night), exclusively (using no bottles, pacifiers, or supplements), and for a prolonged time will usually experience longer lactational infecundity than a woman who breastfeeds less conscientiously.

A woman who breastfeeds intensively, exclusively, and for a prolonged time usually experiences longer lactational infecundity than a woman who breastfeeds less conscientiously.

The fecundity-inhibiting effect of breastfeeding can persist even after a breastfeeding woman has resumed menstruation (John, Menken, and Chowdhury 1988). This effect enhances the demographic contribution of breastfeeding but is of less practical relevance to an individual woman, who would be ill-advised to rely on the contraceptive

effect of breastfeeding after her menstrual cycles have resumed.

Nevertheless, the infecundity associated with breastfeeding fulfills many of the requirements of a good temporary contraceptive method: it is safe, coitus-independent, convenient, and free, and it does not require the services of medical personnel.

It can also be effective. As long as a breastfeeding woman is not ovulating, she has no chance of becoming pregnant. Thus it is 100 percent effective in that period.

Does the fact that 5–10 percent of amenorrhic breastfeeding women become pregnant mean that breastfeeding is less effective than temporary methods of birth control? We cannot directly compare the percentages in Table 1 with the pregnancy rates usually calculated for temporary contraceptive methods, such as those in Table 2. The former have number of women as the denominator, whereas the latter are rates based on woman-years of use. Nevertheless, it is important to note that the actual effectiveness of temporary methods can be much lower than their theoretical or clinical-trial effectiveness.

For example, although we may think of pills as having a failure rate of 1–2 pregnancies per hundred women-years of use, in developing countries pregnancy rates among the general population of women using the pill may be much higher. The survey data from the Philippines shown in Table 2 give a Pearl pregnancy rate of 19 failures per 100 woman-years of pill use. Although the Philippine rates may not necessarily be typical of all developing countries, they do serve to remind us that temporary contra-

Table 1. **Percentage of noncontracepting women who conceived during lactational amenorrhea: selected countries**

Country	Sample size	Percentage conceiving
Bangladesh	107	6.8
Canada (Eskimos)	116	2.6
Chile	170	7.0
Egypt	139	4.3
Egypt	148	6.8
India	68	3.0
India	1,480	1.5
India	1,500	7.0
India	1,079	7.5
Philippines	604	3.0
Rwanda	209	5.4
Rwanda		
Urban	57	2.0
Rural	47	5.0
Taiwan	2,000	6.0
United States	100	10.0
United States	89	13.0

Note: The various studies on which the table is based are not strictly comparable and do not establish a risk of conception specific to length of amenorrhea or type of breastfeeding practice.

Source: Based on Table 1 in Simpson-Hebert and Huffman (1981:126).

ceptive methods, especially those that depend on users' behavior, are far from perfect.

The limitation of breastfeeding as a child-spacing method for the individual is that we do not yet have an absolutely reliable way to predict when ovulation is going to resume. No matter how a woman breastfeeds, she will not be able to suppress ovulation indefinitely. Even exclusive and intense breastfeeding will not necessarily postpone fecun-

dity for the whole duration of breastfeeding or for all women.

Breastfeeding: a family planning method?

Although there is general agreement that breastfeeding makes an important demographic contribution to child spacing, it differs from family planning methods in several respects. It can be used only by new mothers and cannot be used to postpone the first birth. Nor is it

appropriate for women who have attained their completed family size.

It is not appropriate for women who need or want to avoid or postpone another pregnancy at any cost. For such women, immediate postpartum sterilization or the use of an intrauterine device (IUD), injectable, or implant is more suitable. If a woman can take a pill every day, the progestin-only pill is another alternative. Research is under way on whether natural family planning methods are appropriate for breastfeeding women.

Some lactating women may not know that breastfeeding postpones the return of fecundity after childbirth. Others who may suspect it has a contraceptive effect breastfeed not primarily for that reason, but rather to nourish their babies. The child-spacing motivation may be only one of several secondary objectives, such as strengthening the emotional bond between mother and child, convenience, saving money, or following tradition. Only a small number of women in developing countries are convinced that breastfeeding delays fecundity and consider it to be their "contraceptive method."

Finally, as already mentioned, the breastfeeding mother can neither control nor predict when the contraceptive effects of breastfeeding will end. Thus, if breastfeeding can be considered a family planning method, it is a very special kind of method.

Strictly speaking, it is not breastfeeding itself that is the "method." Rather, it is the *infecundity associated with breastfeeding* that constitutes the "method." This point must not be overlooked.

Table 2. Estimates of annual continuation rates, Pearl pregnancy rates, expected Pearl-type pregnancy rates, and contraceptive effectiveness, by method: Philippines

Method	Woman-months ^a	Annual continuation rate ^b	Pearl pregnancy rate ^c	Expected pregnancy rate ^d	Contraceptive effectiveness ^e
Pill	4,875	42	19	113	83
IUD	1,980	70	4	95	96
Rhythm	7,941	51	33	89	63
Condom	1,561	10	60	104	42
Withdrawal	10,668	43	44	90	51
Abstinence	871	13	(17)	107	(84)
Rhythm plus withdrawal	2,863	73	12-17 ^f	90	81
Rhythm plus condom	819	51	22-31 ^f	108	71

Note: Parentheses denote relatively unreliable estimates based on fewer than 600 woman-months of observation. The Pearl pregnancy rate for abstinence is in parentheses because it is based on a denominator of only 455 woman-months after exclusion of months of overlap with postpartum amenorrhea. The contraceptive effectiveness measure of abstinence is also in parentheses because it is derived in part from the Pearl rate.

- Number of woman-months of use from January 1978 to two months before the interview (denominator for annual continuation rate).
- In this case, the annual continuation rate is an index of first-method continuation.
- Pearl pregnancy rate (PRR) is the number of failures (pregnancies) occurring per 100 woman-years of method use by nonamenorrheic users.
- Expected pregnancy rate (EPR) is an estimate of the Pearl-type pregnancy rate that might have been expected in the absence of contraceptive practice.
- Contraceptive effectiveness is the percentage by which the probability of conception is reduced as a result of contraceptive practice. $CE = 100(1 - PPR/EPR)$.
- The higher Pearl pregnancy rate figures for combinations are based on more conservative estimates of the numbers of accidental pregnancies, obtained by counting all conceptions immediately following a month of use of the specified combinations. These estimates are viewed as more realistic and serve as the basis for the contraceptive effectiveness estimates.

Source: Table 1 in Laing (1985:141).

Although the general risks of pregnancy during breastfeeding are known, it is difficult for medical practitioners to predict what will happen in an individual case. But that is the usual situation in the medical field. Advice to a breastfeeding woman must acknowledge this uncertainty while helping the woman make an informed choice about family planning.

Why has the child-spacing effect of breastfeeding been ignored?

Family planning programs have ignored the contraceptive effect of breastfeeding for several reasons.

One reason relates to terminology. Contraception may imply, to both family planning program managers and potential program users, something modern, mechanical, or chemical, whereas breastfeeding's contraceptive effect is a natural biological mechanism involving no modern technology.

Furthermore, if family planning program managers, health professionals, or policymakers were educated in the West, where breastfeeding is of little contraceptive importance, they probably learned little about the child-spacing effects of breastfeeding. Breastfeeding was not listed as an intermediate variable in the well-known article by Davis and Blake (1956) about factors affecting fertility. Nor did Berelson (1969) mention breastfeeding in his compilation of "beyond family planning" policy options, a paper that influenced policymakers to think about what could be done to reduce fertility besides providing contraceptive services.

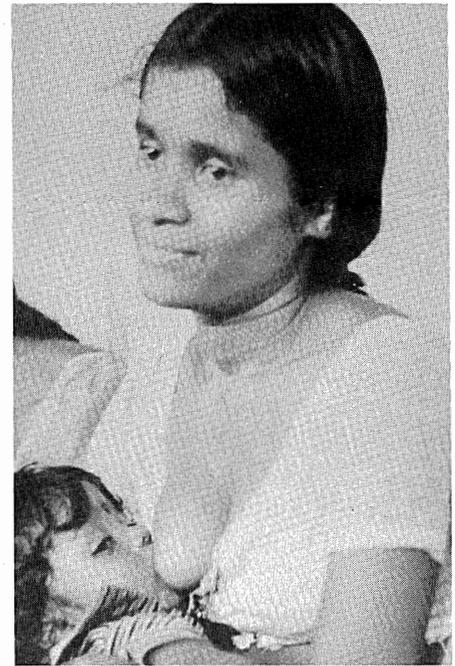
Regardless of where or how family planning professionals were

educated, they may consider claims about the pregnancy-postponing effect of breastfeeding to be examples of an "old wives' tale" or may not consider breastfeeding to be sufficiently effective at the individual level.

Direct-service providers tend to be especially skeptical about the contraceptive effect of breastfeeding. Sooner or later they will encounter a woman who was breastfeeding, using no contraceptive method, and became pregnant. The service provider may not stop to consider whether the breastfeeding woman had resumed menses or how intensively she had been breastfeeding, before concluding that the contraceptive effect of breastfeeding is unreliable.

The medical profession, with its preference for modern contraceptives, generally ignores or is unaware of evidence of the fecundity-inhibiting effect of breastfeeding. A recent study in Mexico (Potter, Mojarro, and Nuñez 1987) found that physicians were more likely than traditional midwives to advocate early food supplementation and shorter periods of breastfeeding. And only 17 percent of the physicians, versus 43 percent of the traditional midwives, thought breastfeeding was very effective at preventing conception.

In the Mexican study, practitioners were also asked to estimate the duration of contraceptive protection offered by breastfeeding. Traditional midwives' predictions were closer to the empirical results from a study in Durango, Mexico (Rivera et al. 1987), than were the predictions of the physicians, who underestimated the contraceptive effectiveness of breastfeeding.



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Breastfeeding—a traditional practice attracting new interest because of its birth-spacing effect.

Breastfeeding does not conveniently fit into the "cafeteria" of family planning methods. It cannot be "delivered" to women by family planning programs. It requires an educational approach rather than a clinical or medical approach. Nor is there any financial advantage to be gained from the promotion of breastfeeding, as may be the case with some contraceptive methods.

Many family planning program managers are more concerned about increasing the use of the methods they deliver than about the effects of their methods on fertility, child spacing, or helping couples realize their ideal family sizes. According to this criterion, a program could declare itself a success if it increased use of the methods it delivered, even if breastfeeding (or

traditional methods) declined, birth intervals became shorter, and fertility increased in the population it served.

In countries where family planning programs are explicitly directed toward reducing fertility, policy-makers and program managers may emphasize methods that they believe have the best chance of bringing about a dramatic decline in fertility. Those methods usually include pills, injectables, sterilization, IUDs, and barrier methods.

Program statistics seldom record breastfeeding status, and programs usually assume that all women in need of contraception have normal menstrual cycles. Most training materials for family planning providers and consumers, for example, are aimed at women who have menstrual cycles, although breastfeeding women may make up a large percentage of potential users.

Little consideration has been given to methods appropriate for lactating women, how breastfeeding can ameliorate or worsen side effects from contraceptive use, and when lactating women should start using contraceptive methods. Programs typically advocate contraceptive use "the sooner, the better." Program workers worry that if a woman does not accept a contraceptive method at the time of delivery, they may never see her again.

Of course, breastfeeding alone can never bring about the amount of fertility control required for a one- or two-child family. At best, it can help women space their second- or higher-order pregnancies and complement the use of contraception. But this contribution, especially in settings where modern

family planning methods are not available or acceptable, is important. Should breastfeeding or other traditional child-spacing practices deteriorate, family planning programs may find it even more difficult to bring about fertility decline with modern methods (Thapa, Short, and Potts 1987).

Breastfeeding promotion tends to fall between the interests of funding agents. Family planning funders do not generally consider breastfeeding education to be their responsibility. Nor is breastfeeding promotion a major funding priority of child-survival funding agencies such as the U.S. Agency for International Development (USAID) and UNICEF. Service programs supported by these agencies have focused mostly on oral rehydration and immunization coverage, growth monitoring, and, more recently, treating acute respiratory infections.

Surveys have tended to overlook the contraceptive effect of breastfeeding. In many contraceptive prevalence surveys, even if a woman spontaneously mentions that she is relying on breastfeeding to postpone her next pregnancy, that fact may not be recorded, or breastfeeding may be included with "other" methods instead of being listed separately. Interviewers are not usually instructed to probe respondents about their use of breastfeeding to delay pregnancy. Fortunately, many recent surveys have begun collecting detailed information on breastfeeding patterns.

Implications of professional attitudes toward breastfeeding

There are negative consequences for both research and action programs

of ignoring the child-spacing effect of breastfeeding. In survey research, ignoring the practice of breastfeeding and its fecundity-inhibiting effect may lead to an underestimation of the extent of contraceptive behavior and protection. In family planning programs, supervisors and workers unaware of breastfeeding's contraceptive effect have little reason to be interested in breastfeeding behavior and how it may be changing.

Few programs have explicit guidelines for integrating contraception with breastfeeding. Thus workers may start a lactating woman on a temporary method immediately after delivery, with the result that she has double contraceptive protection during the early postpartum period. In many countries discontinuation rates are high, and a lactating woman may discontinue her temporary method at about the time ovulation returns and she needs contraception the most.

Combination pills reduce milk production if they are introduced too early in the postpartum period. Some researchers have even argued that use of hormonal contraceptives during lactation may cause ovulation to occur earlier than it otherwise would (Bhatia, Becker, and Kim 1982). Many programs do not stock progestin-only pills, which are more appropriate for breastfeeding women than combination pills.

Most family planning programs consider breastfeeding women who are not using one of their methods to be noncontraceptors, even if the women are still amenorrheic. Such women may be considered prime candidates for contraception even if they themselves do not yet think they need one of those methods.

Some breastfeeding women fear that contraceptive methods will harm their babies. These differences of perception may cause an unnecessarily antagonistic relationship between breastfeeding women and family planning programs:

In programs that have targets for numbers of contraceptive acceptors, workers are not given credit for lactating women because breastfeeding is not considered to have contraceptive efficacy. If workers receive compensation for the number of acceptors they recruit or methods they deliver, they may even be tempted to discourage women from breastfeeding in order to start them on a method for which the workers are rewarded.

Many pediatricians and other health professionals recommend food supplementation one to three months after delivery rather than four to six months or more, which would be better for child spacing. Early supplementation may lead to a temporary improvement of nutrition for the child and can be justified in individual cases. But it may also cause the infant to suckle less intensively and thus bring about the resumption of fecundity. As an unplanned pregnancy could jeopardize the nutrition and health of this child as well as of its siblings, early supplementation can be counterproductive.

If a child is not thriving, it may be better to supplement the mother's diet and encourage her to breastfeed more intensively than to encourage direct supplements to the baby, who might then lose interest in breastfeeding. Although this is a controversial issue and more research on it is needed, there appears to be little justification for

recommending that breastfeeding mothers give food or liquid supplements to a baby who is growing normally before it is four to six months old.

How can women utilize the child-spacing effect of breastfeeding?

Women need to be able to predict when fecundity will resume or detect its resumption in order to take advantage of breastfeeding's child-spacing effect. Over time the probability increases that a woman will become pregnant before the warning sign of menses, and therefore the return of menses alone is an unreliable warning sign.

A woman could be more confident of avoiding an unplanned pregnancy if she had other indications of when to begin or resume contraception. For example, if she started using a contraceptive method as soon as she resumed menses, or when she began to give her baby food supplements, or by six months post partum—whichever came first—she could reduce her risk of pregnancy to a very low level.

If she wanted to be certain she was protected, she could begin using contraception at three months post partum even if fully breastfeeding and amenorrheic. Of course, this would mean only a short period of reliance on breastfeeding to postpone pregnancy.

If past experience were a reliable guide, then women breastfeeding a second or later child in the same manner as the first might expect a similar duration of postpartum amenorrhea. Unfortunately, no one has systematically studied the reliability of past experience. Such a

study could be of considerable practical value to practitioners who counsel women about postpartum contraception.

Various organizations, however, including Family Health International, the World Health Organisation, Johns Hopkins University, the International Institute for Studies in Natural Family Planning, and several research institutions in Australia, Belgium, Chile, the United Kingdom, and other countries, have been studying the contraceptive effect of breastfeeding and how long it lasts. Researchers have been hoping to come up with simple guidelines for women.

Studies in progress are investigating whether other experiential or subjective signs of renewed fecundity, besides the return of menses, exist that women could rely upon. Possible symptoms are changes in cervical mucus, basal body temperature, and cervical position.

Completed studies have found that different frequencies and intensities of breastfeeding have had varying effects on the duration of postpartum amenorrhea in the countries studied (e.g., Diaz et al. 1982; Gray et al. 1986; Howie and McNeilly 1982; Rivera et al. 1985, 1987). Still, it appears that if a woman breastfeeds in what can be called a "traditional" style, she will get high effectiveness from the breastfeeding, especially before menses resume. The traditional style involves

- keeping the baby nearby and feeding on demand rather than according to a schedule
- feeding frequently
- sleeping near the baby and maintaining night feedings

- not giving the baby bottles or pacifiers
- giving the baby only breastmilk for at least four months or, if giving the baby other foods or liquids, giving them as minor supplements rather than as substitutes for breastmilk.

These practices all contribute to the maintenance of frequent and intense suckling, which in turn is linked to the suppression of ovulation.

The traditional style of breastfeeding still exists in rural areas of many developing countries. In such situations, social policies should be directed toward protecting the practice so it will not erode. In urban areas the task is more difficult. Women whose jobs separate them from their infants may be unable to breastfeed in a traditional fashion and hence will derive less contraceptive protection from breastfeeding. In both rural and urban areas, however, one can find examples of programs that have successfully promoted breastfeeding, for example, through education and hospital practices such as encouraging rooming in (Tognetti 1985).

In the long run it may prove easier to promote breastfeeding than many other socially desirable behaviors because most new mothers are favorably disposed toward it and it has the backing of tradition. What mothers may lack is encouragement and accurate information—both of which can be provided by breastfeeding promotion efforts.

Integrating breastfeeding into family planning programs

To integrate breastfeeding into family planning programs, national and

local family planning personnel will need such information about breastfeeding as its incidence, usual duration, types of breastfeeding practices, normal duration of postpartum amenorrhea, and contraceptive use by breastfeeding women. Such information should enable family planning workers to prepare guidelines on when lactating women should start using contraception and what methods they should use. Family planning personnel will need training in this new approach, and educational materials will have to be prepared for both workers and clients.

Family planning staff need instruction in how breastfeeding may affect women's experiences with contraceptive methods. For example, the menstrual changes (such as spotting) that women experience with hormonal methods may be less pronounced for breastfeeding women. Just as programs use checklists of contraindications for oral contraceptives, they could develop and use a list of contraindications for continued reliance on the child-spacing effect of breastfeeding. An illustrative example appears in the Appendix.

Programs using quotas or targets for family planning acceptors will need to add a category for amenorrheic breastfeeding women. Such women could be considered contraceptors but would need to receive advice on when to start a family planning method. Workers who receive fees for recruiting clients should be compensated for promoting breastfeeding for child spacing as well as child welfare and for providing breastfeeding women with appropriate family planning methods at the appropriate time.

Family planning programs in developing countries can serve the contraceptive needs of breastfeeding women and the health needs of their infants better by offering family planning methods compatible with intensive breastfeeding.

Service-statistics forms and other records will have to be modified slightly to reflect this new approach. The types of methods provided may also need to be expanded. For example, for women who want a very high degree of contraceptive effectiveness and do not want to rely on breastfeeding, programs will need to offer postpartum sterilization and immediate postpartum IUD insertion. They will need to stock temporary methods appropriate for other breastfeeding women: progestin-only pills, injectables, implants, and barrier methods.

National programs will have to monitor breastfeeding patterns and trends, including whether lactating women initiate family planning methods at the right time (Knodel and Kamnuansilpa 1986) and whether breastfeeding patterns are deteriorating. Fortunately, national surveys such as the Demographic and Health Surveys and other studies such as that by the World Health Organisation (1985) are making this kind of monitoring easier than in the past. Problems will remain at the local level where data are less available.

(continued on page 20)

Six Microcomputer Programs for Population Projection: An Evaluation

by Nancy J. McGirr
and Shea O. Rutstein

With the increasing availability of microcomputers and software packages oriented toward demographic analysis, many programs for making population projections are now available for use with microcomputers. Some of the projection programs were originally developed for use on mainframe computers and have been modified for use with micros, often with an interactive editor added to facilitate data entry. Others have been written specifically for use on microcomputers.

Many users select a program on the basis of what is available or convenient rather than whether the program allows them to handle data and assumptions in the manner desired and to obtain appropriately formatted output and summary demographic indicators. Furthermore, it has always been assumed that all the programs would yield similar results if tested on the same

set of data; yet the many microcomputer projection programs available have never been tested systematically with a common data set to determine the validity of this assumption. This article evaluates six microcomputer-based projection programs according to common criteria after running all the programs with standard data sets.

■ The six programs

Four of the projection programs examined here have been downloaded from mainframes and modified somewhat, either in the source code itself or by the inclusion of an interactive data entry component. These programs are

- PROJ5 from Microcomputer Programs for Demographic Analysis, converted for microcomputers by the Demographic Data for Development project at Westinghouse;
- FIVFIV/SINSIN from The Population Council;
- PROJPC-II, developed by Kenneth Hill for The World Bank;
- and CELADE, the program developed by Centro Latinoamericano de Demografía (CELADE), which is a microcomputer version, in Spanish, of the population projection program of the United Nations.

The other two programs were developed specifically for use on microcomputers. They are

- DEMPROJ, developed by the RAPID2 project at The Futures Group, and
- ESCAP/POP, developed by the Population Division of the U.N. Economic and Social Commission for Asia and the Pacific (ESCAP).

The six programs are similar in format and are used or were developed by organizations providing technical assistance in developing countries. Lotus-based programs, programs requiring single-calendar-year or single-year-of-age input, and programs whose primary purpose is something other than the calculation of national projections were excluded from this review.

Appendix 1 lists the programs and the addresses of the organizations or persons to contact for copies. Other commonly available projection programs are included in the list.

Appendix 2, compiled by Nancy J. McGirr, describes other kinds of software available for demographic analysis and their sources.

■ Evaluation criteria

To evaluate the six programs, we used a standard set of criteria covering hardware and software require-

Nancy J. McGirr is a demographer and Shea O. Rutstein is a demographer/programmer at the Institute for Resource Development at Westinghouse, Columbia, Maryland.

ments, input data requirements, methodology, projection results, and summary demographic indicators in the output. Depending upon the application, some criteria may be more important than others.

■ Hardware and software requirements

All of the programs included in this review and in the appendixes can be used on IBM or compatible microcomputers. None of the programs requires a hard disk, extensive memory capability, or additional hardware, with the exception of PROJPC-II, which requires a hard disk, memory capability of at least 640K, and an 8087 math coprocessor. (A smaller version of the program, PROJPC-I,

will run on a machine with at least 384K and a single floppy-disk drive, although the 8087 coprocessor is still required.) Some of the programs will make use of an 8087 if one is installed, but it is not required.

The programs downloaded from mainframe versions are written in Fortran, whereas the newly developed programs are written in Pascal. The CELADE program is available only in Spanish, although the methodological and data entry documentation follows the United Nations user's manual (United Nations 1982). PROJ5 programs and documentation are available in French and Spanish, as well as in English. A summary of hardware and software requirements for the six programs is presented in Table 1.

■ Input data requirements

The input data requirements of the programs vary widely (Table 2). The least information is required by the ESCAP/POP program, which needs only an initial age-sex distribution, a total fertility rate, and a level of mortality. The program internally generates, from models, the age-specific fertility schedule and the required life table values. There is no provision for international migration.

At the other extreme, FIVFIV, CELADE, and PROJPC-II provide tremendous flexibility in the input of data. Some of their features are date shifting to midyear, scaling of the population by sex (which is useful for adjusting age distributions for misreporting or not stated cases), redistribution of the terminal

Table 1. Hardware and software requirements

Requirement	PROJ5	FIVFIV	PROJPC-II	CELADE	DEMPROJ	ESCAP/POP
Hardware						
IBM or compatible	Yes	Yes	Yes	Yes	Yes	Yes
1 disk drive	Yes	Yes	No	No	Yes	Yes
2 disk drives	Optional	Optional	No	Yes	Optional	Optional
Hard disk drive	Optional	Optional	Yes	Optional	Optional	Optional
Minimum memory required (K)	192	256	640	384	256	Don't know
8087 math coprocessor	No	Optional	Yes	Optional	No	No
Graphics card	No	No	No	No	Yes ^a	Yes ^a
Software						
DOS version	2.0 +	2.0 +	2.1 +	2.1 +	2.0 +	2.1 +
Programming language	Fortran	Fortran	Fortran	Fortran	Pascal	Pascal
Compiler	Microsoft	Microsoft	IBM Prof.	Microsoft	Turbo Pascal	Turbo Pascal
Source code available ^b	Yes	Yes	Yes	Yes	Yes	Yes
Interactive data entry	In progress	Yes	Yes	No	Yes	Partial
Auxiliary editor required	Yes	No	No	Yes	No	Yes
Foreign language versions	Yes (Spanish, French)	No	No	Yes (Spanish)	No	No

a. If you want to see graphs on the screen.

b. On request.

Table 2. Input data requirements

Requirement	PROJ5	FIVFIV	PROJPC-II	CELADE	DEMRPOJ	ESCAP/POP
Dates and length of projection						
Year to which data refer	Yes	Yes	Yes	Yes	Yes	Yes
Month/day/week of data	Yes	Yes	Yes	No	No	No
Date shift to midyear	No	Optional	Yes	No	No	No
Minimum projection period (years)	5	35	5	5	5	1
Maximum projection period (years)	50	35	75	None	50	None
Age-sex distribution						
Numbers for 5-year categories	Yes	Yes	Yes	Yes	Yes	Yes
Proportions for 5-year categories	No	Yes	Yes	No	No	No
Lowest terminal age	65+	0+	40+	75+	80+	80+
Terminal age for results	80+	75+	75+	80+	80+	80+
Single-year input	No	No	No	Yes	No	No
Scaling to population size	No	Yes	Yes	No	No	No
Fertility data						
Sex ratio at birth	Yes	Optional	Optional	Optional	Optional	Yes
Point or period rates	Point	Period	Period	Period	Either	Point
Total fertility rates	No	Yes	Yes	No	Yes	Yes
Net or gross reproduction rates	No	Optional	No	GRR	No	No
Age-specific fertility rates	Yes	Yes	Yes	Yes	No	Derived
Percentage distributions	No	Yes	No	Yes	Yes	Derived
Model distributions	No	No	Yes	Yes	Yes	Yes
Automatic decline to NRR/GRR=1	No	No	Yes	Yes	No	No
Mortality data						
Point or period data	2 points	Period	Period	Period	Either	2 points
Model life tables						
E_0	Yes	Yes	Yes	Yes	Yes	No
Levels	No	Yes	Yes	No	No	Yes
Types ^a	CD1	CD1,CD2,UN	CD2	CD1,UN	CD2	CD2
User-defined life tables						
S_x, l_x, M_x	S_x	S_x	l_x	S_x, IMR	M_x	No
E_0 or levels	No	Levels	No	Yes ^b	No	No
Split mortality						
Levels	No	Yes	Yes	No	No	No
E_5, E_5+	No	Yes	No	No	No	No
Infant mortality rate (below 5)	No	Yes	No	No	No	No
Male mortality estimated from female	No	Yes	Yes	No	No	No
No mortality	No	Yes	Yes	No	No	No
International migration data						
Point or period data	Period	Point	Period	Period	Either	
Total number of migrants	Yes	No	No	No	No	
Total numbers by sex	No	Yes	Yes	Yes	Yes	
+ or - migration for totals	Yes	Yes	Yes	Yes	Yes	
+ or - migration by age and sex	No	Yes	Yes	Yes	Yes	
Numbers of migrants by age and sex	No	Yes	Yes	Yes	Yes	
Proportions by age and sex	Yes	Yes	Yes	Yes	Yes	
Net rates by age and sex	No	Yes	Yes	Yes	Yes	
Sex ratio of migrants	No	Yes	No	No	No	

Table 2. (continued)

Requirement	PROJ5	FIVFIV	PROJPC-II	CELADE	DEMPROJ	ESCAP/POP
Amount of migration computed	No	Yes	No	No	No	
Model age distribution of migrants	No	No	Yes	No	No	

a. CD1 = Coale and Demeny (1966); CD2 = Coale and Demeny (1983); UN = United Nations (1981).

b. Using UN modified method.

age category, use of model fertility and migration distributions, great variety in specifying assumptions about fertility, mortality, and migration, and built-in models for mortality and fertility decline.

DEMPROJ includes some of these features and also has a provision for using either point or period inputs. PROJ5 is more limited than the other programs in what it will accept as data input. Its only real flexibility is in its use of mortality data for any two dates, regardless of whether the data correspond to the date for the baseline population. The program will interpolate or extrapolate to obtain the needed survival ratios at the midpoint of each projection period.

All the programs have the capability of accepting model life tables, although there is considerable variation in the models they can use. All the programs except PROJ5 and CELADE use the model life tables in the second edition of Coale and Demeny (1983); PROJ5 and CELADE use those in the original edition (Coale and Demeny 1966). FIVFIV and CELADE also accept the UN model life tables (United Nations 1981).

In addition, all programs except ESCAP/POP provide the option of using empirical life table values as input, although the particular values required vary from S_x to L_x

to M_x . FIVFIV and PROJPC-II have "split mortality" options, which provide great flexibility to the user who wishes to use a combination of model life tables to replicate unusual age patterns of mortality.

Methodology

All six programs make use of what is called a cohort-component projection. There is considerable variety, however, in how the programs apply that methodology. The differences are not due to errors in the projection equation, but rather reflect different approaches to incorporating the various components of growth into the equation. We have had the benefit of examining the source code as an aid in unraveling what each program does. The typical user would have a difficult time doing that because most of the documentation manuals for the programs do not show mathematical derivations. (The mathematical equations describing the projection procedures used in the programs are available from us upon request.)

FIVFIV and the second version of PROJPC are good examples of what technical documentation should be (Shorter, Pasta, and Sendek 1987; Hill 1987). Assumptions about how the average number of women in the projection period are calculated, how migrants are assigned to co-

horts and exposed to the risk of dying during the period, etc., are fully described and equations provided. PROJ5 is the only other program to publish the estimation equations in the documentation (McGirr and del Pinal 1986).

ESCAP/POP provides citations to the sources where the methodology is described, and as it has no provision for international migration, the citations are reasonably satisfactory (ESCAP 1986). The UN methodology, used by the CELADE program, is documented elsewhere; only citations and a brief description are provided in the user's manual (United Nations 1982).

The DEMPROJ manual contains virtually no information on the projection methodology for national projections, but it has a section describing its method for projecting urban growth rate differences, which is used for its urban-rural subnational projection component (The Futures Group 1987).

The primary difference between programs, as reflected in the projection equations, is in how they handle migrants and migrant survival. Most of the programs separate migrants into cohorts in some way and make assumptions about their exposure to the risk of mortality. PROJPC-II even includes different equations for when there is net immigration and net out-migration.

■ Projection results

The projection programs were tested with six data sets reflecting various assumptions about mortality, fertility, and international migration. Because of the diversity of input requirements, the data sets and assumptions we selected were not necessarily realistic or best suited for testing any one program's capabilities but rather were intended to serve as input for all the programs.

Thus, for a projection interval of 35 years, fertility decline is represented by linear change in the total fertility rate and assumes no change in the underlying age patterns. In the case of mortality, change is represented by a linear decline in the index of life expectancy at birth as projected in the Coale and Demeny model life tables. We also assumed constant net out-migration in two projections.

The baseline population for the projections refers to 1 January 1985. The initial population size is 10 million, distributed evenly between males and females. The population is distributed by age and sex using a Coale and Demeny stable population model at level 17, assuming a 2.5 percent rate of natural increase.

A baseline total fertility rate of 5.0 was selected as being consistent with this population, and total fertility was assumed to decline to 2.5 over the 35-year projection interval. Associated baseline and projected age-specific fertility rates were estimated using the ESCAP/POP program, which makes use of the Gompertz relational model.

The level 17 West model life table represents a male life expectancy of 56.47 years and a female life expectancy of 60.00 years. Life expectan-

cy was assumed to increase to level 22 over the projection interval (to 68.56 and 72.50 years for males and females, respectively).

For the two projections in which migration was included as a component of growth, net out-migration was assumed to remain constant and to subtract 50,000 persons from the population during each five-year period (35,000 males and 15,000 females).

In testing the programs, it was necessary to find a lowest common denominator for the input data and for running a simple projection that all programs could handle. Therefore, all six variants were for national projections and no attempt was made to incorporate subnational projections, although FIVFIV, PROJPC-II, and DEMPROJ do have this capability.

Despite variations in the input data requirements and implementation of the component methodology, results from the six projection programs are similar. To understand the differences between programs, it is best to examine results after five years (Table 3). The results at the end of the 35-year projection interval (Table 4) represent the cumulative effect of these differences.

The differences in projection results are minor, especially over the short term. After five years, the maximum difference between projections yielding the highest and lowest population sizes is 23,805, or approximately 0.2 percent of the average population size for projection 3 in 1990.

By the year 2020, however, the difference is 412,357 for projection 3, or 1.6 percent of the average population size. At both times and for all six variants, the DEMPROJ

program yields the highest values for population size. The ESCAP/POP program yields the lowest results for those variants that do not include the effects of migration. (ESCAP/POP has no provision for migration.)

A probable reason for the difference in results for the ESCAP/POP program is that it performs all calculations by single years of age and single calendar years and then reaggregates the data into standard five-year age categories. It also uses a procedure for estimating survival ratios from model life tables that is different from the interpolation procedures the other programs use.

Results from each projection also are presented for age groups 0-4 and 5-9, for which percentage differences among the packages may be larger than for the population as a whole. These results allow an examination of differences due to fertility and mortality. The results for the projections for 1990 in the age group 0-4 illustrate the differences in the procedures used to estimate births. Mortality differences also enter into the picture, as does the age distribution of migrants in projections 5 and 6.

PROJPC-II yields the lowest values because it uses a geometric mean to obtain the average number of women who experience the age-specific fertility rates during the period. The other programs make use of an arithmetic average. No single program consistently yields the highest values for the age group 0-4.

Examination of the population of ages 5-9 in 1990, projected without assumptions about migration, shows differences due to both the model life tables used and the method for

deriving survival ratios (projections 1 and 2) and also differences due to interpolation used to obtain the survival ratio values when mortality is declining (comparison of projections 3 and 4 with projections 1 and 2).

For the population of ages 5-9 in 1990, DEMPROJ once again yields the highest values and ESCAP/POP the lowest. As we have already mentioned, ESCAP/POP uses survival ratios obtained from the model life tables using an equation based on logits, rather than interpolation, to obtain the required values.

FIVFIV and PROJPC-II produce virtually identical results for projections 1 and 2, as they should, since both programs use the second edition of Coale and Demeny's model life tables. PROJ5 and CELADE use the original version of the Coale and Demeny model life tables, but it is unclear why their results are not more similar. DEMPROJ presumably uses the second edition of the models but yields values that are quite a bit higher than those of the other programs.

Projections 3 and 4, which assume declining mortality, involve

interpolation between levels of model life tables. The difference between FIVFIV and PROJPC-II for those two projections must be due to differences in interpolation.

■ Summary demographic indicators

The basic summary demographic indicators from a population projection program include the projected population size, age-sex and percentage distributions, crude rates, the growth rate, the assumed total fertility rate, and values of life ex-

Table 3. Projection results after five years, in 1990

Program	Projection 1	Projection 2	Projection 3	Projection 4	Projection 5	Projection 6
1990 total population						
PROJ5	11,356,400	11,288,510	11,378,190	11,309,930	11,301,980	11,255,830
FIVFIV	11,355,870	11,292,170	11,377,470	11,313,420	11,301,430	11,259,100
PROJPC-II	11,353,643	11,289,881	11,375,509	11,311,409	11,303,643	11,261,409
CELADE	11,356,368	11,292,298	11,377,828	11,313,421	11,300,922	11,258,147
DEMPROJ	11,372,818	11,305,035	11,397,968	11,329,731	11,318,051	11,275,294
ESCAP/POP	11,349,466	11,284,292	11,374,163	11,308,592		
Maximum difference ^a	23,352	20,743	23,805	21,139	17,129	19,464
1990 population, ages 0-4						
PROJ5	1,771,901	1,704,017	1,781,174	1,712,905	1,765,841	1,707,187
FIVFIV	1,769,625	1,705,918	1,779,008	1,714,963	1,763,583	1,709,078
PROJPC-II	1,767,340	1,703,578	1,776,673	1,712,574	1,765,390	1,710,624
CELADE	1,770,957	1,706,886	1,780,248	1,715,841	1,763,561	1,708,617
DEMPROJ	1,772,413	1,704,631	1,783,307	1,715,070	1,765,149	1,708,164
ESCAP/POP	1,768,789	1,703,615	1,779,120	1,713,549		
Maximum difference ^a	5,073	3,308	6,634	3,267	2,280	3,437
1990 population, ages 5-9						
PROJ5	1,498,136	1,498,136	1,500,505	1,500,505	1,496,528	1,498,895
FIVFIV	1,497,707	1,497,707	1,500,535	1,500,535	1,496,105	1,498,931
PROJPC-II	1,497,708	1,497,708	1,500,579	1,500,579	1,496,408	1,499,279
CELADE	1,499,001	1,499,001	1,501,743	1,501,743	1,497,701	1,500,443
DEMPROJ	1,499,606	1,499,606	1,502,941	1,502,941	1,498,323	1,501,656
ESCAP/POP	1,489,909	1,489,909	1,492,117	1,492,117		
Maximum difference ^a	9,697	9,697	10,824	10,824	2,218	2,761

a. Maximum difference is the absolute difference between projections yielding the highest and lowest population sizes.

pectancy. As can be seen in Table 5, many of the programs provide much more information.

CELADE has the most extensive output, probably because the output was designed originally to produce all the information, in camera-ready format, needed for the United Nations Population Division's regular assessments of the world population. PROJPC-II and FIVFIV also have extensive output, eliminating the need to make many additional calculations. One shortcoming of those two programs, however, is their failure to include

the age distribution for the total population.

CELADE, DEMPROJ, and ESCAP/POP have the capability of graphic output included as part of the printed output, the latter two having the best graphs.

Another aspect of the output, not categorized in Table 5, is the formatting and presentation of the printed results. The programs we examined offer considerable variation in their output formats and procedures, from automatic output of results to user-determined print

and format options, such as tables or graphs.

Some programs also have the capability of transferring results to a file that can be printed out later. The page layouts of the printed results vary considerably.

PROJ5 automatically prints results for each five-year projection period on a separate page. FIVFIV prints the input data, assumptions, projected population sizes, age-sex distributions, and all the indicators shown in Table 5. PROJPC-II follows roughly the same format as FIVFIV but provides several options,

Table 4. Projection results after 35 years, in 2020

Program	Projection 1	Projection 2	Projection 3	Projection 4	Projection 5	Projection 6
2020 total population						
PROJ5	24,294,590	18,772,040	26,366,020	20,293,100	23,806,880	19,846,740
FIVFIV	24,276,760	18,798,510	26,382,090	20,342,230	23,788,930	19,894,490
PROJPC-II	24,231,218	18,779,880	26,346,746	20,324,538	23,776,010	19,889,468
CELADE	24,296,489	18,809,086	26,399,329	20,352,171	23,774,982	19,879,779
DEMPROJ	24,379,345	18,854,655	26,682,418	20,529,785	23,863,358	20,060,091
ESCAP/POP	24,152,759	18,728,627	26,270,061	20,299,444		
Maximum difference ^a	226,586	126,028	412,357	236,685	88,376	213,351
2020 population, ages 0-4						
PROJ5	3,775,144	1,833,308	4,210,799	2,042,014	3,720,314	2,011,389
FIVFIV	3,767,843	1,837,252	4,212,583	2,052,361	3,713,100	2,021,415
PROJPC-II	3,732,545	1,821,599	4,201,117	2,048,938	3,709,443	2,020,252
CELADE	3,773,684	1,842,338	4,217,302	2,057,147	3,710,951	2,021,351
DEMPROJ	3,773,157	1,833,017	4,267,160	2,069,238	3,711,080	2,033,827
ESCAP/POP	3,760,686	1,837,699	4,185,552	2,045,393		
Maximum difference ^a	42,599	20,739	81,608	27,224	10,871	22,438
2020 population, ages 5-9						
PROJ5	3,233,970	1,868,888	3,589,684	2,072,797	3,190,005	2,043,550
FIVFIV	3,227,567	1,869,259	3,596,486	2,082,032	3,183,683	2,052,516
PROJPC-II	3,221,082	1,866,648	3,588,105	2,078,708	3,181,282	2,051,573
CELADE	3,234,652	1,872,205	3,601,091	2,083,405	3,184,672	2,049,797
DEMPROJ	3,236,387	1,870,977	3,639,995	2,102,065	3,186,912	2,068,696
ESCAP/POP	3,205,024	1,866,330	3,569,260	2,077,558		
Maximum difference ^a	31,363	5,875	70,735	29,268	8,723	25,146

a. Maximum difference is the absolute difference between projections yielding the highest and lowest population sizes.

Table 5. Summary demographic indicators from the output

Indicator	PROJ5	FIVFIV	PROJPC-II	CELADE	DEMPROJ	ESCAP/POP
For calendar years						
Total population	Yes	Yes	Yes	Yes	Yes	Yes
Total population by sex	Yes	Yes	Yes	Yes	Yes	Yes
Total population by age	Yes	No	No	Yes	Yes	Yes
Population by age and sex	Yes	Yes	Yes	Yes	Yes	Yes
% distribution by age and sex	Yes	Yes	Yes	Yes	Yes	No
% distribution in broad age groups	No	Yes	Yes	Yes	Yes	No
Dependency ratios	No	No	Yes	Yes	No	No
% male and female	No	No	No	Yes	Yes	No
Sex ratio for total population	No	Yes	No	Yes	No	No
Sex ratio at birth	Yes	Yes	Yes	Yes	No	No
Mean age	No	No	No	Yes	No	No
Graphs	No	No	No	Yes	Yes	Yes
Pyramid				Yes	Yes	Yes
ASFRs				No	No	Yes
Total population				No	Yes	No
Births and deaths				No	Yes	No
For periods						
Midperiod population	No	Yes	No	No	No	Yes ^a
Growth rate	Yes	Yes	Yes	Yes	Yes	No
Rate of natural increase	Yes	Yes	Yes	Yes	Yes	Yes ^a
Crude birth and death rates	Yes	Yes	Yes	Yes	Yes	Yes ^a
Annual births and deaths	No	Yes	Yes	Yes	Yes	No
Annual births and deaths by age group	No	No	Yes	No	No	No
Net migration rate	No	Yes	Yes	Yes	Yes	No
Annual migrants	No	Yes	Yes	Yes	No	No
Life expectancy by sex	Yes	Yes	Yes	Yes	Yes	Yes ^a
Life expectancy for total	No	Yes	Yes	Yes	Yes	No
E_5 or E_{10}	No	Yes	Yes	No	No	No
Survival ratios	Yes	Yes	Yes	Yes	No	No
Infant mortality rate	No	Yes	Yes	Yes	No	No
Q_5	No	No	Yes	No	No	No
Total fertility rate	Yes	Yes	Yes	Yes	Yes	Yes ^a
General fertility rate	Yes	Yes	No	Yes	No	No
Net reproduction rate	No	Yes	Yes	Yes	No	No
Gross reproduction rate	No	Yes	Yes	Yes	No	No
Mean age at childbearing	No	Yes	Yes	Yes	No	Yes ^a
Other outputs						
Title on every page	Yes	Yes	Yes	No	No	No
Single-calendar-year output	No	Yes	Yes	No	Yes	Yes
Single years of age	No	Yes	Yes	Yes ^b	No	No
Special age groups	No	Yes	Yes	Yes	Yes	No
Rural-urban projections	No	Yes	Yes	No	Yes	No

a. For a single calendar year.

b. Only for ages 5-24.

Table 6. Programs' strengths and weaknesses

Program	Strengths	Weaknesses	Comments
PROJ5	Methodology clearly specified Well-formatted output Available in French and Spanish	Coding instructions not intuitive Sensitive to format errors Unhelpful error messages	Interactive editor in progress Part of a package with 31 other programs
FIVFIV	Easy to use Good data entry module Extensive methodological capabilities Excellent documentation		
PROJPC-II	Extensive methodological capabilities Extensive well-formatted output Forward and reverse projections Subnational and urban-rural projections	Cumbersome data entry File management burdensome Slow to read projection program into memory	Revised user's manual has complete methodological documentation
CELADE	Extensive output Graphic capabilities Forward and reverse projections Available in Spanish	Very slow print utility Tedious data entry No Spanish user's manual No methodological documentation	
DEMPROJ	Excellent data entry program Graphic capabilities Urban-rural projections Easy to use	Poor print formats Little methodological documentation	Output can be used as input to other models
ESCAP/POP	Easy to use Simple data entry module Built-in graphics	Limited output and printing capabilities Few methodological options	Includes 25 example data sets for Asian and Pacific countries

such as including 25-year summaries and results for special age categories.

CELADE includes a special utility program for generating printed results, which controls page breaks and character size. Using the program is a slow process, in part owing to the extensiveness of the output, but it must be used to obtain readable and well-formatted output.

DEMPROJ has seven print options, most of which allow a choice between graphic output or tables. For some reason, it has no provision for page advances, condensed print, or column alignment when

printing numbers with more than six digits.

For each year of the projection, ESCAP/POP requires the user to indicate whether tabular results should be sent to the printer or shown on the screen. To obtain graphic output, the SHIFT and PRTSC keys must be used.

■ Conclusions

The programs and data sets we examined produce similar results, especially the four programs yielding middle-range values: PROJ5, FIVFIV, PROJPC-II, and CELADE. But the programs do vary substan-

tially in their features and capabilities (Table 6).

The selection of a program best suited to a user's needs depends not only upon its availability, but also upon such factors as ease of use, quality of documentation, and the degree of control the user wishes to have in specifying assumptions and entering the assumptions into the projection equation. Some applications may require the use of a special feature available in only a few programs. Thus the choice of a package should be based on its intended use. □

(Appendix 1 on page 22)

Reviews

World Population and U.S. Policy: The Choices Ahead edited by Jane Menken. New York: W. W. Norton, 1986. 255 pp. ISBN 0-393-02419-9. US \$18.95. Available from W. W. Norton Company, Inc., 500 Fifth Avenue, New York, NY 10110, U.S.A.

The papers contained in this monograph were prepared originally as background reading for the 71st American Assembly of Columbia University, held in Harriman, New York, during 17-20 April 1980. Dr. Jane Menken of Princeton University served as director for the meeting and supervised the preparation and editing of the papers.

At the Assembly, 59 participants from the U.S. federal government, Congress, business, universities, the legal profession, trade unions, and nonprofit organizations discussed the relationship of population growth to economic development and individual welfare, the international consequences of population growth, and the policies that the United States might follow in response to those consequences.

Editor Menken begins the volume with an introduction and overview of the Assembly. Next, Paul Demeny reviews the trends and prospects for world population that have emerged since an earlier American Assembly published *The Population Dilemma* in 1963. Samuel H. Preston explores the question of the economic consequences of population growth as a basis for population policy, and this is followed by a chapter by Ansley J. Coale on population change and economic development.

Other chapters examine the transition in reproductive behavior in the Third World (John Bongaarts); immigration, demographic change, and U.S. immigration policy (Michael S. Teitelbaum); and family planning programs (George B. Simmons). The concluding chapter by David E. Bell, director of Harvard University's Center for Population Studies, addresses the issue of population policy choices for the United States.

World Population and U.S. Policy is very pertinent to the current policy milieu. The U.S. federal government has shifted its population policy during the Reagan administration. At the International Conference on Population in Mexico City in 1984, it attributed reduced significance to the effects of population increase on economic growth (a reversal of the U.S. position at the Bucharest Conference ten years earlier).

It has also taken a strong stand against abortion and has prohibited use of U.S. aid funds to pay for abortions performed for family planning purposes. Implementation of this policy has led to withdrawal of funding from the United Nations Fund for Population Activities (UNFPA) and the International Planned Parenthood Federation (IPPF). It continues to support voluntary family planning programs, but even this support may be curtailed.

The contributors to this volume—all demographers and social sci-

tists with long, prestigious careers as authors and administrators—took part in the reevaluation of world population issues and the U.S. response at the Assembly meeting. Their recommendations for U.S. foreign policy in the years ahead include continued U.S. funding of population programs in developing countries; endorsement of the voluntary basis for U.S. family planning assistance along with full access to contraceptive services; respect of the sovereignty of other countries; and not imposing sanctions on other countries or organizations working in those countries that conduct programs the U.S. government decides not to support, provided that the programs do not violate human rights.

They also urge the U.S. government not to withhold funds from countries or organizations that engage in abortion activities where abortion is legal. They recommend that the U.S. government maintain full support for the UNFPA and IPPF.

Other recommendations are that the federal government recognize reproductive freedom as a fundamental human right; that it seek to improve education, economic opportunities, and the health of women; and that it reformulate its immigration policies.

The authors' views are stimulating and provocative. Although not all readers will agree with them, this is a book that should be read by policymakers and anyone interested in U.S. population policy.

—Alice D. Harris

The New American Grandparent: A Place in the Family, A Life Apart by Andrew J. Cherlin and Frank F. Furstenberg, Jr. New York: Basic Books, 1986. x, 278 pp. \$17.95. ISBN 465-04993-1. Available from Basic Books, Inc., 10 East 53rd Street, New York, NY 10022, U.S.A.

As life expectancies rise throughout the world and population aging becomes an important demographic trend, the roles grandparents play within families is beginning to receive more attention. In the United States, according to sociologists Andrew J. Cherlin and Frank F. Furstenberg, Jr., authors of *The New American Grandparent: A Place in the Family, A Life Apart*, most people still associate grandparents with traditional, old-fashioned families—"the rural, extended, multigenerational kind much celebrated in American mythology."

The notion that grandparents belong to a bygone era is mistaken, they assert. Instead, the modern era is "the first time in history that most adults live long enough to get to know most of their grandchildren, and that most children have the opportunity to know most of their grandparents."

When birth and death rates were high, grandparents were in relatively short supply. By the time U.S. children born in the 1900 turned 15, only one in 50 had all four grandparents still living. Today, it is grandchildren who are relatively scarce. By the year 2000, the number of Americans 55 and older will exceed the number of children under age 15 for the first time in history.

Most people are in their 40s or 50s when they first become grandparents. Now, because people live

longer, many more grandparents are in their 60s or older. Moreover, Cherlin and Furstenberg observe, today's grandparents are less likely to be still raising their own children, and therefore fewer other roles compete for grandparents' attention. In interviews with hundreds of grandparents the authors found that, although most older people value their role as grandparents, they also value their independence.

"They want affection and respect from their children and grandchildren, but they do not want to be obligated to them," write Cherlin and Furstenberg. "The price paid for strong family ties by family members in developing countries around the world is a substantial loss of autonomy. It is a price most American grandparents are not willing to pay."

Such attitudes may seem strange to many readers from Asia, where three-generation households are more common than in the United States. Elderly people in cultures

other than the United States may have different values, and their grandchildren may continue to expect them to play important roles in their lives, even as traditional societies give way to modern ones and longevity increases. However, "given the central place of personal autonomy in American culture and the improved material circumstances of older people, the shift among grandparents toward greater independence seems inexorable," Cherlin and Furstenberg conclude.

After describing the demographic changes that lie behind today's relationships between grandparents and their families, the authors examine the variety of lifestyles that grandparents have adopted in the United States. They devote one chapter to the effect of divorce on extended family relationships and another to the influence grandparents have on their grandchildren. The authors' findings are based on interviews with a representative national sample of U.S. families in 1982. □

—Bryant Robey

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BREASTFEEDING WOMEN . . .

(continued from page 8)

In summary, family planning programs need to take more seriously the special needs of breastfeeding women and to devise procedures, training programs, supervision routines, and informational and outreach materials that meet those needs. The task is to integrate traditional methods of child spacing with modern ones.

Although, in the short run, this new approach may increase the complexity of family planning pro-

grams, integrating breastfeeding promotion and family planning promotion should be less difficult than, say, integrating health and family planning programs. It will involve mainly role integration for family planning workers rather than structural or administrative integration. Family planning workers will have to counsel new mothers about appropriate contraceptive methods and timing, and they will need to see the women more frequently than is currently the practice.

The main advantage of this proposed approach is that family planning workers and breastfeeding women will be "on the same team," both concerned with the women's special needs. A woman who does not want to use contraception immediately after delivery will be given advice about the risks of an unplanned pregnancy and appropriate means of avoiding it. She will then be able to make an informed choice about family planning.

APPENDIX

The following checklist could be used by a family planning counselor to determine whether a woman who is not interested in a terminal contraceptive method is likely to receive contraceptive protection from breastfeeding or whether she should start a family planning method. As our ability to predict resumption of fecundity improves through research, the checklist could be modified.

ILLUSTRATIVE CHECKLIST FOR WOMEN USING BREASTFEEDING TO SPACE BIRTHS

1. Are you currently breastfeeding your child? Yes No
2. Have you resumed sexual activity with your partner (or do you plan to do so very soon)? Yes No
3. Do you want to postpone your next pregnancy? Yes No
4. Are you using breastfeeding as your only means of delaying pregnancy? Yes No

Note: If the woman responds "yes" to all four questions, ask her the following questions:

5. Regarding the baby you are currently breastfeeding, when was he or she born? _____ Mo. _____ Day _____ Yr.
6. How many months old is your baby? _____ months

(Answers to questions 5 and 6 should be consistent.)

7. Have your menses resumed since you gave birth? Yes No
8. Have you stopped breastfeeding your baby at night? Yes No
9. Are you giving your baby foods or liquids as a substitute for breastfeeding? Yes No
10. Are you giving your baby liquids from a bottle? Yes No
11. Have you had a previous unplanned pregnancy while you were breastfeeding? Yes No

Note: If the respondent answers "yes" to at least one of questions 7-11, she should be advised that she is at risk of an unplanned pregnancy and should start using a contraceptive method. If she answers "no" to each question but the baby is at least *X* months old, the respondent should nevertheless be advised to start using a contraceptive method. (*X* is a local estimate of mean duration of postpartum amenorrhea. In some settings it will be six or eight months; in other settings it could be 12 or 18 months. The duration must be determined from local data.) If the respondent answers "no" to questions 7-11 and her baby is less than *X* months old, she should be told to return to the family planning clinic in a month to be reevaluated. She should also be told to return *immediately* if any of the conditions described in questions 7-10 changes (i.e., her menses resume, she begins supplements, or she discontinues night breastfeedings.)

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SIX MICROCOMPUTER PROGRAMS . . .

(continued from page 17)

APPENDIX 1. Addresses and Contacts for Microcomputer Projection Programs

- | | | | |
|-----------|--|--|--|
| PROJ5 | A population projection program from Microcomputer Programs for Demographic Analysis, 1985
Demographic Data for Development Project
Institute for Research Development, Inc., at Westinghouse
P.O. Box 866
Columbia, MD 21044, U.S.A.
Telephone: (301) 992-0066 | ESCAP/POP | A computer program for projecting populations by age and sex, 1986
ESCAP/Population Division
United Nations Building
Rajdamnern Nok Avenue
Bangkok 10200, Thailand
Telephone: 282916-200, 282938-389
Telex: 82392 ESCAP TH, 82315 ESCAP TH
Cable: ESCAP BANGKOK |
| FIVFIV | Computational methods for population projections, with particular reference to development planning, Version 9, September 1987
Mr. Robert Sendek
The Population Council
1 Dag Hammarskjold Plaza
New York, NY 10017, U.S.A.
Telephone: (212) 644-1300
Telex: 234722 POCO UR
Cable: POPCOUNCIL, NEW YORK | <i>The following programs are not reviewed in the article.</i> | |
| PROJPC-II | A population projection program developed for The World Bank, July 1987
Dr. Kenneth Hill
Population Dynamics Department
The Johns Hopkins University
615 N. Wolfe Street
Baltimore, MD 21205, U.S.A.
Telephone: (301) 955-7816
Telex: 710 2340022 PUB HYGBAL | FUTPOP | FUTURE POPulation: a demographic population projection program for microcomputers, Version 1.01, July 1985
Dr. Ralph Sell
Department of Sociology
University of Rochester/River Campus
Rochester, NY 14627, U.S.A.
Telephone: (716) 275-3163 |
| CELADE | United Nations projection program, translated into Spanish, September 1986
CELADE
Population Documentation and Data Processing Division
Avenida Dag Hammarskjold
Casilla 91
Santiago, Chile
Telephone: 2283206
Telex: 240077
Cable: UNATIONS | IMPP | An integrated multiregional population projection model, Version 1.02, 1987
Dr. James Kocher
INPLAN
Research Triangle Institute
P.O. Box 12194
Research Triangle Park, NC 27709-2194, U.S.A.
Telephone: (919) 541-7261
Telex: 802509 RTI RTPK
Cable: RESTRINS RALEIGH NC |
| DEMPROJ | A demographic projection model for development planning, Version 2.52, January 1987
The Futures Group
76 Eastern Boulevard
Glastonbury, CT 06033, U.S.A.
Telephone: (203) 633-3501
Telex: 955318
Also
1111 14th Street, N.W.
Washington, DC 20005, U.S.A. | POPILO | Population and labor force projections (Lotus-based), 1986
Employment Planning and Population Branch
International Labour Organisation
4, route de Morillons
Geneva 22, Switzerland
Telephone: 99-64-53
Telex: 22 271 BIT CM
Cable: INTERLAB GENEVE |
| | | PROJECT | A projection program from the LOTPACK Programs (Lotus-based), 1986
Dr. Douglas Ewbanks
University of Pennsylvania
Population Studies Center
3718 Locust Walk
Philadelphia, PA 19104, U.S.A.
Telephone: (215) 898-7999 |
| | | EASWESPOP
PROJECTION | A projection program based on parity progression, 1987 |

Data Analysis Unit
 East-West Population Institute
 1777 East-West Road
 Honolulu, HI 96848, U.S.A.
Telephone: (808) 944-7420
Cable: EASWESCE
Telex: 989171

POP
 TOTPROJ
 MINIPROJ

Microcomputer programs for making age-sex population projections, January 1988
 Dr. Donald J. Bogue
 Social Development Center
 1313 East 60th Street, Room 476
 Chicago, IL 60637, U.S.A.
Telephone: (312) 947-2010
Telex: 206021

HALLEY A population analysis program (Lotus-based), 1986
 Dr. Ned Levine
 Graduate School of Architecture and Urban Planning
 University of California
 405 Hilgard Avenue
 Los Angeles, CA 90024, U.S.A.
Telephone: (213) 825-3791

FUNC
 A microcomputer program for making functional population projections, January 1988
 Dr. Donald J. Bogue
 Social Development Center
 1313 East 60th Street, Room 476
 Chicago, IL 60637, U.S.A.
Telephone: (312) 947-2010
Telex: 206021

APPENDIX 2. Microcomputer Software Available for Demographic Applications

compiled by Nancy J. McGirr

This appendix lists additional IBM-compatible microcomputer software available for various demographic applications.

Part 1 describes programs and packages available for demographic estimation. The table identifies software for various estimation techniques; its column headings represent the names of the organizations or persons responsible for developing the software and the names of the software packages if the names are available. The cells of the table identify the programs within given packages. If a program name is

not known, it is represented by a dash. Detailed descriptions of estimation programs follow.

Part 2 lists family planning and health models; Part 3 lists education, labor force, agriculture, and other planning models; and Part 4 lists models useful for learning about population dynamics and population-development interrelationships. Addresses and names of contact persons are listed for readers interested in obtaining copies of the software.

■ Part 1. Programs and packages for demographic estimation

Demographic estimation programs

Estimation technique	DDD, MCPDA	UN, MORTPAK	EWPI, EASWESPOP FERTILITY	UPENN, LOTPACK	KEN HILL	PRINCETON	CELADE, PANDEM (Spanish)	Other programs
Fertility								
Brass P/F ratio	PFRAT	FERTPF	PFRATIO	BRASSPF	AFEMO		—	
Parity increment			PARITY					
Rele's method			RELE					
Palmore regression method			PALMORE					
Own-children technique			OWN					
Arriaga method	MARF	FERTCB, FERTPF						
Age-specific fertility rates	ADJFR							
Net reproduction rates	NRSFR							
Coale-Trussell model						MODEL		
Mortality								
Childhood mortality	INCHM	CEBCS		SURVIVAL	AFEMO		—	
Maternal orphanhood		ORPHAN		MORPHAN	MORPH		—	

Demographic estimation programs (continued)

Estimation technique	DDD, MCPDA	UN, MORTPAK	EWPI, EASWESPOP FERTILITY	UPENN, LOTPACK	KEN HILL	PRINCETON	CELADE, PANDEM (Spanish)	Other programs
Paternal orphanhood				PORPHAN	PORPH		—	
Widowhood		WIDOW			WIDAGEPC		—	
Bennett-Horiuchi		BENHR						
Preston-Coale				COVERAGE				
Brass growth balance				COVERAGE	GBEPC		—	
Preston integrated method		PRESTO			PRIM			
Intercensal survival	TWOCN							
Life tables								
Life table	ELT	LIFTB		LTPROG			—	SURVIVAL
Adjustments to life table	QXADJ	UNABR, ICM		LOGIT				
Compare observed life table to model	PKREG	COMPAR						
Spliced life table		COMBIN						
Coale-Demeny model tables	MLT, BLT	MATCH						
UN model tables		BESTFT, MATCH						
4-parameter table				4PARAMLT				
Fit Coale-Demeny model to observed data							—	
Evaluation								
UN age-sex accuracy index	AGESX							
Pyramids	PYRMD							PYRAMIDS
Smoothing	SMOTH							
UN moving average	UNSMH							
Beers interpolation	BEERS							
Compare age distributions	IRDID, FWDRV							
Evaluate 0-4 age group	RVFWD							
Census coverage		CENCT						
Stable population								
Fit a stable population	INTSP, SPP	STABLE						
Quasi-stable population	ONECN, ADJBG							
Intrinsic rate of growth	INTRT							
Other techniques								
Linear interpolation	INTRP							
Equalize age groups	ABREV							
Calculate medians	MDRNS							
Reverse survival	REVR5							
Forward survival	FWDRV							
Survival ratios	MORDJ, SURVI, LIFIT							
Net migration rates from Census survival ratios Life table survival ratios								MIGCSR MIGLFT

DDD = Demographic Data for Development Project; MCPDA = Microcomputer Programs for Demographic Analysis.

UN = United Nations; MORTPAK-LITE = The United Nations Software Package for Mortality Measurement.

EWPI = East-West Population Institute; EASWESPOP FERTILITY = EWPI Fertility Estimation Programs.

UPENN = Population Studies Center, University of Pennsylvania; LOTPACK = Lotus-based Demographic Estimation Programs.

KEN HILL = Kenneth Hill of the Population Dynamics Department, The Johns Hopkins University.

PRINCETON = Office of Population Research, Princeton University.

CELADE = Centro Latinoamericano de Demografía; PANDEM = Paquete para Análisis Demográfico para Microcomputadoras.

Microcomputer Programs for Demographic Analysis (MCPDA)

Institute for Resource Development, Inc., at Westinghouse
P.O. Box 866
Columbia, MD 21044, U.S.A.
Telephone: (301) 992-0066
Telex: 87775

ABREV	Equalizes the number of age groups in two distributions
ADJBG	Estimates quasi-stable crude vital rates
ADJFR	Changes the level of age-specific fertility rates
AGESX	Calculates age and sex ratios
BEERS	Separates grouped data into five parts
BLT	Calculates a life table for both sexes combined
ELT	Calculates an abridged life table from M_x or Q_x values
FWDRV	Adjusts age-sex population distributions
INCHM*	Is a modified Brass mortality estimation technique
INTRP	Makes a linear or exponential interpolation
INTRT	Calculates an intrinsic growth rate
INTSP	Calculates a stable population
IRIDID	Compares two age-group distributions
LIFIT	Compares two sets of survival rates
MDRNS	Ranks a set of values and gives the median
MLT	Calculates a Coale-Demeny model life table, by sex
MORDJ	Calculates a set of survival rates
NRSFR	Calculates age-specific fertility rates
ONECN	Calculates stable or quasi-stable parameters
PFRAT*	Is a modified Brass fertility estimation technique
PKREG	Selects a pattern of mortality from the Coale-Demeny tables
PROJ5	Makes a population projection
PYRMD	Constructs a population pyramid
QXADJ	Estimates a set of Q_x life table values
REVR5	Makes a population rejuvenation
RVFWD	Evaluates age group 0-4 in a population distribution

SMOTH	Smooths a population into five-year age groups
SPP	Calculates a stable population
SRX10	Calculates survival rates for open-ended age groups
SURVI	Calculates survival rates
TWOCN	Calculates life table and crude rates from two population distributions
UNSMH	Smooths a population distribution of 5-year age groups using a formula derived by the United Nations

*INCHM and PFRAT have replaced, respectively, BRASM and BRASF, described in the original census manual.

The United Nations Software Package for Mortality Measurement (MORTPAK-LITE)

Director, Population Division
United Nations
New York, NY 10017, U.S.A.
Telephone: (212) 754-8046
Telex: 232422 UNH UR

BENHR	Estimates completeness of adult death registration on the basis of the Bennett-Horiuchi method
BESTFT	Fits observed data to a United Nations model life table using principal components method
CEBCS	Calculates indirect estimates of infant and childhood mortality from data on children ever born and children surviving
CENCT	Estimates completeness of one census relative to a second census
COMBIN	Calculates a life table from life expectancy at age 20 and estimates of early-age survivorship
COMPAR	Compares empirical mortality rates to those from a UN or Coale-Demeny model life table
FERTCB	Estimates age-specific fertility rates from data on children ever born at one or two time points (Arriaga method)
FERTPF	Estimates age-specific fertility rates from data on children ever born and the age pattern of fertility, at one or two time points (P/F ratio technique and Arriaga extension)

ICM	Estimates single-year probabilities of dying for ages under 5	MORPHAN	Calculates indirect estimates of female adult mortality from maternal orphanhood data
LIFTB	Calculates a life table based on nM_x or nQ_x values	PORPHAN	Calculates indirect estimates of male adult mortality from paternal orphanhood data
MATCH	Calculates United Nations, Coale-Demeny, or user-designated model life tables	LTPROG	Calculates a life table from age-specific death rates
ORPHAN	Calculates indirect estimates of female adult mortality from orphanhood data	4PARAMLT	Fits a four-parameter life table
PRESTO	Calculates integrated estimates of intercensal mortality, fertility, and age distribution (Preston integrated method)	LOGIT	Uses logits to adjust life table to model
STABLE	Calculates a stable population		
UNABR	Graduates a set of age-specific probabilities of dying		
WIDOW	Calculates indirect estimates of male and female adult mortality from widowhood data		

East-West Population Institute Fertility Estimation Programs (EASWESPOP FERTILITY)

East-West Population Institute
1777 East-West Road
Honolulu, HI 96848, U.S.A.
Telephone: (808) 944-7420
Telex: 989171

PFRATIO	Uses P/F ratio method to estimate fertility (Coale-Trussell version)
PARITY	Estimates parity increment fertility using parity of women from two censuses
RELE	Uses Rele's method to estimate fertility from the child-woman ratio
PALMORE	Uses Palmore's regression method to estimate fertility from census data
OWN	Uses the own-children method to estimate fertility trends

Lotus-based Demographic Estimation Programs (LOTPACK)

Population Studies Center
University of Pennsylvania
3718 Locust Walk
Philadelphia, PA 19104, U.S.A.
Telephone: (215) 898-7999

BRASSPF	Estimates fertility from Brass's P/F ratio technique
SURVIVAL	Estimates infant and childhood mortality from information on children ever born and children surviving, by age of mother
COVERAGE	Estimates the coverage of death reports by the Brass growth-balance method and the Preston-Coale method

Demographic Estimation Programs by Kenneth Hill (KEN HILL)

Dr. Kenneth Hill
Population Dynamics Department
The Johns Hopkins University
615 N. Wolfe Street
Baltimore, MD 21205, U.S.A.
Telephone: (301) 955-7816
Telex: 7102340022 PUB HYGBAL

AFEMO	Estimates age-specific fertility using the P/F ratio technique (Coale-Trussell version), the E1-Badry adjustment, and the P/F method for first births; estimates infant and childhood mortality using the Trussell multipliers
MORPH	Calculates indirect estimates of female adult mortality from maternal orphanhood data
PORPH	Calculates indirect estimates of male adult mortality from paternal orphanhood data
PRIM	Applies the Preston integrated method to estimate the birth rate and mortality level during the intercensal period
GBEPC	Applies the Brass growth balance, general growth balance, and open growth balance methods to estimate the completeness of death registration

Princeton Program (PRINCETON)

Office of Population Research
Princeton University
21 Prospect Street
Princeton, NJ 08544, U.S.A.
Telephone: (609) 452-5510
Telex: 510 6005694 POPREF

MODEL	Fits observed mortality to a Coale-Demeny model life table
—	Estimates parameters M and m in the Coale-Trussell marital fertility model

Paquete para Análisis Demográfico para Microcomputadoras (PANDEM)

CELADE
Avenida Dag Hammarskjöld
Casilla 91
Santiago, Chile

Telephone: 2283206
Telex: 240077

Analyzes population by age and sex, sex ratios, Myers's and Whipple's indexes, dependency ratios, and mean and median age

Calculates a life table

Estimates fertility by the P/F method

Estimates fertility by the P1+/F1 method

Estimates infant and childhood mortality

Estimates female adult mortality from maternal orphanhood data

Estimates male adult mortality from paternal orphanhood data

Estimates male adult mortality from information on female widowhood

Estimates female adult mortality from information on male widowhood

Estimates adult mortality from information on the distribution of deaths by age

Other demographic estimation programs

PYRAMIDS Constructs population pyramids and gives instruction for their interpretation

Developed by:

Applied Population Laboratory
Center for Demography and Ecology
University of Wisconsin

Available from:

Software Development and Distribution Center
Room 1161 K
1025 West Johnson Street
Madison, WI 53706, U.S.A.
Telephone: (608) 263-9484

MIGCSR Calculates net migration rates using census survival ratios

MIGLFT Calculates net migration rates using life table survival ratios

Dr. Donald J. Bogue
Social Development Center
1313 E. 60th Street, Room 476
Chicago, IL 60637, U.S.A.
Telephone: (312) 947-2010

SURVIVAL Computes basic life tables and multiple decrement and cause-elimination life tables

Dr. David P. Smith
Center for Health and Manpower Policy Studies
University of Texas School of Public Health
P.O. Box 20186
Houston, TX 77225, U.S.A.
Telephone: (713) 792-4315

Part 2. Family planning and health models

Addresses are provided only if they have not been listed previously.

TARGET Family planning target-setting model
The Futures Group

POPULATION COUNCIL The Population Council target-setting model

TARGET Mr. Robert Sendek
The Population Council

CBA/CEA Cost-benefit analysis of births averted and cost-effectiveness of family planning investments model

Mr. Stan Bernstein
Department of Population Planning and
International Health
University of Michigan
Ann Arbor, MI 48109, U.S.A.
Telephone: (313) 763-3229
Telex: 4320815 FM UI

DYNPLAN Health and family planning projection model
Mr. Stan Bernstein
University of Michigan

— Integrated population, family planning, and health planning model
Research Triangle Institute/INPLAN

MORTSIM Simulation of the impacts of fertility behavior and contraceptive availability on infant and child mortality (forthcoming)

Dr. Shea O. Rutstein (for)
United Nations Population Division

Several additional programs for measuring the impact of family planning programs are forthcoming from the Social Development Center at the University of Chicago and will be integrated into their package POP/SYN. The programs are based on the original Fortran code included in the Rapid Feedback for Family Planning Improvement series of family planning research and evaluation manuals.

Part 3. Education, labor force, agriculture, and other planning models

EDFISIMO Education and finance simulation model

Dr. Manual Zymelman
The World Bank
1818 H. Street, N.W.
Washington, D.C. 20433, U.S.A.
Telephone: (202) 473-4825

EDUC HOST-based education planning model

The Knowles Corporation (for)
Research Triangle Institute/INPLAN

- | | | | |
|---------|---|-------------------|---|
| EDSIM | Education simulation model
The Futures Group | DEMO-
GRAPHICS | World populations and projections

Population Dynamics Group
Urbana, IL U.S.A.
<i>Distributed by:</i>
COMPRESS
P.O. Box 102
Wentworth, NH 03282, U.S.A.
<i>Telephone:</i> (603) 764-5831 |
| PETS | Primary education tracking system
Research Triangle Institute/INPLAN
(with Harvard University) | | |
| — | Educational system and labor force projection
model for Indonesia (HOST-based)
Research Triangle Institute/INPLAN | | |
| CAPPA | Computerized system for agricultural and
population planning assistance and training
Ms. Françoise Petry
Policy Analysis Division
Food and Agriculture Organisation of the United
Nations (FAO)
Via delle Terme di Caracalla
00100 Rome, Italy
<i>Telephone:</i> 57974983
<i>Telex:</i> 610181 FAO I | TMI | Planning for population, labor force, and
service demand: a microcomputer-based train-
ing module

Employment Planning and Population Branch
International Labour Organisation |
| — | Population-food demand model
Research Triangle Institute/INPLAN | — | Population and development game (an inter-
active role-playing game designed to give
players experience in making public policy
and planning decisions in the areas of popu-
lation, education, employment, and the
economy)

Research Triangle Institute/INPLAN |
| REDATUM | Retrieval of census data for small areas by
microcomputer
CELADE | | |
| LRPM/PC | Long-range planning model for personal com-
puters
CELADE | | |
| RAPID | Population projection and socioeconomic
forecasting model (available for many de-
veloping countries)
The Futures Group | | |
| HOST | Model development and support system for
implementing all types of models
Research Triangle Institute/INPLAN | | |
| HOMES | Household model for economic and social
studies
East-West Population Institute | | |
- **Part 4. Programs useful for learning about population dynamics and population-development interrelationships**
- POPSHOW Programs for teaching introductory demography
Dr. George Immerwahr
Department of Sociology
University of Washington
Seattle, WA 98105, U.S.A.
Telephone: (206) 543-5033

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ASIAN AND PACIFIC POPULATION FORUM

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AIDS in Asia and the Pacific

by Stephen G. Karel
and Bryant Robey

SINCE THE FIRST cases of AIDS—acquired immune deficiency syndrome—were diagnosed in 1981, concern has been spreading as the number of AIDS-related deaths has grown. As of 30 June 1988 the World Health Organization (WHO) had received reports of 108,176 cases of AIDS from 177 countries. About 73 percent of the cases were from the Americas, 14 percent from Africa, 12 percent from Europe, and the remaining 1

percent from Oceania and Asia (see Table 1).

For the most part, Asia has not yet felt a major impact from AIDS. Of the 108,176 reported cases last June, only 264 were from some 19 Asian countries. These statistics are highly misleading, however, both because of underreporting and because many cases could be in the early stages of the infection and not yet diagnosed as AIDS.

“AIDS is knocking on the door of Asia,” according to Dr. Halfdan Mahler, the former director general of WHO (Panos Institute 1987:60). WHO has warned Asian governments that AIDS is likely to spread rapidly throughout the region within the next five years unless health standards improve rapidly and effective public education campaigns are undertaken.

Assuming that between 5 and 10 million people worldwide have already been infected with HIV, the AIDS virus, it is likely that from 500,000 to 3 million new cases of AIDS will occur by 1991. WHO warns that if HIV infection spreads among the populations of Latin America and Asia as rapidly as it

Table 1. Reported AIDS cases worldwide, by region: June 1988

Region	No. of cases
Americas	78,908
Africa	14,786
Europe	13,214
Oceania	1,004
Asia	264
Total	108,176

Source: *Health & Development* July 1988:4.

ASIAN AND PACIFIC POPULATION FORUM

Editor Linda G. Martin
Associate Editors Fred Arnold
Robert D. Retherford
Managing Editor Sandra E. Ward

The *Asian and Pacific Population Forum*, published quarterly, brings articles of potential value in policy formulation, program administration, and research to the notice of professionals concerned with population matters, particularly in Asia, the Pacific, and the United States.

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The EAST-WEST POPULATION INSTITUTE, a unit of the East-West Center, conducts research, training, and related activities in the field of population, with emphasis on economic, social, psychological, and environmental aspects of population problems in the region of concern to the East-West Center.

The EAST-WEST CENTER is a public, nonprofit educational institution with an international board of governors. Some 2,000 research fellows, graduate students, and professionals in business and government each year work with the Center's international staff in cooperative study, training, and research. They examine major issues related to population, resources and development, the environment, culture, and communication in Asia, the Pacific, and the United States. The Center was established in 1960 by the United States Congress, which provides principal funding. Support also comes from more than 20 Asian and Pacific governments, as well as private agencies and corporations.

Has spread elsewhere, 50 to 100 million people worldwide could be infected by 1991 (Mann 1987:366). (See Figure 1.)

Some Asian governments do not yet appear to view AIDS as a serious national public health issue. Others have been reluctant to report AIDS cases to WHO for fear of hurting tourism (*Bangkok Post*, 28 November 1987). Many still consider AIDS to be an imported disease, the product of western sexual promiscuity.

Measures to control the spread of AIDS have focused primarily on preventing its introduction into countries by foreign travelers, students, or military personnel, and screening of high-risk groups. Asian governments generally have approached publicity about AIDS with caution, and public education efforts have been limited (*Tokyo Journal* 1987:9).

This attitude may be changing, however, as the number of AIDS cases rises and public awareness increases. For example, the permanent secretary of Thailand's Ministry of Health, Dr. Pairoj Ningsanont, recently acknowledged that an increase of AIDS carriers among drug users posed a serious health concern in his country (*Bangkok Post* 31 March 1988).

This article reports current information about AIDS and its effects, and discusses the efforts of governments and international organizations to deal with AIDS in Asia and the Pacific. Confirmed statistics on cases of AIDS and HIV infection in the Asian and Pacific region are difficult to obtain, and not all

reports agree. We have attempted to use the best available data, but some numbers have been drawn from news reports and public statements in cases where official statistics were not readily available.

■ Medical overview

Acquired immune deficiency syndrome, or AIDS, is the name given to a complex of health problems caused by the human immunodeficiency virus (HIV). This virus attacks an individual's immune system and ultimately destroys its ability to ward off disease. The individual then becomes vulnerable to infections by bacteria, other viruses, and malignancies, which may cause such life-threatening illnesses as pneumonia, meningitis, and cancer.

HIV infection causes a range of debilitating symptoms, such as fevers, diarrhea, and swollen lymph nodes. Other symptoms include weight loss, night sweats, and exhaustion. Neurological problems such as dementia may also result from HIV infection. Individuals infected with HIV who show less severe symptoms of AIDS are considered to have AIDS-related complex (ARC).

HIV has been isolated from blood, semen, vaginal secretions, saliva, tears, breast milk, and urine and is likely to be present in other body fluids, secretions, and excretions (Mann 1987:363). However, epidemiological evidence has implicated mainly blood, semen, and vaginal secretions in transmission.

As the etiological agent of AIDS, HIV is transmitted in the following ways:

- through intimate sexual contact with an infected individual;

- through exposure to contaminated blood and blood products;
- from an infected mother to her child before, during, or shortly after birth;
- by means of infected body organs, other tissues, or semen from an infected donor.

Sexual contact has been the main mode of HIV transmission worldwide. Sexual contact between homosexual men has been a leading form of transmission in the United States and Europe. Infected men can infect their female sex partners as well, and infected women can similarly infect men. Transmission occurs through vaginal, oral, and anal intercourse, although the relative efficiency of each route is not known.

An infected individual does not need to display symptoms to spread the infection (Mann 1987:364). The risk of HIV infection is increased by having multiple sex partners, either homosexual or heterosexual. However, the specific type of sexual activity, and the prevalence of HIV in the sex partner, may be even more important determinants of the spread of the virus.

Transmission of HIV infection through exposure to blood and blood products occurs as a result of the transfusion of infected blood or blood products, the use of blood-contaminated needles or equipment by drug abusers, or the use of inadequately sterilized needles or other skin-piercing instruments. HIV is *not* spread through immunization programs using properly sterilized syringes (Mann 1987:364), nor can the virus be transmitted by donating blood as long as a sterile needle is used.

If a woman infected with HIV becomes pregnant, there appears to be about a 50 percent chance that her

child will also become infected with HIV. Breastfeeding has been implicated in the after-birth trans-

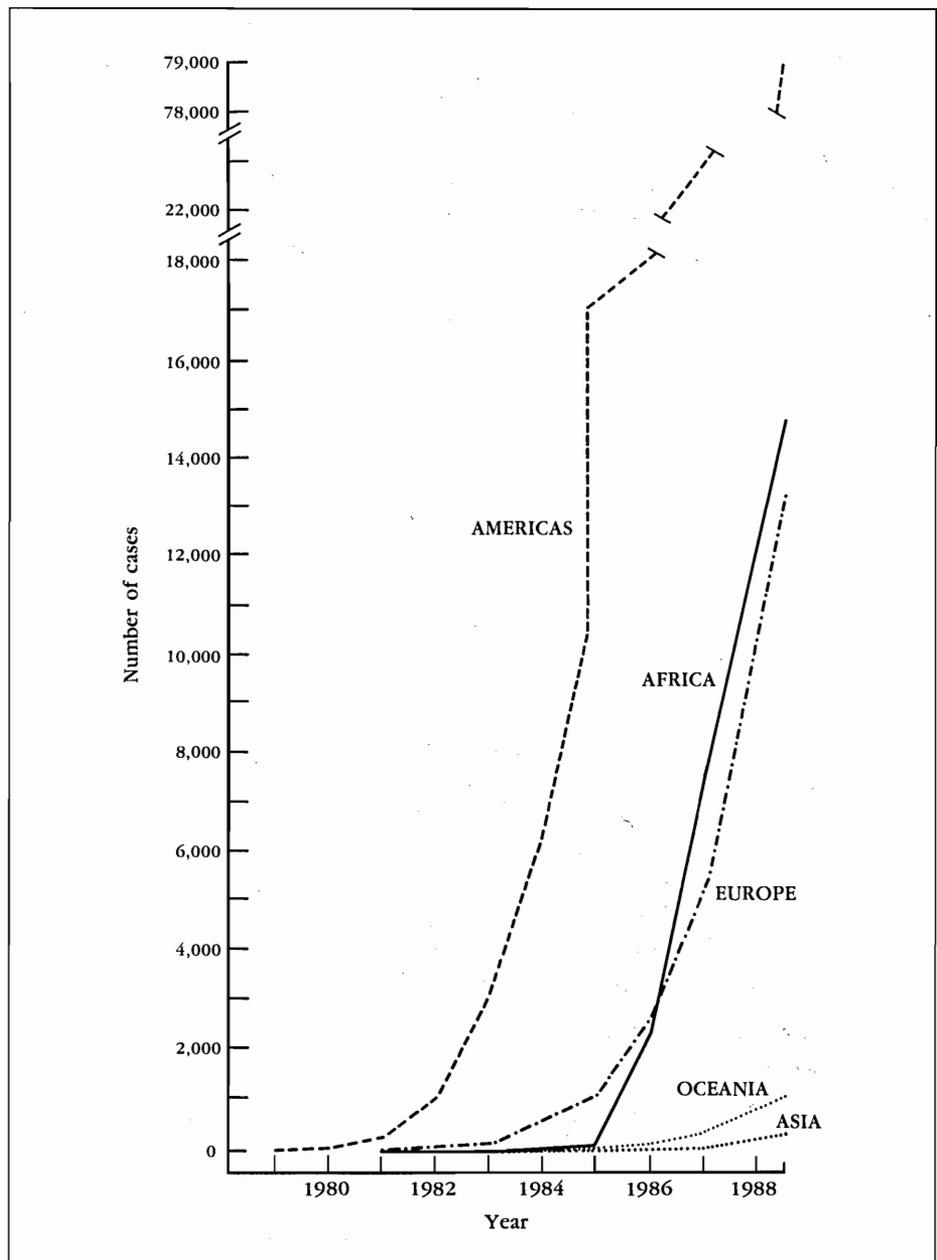


Figure 1. AIDS cases reported to WHO, by region: 1979 to June 1988

Source: *Health & Development* July 1988:4.

mission of HIV in several cases, but other instances have been reported of infected mothers who breastfed their infants and did not transmit HIV to them (Lifson 1988:1353).

Because of the possibility of post-natal transmission to a child who may not yet be infected, the U.S. Public Health Service currently recommends that known HIV-infected women avoid breastfeeding (Lifson 1988:1353). This recommendation may not be feasible in many parts of the developing world, where the HIV status of most pregnant and nursing women is unknown. Public

health officials in developing countries have been encouraging breastfeeding as infants' best protection against other life-threatening infections, which so often lead to infant death (Sabatier 1987a:100).

There is no evidence that the infection is transmitted by so-called casual contact—that is, contact that can be even quite close between persons in the course of daily activities. It is extremely unlikely that HIV can be transmitted by insect bites, sneezing, shaking hands, sharing a drinking glass, or living in the same household with an AIDS

sufferer or an HIV-infected person.

The period between infection with HIV and the onset of AIDS symptoms seems to range from six months to ten years or more. Some estimates put the median period as high as eight years. This long and often unrecognized period of asymptomatic infection, during which an infected person can infect others, complicates the task of dealing with the spread of the virus.

The risk of progressing from HIV infection to the development of AIDS appears to increase with time; that is, the risk during the third year of infection is greater than the risk during the first year. Within five years of being infected with HIV, 10 to 30 percent of people develop AIDS, and another 25 to 30 percent develop ARC (Figure 2). To date, some 30 percent of ARC patients have gone on to develop AIDS (Rowe and Ryan 1987:1-2). Experts estimate that within ten years after being infected by HIV, a majority (and perhaps all) of these people will develop AIDS. Those who do not are likely to develop ARC (Mann 1987:363).

AIDS is fatal to nearly all of its victims. Of all AIDS cases reported to the health authorities in the United States and Western Europe, 50 percent have since died. For AIDS cases diagnosed in the United States three years ago, the case fatality rate is above 75 percent. Among those diagnosed before 1982, the case fatality rate is 90 percent (WHO 1986:A-6). It could be even higher, for many cases are lost in follow-up.

The most common cause of death from AIDS in the United States is *Pneumocystis carinii* pneumonia, a

(continued on page 18)

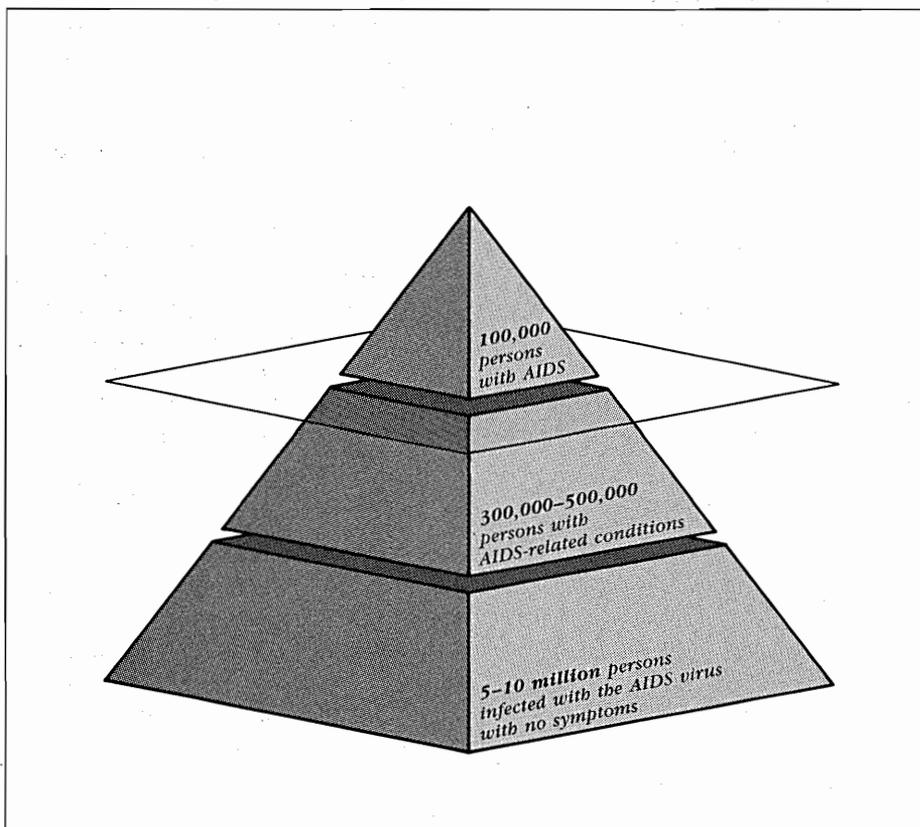


Figure 2. The deadly AIDS pyramid: Estimated cases of HIV infection as of April 1987

Source: World Health Organization, Global Programme on AIDS.

Strength of Fertility Motivation and Contraceptive Use in Nepal

by Robert D. Retherford,
Jayanti Tuladhar,
and Shyam Thapa

Nepal's 1986 Fertility and Family Planning Survey included questions intended to measure the strength of respondents' fertility motivations. The responses can be used for improved prediction of current contraceptive use, over and above the effects of other causal variables typically included in studies of the determinants of contraceptive use. Controlling selected demographic and socioeconomic background characteristics of the respondents, the authors of the following article found the effect of the strength of fertility motivation on current contraceptive use to be substantial and highly statistically significant.

Nevertheless, the background factors largely captured the effect of motivational strength on current use when motivational strength was deleted from the model, inasmuch as measures of global fit declined only slightly as a consequence of the deletion.

These findings indicate that respondents' demographic and socioeconomic background characteristics affect motivational strength, so that motivational strength does not have a large independent effect on use.

ALREADY A DECADE AGO, Westoff and Ryder (1977) showed that the predictive validity of reproductive intentions could be enhanced by supplementing survey questions on desired family size with questions designed to assess the degree of certainty with which respondents intended to have or not to have another child. Despite this earlier work, questions on strength of fertility motivation have been slow to make their way into major fertility survey questionnaires.

The World Fertility Surveys, for example, did not include any questions on strength of fertility motivation. Nor did the Contraceptive Prevalence Surveys. The ongoing round of Demographic and Health Surveys includes questions on strength of fertility motivation, but to our knowledge these data have not yet been analyzed.

The importance of measuring strength of fertility motivation has been noted by Cleland (1986:5): "Variations in the intensity of the desire to avoid childbearing might also explain why couples in different socioeconomic strata who desire the same number of children differ widely in their use of contraceptives. Few recent surveys have attempted to address this issue, which is of both practical and theoretical importance." Others have also emphasized the potential use-

fulness of detailed data on family planning motivation and attitudinal intensity (e.g., Fishbein and Jaccard 1973; Fishbein 1974; Retherford and Palmore 1983; Retherford 1985).

In this article, we test whether new survey questions on strength of fertility motivation, included in Nepal's 1986 Fertility and Family Planning Survey, enable improved prediction of current contraceptive use and of intention to use contraception in the future, over and above the effects of socioeconomic background factors.

■ Data and methodology

The 1986 Nepal Fertility and Family Planning Survey (NFFS) is the most recent nationally representative sample survey in Nepal, collecting information from women on their maternity histories, contraceptive knowledge and use, fertility motivation, and both their and their husbands' demographic and socioeconomic background characteristics. Designed to elicit information useful for family planning program evaluation, it is a follow-up to the 1976 Nepal Fertility Survey and the 1981 Nepal Contraceptive Prevalence Survey.

The NFFS sample included currently married women 15-50 years of age. The sample was drawn separately for urban and rural areas, and urban areas were oversampled. A total of 1,255 urban women and

3,774 rural women were successfully interviewed. Response rates were 95.8 percent for urban and 98.3 percent for rural women. Details of sample design are contained in the survey report (Nepal Family Planning and Maternal and Child Health Project 1987).

The dependent variables in our analysis of the NFFS data are, alternatively, current use of contraception (coded as 1 if a respondent was using any method, 0 otherwise) and intention to use contraception in the future (coded as 1 if a respondent intended to use it in the future, 0 otherwise). The "current use" variable is based on an NFFS question that covers both modern and traditional methods of contraception. The "intention to use" variable is based on a question that asked the respondent whether she or her husband had thought of using any family planning method in the future.

The analysis of current use excludes sterilized and otherwise nonfecund women, who were not asked the questions on the strength of their fertility motivation.¹ The analysis of intention to use excludes not only nonfecund women but also all current users of any method of contraception.

The principal independent variable in our analysis is strength of fertility motivation. This variable,

1. The exclusion of sterilized women from the analysis of current use involves some selection of the sample on the basis of the dependent variable, current use. The effects of strength of fertility motivation are probably biased downward as a result. To estimate the magnitude of this bias, we did a test run that included sterilized women with imputed RPI values of -3 in the analysis and found that the effects of RPI on both current use and intention to use were much larger than those reported here.

which we call relative preference intensity (RPI), is a seven-point scale based on two questions included to assess how strongly respondents felt about having or not having another child. The two questions were asked only of fecund women, i.e., women who thought it was physically possible for them to have another child, as far as they knew.¹

Women who answered "yes" to the question, "Do you want to have any/another child sometime?" (apart from current pregnancy, if any) were then asked, "Would you say that your desire to have children/more children is not very strong, strong, or very strong?" Women who answered "no" to the first question were asked, "Would you say that your desire not to have any more children is very strong, strong, or not very strong?"

Responses were coded into relative preference intensity (RPI) scores as follows:

Response	RPI score
Want another child	
Very strongly	+3
Strongly	+2
Not very strongly	+1
Undecided	0
Want no more children	
Not very strongly	-1
Strongly	-2
Very strongly	-3

We have used the RPI scores first to construct family-size preference profiles, which are plots of cumulative RPI values by number of living children. (A current pregnancy is counted as a living child.) These profiles are synthetic, because family-size preference profiles cannot be constructed for individual

women using the NFFS data. For a particular woman, RPI is specific to the number of children she had at the time of the survey. For example, if she had three children, her RPI value tells us how strongly she wanted or did not want a fourth child. We do not know how strongly she wanted another child at earlier times in her life when she had, say, one or two children.

Synthetic family-size preference profiles may be calculated by chaining together average RPI values for women of each possible number of living children, as shown in Figures 1-3, so that in each preference profile, the quantity plotted on the vertical axis is the cumulative relative preference intensity (CRPI). To calculate CRPI, one first calculates a mean value of RPI for women of each number of living children. The value of CRPI for zero living children is arbitrarily set at zero. (Because the values of RPI are relative, the starting point of CRPI is arbitrary.)

CRPI(1) is simply RPI(0); i.e., cumulative relative preference intensity for one child equals the mean RPI score for women with no living children. $CRPI(2) = RPI(0) + RPI(1)$, and in general $CRPI(i) = \sum_{x < i} RPI(x)$. The preference profiles peak at values close to mean desired number of children. The coincidence is not exact, however, because the peaks in the profiles are constrained to integer values. The CRPI profiles have some additional analytical limitations that will be discussed later.

We also analyze in a multivariate mode the determinants of contraceptive use and of intention to use contraception in the future, with RPI as only one of several ex-

planatory variables. The multivariate analysis includes additional demographic and socioeconomic control variables because we wish to know whether RPI contributes to explanation over and above the effects of demographic and socioeconomic variables usually included in analyses of the determinants of contraceptive use (see, for example, Cleland et al. 1979).

The additional variables we include are number of living children, age at first marriage, urban residence, woman's education, and an amenities index. Age of mother, which is often included in analyses of the determinants of contraceptive use, is omitted in our analysis because of its collinearity with number of living children. Husband's education is likewise omitted because of its collinearity with woman's education. Our amenities index is a four-point scale variable obtained by adding responses to three items: drinking water (1 if the household used a tap or tube well, 0 otherwise), latrine (1 if the household had a latrine, 0 otherwise), and electricity (1 if the household had electricity, 0 otherwise). We use the amenities index instead of three separate items because of multicollinearity among the three items.

Because our dependent variables, current use of contraception or intention to use contraception in the future, are binary variables, we use logit regression as our method of multivariate analysis.

■ Results of family-size preference profiles

The range of variation in mean desired number of children by socioeconomic category in the NFFS

is rather small, between three and four children (Table 1). The family-size preference profiles in Figures 1-3, however, show more variation than is immediately apparent from the values of mean desired number of children in Table 1.

For example, Table 1 shows that mean desired number of children is 3.4 for urban women and 3.9 for rural, but Figure 1 shows addition-

ally that the shapes of the two profiles are markedly different, with the peak for urban considerably flatter than the peak for rural. (The urban curve is truncated at 5 living children, because RPI(5) is based on fewer than 15 women, the number we somewhat arbitrarily chose as a cutoff value.)

The shape of the urban curve in Figure 1 is of considerable interest.

Table 1. Mean desired number of children, by selected socioeconomic characteristics, for women reporting relative preference intensity (RPI): Nepal 1986 Fertility and Family Planning Survey

Characteristic	Mean desired number of children	
	Urban	Rural
Residence		
Urban	3.4 (484)	na
Rural	na	3.9 (1,598)
Region		
Mountain	na	3.7 (128)
Hill	3.1 (231)	3.9 (732)
Terai	3.8 (262)	3.9 (739)
Woman's education		
No schooling	3.7 (317)	3.9 (1,472)
Some schooling	2.9 (167)	3.6 (126)
Husband's education		
No schooling	4.0 (152)	4.0 (928)
Some schooling	3.2 (338)	3.7 (663)
Drinking water		
Tap or tube well	3.2 (356)	3.7 (643)
Other	4.0 (131)	4.0 (949)
Latrine		
Yes	3.1 (249)	3.8 (112)
No	3.8 (239)	3.9 (1,486)
Electricity		
Yes	3.1 (279)	3.5 (62)
No	3.9 (209)	3.9 (1,535)
Total	3.4 (493)	3.9 (1,599)

Note: Sample numbers are shown in parentheses. Total sample numbers for characteristics may differ because of variability in nonresponse.

na—not applicable.

It suggests that the potential for family planning adoption in urban areas is rather limited, because women, on average at least, are almost indifferent to the alternatives of three, four, and five children. For such women, birth control costs do not have to be very high to discourage those with three children from stopping at three. They are likely to go on to have at least two more children, even if they express a preference for three.

As has been elaborated elsewhere (Retherford 1985), the shape of the CRPI curve in the neighborhood of its peak conveys considerable information about the potential for family planning adoption in a population. That potential would seem to be especially great in populations where the preference profile peaks at a low number of surviving children and falls off rapidly after the peak. By this criterion, the preference profiles in Figures 1-3 suggest

that women with some education and modern amenities living in urban areas have a higher potential than other women for adopting family planning.

Although the preference profiles are useful, they have some analytical limitations. Their calculation assumes cardinal measurement, whereas measurement is really ordinal. This means that cumulation of RPI values can be misleading. For example, although CRPI(6) is greater than CRPI(3) in the rural preference profile in Figure 1, this fact does not necessarily mean that rural women on average prefer six over three children.

A direct question (not included in the NFFS) on their preference for three compared with six children might conceivably have shown that, on average, respondents preferred three over six. Such a discrepancy could occur because of the ordinal measurement. (For further discussion of this point, see Coombs et al. 1975.)

The preference profiles must therefore be interpreted cautiously. Perhaps the greatest utility of the curves is that they permit inferences about the potential for family planning adoption drawn from examination of the slopes of the curve extending to one child on either side of the peak.

A further limitation of the preference profiles is that they are not multivariate. For our multivariate analysis of contraceptive use, we use logit regression.

■ Results of logit regression analysis

Because only women for whom RPI scores could be calculated are included in the analysis, and because

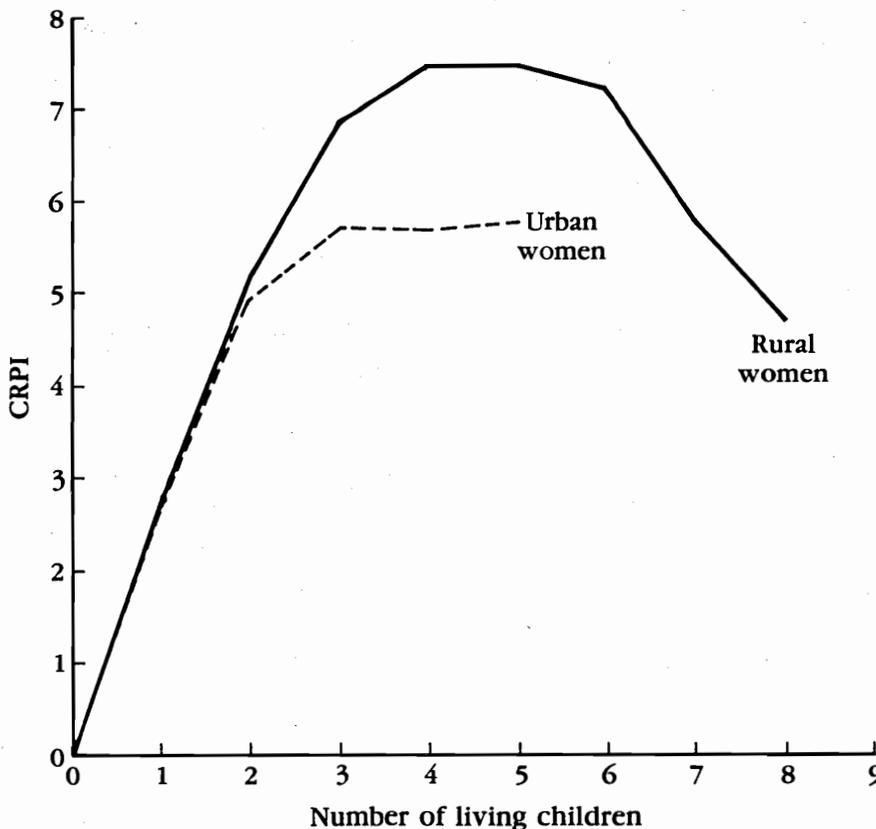


Figure 1. Cumulative relative preference intensity (CRPI) profiles, by urban-rural residence: Nepal 1986 Fertility and Family Planning Survey

Note: Plotted points are based on at least 15 women.

scores could not be calculated for sterilized women for whom the questions on strength of fertility motivation were not asked, the distribution of women by contraceptive use (shown in Table 2) is skewed heavily toward nonusers. Only 9.8 percent of urban women and 3.0 percent of rural women were currently using contraception, excluding sterilization. Had it been possible to include sterilized women in the analysis, these percentages would have been considerably higher, because sterilization accounts for about 85 percent of contraceptive use in Nepal (Nepal Family Planning and Maternal and Child Health Project 1987:table 10.23).

The percentage of women not currently using contraception but intending to use it was considerably higher, 37.4 percent for urban women and 23.6 percent for rural women.

Table 2 also shows that the mean number of living children was fairly low, at 1.8 for urban women and 2.1 for rural women, because most women in the sample had not yet completed their families. The combined sample was heavily rural, concentrated in the hill and terai (lowland) regions, largely uneducated, and with few modern amenities. The distribution of women by RPI score shows that 22.4 percent of urban women and 17.9 percent of rural women did not want any more children. Only 4.2 percent of urban women and 3.8 percent of rural women were undecided about having more children. Some 70.6 percent of urban women and 73.3 percent of rural women felt either strongly or very strongly that they wanted another child.

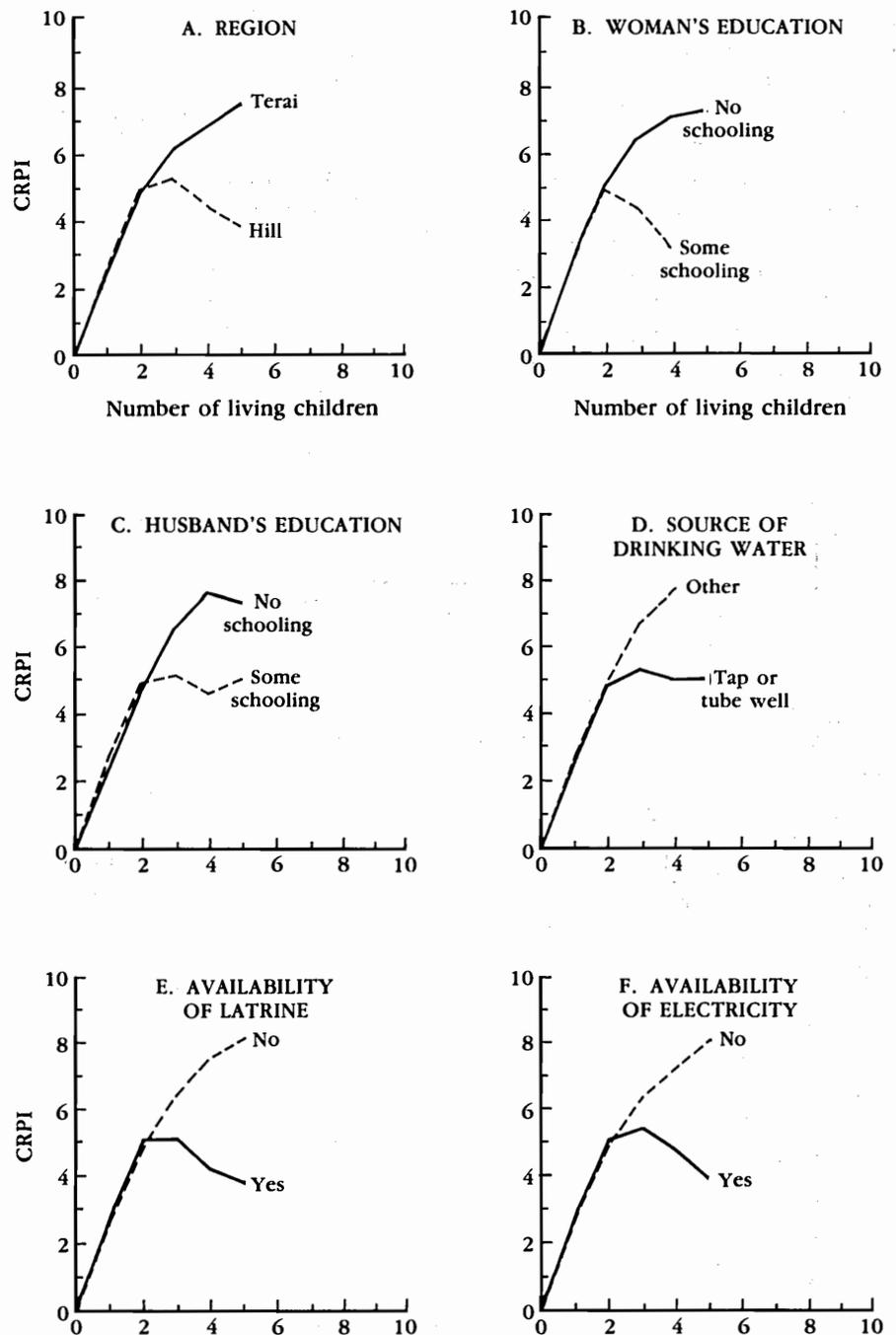


Figure 2. Cumulative relative preference intensity (CRPI) profiles, by selected socioeconomic characteristics of urban women: Nepal 1986 Fertility and Family Planning Survey

Note: Plotted points are based on at least 15 women.

Tables 3 and 4 show results of the logit regression analysis. In Table 3, two models are presented for each dependent variable. Models 1 and 3 exclude RPI as an independent variable, and models 2 and 4 include it. The purpose of this design is to ascertain whether RPI adds significantly to the explanation of current use or intention to use, over and above the other independent variables.

The other independent variables are as described previously, except that number of living children squared is included, as well as number of living children, to capture the relationship between number of living children and contraceptive use, which tends to be shaped like an inverted U. Woman's education is a continuous variable, number of completed years of education.

We represent the seven RPI values by six dummy variables instead of one continuous variable, because we expect the relationship to be nonlinear. If birth control is used primarily for limiting family size but not much for birth spacing, as is often the case early in the process of fertility transition and as we expect in Nepal, then there should be little or no contraceptive use when RPI is greater than or equal to zero but increasing levels of use for RPI values of -1, -2, and -3.

Instead of underlying coefficients, Table 3 presents odds ratios, which are easier to interpret. For example, the odds ratio of 0.822 for urban in model 1 for current use means that the odds of using contraception are 0.822 times as great for urban women as for rural women, when the other independent variables are held constant. Thus the odds ratio

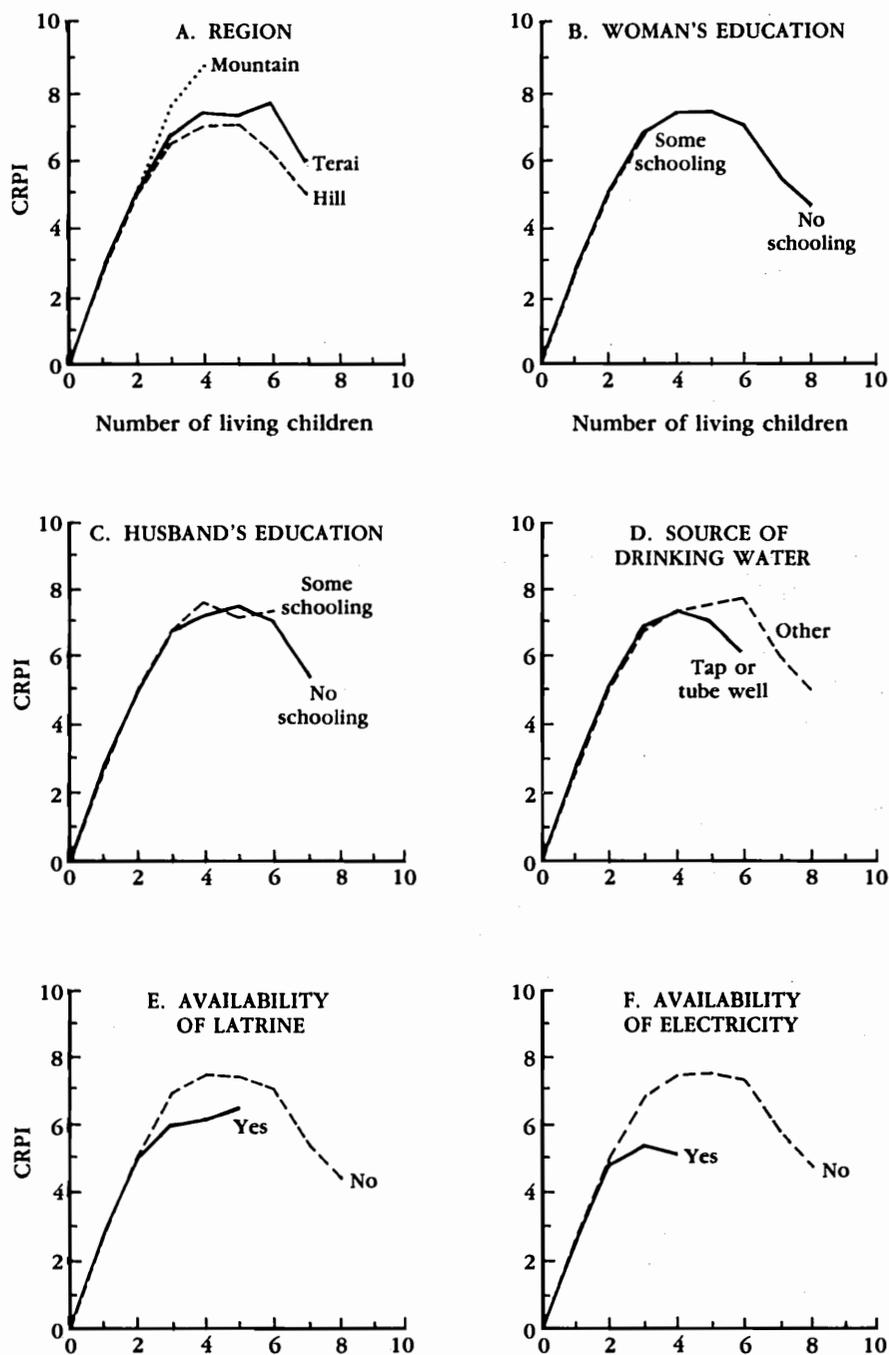


Figure 3. Cumulative relative preference intensity (CRPI) profiles, by selected socioeconomic characteristics of rural women: Nepal 1986 Fertility and Family Planning Survey

Note: Plotted points are based on at least 15 women.

measures the effect of being urban, relative to being rural, on the odds of using contraception. (The effect of being urban is not in the expected direction in model 1, but the effect does not differ significantly from unity.)

The odds ratio of 1.082 for age at first marriage means that the odds of using contraception are increased by a factor of 1.082 for each one-year increase in age at marriage.

The estimated effect of a one-child increase in the number of living children depends on the number of living children that a woman has, because of the squared term.

For example, if the woman has one living child, the effect of a one-child increase in the number of living children is to increase the odds of using contraception by a factor of $(3.423)(0.835)^{(2)(1)} = 2.387$. If the woman has five living children, the effect of a one-child increase in the number of living children is to decrease the odds of using contraception by a factor of $(3.423)(0.835)^{(2)(5)} = 0.564$.

Quantities in parentheses following the odds ratios are prob-values. They indicate exact level of statistical significance for the logit regression coefficients from which the odds ratios are calculated as $\exp(B)$, where B is the underlying coefficient.

The findings for current use show that all variables except urban residence have highly statistically significant effects in both models 1 and 2. Such variables as woman's education and amenities evidently account for the effect of urban residence on use, shown in Table 2, using a simpler cross-tabulation mode of analysis.

In model 1, the effects of number

Table 2. Demographic and socioeconomic characteristics of fecund women reporting relative preference intensity: Nepal 1986 Fertility and Family Planning Survey

Characteristic	Urban	Rural
Currently using contraception (%) ^a		
Pill	4.4	1.2
Condom	2.8	1.0
Loop	1.4	0.2
Injectable	1.2	0.6
Currently not using contraception (%)	90.2	97.0
(N)	(502)	(1,622)
Intending to use contraception (%) ^b		
Yes	37.4	23.6
No	62.6	76.4
(N)	(452)	(1,574)
Mean number of living children	1.8	2.1
(N)	(500)	(1,622)
Mean age at first marriage	18.0	17.1
(N)	(499)	(1,616)
Region (%)		
Mountain	0.0	7.9
Hill	46.8	45.8
Terai	53.2	46.4
(N)	(502)	(1,622)
Woman's education (mean number of completed years)	2.8	0.4
(N)	(493)	(1,621)
Husband's education (mean number of completed years)	6.3	2.8
(N)	(499)	(1,614)
Source of drinking water (%)		
Tap or tube well	73.0	40.4
Other	27.0	59.6
(N)	(496)	(1,615)
Availability of latrine (%)		
Yes	51.1	6.9
No	48.9	93.1
(N)	(497)	(1,621)
Availability of electricity (%)		
Yes	57.3	3.9
No	42.7	96.1
(N)	(497)	(1,620)
Mean of amenities index	1.8	0.5
(N)	(496)	(1,614)
Relative preference intensity (RPI)		
Mean of RPI scale	1.25	1.50
Percent with specified RPI scale values		
-3	13.0	8.1
-2	5.4	6.0
-1	4.4	3.8
0	4.2	5.1
1	2.6	3.7
2	35.3	33.0
3	35.3	40.3
(N)	(502)	(1,622)

a. Traditional methods accounted for less than 0.5 percent of contraceptive use and are not shown. Sterilized persons, who were much more numerous, are excluded from the table.

b. Pertains only to current nonusers.

of living children, age at first marriage, and urban residence have already been discussed. Each additional completed year of education increases the odds of current use by a factor of 1.097. A one-unit increase in the amenities index increases the odds of current use by a factor of 2.120.

In model 2, with RPI additionally included among the independent variables, strongly not wanting another child, corresponding to an RPI value of -3, increases the odds of current use by a factor of 6.394,

relative to the reference category of strongly wanting another child, corresponding to an RPI value of +3.

As expected, the odds ratio tends to decrease, though somewhat irregularly, as RPI increases. Contrary to expectation, the odds ratios are greater than unity for RPI values of 0, 1, and 2, suggesting that some women may be using contraception for birth spacing. (At positive values of RPI, one expects virtually no contraception to be used for family limitation.) All six of the RPI effects on contraceptive use, as indicated

by odds ratios, differ significantly from unity, pertaining to the reference category of RPI = 3 ($p < .04$).

When RPI is introduced into the logit regression in model 2, the effects of all other independent variables except age at first marriage are somewhat smaller than in model 1 (i.e., the odds ratios move toward a value of unity, indicating no effect). The reduction is especially large for number of living children. The result is that R^2 (the logit regression analogue of the coefficient of deter-

(continued on page 30)

Table 3. Effects of demographic and socioeconomic variables on the odds of currently using contraception and the odds of intending to use contraception in the future: logit regression model estimates of odds ratios, Nepal 1986 Fertility and Family Planning Survey

Characteristic	Dependent variable			
	Currently using		Intending to use	
	Model 1	Model 2	Model 3	Model 4
Number of living children	3.423 (.000)	1.981 (.023)	1.173 (.068)	1.248 (.019)
Number of living children squared	0.835 (.000)	0.878 (.012)	0.975 (.082)	0.971 (.059)
Age at first marriage	1.082 (.007)	1.086 (.006)	1.005 (.748)	1.004 (.801)
Urban residence	0.822 (.558)	0.793 (.504)	0.990 (.948)	1.009 (.954)
Woman's education	1.097 (.002)	1.075 (.022)	1.081 (.000)	1.083 (.000)
Amenities	2.120 (.000)	2.004 (.000)	1.334 (.000)	1.331 (.000)
Relative preference intensity				
-3		6.394 (.000)		.841 (.406)
-2		6.976 (.000)		.937 (.788)
-1		3.423 (.035)		.491 (.026)
0		3.551 (.026)		.220 (.000)
1		4.287 (.009)		.935 (.816)
2		2.187 (.031)		.953 (.700)
3		1.000		1.000
R^2	0.154	0.172	0.029	0.035
-2 log likelihood	647	621	2299	2272
Degrees of freedom	6	12	6	12

Note: Sterilized women are excluded from the logit regressions of current use. Prob-values (i.e., exact significance levels) are shown in parentheses after odds ratios. (The prob-values actually pertain to the logit regression coefficients that underlie the odds ratios.) The R^2 statistic is somewhat similar to R^2 in ordinary least squares multiple regression, but it is calculated quite differently and it cannot be used in tests of significance like an ordinary R^2 (Harrell 1983). The logit regressions of current use are based on all fecund women who reported relative preference intensity. The logit regressions of intent to use are based on all fecund women who reported relative preference intensity and who were not currently using any method of contraception.

Reviews

Thailand's Reproductive Revolution: Rapid Fertility Decline in a Third-World Setting

by John Knodel, Aphichat Chamrathirong, and Nibhon Debavalya. Madison: The University of Wisconsin Press, 1987. ISBN 0-299-11050-8 (cloth), ISBN 0-299-11054-0 (paper). xiii, 251 pp. US \$45.00 (cloth), \$19.95 (paper). Available from The University of Wisconsin Press, 114 N. Murray Street, Madison, WI 53715, U.S.A.

In the last 25 years Thailand has undergone one of the most rapid fertility transitions ever recorded. The total fertility rate dropped from 6.4 children per woman during the first half of the 1960s to less than 3.0 in 1985. About two-thirds of currently married Thai women 15-44 years of age are using contraception, a level that approaches contraceptive prevalence rates in more developed countries. A two-child family is now preferred by a majority of married couples in Thailand, and very few couples want more than three children.

The transformation in reproductive attitudes and behavior has been so rapid and wide-ranging that the authors of this volume have decided to label it "a reproductive revolution." This revolution is all the more remarkable because it has taken place in a Third World country that is still overwhelmingly rural and predominantly agrarian.

Although a rise in the average age at marriage has contributed to Thailand's fertility decline, the most important proximate determinant has been the use of contraception by married couples. After presenting

a comprehensive picture of the nature and extent of Thailand's fertility decline, the authors of *Thailand's Reproductive Revolution* explore the factors responsible for the easy acceptance of family planning and the rapid reduction in marital fertility, seeking answers to the following questions.

Is Thailand's reproductive revolution due to fundamental social and economic changes that have increased the cost of raising children while decreasing some of the benefits? Or is it a function of Thailand's cultural setting, which provides women with substantial autonomy and makes couples largely responsible for their own reproductive decisions (free of the dictates of parents, kin, or religion)? Could it be a result of the latent demand for fertility control that was present among a substantial proportion of couples long before the fertility transition started? And what has been the role of organized family planning programs in Thailand, which have shown an unusual willingness to incorporate new contraceptive methods and to use innovative distribution systems?

As the authors of this volume ably demonstrate, these four factors worked together and reinforced each other in producing the rapid fertility transition.

One unique contribution of this book is a careful melding of quantitative and qualitative research methods. The authors call their approach "demographically informed qualitative research." They make extensive use of focus-group inter-

viewing, a technique often used for marketing research but rarely adapted to social science research.

Although the book is primarily a case study of Thailand's fertility decline, the authors begin by putting Thailand's reproductive revolution in the context of fertility change throughout the Third World. The text is also peppered with references to the experience of other Third World countries and the historical experience of the demographic transition in Europe. In the final chapter, the authors return to the wider world context by exploring the extent to which Thailand's reproductive revolution contains lessons for family planning programs in other Third world countries.

This comprehensive volume deals with nearly every aspect of Thailand's fertility transformation. The only oversight is an inexplicable lack of discussion about the relationship between migration and fertility and the relevant research on that topic. Overall, the book is nothing less than what we would expect from three of the foremost analysts of Thailand's demographic situation.

—Fred Arnold

Management Information Systems and Microcomputers in Primary Health Care

edited by Ronald G. Wilson, Barbara E. Echols, John H. Bryant, and Alexandre Abrantes. Geneva: Aga Khan Foundation, 1988. Paper, 176 pp. Available from: The Aga Khan Foundation, P.O. Box 435, 1211 Geneva 6, Switzerland.

This report summarizes discussions and recommendations of experts in the design and implementation of management information systems for primary health care who attended an international workshop organized and supported by the Aga Khan Foundation, the Aga Khan University, and the National School of Public Health, Ministry of Health, Portugal. Participants represented organizations and projects in Asia, Europe, North America, and Africa.

The report provides an overview of the problems facing management information systems for primary health care. Inadequate information support is cited as a major constraint to improving efficiency in the management of scarce resources for primary health care (PHC) programs. This problem, however, is not due to a lack of data. On the contrary, the World Health Organization estimates that PHC workers, who form the base of any PHC information system, spend an average of 40 percent of their working time collecting data and filling in forms.

These vast amounts of data, which are usually passed to the provincial or national level for collating and analysis, tend to be unreliable, incomplete, and often of little use in decision making. Despite their efforts, PHC workers rarely receive feedback from the information they collect, and the lack of feedback compounds problems of motivation. In short, information systems for primary health care tend to be oriented toward data generation rather than information use.

Microcomputers have been introduced in many countries as an appropriate technology to alleviate

some of the data-processing problems associated with information systems. Increased data accuracy, speed, storage, sophisticated analysis, and rapid feedback are considered key advantages that could facilitate decision making and stimulate improved performance throughout the entire health system.

The authors cite numerous case studies (in Bangladesh, Haiti, Kenya, Nepal, Pakistan, Thailand, and Uganda) of the impact of the introduction of microcomputers on information systems. Although microcomputers have made substantial data-processing improvements to existing systems, there remains an underlying concern as to the quality of the data upon which the systems are based.

There is consensus among the views expressed that information systems should be simple and community-based. On the basis of these criteria, the report provides general recommendations and guidelines, together with a description of a model system, for use in future development of information systems. Community-based systems are considered preferable because they allow communities to determine their own PHC needs, select priorities, and benefit directly from the information generated.

The authors emphasize the importance of addressing the following major issues during the design and implementation of an appropriate community-based information system for primary health care: discussions between information users and collectors before the system is established; agreement on what needs to be collected and by whom; reduction of data collected to an absolute minimum; adequate

training of and feedback to data providers; and constant supervision of personnel involved in the system, especially at the data-collection level.

The authors conclude that, coupled with appropriate application of microcomputer technology, this type of community-based management information system can provide relevant, reliable, and practical information as a prerequisite to implementation of a rational strategy for expanding the coverage of primary health care services under present conditions of decreasing per capita resources.

—John C. Wilson

Recent Trends in Fertility and Mortality in Indonesia by the Panel on Indonesia, Committee on Population and Demography, Commission on Behavioral and Social Sciences and Education, National Research Council. Committee on Population and Demography, Report No. 29; Papers of the East-West Population Institute, No. 105. Honolulu: East-West Center, 1987. ISBN 0-86638-092-2. xvi, 96 pp. US \$3.00. Available from East-West Center, Distribution Office, 1777 East-West Road, Honolulu, HI 96848, U.S.A.

This study presents estimates of the levels and trends of fertility and mortality for Indonesia during the past several decades, using available data sources and both traditional and recently developed demographic techniques. A general assessment of the age distribution of the Indonesian population and recent patterns of nuptiality are also presented.

The study is the work of the Panel on Indonesia, Committee on Population and Demography, of the National Research Council, consist-

ing of demographers and statisticians from various countries. The principal sources used to construct the estimates are the 1961, 1971, and 1980 censuses, the 1973 Fertility-Mortality Survey, and the 1976 Intercensal Population Survey, which included the Indonesian Fertility Survey in Java and Bali.

Because of such data limitations as the absence of a complete or nationally representative vital registration system in Indonesia, the exact measurement of child, infant, and adult mortality is not possible. Nevertheless, by applying indirect estimation techniques to available data, the panel members were able to estimate mortality levels.

Two principal fertility estimation methods, used with initial tabulations from the 1980 census, are the Cho-Graybill "own-children" procedure and adjusted reverse survival, both of which involve the backward projection of numbers of mothers and children within households to the time of each birth and aggregating them over households, taking into account necessary adjustments and imputation rules.

To compensate for underenumeration of children under age 1, the data are grouped into broader age groups. As a result, the fertility estimates are centered on a period several years prior to the data collection date.

The authors report that child mortality declined substantially during the late 1960s and early 1970s, especially in Jakarta and Sumatra, but remained at fairly high levels (about 160 deaths per thousand). By the mid-1970s life expectancy was about 50 years, slightly higher for females and slightly lower for males.

The 1976 Intercensal Population Survey found age at marriage for women still to be fairly early (nationally, half of all women between ages 20 and 24 were married at age 18.3), but a strong upward trend is evident in most urban areas, where median age at first marriage exceeds 20.

The total fertility rate was about 5.5 children per woman in 1967-70, but by the late 1970s it had fallen to about 4.8. Most of the decline is attributed to a substantial and rapid increase in the use of modern contraception, especially in East Java and Bali. The government's family planning program has been the principal source of contraceptive supplies and services.

The report contains a detailed summary of its findings, which are illustrated with numerous tables and graphs.

—Alice D. Harris
and Sandra E. Ward

The Economics of Mass Migration in the Twentieth Century edited by Sidney Klein. New York: Paragon House Publishers, 1987. ISBN 0-88702-213-8 (paper). 179 pp., US \$10.95. Available from Paragon House Publishers, 2 Hammarckjold Plaza, New York, NY 10017, U.S.A.

The five papers in this book seek to develop a cost/benefit model for assessing the effects of twentieth-century mass migration on sending and receiving countries. Economists representing a wide variety of institutions and points of view first presented the papers at a conference on *The Economic Consequences of Mass Migration*, sponsored by the Washington Institute for Values in Public Policy and held in Washington, D.C., in 1985.

In the first paper, "Benefits and Costs of Migration," Edwin P. Reubens provides an analytical framework for discussing the economic issues involved. He constructs taxonomies of economic benefits and costs for both sending and receiving countries, noting in particular the U.S. experience. Topics covered include the volume of immigration, modes of entry and types of immigrants, skilled versus unskilled workers, and the capacity of a country to absorb foreign workers. With only minor modifications to fit individual national economies, his taxonomies have worldwide applications.

Each of the next four papers has a narrower geographic focus.

In the paper "Koreans in America: Recent Migration from South Korea to the United States," Paul W. Kuznets analyzes the reasons for Korean emigration and its economic effects on South Korea.

The third paper, "Indian Emigration: Its Dimension and Impact on Indian Economy" by M. C. Madhavan, focuses on a country that has one-third the land area of the United States but a population over three times as great. Although only 200,000 Indian immigrants were living in the United States in 1985, this number is expected to rise during the next decades. Madhavan examines the dimensions of Indian emigration worldwide, its causes, and its impact on the Indian economy.

The paper "Economic Impact of European Migration to Latin America after World War II" by Norman Plotkins analyzes Spanish, Italian, Portuguese, and other European migrations to Argentina, Brazil, Venezuela, and other Latin Ameri-

can countries. Plotkins contrasts pre- and post-World War II migrations and employs the economic criteria described in Reubens's paper to evaluate the economic consequences of the migrations.

The last paper, by John Walker, deals with the migration experiences of New Zealand and Australia. Despite the similarities between the immigration policies of those two nations and those of the United States, there are major differences: the remote location of the two "down-under" nations and their consequent greater control over immigration, their recent interest in stimulating migration for defense as well as for economic purposes, and the techniques of migration control practiced in Australia and New Zealand.

According to editor Klein, these papers "deal with the tip of an iceberg which is rapidly becoming more visible to the world." As large numbers of people react to all sorts of "pulls" and "pushes," it will be important for nations to know in advance what the economic costs and benefits of those migrations are likely to be. This book provides insight on the subject. The authors have dealt with a great deal of material with a welcome clarity and brevity. Tables, bibliographic references, and an index supplement the text.

The volume is a worthwhile addition to academic, economic, and population libraries.

—Alice D. Harris

Input-Output Tables of China, 1981 by Centre of Economic Forecasting, State Planning Commission of China, and

Department of Statistics on Balances of National Economy, State Statistical Bureau. Beijing: China Statistical Information and Consultancy Service Centre; Honolulu: East-West Population Institute, East-West Center, 1987. ISBN 0-86638-104-X (paper). iv, 107 pp. US \$14.95. Available from: University of Hawaii Press, 2840 Kolowalu Street, Honolulu, HI 96822, U.S.A.

Western understanding of intersectoral economic transactions in China has long been impeded by the unavailability of input-output tables for the country. An input-output table depicts an economy as a system of interdependent producing and consuming sectors. Several Chinese input-output tables were compiled in the past, but their use was largely restricted to economic and statistical organizations within China.

The publication of *Input-Output Tables of China, 1981* makes these important economic data available in English for the first time. The tables disaggregate the Chinese economy into 24 material or product sectors, and into six broad economic classifications including agriculture; heavy industry; light industry; construction; transport, mail, and telecommunications; and commerce. The data are presented according to two methods of analysis, the industry method and the commodity method.

In the industry method "the entire output of an enterprise is classified into the industry of which predominant products of the enterprise belong." For example, the value of machinery produced by a metallurgical enterprise is included in the industry of metallurgy. Such treatment is consistent with China's economic management system and

reflects the technological and economic relationships among the many sectors of the nation's economy.

In the commodity method of analysis products are classified as "homogeneous with respect to economic usage, technology, or structure of intermediate consumption." The authors suggest that, although the commodity method of analysis is useful in some circles, it is not consistent with the way in which statistics for commodity production are collected in China.

The book is divided into three parts: an introduction, 10 summary national input-output tables, and the entire body of national input-output tables. The introduction provides a useful description of the methods by which the tables were compiled and interpretations and uses of the data. The authors frankly admit that input-output analysis in China is still in an early stage. The aggregated data presented in the summary tables permit quick and broad economic interpretations. The detailed tables, however, are the most useful for economic research and interpretation of the interrelationships among the various sectors of the Chinese economy.

For example, the flow or transactions table includes an intermediate quadrant, a final products or demand quadrant, and a primary inputs quadrant. The intermediate quadrant (24 × 24 sector) contains the industries that produce goods and services in China and thus represents the economic interdependence among the producing sectors of the economy. Because the data are expressed in producers' prices, each cell in the intermediate quad-

rant represents a free-on-board (f.o.b.) value.

The final products section of the input-output table is important because it represents the autonomous sector—the one in which changes occur that are reflected throughout the rest of the table. Depreciation of fixed assets, personal income, and enterprise income are contained in the third quadrant—the primary inputs quadrant—which lists inputs into each intermediate sector that originate outside the production system (i.e., are not purchased from firms within the local economy).

According to the input-output table, the sum of purchases and sales, or total gross output, in China in 1981 was 904.8 billion yuan (1981 US \$530.8 billion). This figure represents the total product of the society or the total value of gross output from the six major material-product sectors.

In addition to the national flow tables, Part III contains direct input coefficient tables, total requirement coefficient tables, distribution coefficient tables, and structural coefficient tables of final products—all of which are necessary for detailed economic interpretations. The authors describe several types of analysis that can be done with these tables, including analysis of major proportional relationships within the national economy, the effects of economic policy changes on the national economy, and verification of development plans and economic forecasting.

As a tool, the input-output technique is considered useful because of its ability to trace economic activities beyond direct, or apparent, impacts to their indirect implica-

tions for an economy as a whole, and also its ability to disaggregate an entire economy into numerous sectors. A drawback is its assumption of the linearity of an economy.

Although China's input-output tables depict just 24 sectors, they provide a basic understanding of the interrelationships of those sectors in China's national economy, which has expanded considerably in recent years.

—James P. Dorian

ALSO NOTED

Recent Literacy Trends in India by O. P. Sharma and Robert D. Retherford. Occasional Paper 1 of 1987. New Delhi: Office of the Registrar General and Census Commissioner, India. viii, 107 pp. Free. Available from Office of the Registrar General and Census Commissioner, Ministry of Home Affairs, Government of India, 2/A Mansingh Road, New Delhi, India. *Demographic libraries may also request single copies from the East-West Population Institute.*

This study describes literacy trends in India, based on data from the 1961, 1971, and 1981 censuses. The study begins with an examination of literacy trends for all India, which is followed by an examination of trends for states and union territories. The section on states and union territories includes an examination of sex differentials and urban-rural differentials in literacy rates. Subsequent sections present an examination of age differentials in literacy rates, an analysis of the quality of literacy in terms of its changing composition by educational attainment, and an analysis of how female literacy and several development indices covary across 14

major states. The final section presents some rough projections of literacy rates for states and union territories.

—Authors' abstract

Regression Estimates of Fertility for India, 1971 and 1981 by N. Rama Rao, J. R. Rele, and James A. Palmore. Occasional Paper No. 3 of 1987. New Delhi: Office of the Registrar General and Census Commissioner, India. vi, 85 pp. Free. Available from Office of the Registrar General and Census Commissioner, Ministry of Home Affairs, Government of India, 2/A Mansingh Road, New Delhi, India. *Demographic libraries may also request single copies from the East-West Population Institute.*

Estimates of the total fertility rate and crude birth rate are presented for all India, its major states, and urban and rural subdivisions of those states for both 1971 and 1981. These new estimates were prepared using Palmore's regression methods and the 1971 and 1981 Indian censuses. For 1981, the 5 percent sample of the census was used. For 1971, the 10 percent rural sample and the 20 percent urban sample of the census were used. The paper includes discussion of the Palmore method, compares the results using this method with the results of other estimation techniques, and assesses trends in fertility during the 1971-81 decade.

—Authors' abstract

AIDS in Asia . . .

(continued from page 4)

previously rare type of pneumonia. Another major cause of death among AIDS patients is Kaposi's sarcoma, a rare cancer of the blood vessels that initially appears on the skin and eventually attacks the internal organs.

In Africa, "wasting" or "slim disease" is the local term for AIDS. Its associated chronic weight loss, recurrent fever, and diarrhea account for the majority of deaths there. It could be that Asian cases will resemble the African more than the U.S. pattern.

At present there is no cure for AIDS, and the development of a vaccine is at least a decade or two away. The drug azidothymidine (AZT) is helpful, however, in treating AIDS symptoms and in prolonging the lives of patients.

■ **The global AIDS epidemic**

No one knows for certain where AIDS originated. HIV has spread globally in several patterns.

The first is typified by North America, Europe, Australia, and New Zealand. In those regions and countries, where the virus has been present since the early 1980s, the major groups infected are homosexual and bisexual men and intravenous drug users. Some people have also acquired the virus through heterosexual contact (WHO 1987b).

The second pattern, most common in Africa and Haiti, spreads principally through heterosexual contact, both from man to woman and from woman to man. A high incidence of AIDS among heterosexual men and women exists in Central and East Africa.

There are few intravenous drug users in Africa, but the virus also spreads through the use of un-screened blood in transfusions and the use of unsterile injection equipment by medical personnel and traditional healers. As in other parts of the developing world, many patients in Africa demand injections because they associate them with modern medicine (Sabatier 1987a: 100). Because pregnant women in Africa are more likely than pregnant women elsewhere to become infected, the spread of HIV to infants has been much more common there than in other areas of the world.

In Asia, where the virus is still relatively rare, HIV infections have resulted primarily from contact between Asians and people from other parts of the world where the virus is more common. Exposure to blood or blood products from Europe or North America and sexual contact with infected persons from those regions have been the leading causes of infection among Asians. For example, the AIDS cases diagnosed in Asia by the end of 1986 were almost all among male and female prostitutes who had had sexual contact with infected foreigners, and among hemophiliacs who had received contaminated blood products from the United States. More recently, however, AIDS has also been diagnosed among Asian intravenous drug users (WHO 1987b).

■ **Asian and Pacific focus**

Cases of AIDS first began appearing in Asia in 1985. By early March 1988, Japan had reported 59 cases, Thailand 11, Philippines 10, India nine, Hong Kong six, and China, Singapore, and Sri Lanka two each.

Taiwan, Malaysia, Indonesia, and the Republic of Korea each reported only one case (Chinn 1988:41). The numbers are higher now, as indicated in recent public statements and news reports.

Nevertheless, as these small numbers suggest, Asian nations have yet to feel the impact of the AIDS global epidemic. With more than half of the world's population, Asia contains less than 1 percent of AIDS cases. Some experts have said that the number of reported cases in Asia is so small as to be unbelievable; but government officials have been quoted as maintaining that, although there may have been an initial reluctance to acknowledge the disease, they are now reporting AIDS cases to WHO (*Bangkok Post*, 28 November 1987).

According to some experts, the reporting problem may not have been that governments were hiding statistics on AIDS cases, but rather that "they were not looking hard enough" for them (*Bangkok Post*, 28 November 1987). The number of individuals reported to be infected with HIV would likely rise considerably if more testing were done among the high-risk groups in Asia—prostitutes, drug addicts, and prison inmates.

The challenge for Asian public health authorities is to identify the high-risk individuals, gain their cooperation in testing, and assure them that they will not suffer any punitive measures by volunteering for HIV antibody testing. The cost of testing and perhaps an initial reluctance to acknowledge the existence of AIDS may also help explain why so few cases have been reported from Asia.

Other suggested explanations for the small numbers of reported cases in Asia include biological resistance to the virus, greater use of condoms, and the smoking of illicit drugs rather than the injection of them with shared needles (*Asia-week* 29 March 1987:49). Whatever the other reasons, because HIV has only recently spread to Asia, cases there are more likely than in other regions still to be in the asymptomatic phase. It is very likely only a matter of time, therefore, before symptoms will begin to appear and the number of AIDS cases in Asia will rise substantially.

Some Asian countries, particularly the Philippines and Thailand, are at greater risk than others because

they are "sex holiday" destinations for men from Europe, the United States, Australia, and Japan. Prostitutes of both sexes who cater to foreigners are more likely to pick up the HIV infection from them than from local people. Though this fact may slow the spread of the virus outward from the infected groups concentrated in major cities, it seems unlikely to contain it completely (Panos Institute 1987:60).

Recent testing has shown the HIV infection turning up among increasing numbers of intravenous drug users, especially in Thailand. At a conference on retroviral infections held in Honolulu in February 1988, Dr. Praphan Phanupark, professor of medicine at Chulalongkorn

Hospital School of Medicine in Bangkok, announced that of the 161 HIV-positive Thais, fully 86 were intravenous drug users.

More recently, the Thai Health Ministry announced that Thailand had nearly 900 HIV-infected individuals, 776 of whom were intravenous drug users (*Honolulu Advertiser*, 15 July 1988). If this type of HIV spread occurs in other Asian countries, many thousands of drug addicts could become infected. The U.S. Agency for International Development recently estimated there to be 500,000 heroin addicts in Thailand, 450,000 in Pakistan, 400,000 in Malaysia, and 48,000 registered heroin addicts in Burma (*International Herald Tribune*, 29 June 1987). (See Figure 3.)

Dr. Jonathan Mann, head of the global program on AIDS for the World Health Organization in Geneva, reported to the U.S. Presidential AIDS Commission in Washington, D.C. (*New York Times*, 19 April 1988):

Somewhat to everyone's surprise, rather than sex or prostitution being the entry point for AIDS and the real point of amplification, the intravenous drug-user is playing that role. This Thai experience shows very clearly that Asia is just as vulnerable to an explosion of HIV infection as any other part of the world.

Once introduced into the drug-user population, AIDS could spread not only among drug users who share infected needles, but also to their sex partners, and thereby to a widening circle of others, including infants. Asian governments have been warned that, in spite of the small current number of AIDS cases, the epidemic could explode in their countries within the next five years unless improvements in health stan-

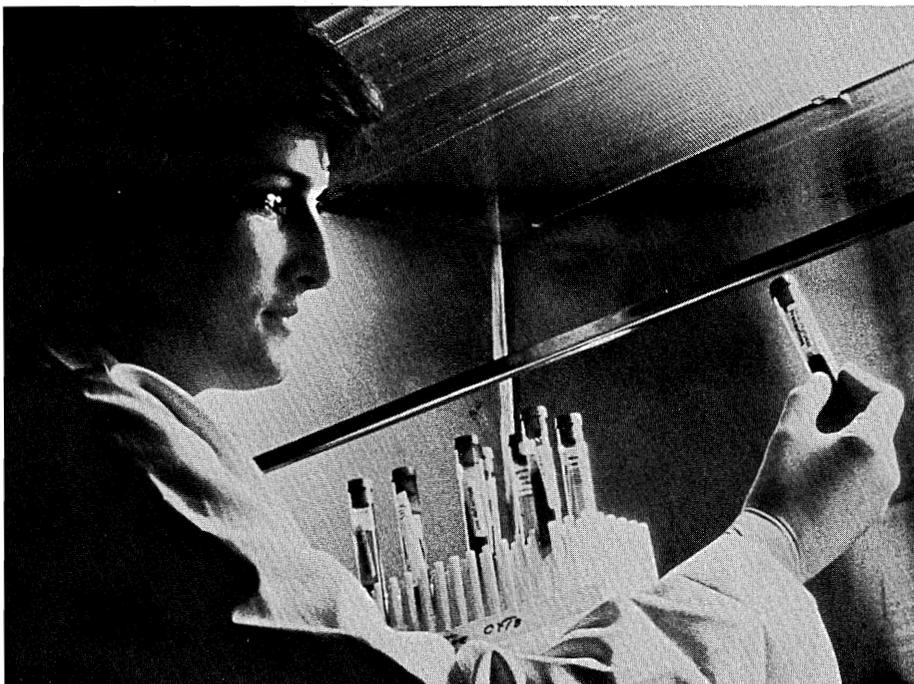


Figure 3. HIV testing, because it could divert funds needed for basic health care programs, should focus on high-risk groups.

dards and public health education campaigns are undertaken.

According to Dr. John Dwyer, director of the AIDS Treatment and Research Unit at Prince Henry Hospital, Sydney, all the factors that have allowed AIDS to assume epidemic proportions in Africa—poor genital health of women, malnutrition, hepatitis, intestinal worms, low immunity levels—are just as endemic in Asia (ESCAP 1988). These factors are all suspected to reduce a person's resistance to disease, including HIV infection and AIDS.

It may be unreasonable to expect governments throughout the Asian and Pacific region to have already undertaken vigorous action against AIDS, because only three years have elapsed since the first reported case in 1985 and only several hundred cases have appeared since then. It is also understandable that, because the problem began in other parts of the world, many officials view it as imported from abroad and some public officials have therefore attempted to contain it at national borders or through selective sanctions directed at foreigners.

As the potential for an AIDS epidemic is as likely in Asia and the Pacific as elsewhere, more concerted action than inefficient screening at borders will be required.

As it becomes increasingly evident that the potential for an AIDS epidemic is as likely in Asia and the Pacific as elsewhere, however, more concerted action than inefficient screening at borders, which may not identify those recently infected,

will be required. The sooner that appropriate preventive public health measures can be undertaken, the better are the chances for containing the epidemic.

Dwyer (ESCAP 1988) has urged Asian nations to pattern their regional battle plans against AIDS after the African experience, not after that of Europe and the United States, because of the similarity of

public health conditions in Asia and Africa. The reports of increasing HIV infections among Asian drug addicts, however, suggests that Asia's pattern may be growing more similar to the European and U.S. pattern.

The shaded box beginning on this page reviews the AIDS situation in selected Asian and Pacific countries as of June 1988. Our information

Summary of AIDS in the Region

East Asia

China. The world's most populous country reports only a handful of cases of AIDS, which is regarded as a foreign disease. The import of foreign blood products is now banned, and blood tests are required for many Chinese who serve as translators, maids, cooks, and embassy employees for foreign diplomats. All foreigners staying longer than one year must be tested before entry. As of August 1987, China had no AIDS education program for the general public (*Los Angeles Times*, 9 August 1987:11).

Hong Kong. Hong Kong has reported 13 cases, of whom four have died. Another 72 residents are known to be HIV-infected, most of them hemophiliacs and homosexual or bisexual men.

The government has launched an advertising and education campaign promoting safe sex and the use of condoms, and providing advice on the correct use of acupuncture needles (*Asiaweek*, 29 March 1987:53; 20 May 1988).

Japan. Japan ranks first among Asian nations in reported cases of AIDS, with 59. More than 1,000 cases of HIV infection or other pre-AIDS conditions have been identified. The great majority are hemophiliacs who were infected through imported blood products. The Health and Welfare Ministry now screens all blood supplies, and the 1988 health budget has been increased substantially to combat AIDS through research, the development of drugs and vaccines, and the establishment of medical information centers. AIDS is still viewed as a U.S. or western disease, and the government is reportedly considering a bill to bar foreigners who belong to high-risk groups from entering Japan (*Tokyo Journal* 1987).

Republic of Korea. One case of AIDS and 13 carriers of HIV had been detected by the end of 1987 (*Bangkok Post*, 18 January 1988). Officials periodically conduct AIDS tests on the estimated 12,000 prostitutes serving per-

comes chiefly from accounts in the Asian press and other public sources. Because the situation is changing rapidly, new statistics are reported frequently. WHO regularly provides updates of national AIDS statistics and medical progress against the disease.

■ The effects of AIDS

Unless brought under control, AIDS

could undermine decades of progress toward improved health and economic progress in the developing nations (Heise 1988:19). Combating an AIDS epidemic would raise medical care expenditures dramatically, particularly for less developed nations, which are least able to afford additional medical care costs.

Health care costs. The cost of treating any particular AIDS case varies with the symptoms, length, and severity of illness, as well as with the type of case management. Most estimates of direct medical costs have been of inpatient treatment in acute care hospitals. Other costs include the use of outpatient hospital clinics, physicians' offices, and long-term care facilities. Home-based services and the value of the services provided by family members, friends, and others in support of terminally ill patients' daily living requirements can also be considered costs (Institute of Medicine, NAS 1986:155).

In the United States, costs for inpatient medical care per AIDS patient have been estimated to range from about \$34,000 to \$147,000 per year, depending on the length of hospital stay and the availability of outpatient services (Hardy et al. 1986:210; Scitovsky and Rice 1987:6). By 1991 the cost of providing health care and supportive services to a projected 145,000 AIDS patients in the United States will be between \$8 and \$16 billion (Koop 1987:6).

The World Bank (1988:266) has reported that, in 1986, health care accounted for an average of only 3.6 percent of central-government expenditures in low-income countries and only 4.8 percent in middle-income countries. Such limited allocations for health programs suggest that many developing nations will be unable to afford the high medical treatment costs associated with AIDS in the United States.

AIDS-related treatment costs and programs will likely compete for and possibly crowd out other medi-

sonnel of U.S. military bases. This program has been expanded to include about 100,000 women working at nightclubs and other spots frequented by foreign tourists. Foreigners applying for long-term visas must supply medical certificates showing they are AIDS-free (*Los Angeles Times*, 9 August 1987:12). *Asiaweek* (20 May 1988:) reported that South Korea has prison sentences for AIDS spreaders. The government is considering restrictions on foreign visitors, but short-term visitors, such as those attending the Seoul Olympics, would not be subject to these measures.

Taiwan. There have been four AIDS cases and 54 people who tested HIV-positive (*Bangkok Post*, 18 January 1988). Anti-AIDS measures include test centers in major hospitals and international airports. More than 60,000 individuals in high-risk groups have been tested, and a public information campaign is being conducted.

Southeast Asia

Philippines. Three homosexuals are known to have died after

contracting the virus. Through 1987, of the 41,927 Filipinos tested for HIV infection, only 52 were found to be seropositive. The great majority (38,429) were classified as "hospitality girls," mostly prostitutes working in bars around the two U.S. military bases in Angeles City and Olonago and in Manila's tourist belt of Ermita. The issue of AIDS has even been raised in the negotiations between the United States and the Philippines over the continued presence of the U.S. bases (*Los Angeles Times*, 30 March 1987).

Singapore. Recent reports indicate nine individuals infected with HIV in addition to two AIDS cases. Singapore had no positive HIV reactions among 2,466 prostitutes examined. The Health Ministry has distributed at least 100,000 booklets to educate the public (Panos Institute 1987:63).

Thailand. With some 900 carriers of the HIV virus reported in Thailand, there have been 12 AIDS cases reported since 1984, including four among foreigners

cal services and programs, such as malaria and diarrheal diseases control and immunization programs. Treating AIDS patients will put a greatly increased burden on such scarce health resources as hospital beds, pharmaceuticals, and medical personnel.

AIDS-related treatment costs and programs will likely compete for and possibly crowd out other medical services and programs.

The governments of less developed Asian and Pacific nations may be unable to allocate large amounts of public funds to combat AIDS when they are struggling to find adequate resources for basic medical care for the majority of their peoples. Dr. Ofelia Monzon, a researcher at the Research Institute for Tropical Medicine in the Philippines, has summarized this problem very clearly (*Los Angeles Times*, 30 March 1987:8):

Thousands of Filipinos are still dying each year of stomach disorders, tuberculosis and pneumonia—curable diseases—because they live in places where modern medicine still does not reach them. Here, we're talking about containing an incurable disease [AIDS] that has only begun to show up, when we cannot even save the lives of people who suffer from diseases we can cure.

In developing nations, the costs of screening for HIV infections also may be unaffordable. A single ELISA (enzyme-linked immunosorbent assay) test to detect HIV antibodies in blood samples in the Third World costs around US \$1, and the confirmatory western blot test costs

\$30–\$50 (see Appendix for definitions); one machine for reading blood samples costs up to US \$15,000 (Tinker 1988:44). Recently, however, scientists have been attempting to develop more rapid and cheaper tests for the AIDS virus.

Economic costs. In addition to the direct costs of health care for individuals infected with HIV are many indirect costs. These include not only the loss of wages for sick individuals, but also the loss of future earnings for persons who are permanently incapacitated, or who die prematurely.

Bloom and Carliner (1988:606) estimate that in the United States the lost earnings from AIDS victims are about six to eight times greater than the medical costs. By the end of 1991, indirect losses could rise to between \$146 billion and \$168 billion. Thus, if AIDS were to reach epidemic proportions in Asia and the Pacific, the economic effects of forgone output for a society there would probably far exceed the direct medical costs.

The economic effects of lost productivity might be most serious in developing nations. Jon Tinker, president of the Panos Institute, observed (1988:44):

Most third world diseases kill mainly the very young and the old. But the vast majority of deaths from AIDS in developing countries will be among the sexually active age groups, the people who are the wage earners, and the food producers. . . . Deaths in this breadwinning age group will mean that each worker will have more dependents to support.

Some scientists think, however, that this will not prove to be the case because there are also many pediatric AIDS cases who die and do not remain dependent.

In developing nations, the poor may suffer most from the social and economic fallout from an AIDS epidemic. Tinker (1988:46) predicts:

The global underclass—those who live in rural and urban shantytowns and squatter settlements, . . . who cannot afford condoms and are not reached by family planning advice, who often cannot read and are therefore least likely to be reached by educational campaigns, who have little or no access to health clinics, whose medical needs have to be satisfied by street-corner injections—will be disproportionately affected by AIDS.

Other researchers believe Tinker may be overemphasizing this class issue because HIV infection may be more related to sexual promiscuity and choice of partner than to status group, and in Africa HIV infection is prevalent among upper-status groups (N'Galy 1988).

Social costs. AIDS extracts a heavy emotional toll on patients and their families, who face anxiety, depression, despair, and grief. Health care workers and therapists must deal with new modes of treatment and patient counseling, while worrying about accidental infection on the job. The demand for mental health services will increase as more psychiatric and neurological disorders are linked to AIDS.

AIDS also accentuates social divisiveness. Almost universally, the official response to the appearance of HIV infection in a society has been to try to locate the source of the epidemic in another country, culture, or race. Despite the enormous cost and inconvenience of testing—not to mention the inability to detect HIV infection in those whose exposure to the virus is recent—mandatory testing of immigrants, foreign students, military

personnel, and travelers is being undertaken or considered in many countries.

In the United States, such high-risk groups as homosexuals, prostitutes, intravenous drug users, hemophiliacs, minorities, and the poor have become targets of discrimination, ridicule, and even violence (Ergas 1987:35). Violent homophobic backlash has already been reported in the United States, Europe, Brazil, and Mexico (Sabatier 1987b:713). As the number of HIV infections rises, polarization between those who are carriers, or thought to be in high-risk groups, and those who are not could increase.

Demographic effects. The effect of AIDS on population growth rates and the demographic structure of nations is difficult to estimate because detection of the disease is so recent and knowledge about it so limited. Researchers from the Parasite Epidemiology Research Group of Imperial College, London University, studied the potential demographic impact of the disease in developing nations, using mathematical models. Their results suggest that high rates of HIV infection sustained over many decades are capable of producing declining rates of population growth and even declines in population size (Anderson et. al. 1988:228).

Other demographers argue such an outcome would be unlikely. The projection by Anderson and his colleagues depends on assumptions of no change over a 50-year period in the behavior of the general population and the spread of HIV infection at a rate currently found only among prostitutes and other high-risk groups. If appropriate public

(*Honolulu Advertiser*, 15 July 1988). More than 180,000 people have been tested for the virus. Male prostitutes, intravenous drug users, and prison inmates show the highest rates of HIV infection, whereas others tested, such as female prostitutes, blood donors, and laborers going to the Middle East, show the lowest (*Far Eastern Economic Review*, 5 November 1987). The Thai Red Cross has not found any HIV-contaminated blood to date in more than 4,000 samples (Panos Institute 1987:63).

Thailand initially rejected a full-scale anti-AIDS campaign, fearing its effect on tourism, but a more extensive campaign has been proposed that would include mandatory testing of blood donations, education campaigns in secondary schools, and free distribution of condoms at clinics. The Population and Community Development Association has conducted a campaign to provide AIDS information to educational institutions, government agencies, and businesses.

Elsewhere in Southeast Asia. Two cases and five carriers have been reported in Malaysia, and the government there is considering requiring foreigners to undergo testing for AIDS. Government officials have expressed concern about the possible spread of AIDS among intravenous drug users. Indonesia also has reported one case. Both countries have low-key information campaigns about the disease (*Bangkok Post*, 18 January 1988).

South Asia

India. Of an unspecified number of people tested for HIV, 191 have been found to be seropositive. Twelve reported cases with AIDS symptoms have all been foreigners or Indians who had been living abroad. The Indian government now requires mandatory testing of all foreign students and all tourists visiting the country for more than one year. African students with HIV have been deported (*Los Angeles Times*, 9 August 1987:11).

Of great concern to Indian health officials is the possibility that the AIDS virus will be widely transmitted through contaminated needles and syringes used for vaccinations and medical injections. This could become a huge problem in India, where disposable needles are too costly for most rural clinics to throw away and may be used hundreds of times. The government is undertaking extensive screening for AIDS in 40 centers across the country and is conducting a campaign to stop the reuse of disposable needles (*Los Angeles Times*, 9 August 1987:12).

Elsewhere in South Asia. Only two AIDS cases have been reported in Sri Lanka. A Briton suffering from AIDS has been deported. The government is concerned about AIDS spreading in tourist areas and requires testing of all hotel and restaurant employees approved by the Tourist Board. Bangladesh, Nepal, and Pakistan have reported no cases of AIDS.

Oceania

In Oceania, 787 AIDS cases have been reported from four countries. Australia has reported more than 700 cases, and New Zealand nearly 40. Single cases have been confirmed in French Polynesia and Tonga. The cases in Australia and New Zealand have been primarily among homosexuals (80 percent) and hemophiliacs. Heterosexual contact and intravenous drug use each account for only about 1 percent.

WHO officials report that Australia has one of the most imaginative and far-reaching AIDS control programs in the world. The program emphasizes community-based education targeted at a wide range of groups. An

"AIDS bus" dispenses condoms and provides health advice to Sydney's streetwalkers, and powerful anti-AIDS television commercials have been aired in 16 languages (*Los Angeles Times*, 9 August 1987:13).

Guam has reported six AIDS cases, and the Trust Territory of the Pacific Islands (on behalf of the Republic of the Marshall Islands) one case. Seven other AIDS cases diagnosed among Pacific Islanders have either died or gone for medical care to Hawaii or the U.S. mainland. Other Pacific Islanders with AIDS have returned to their island homes and are receiving medical care from local health care institutions (Villagomez 1988:2-3).

are degenerative and man-made diseases, such as cardiovascular disease and cancer.

Anderson et al. stress that their results are derived from deliberately simplified models and limited empirical data. Their purpose is "setting the agenda for data collection to improve the accuracy of predictions" (p. 233). In particular, they cite the need for better data on the sexual activity of various groups within society, as well as the need for more information about infectiousness and transmission rates related to HIV. Because HIV is transmitted through sexual contact, as well as contaminated needles and blood products, the AIDS epidemic is strongly related to the sexual conduct of the general population and the various subgroups within it.

Public education campaigns aimed at changing sexual behavior are essential to control the spread of AIDS, Anderson and his colleagues believe. "The predictions of our simple models highlight the urgency of implementing such programs" (p. 233). Bulatao and Bos (1988:6) of the World Bank agree that "in a situation where HIV is relatively widely spread, changes in sexual behavior are essential to reduce the scale of the epidemic. Earlier changes lead to better containment than later changes."

Other sexually transmitted diseases appear to increase susceptibility to HIV, though the evidence is limited. Piot et al. (1988:578) believe the control of other sexually transmitted diseases could prove to be a means for indirect control of HIV transmission.

Condom use, in particular, may be an effective means of preventing HIV infection, just as it has been

education campaigns are undertaken and behavior is changed, this projection may not be an accurate forecast.

Contrary to the view (e.g., of Tinker 1988) that because the sexually active adult population is more likely than older people or children to become infected with HIV, an AIDS epidemic would cause the dependency ratio to rise, Anderson et al. (1988) suggest that the potential spread of the disease would have little effect on the age structure of populations or dependency ratios. According to them (p. 233), "for some plausible ranges of values, AIDS would have little effect on, or even slightly decrease, the dependency ratio."

Their reasoning is that, although "the direct effects of mortality in

the sexually active adult age classes due to AIDS tends to increase the ratio, . . . the general depression of the overall population growth rates due to adult deaths, and to the reduction in effective birth rates due to the deaths of infected babies, tends to decrease the ratio" (pp. 232-233).

The effect of AIDS on mortality patterns in individual countries is likely to vary according to each country's place in the epidemiologic transition. In countries at the earlier stages of the transition, where the major causes of morbidity and mortality are still malaria, diarrheal diseases, and malnutrition, we speculate that the effect of AIDS could be greater than in countries further along in the transition, where the leading causes of death

shown to prevent many other sexually transmitted diseases. The current public education campaign within the United States encouraging "safe sex" urges the use of condoms, as well as limiting sexual relationships to a reliable partner. The use of condoms varies greatly, however, among societies and groups within them.

Condom use may be an effective means of preventing HIV infection, just as it has been shown to prevent many other sexually transmitted diseases.

In Asia, condoms are widely used for family planning, especially in China and Japan. They are also among the leading contraceptive methods in Singapore and Pakistan (Bulatao and Palmore 1988:chap. 14). Encouraging the use of condoms, particularly those containing the spermicide nonoxynol-9, for family planning is likely to help contain the spread of AIDS as well as other sexually transmitted diseases, although this method does not provide as high a level of protection against pregnancy as certain other methods.

Health care and family planning providers may need to encourage use of two contraceptive methods, one for effective protection against AIDS, the other for effective protection against unwanted pregnancy. It may be unrealistic, however, to expect many clients to use two methods consistently (Donovan 1987:112).

As yet, there is little evidence about any relationship between AIDS and other family planning

methods. Piot et al. (1988:575) have noted the possibility that oral contraception may increase women's susceptibility to sexually-acquired HIV infection. Their report of an increased risk of HIV infection among pill users independent of sexual activity, was based on a study of prostitutes in Nairobi, Kenya, and has yet to be confirmed by others.

AIDS appears to reflect and magnify existing infectious diseases. Sabatier (1987a:100) has reported that the increase in tuberculosis (TB) in Haiti and Africa is probably due to the HIV virus. TB has also been diagnosed among many AIDS patients in the United States.

If a person has had TB, it can remain dormant after being conquered by the immune system, but the individual remains a lifelong carrier. When HIV infects a TB carrier, the weakened immune system allows the TB bacteria to attack. Because the person becomes contagious, an epidemic of TB could be loosened in a healthy community by an HIV carrier who may have no apparent AIDS-related symptoms (Sabatier 1987a:100).

Piot et al. (1988) have observed that HIV infection has effects on carriers of syphilis similar to the effects found for TB. "These effects may lead to higher rates of transmission of endemic diseases in the population. Consequently, standard management of common diseases may become less effective, and more expensive approaches may have to be used" (p. 578). Sabatier (1987a:100) has noted: "By being a potential instigator of other infectious diseases, AIDS poses multiple challenges to health systems wherever it spreads."

There is growing concern about the possibility that other infectious diseases may hasten the progression from HIV infection to AIDS. The U.S. Department of State (1987:2) warned its overseas personnel that "there is an increasingly strong suspicion among experts that repeated exposure to viral, bacterial, parasitic and fungal infections activates the latent HIV virus and hastens the progression to the fully-manifested and uniformly fatal AIDS." The department also noted that in areas where vaccination against contagious diseases is required, "it is theorized that vaccines can activate a latent HIV infection into destructive activity" (p. 9).

The potential impact of AIDS on mortality rates in developing nations must include both the effect of deaths from AIDS itself, and an increase in deaths from other diseases, not only among high-risk sexually active men and women, but also among children of these women. "In areas where ten percent or more of pregnant women are infected with the AIDS virus, infant mortality from this cause alone may exceed the infant mortality rate from all causes in industrialized countries" (Mann 1988:6).

■ Efforts to combat AIDS

The magnitude of the global AIDS epidemic represents a challenge to international cooperation if the containment of HIV infection is to be achieved. The World Health Organization is acting as the spearhead for the global attack on AIDS. WHO's Global Programme on AIDS (GPA) was established in February 1987 with three objectives: to prevent HIV transmission, to reduce morbidity and mortality associated with

HIV infections, and to unify and unite national and international efforts to control and prevent AIDS (Piot et al. 1988:579).

Specific tasks assigned to the GPA include assisting governments to create national AIDS control strategies and to develop, implement, and monitor activities that teach people how to prevent the further spread of HIV infection; supporting, promoting, and coordinating AIDS research in medical, social, behavioral, and other fields; and helping to describe current and predict future trends in HIV infection and to assess the economic and social impact of the epidemic (Sabatier 1987a:102).

National AIDS committees have already been established in more than 150 countries. Since February 1987, governments of 111 countries have entered into collaboration with WHO to support and strengthen their national AIDS programs (Mahler 1988:2). At the request of these governments, WHO is providing staff and organizing workshops to train laboratory workers, who in turn will train others in the latest AIDS laboratory techniques.

The GPA has sponsored 32 technical and scientific meetings and consultations on research and policy issues and published over 30 consensus statements, reports, guidelines, and articles on such subjects as criteria for HIV screening, advice on international travel, safety of blood and blood products, and AIDS prevention and control (WHO 1987a). The 1987 budget for these activities was approximately US \$37 million, of which \$25 million was provided by development aid authorities from 10 nations in Europe and North America. For 1988,

the program is estimated to require \$66.2 million.

WHO has also been working closely with the United Nations Children's Fund (UNICEF) in addressing the AIDS challenge. Experts from WHO and UNICEF believe that HIV-contaminated breast milk is unlikely to prove a principal route for the transmission of the virus from mother to child and strongly recommend that mothers continue to breastfeed their babies because of breastfeeding's nutritional and health benefits.

Another problem that WHO and UNICEF foresee is the potentially negative impact that AIDS could have on vaccination programs. Over the past decade, many highly successful infant and child immunization programs have been conducted against measles, whooping cough, polio, tetanus, and other avoidable—and often fatal—diseases. But babies infected with HIV are likely to have immune systems working less effectively than normal, even before they show any symptoms of AIDS (Sabatier 1987a:100).

Some virologists worry that early childhood vaccination, particularly when live vaccines are used, could induce the very disease that the inoculation is supposed to prevent, although there is no evidence so far that this has happened (CDC 1986:595). Nonetheless, WHO and the U.S. Centers for Disease Control still recommend childhood vaccinations. UNICEF is distributing easily sterilized reusable needles and the equipment needed to keep them clean to clinics that carry out immunization.

WHO and the United Nations Development Programme (UNDP) recently formed an alliance to

coordinate the campaign against AIDS in developing nations. The WHO-UNDP alliance should help ensure that governments involve a wide spectrum of their ministries in designing, implementing, and evaluating national AIDS programs and give AIDS priority in national development plans and budgets. The alliance will also coordinate UN support to national AIDS programs and help governments to coordinate all external support to those programs. It will strengthen support for teams from the GPA based in many countries (WHO 1988).

The U.S. Agency for International Development (USAID) views the AIDS global epidemic as an enormous potential threat to the economic and social development of less developed countries. Key components of a new USAID policy on AIDS are prevention and control of the HIV epidemic through bilateral assistance efforts and support of and coordination with WHO's Global Programme on AIDS (USAID 1988:1).

The agency has launched several programs to control the spread of HIV and monitor the epidemic and its effect on development (USAID 1988:1). The programs cover a wide range of activities, highlights of which are:

- increased funding each year (since 1986) for anti-AIDS activities to a projected \$30 million for fiscal year 1988;
- AIDS Technical Support Project: Public Health Communications Component (AIDSCOM), a five-year, \$15.4 million project to use lessons learned from social marketing and behavior analysis to help national AIDS committees develop effective models of public education, social

mobilization, and counseling for AIDS prevention;

- AIDS Technical Support Project: Technical Assistance Component (AIDSTECH), a five-year, \$28 million project providing technical assistance for epidemiological surveillance, prevention of sexual transmission, blood screening, and consultation on the financing of AIDS health care and prevention;

- provision of condoms for AIDS prevention to 21 developing countries to date;

- operations research to assess the interaction of family planning and AIDS prevention activities, development of improved condoms and spermicides, and numerous training and educational activities;

- collaboration with WHO and UNICEF activities;

- and sponsorship of the attendance of hundreds of international public health officials and scientists at conferences and meetings around the world (USAID 1988:2-5).

The World Bank began direct lending to governments for health programs in 1980 and by 1983 had become, along with the United States and Japan, one of the three largest funders of health programs in less developed countries. The Bank is providing support for the fight against AIDS through existing health loans and may in the long run become the major funder.

Nongovernmental organizations, such as the League of Red Cross and Red Crescent Societies, and private voluntary organizations are also contributing their assistance to the global efforts to control the spread of AIDS.

■ Policy recommendations

The fact that HIV infection can oc-

cur without initial symptoms for a period of years allows the virus to spread, potentially widely, before the need for preventive measures is recognized. This delay means that the eventual containment of AIDS may become more difficult. It is critical, therefore, that governments begin immediately to develop policies and plans for containing the spread of HIV infection, even if the number of recognized AIDS cases is small at present. There is broad agreement among health care professionals about policies likely to be most effective in AIDS prevention and control.

Perhaps most important, because AIDS is spread primarily through voluntary behavior, in particular through sexual activity and intravenous drug use, prevention efforts should be targeted at changing those specific behaviors that place individuals at greater risk of HIV infection. Educational programs focusing on behavior modification of high-risk groups may yield the greatest return in containing the spread of HIV infection in Asia and the Pacific.

Educational programs focusing on behavior modification of high-risk groups may yield the greatest return in containing the spread of HIV infection in Asia and the Pacific.

All countries should develop and implement specific preventive programs for such high-risk groups as prostitutes, intravenous drug users, and prison inmates. These programs should include low-cost HIV screening that encourages voluntary

cooperation, ensures confidentiality, and does not result in any punitive or discriminatory actions against those who participate.

It is important that counseling accompany all such testing programs, not only to encourage modified behavior among high-risk groups, but also to explain the meaning of the test results and to provide psychological help to those who test positive.

HIV testing of tourists, international travelers (both long- and short-term), foreign students, foreign workers, and students returning from study abroad is strongly discouraged because it is logistically impractical, questionably effective in changing behavior, scientifically not always accurate, and wasteful of scarce resources better spent on activities of known value. Educational programs are less costly and less intrusive measures for preventing HIV transmission than such screening programs.

A variety of public and private clinics and other institutions currently provide reproductive counseling, family planning services, and maternal and child health care.

These programs should provide information to their clientele about the transmission of HIV, safe sex practices, and other measures designed to contain the AIDS epidemic.

Every country should develop a national AIDS control plan and create a national AIDS committee to coordinate activities related to the disease. Such activities should include establishing a surveillance system to monitor the appearance of AIDS cases and HIV infections, integrating all HIV prevention and control programs with primary

health care delivery, providing AIDS education for health care workers, and incorporating AIDS education into the work of sexually transmitted disease (STD) programs, clinics, and centers.

In countries where school curricula include sex education, AIDS education appropriate for each age group should be integrated into those curricula.

Public health experts assert there is no scientific rationale to justify isolation, quarantine, or discriminatory measures against individuals based solely on the fact of their being known or suspected to have HIV infection. Moreover, the experts urge that childhood immunization programs continue on schedule, because the dangers of childhood diseases outweigh the potential AIDS-related dangers of vaccination.

Public health experts find no scientific rationale to justify isolation, quarantine, or discriminatory measures against individuals based solely on their having HIV infection.

It is important that public health systems establish the necessary laboratory, hospital, and other resources to assure the safety of donated blood and to prevent HIV transmission through unsterile or shared needles. WHO has recommended that countries consider distributing sterile needles to intravenous drug users to stem the spread of HIV, noting that there is no evidence that needle and syringe distribution programs have in-

creased levels of illicit drug use among recipients, encouraged others to begin injecting drugs, or reduced demand for addiction treatment (*American Medical News*, 12 February 1988:47).

Given the many other development and public health needs of most Asian and Pacific nations and their limited resources, it may prove politically as well as economically difficult for them to mount major public campaigns against AIDS in the absence of widespread infection among the general population. But there is much that existing public health and family planning programs could accomplish in preventing the spread of HIV infection.

With the support of international health agencies, national AIDS control programs are being established throughout the world (Piot et al. 1988:579). Asian and Pacific policymakers should benefit from the position their nations still enjoy of having few AIDS cases, and from the scientific knowledge and public health policy experience developed since the epidemic appeared in other areas of the world.

Together, these conditions provide a unique, but temporary, opportunity to embark on the necessary preventive programs and public education strategies that hold promise for preventing the spread of HIV infection and avoiding or containing a potential AIDS epidemic in the region.

APPENDIX: Definitions of Commonly Used Terms Related to AIDS

Antibody. A protein produced in response to foreign material that enters the body.

Acquired immunodeficiency syndrome (AIDS). A usually fatal clinical condition caused by a retrovirus and characterized by infections that indicate underlying cellular immunodeficiency.

AIDS-related complex (ARC). A combination of physical problems, existing over time, that indicate infection of a person with human immunodeficiency virus (HIV). Symptoms include fatigue, fever, weight loss, diarrhea, night sweats, and swollen lymph nodes.

Case fatality rate. A measure of the number of individuals with a disease who die of it during a specified period.

Cofactor. A factor other than the basic causative agents of a disease that increases the likelihood of developing that disease. Cofactors may include other microorganisms or psychosocial factors, such as stress.

ELISA (acronym for enzyme-linked immunosorbent assay). A test used to detect antibodies against HIV in blood samples.

HIV infection. The establishment of HIV in cells of a person's body. Once infection occurs, the possibility exists for the virus to be present in the blood and body fluids, although the infected person may not show symptoms of illness.

Human immunodeficiency virus (HIV). HIV-1 (previously called HTLV-3 or LAV) is the retrovirus generally responsible for causing AIDS. HIV-2 is a second form of HIV discovered in 1986 in West Africa that also causes AIDS.

Immune system. The body's natural system of defense mechanisms, in which specialized cells and proteins in the blood and other body fluids work together to eliminate disease-producing microorganisms and their foreign substances.

Opportunistic infection. An infection caused by a microorganism that rarely

causes disease in persons with normal immune systems.

Seropositive status. In the context of HIV, the condition in which antibodies to the virus are found in the blood.

Western blot technique. A test that involves identifying the presence of antibodies against specific protein molecules. This test is more specific than the ELISA in detecting antibodies to HIV in blood samples, but more difficult to perform and much more expensive. Some laboratories use it to confirm samples found to be repeatedly reactive in ELISA tests.

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Strength of Fertility Motivation . . .

(continued from page 12)

mination R^2 in ordinary least squares multiple regression) increases only from 0.154 to 0.172.

This result indicates that, although RPI has a substantial and highly statistically significant effect on current use in model 2, the effects of RPI are largely captured by the other independent variables in model 1 (except for age at first marriage) because RPI is correlated with these other variables. Thus RPI appears to play a mediating role between the socioeconomic factors and current contraceptive use and does not add greatly to the explained variation in contraceptive use as measured by R^2 . (By "mediating role" in this context, we mean that socioeconomic factors affect RPI, which in turn affects contraceptive use.)

Unfortunately, one cannot test the difference between models 1 and 2 using the logit regression analogue of R^2 , since the sampling distribution of this statistic is unknown. A test of global difference in fit can be done, however, using the likelihood statistics in the last two rows of Table 3. The difference between models 1 and 2 in $-2 \log$ likelihood is approximately distributed as chi-square, with degrees of freedom equal to the difference in the number of estimated coefficients in the

two models. The difference in $-2 \log$ likelihood between models 1 and 2 is 26, with 6 degrees of freedom, indicating that the two models differ significantly at the 1 percent level, despite the small difference in R^2 . Evidently RPI has some independent effect on contraceptive use that is not captured by the background variables, but it appears to be rather small.

When intention to use contraception in the future is substituted for current use of contraception, in the right half of Table 3, the results for models 3 and 4 are somewhat similar to those for models 1 and 2, except that the effects of the independent variables on the odds of intention to use are attenuated (i.e., closer to one). In model 3 the effects of number of living children, age at first marriage, and urban residence are no longer statistically significant. In model 4 the effect of RPI tends not to be statistically significant, and the addition of RPI to the regression increases R^2 almost not at all, compared with the value of R^2 in model 3.

The odds ratios for RPI = 0 and RPI = -1 in both models 3 and 4 are exceptions to the general lack of statistical significance of RPI in these models. These two odds ratios are low and highly statistically

significant. The very low odds ratio of 0.22 for RPI = 0 suggests that women who say they do not know whether they want another child tend to be fatalistic and for that reason are unlikely to express an intention to use contraception in the future. Why the odds ratio for RPI = -1 should also be low, at 0.49, is not clear.

Interestingly, the chi-square test of difference in global fit between models 3 and 4 again indicates significance at the 1 percent level, despite the generally low levels of significance of the RPI dummy variables and the small difference in R^2 between the two models.

It is perhaps not surprising that the independent variables have larger effects on actual use than on intention to use contraception in the future, since intention refers to some indefinite time in the future and is therefore less subject to reality constraints. Moreover, an affirmative answer to the question about intention may be given simply to please the interviewer.

As already mentioned, the odds ratios in Table 3 are easier to interpret than the underlying logit regression coefficients (not shown), from which the odds ratios are calculated. Easier yet to interpret are the predicted percentages of women

currently using or intending to use, which can also be calculated from the underlying coefficients (Table 4).

The unadjusted columns in Table 4 are based on simple bivariate logit regressions, and the adjusted columns are based on multivariate logit regressions with control variables set at their mean values. We have subdivided the unadjusted columns by urban and rural residence because of the oversampling of the urban population, which makes the sample unrepresentative at the national level. It was not likewise necessary to split the adjusted column by residence, because in this case urban residence is included as an independent variable.

The adjusted columns show the net effect of each variable, holding constant remaining variables in the model at their mean values. The results for current use again suggest that RPI tends mainly to mediate the effects of socioeconomic background variables on current use.

Table 4 also shows, more clearly than Table 3, a large gap between intended use and current use, which is much lower. (This latter finding must be interpreted cautiously, however, because the results for current use and intended use are based on different subsamples.)

There appears to be considerable latent receptivity to family planning among nonusers.

Both current use and intended use first rise, then fall, as the number of living children increases, forming the inverted U pattern already mentioned. Both current use and intended use also tend to rise with age at marriage, but the adjusted effects are quite small. The adjusted effects of residence are

Table 4. Effects of demographic and socioeconomic variables on current use of contraception and on intention to use contraception in the future: logit regression estimates of risk, expressed as percentages of women using or intending to use, Nepal 1986 Fertility and Family Planning Survey

Characteristic	Currently using			Intending to use		
	Unadjusted		Adjusted	Unadjusted		Adjusted
	Urban	Rural	Urban + Rural	Urban	Rural	Urban + Rural
Number of living children						
1	8.7	1.8	2.4	33.4	23.2	23.3
2	17.5	3.5	3.2	33.5	25.0	25.8
4	5.6	5.2	2.7	35.2	23.8	27.7
6	0.0	2.7	0.8	38.9	16.9	25.0
8	0.0	0.4	0.1	44.8	8.6	18.8
Age at first marriage						
15	7.0	2.7	1.9	33.2	22.5	24.3
20	11.4	3.3	2.9	35.3	23.7	24.7
25	18.1	4.1	4.3	37.5	25.0	25.0
Residence						
Urban	na	na	2.0	na	na	24.6
Rural	na	na	2.4	na	na	24.4
Woman's education						
0	5.2	3.0	2.2	30.1	21.3	23.1
2	7.1	2.9	2.5	33.2	28.7	26.1
4	9.7	2.8	2.9	36.4	37.5	29.3
6	13.1	2.7	3.3	39.8	47.2	32.7
8	17.4	2.6	3.8	43.2	57.0	36.3
10	22.8	2.6	4.4	46.7	66.4	40.1
Amenities						
0	1.0	1.8	1.3	22.1	19.1	20.5
1	2.8	3.7	2.6	28.1	26.5	25.5
2	7.6	7.7	5.2	35.1	35.5	31.3
3	18.8	15.3	9.9	42.7	45.7	37.7
4	39.5	28.2	17.9	50.7	56.3	44.7
Relative preference intensity						
-3	13.8	13.0	7.0	47.7	20.6	23.9
-2	29.6	6.1	7.5	33.3	28.6	25.9
-1	22.7	1.6	3.8	22.7	17.7	15.5
0	19.0	1.2	4.0	19.0	4.9	7.6
1	23.1	5.0	4.8	30.8	28.3	25.8
2	9.0	2.0	2.5	29.9	25.0	26.2
3	2.8	1.4	1.2	37.3	23.3	27.1

Note: By risk is meant probability of currently using or probability of intending to use contraception. The unadjusted columns are based on simple bivariate regressions, except for the regression on number of living children, which includes a squared term, and the regression on relative preference intensity, which includes six dummy variables to represent the seven possible values of this characteristic. Each set of bivariate regressions was run separately for urban and rural women. The adjusted columns are based on multivariate logit regressions that include all the independent variables shown in the table. In the adjusted columns, the effects of any given variable on current use or intent to use were calculated by holding constant the other independent variables by setting these other variables at their mean values in the entire sample. The multivariate regressions were run for the entire sample, including both urban and rural samples.

na—not applicable.

negligible. In the adjusted results, the effect of education on intended use is large, but the effect of education on current use is small. In contrast, the adjusted effect of amenities is large, on both current and intended use. The effect of amenities on current use is small at lower levels of amenities but considerably larger at higher levels of amenities.

The adjusted effect of RPI on current use is substantial overall, but differences in proportions using between adjacent RPI categories are in most cases small. In contrast, the adjusted effect of RPI on intended use is small and erratic. The unusually low proportion intending to use among women for whom RPI equals zero again stands out.

■ Conclusion

Strength of fertility motivation, as measured by relative preference intensity (RPI), contributes to the explanation of current contraceptive use, over and above the effects of demographic and socioeconomic background variables usually included in analyses of the determinants of contraceptive use. The effect of RPI is large and highly statistically significant. Most of this effect, however, appears to be captured by the background variables when RPI is deleted from the model. Including RPI in the model, as opposed to excluding it, attenuates the effects of the background variables and improves global fit only modestly, even though this improvement is highly statistically significant. These findings indicate that strength of motivation plays a mediating role between demographic and socioeconomic background variables and contraceptive use but does not have a large in-

dependent effect on use. In other words, background variables affect motivational strength, and motivational strength affects use; but when motivational strength is deleted from the model, background variables alone do almost as good a job of explaining use as do background variables and motivational strength together.

The findings also indicate that the independent variables have considerably larger effects on current use than on intended use. When intention to use contraception in the future is substituted for current use of contraception as the dependent variable, the effects of RPI are mostly small and statistically non-significant. The effects of the demographic and socioeconomic background variables are also reduced, and the inclusion of RPI in the analysis improves global fit only very slightly. Again, however, the marginal improvement in global fit is highly statistically significant.

These results raise the question of whether strength of fertility motivation can be affected by educational efforts mounted by family planning programs to increase contraceptive use. Our analysis shows that strength of motivation does have some independent effect on contraceptive use, and it is quite possible that this independent effect could be enhanced by educational programs operating independently of the socioeconomic characteristics of program recipients. Because the 1986 survey lacks relevant data, we have not been able to explore this possibility empirically.

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ASIAN AND PACIFIC POPULATION FORUM

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1990 Censuses to Increase Use of Automation

by Sandra E. Ward

Most of the information for this article came from selected reports presented at the Twelfth Population Census Conference. Copies of those and other reports, the titles of which are listed with the conference participants in the shaded box, may be requested directly from the authors.

Plans for the 1990 round of censuses in many countries of Asia and the Pacific call for increased use of automation, with applications ranging from the use of computer-generated maps of enumeration areas and optical mark readers for data processing, to desktop publishing and electronic mail for disseminating the results. The innovations are expected to improve the efficiency and accuracy of the

censuses while reducing costs. In addition, significant improvements can be expected in the timeliness of census results.

The next census round was the major focus of the Twelfth Population Census Conference held in Beijing, China, 5-9 September 1988, under the auspices of China's State Statistical Bureau and the East-West Population Institute. Representatives of census organizations from 17 countries, the United Nations Population Fund (UNFPA), and the Economic and Social Commission for Asia and the Pacific (ESCAP) took part in the meeting.

Held every one to two years, the census conferences provide an opportunity for census directors of the Asia-Pacific region to compare their operations and pose solutions to problems encountered in the conduct of national censuses and related activities.

At the Beijing conference, five sessions were devoted specifically to the topic of computer technology in census applications and innovations being planned for the next census round. Representatives of

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ASIAN AND PACIFIC POPULATION FORUM

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The EAST-WEST POPULATION INSTITUTE, a unit of the East-West Center, conducts research, training, and related activities in the field of population, with emphasis on economic, social, psychological, and environmental aspects of population problems in the region of concern to the East-West Center.

The EAST-WEST CENTER is a public, nonprofit educational institution with an international board of governors. Some 2,000 research fellows, graduate students, and professionals in business and government each year work with the Center's international staff in cooperative study, training, and research. They examine major issues related to population, resources and development, the environment, culture, and communication in Asia, the Pacific, and the United States. The Center was established in 1960 by the United States Congress, which provides principal funding. Support also comes from more than 20 Asian and Pacific governments, as well as private agencies and corporations.

several computer and software manufacturers also demonstrated products developed for census operations. Although automation will be used to a greater extent in the more developed countries of the region than in less developed countries, nearly every participant reported plans for increased reliance on computers in his or her country's next census.

Reasons that conference participants cited for turning to automation include reducing labor-intensive clerical tasks and improving the productivity of census personnel, facilitating the flow of census information to the public prior to the census, maximizing the number and quality of returns from households, increasing the accuracy of data processing, permitting the bureaus to produce more detailed tabulations, refining the analysis of census data, releasing census information earlier, and, above all, lowering costs.

Automation can reduce clerical tasks, improve productivity of census personnel, increase data accuracy, speed the release of census results, and reduce costs.

Mike Giles of the Australian Bureau of Statistics reported, for example, that the Australian government has directed that the 1991 census cost 20 percent less than the 1986 census. Because users of Australia's census data objected to having a scaled down census in 1991, the Bureau of Statistics plans instead to achieve the cost-saving re-

quirement through greater use of self-coding by respondents, use of optical mark readers to enter data from census questionnaires into computers, and computer-assisted coding of responses requiring office coding.

The 1990 U.S. census also will be much more automated than previous censuses. According to a paper by Peter A. Bounpane of the Census Bureau, two principal aims of the 1990 census are to automate many time-consuming and labor-intensive clerical tasks required in previous censuses, and to convert the census data to computer-readable format earlier than in 1980. "The use of automated equipment can help us deal with the mountains of paper and thousands of clerical tasks in a much more accurate and controlled way," he stated (Bounpane 1988:5).

Mounting a national census resembles in its complexity the launching of a space rocket. The hundreds of operations involved in census taking can be roughly classified into six stages: preparation, enumeration, data processing, evaluation, analysis, and dissemination (Cho and Hearn 1984:xii). The sections that follow describe how regional census bureaus' automation plans will affect each stage in the 1990 census round.

■ The preparatory stage

The preparatory stage is critical because it affects every step that follows. Preparation includes organizing the census administration, establishing the key dates in the census calendar, including the enumeration day or period, and developing budgets and cost controls. It entails procuring office space and equipment, consulting users in

government and the private sector and publicizing the census, preparing maps and a system of identifying small enumeration areas, preparing the questionnaires, and conducting tests of the questionnaires and census operations. Finally, it involves recruiting and training a workforce who will be engaged in the field work and data processing (Cho and Hearn 1984:xii-xiii).

The planning process is guided not only by legal requirements, budgetary constraints, and the kinds of information needed by users, but also by such considerations as the educational level of the general populace and personnel who will be involved in the census, the size and distribution of the population to be enumerated, and, increasingly, the availability of labor-saving computer technology. All these factors affect the ways computers are used to collect, process, and disseminate information.

Automation is now being applied to the complicated task of mapping census districts in several countries. The maps are used to identify all housing units before the census is taken so that no households are missed when enumerators visit the areas or census forms are mailed to respondents. The data for the maps are gathered from a variety of sources—for example, the national postal agency, commercial mailing lists, and household enumerators who check the accuracy of existing maps. The mapped enumeration areas together form a grid, or mesh, system.

For the 1990 census, Hong Kong is computerizing its records of housing units in what it calls a "living quarters frame system." The Republic of Korea is planning to in-

roduce a mesh code for each enumeration district.

Japan plans to use a computerized mapping system that will be able to identify densely inhabited districts, produce maps showing the distribution of its population, and relate the local-area population data to other kinds of statistics. The information obtained from the combined sources will be used for local-area studies of phenomena affected by population distribution, such as traffic patterns and air pollution.

According to Akihiko Ito of Japan's Statistics Bureau, compiling the mesh statistics formerly required manually matching up grid squares on enumeration maps with data from the corresponding enumeration districts. The mapping system planned for the 1990 census will be able to do the matching at the grid-square level (the smallest areal unit) by computer.

Using information from many sources and computerized mapping systems, Japan and the United States are producing highly accurate maps of census districts.

In the United States, an automated mapping system called Topologically Integrated Geographic Encoding and Referencing, or TIGER, is being used to compile complete and accurate maps for the 1990 census. As explained by Bounpane, each census area, or block, is numbered. Adjacent blocks are aggregated into block groups, which in turn can be grouped to form census tracts.

The TIGER system will integrate into one computer file all the geographic information that was produced in separate operations during the 1980 census. TIGER's digital foundation map can then be updated with new information—for example, recent construction or demolition of housing units—provided by state and local officials. The resulting consistent data base is expected to facilitate more timely and more accurate census reports.

The United States is also developing an automated management information system "that will help us meet critical deadlines in planning the census and monitor the cost and progress of census operations," according to Bounpane. "We will have computers in the local temporary offices to report cost and progress, to keep track of payroll, to organize job applicant information, and to control the field follow-up work" (Bounpane 1988:6).

Representatives of several other countries reported plans to use computers in planning and staffing for their censuses. Joseph Man-Kong Lee of Hong Kong's Census and Statistics Department told conference participants that automation will be used in the selection, training, deployment, and payment of enumerators during the 1991 Hong Kong census and that computer-generated letters will be sent to households notifying them that a particular enumerator will visit them.

Rapid developments in computer technology can complicate the planning of a census. Naibuka Navunisaravi of Fiji's Bureau of Statistics cautioned that changes in computer hardware between censuses, espe-

cially if accompanied by changes in staff, can result in lack of continuity, as new personnel have to plan their computer operations from scratch.

To overcome problems associated with the introduction of its new technology, China's State Statistical Bureau is planning to improve the training in computer use of its census personnel before the 1992 census.

■ Enumeration

The traditional method of enumeration involves the use of trained enumerators, who visit respondents in their homes or meet them in enumeration centers, read the questions to the respondents, and record the responses. The larger the population to be counted, the greater is the number of enumerators and supervisory staff needed. In India, for example, some 1.6 million enumerators and other staff will be involved in field operations for the 1991 census.

In recent years countries with high literacy levels and well-developed postal systems have begun mailing the census questionnaires to households and relying upon them to complete and return the questionnaires. The questionnaires have been redesigned to maximize self-coding, which requires respondents to select an appropriate answer from a list of possible responses for each question and to mark a box or circle next to it.

Where self-coding is possible, it is considered preferable to the enumeration method not only because it greatly reduces the number of people who must be hired, trained, and paid to do field work, but also because it better protects the con-

fidentiality of responses and can be more accurate. Enumerators may form opinions about households during the census interviews and record answers not actually given to them by the persons they interview. Self-coding is also preferred because it greatly speeds up processing of the completed questionnaires. The coded responses do not need to be edited or otherwise altered to be computer-readable.

Australia, Canada, New Zealand, and the United States plan to use their postal systems to deliver the census questionnaires to most respondents, relying upon enumerators only in selected areas where the postal approach would be less effective and for following up households that do not return the completed forms within a reasonable period of time. Hong Kong plans to mail the forms to households and have enumerators collect them.

■ Data processing

The most dramatic breakthroughs in automation are occurring in the data processing stage of many of the region's censuses. Keying, the traditional method of transferring information from the census questionnaires to computers, has several disadvantages, including the cost of training and paying the operators, human error, and the amount of time that keying involves.

Muhammad Chaudhry of Pakistan's Population Census Organization reported that plans for the 1991 census call for finishing the processing of completed questionnaires within one year, half the time that it took to process the 1981 census. To achieve this objective, the organization will need

several times as many key-punch operators as were used in the 1981 census or it will have to use automation to transcribe and code the data.

Several countries in the region are experimenting with automated systems to speed up data processing and reduce keying and coding errors. The two main technological advances in processing are optical mark readers (OMRs) and optical character readers (OCRs). OMRs read marks, usually filled-in circles, that respondents make next to suggested answers to multiple-choice questions. OCRs read answers written in block letters or typed by respondents in their own words. Although OCRs can read answers to questions that do not lend themselves to a multiple-choice format, they are considered less reliable than OMRs for processing censuses because of the wide variety of respondents' and enumerators' handwriting and the greater possibility that the machines will misread the answers.

The Republic of Korea used OMRs in a recent survey of 60,000 households, with encouraging results, and plans to use them in pretests for the 1990 census. Hong Kong is considering switching from keying its census data to using OCRs or OMRs for data entry so that it can input and edit all its census schedules within 15 weeks. According to Joseph Lee, a combination of two methods will probably be used, OCR or OMR data entry for the short form and keying for the long form. Enumerators in the field, however, will transcribe information from the completed

(continued on page 7)

Presentations and Participants at Twelfth Population Census Conference

Readers wishing to obtain copies of the papers (those titles below designated with an asterisk) should direct requests to the authors, whose addresses are included in the list of participants.

PAPERS AND PRESENTATIONS

Opening Ceremony (*Sun Jingxin, chair*)

*Opening Remarks, by *Zhang Sai*

Opening Remarks, by *Lee-Jay Cho*

Use of Computer Technology in the 1990 Round of Censuses (*V. S. Verma, chair*)

*Automation and Data Processing of the Hong Kong 1991 Population Census, presented by *Joseph Man-Kong Lee*

*The Use of Computerised Technology in the 1991 New Zealand Census of Population and Dwellings, by *Michael Moore*

*A New Processing System for Australia's 1991 Census, by *Mike Giles*

Plans for the 1990 Round of Censuses (*Mike Giles, chair*)

*Approach to the 1991 Census of India, by *V. S. Verma and N. Rama Rao*

*Status Report on the 1990 Census of Population and Housing of the United States, by *Peter A. Bounpane* (presented by *Susan Miskura*)

*Some Policy Considerations for Planning the 1991 Census of Housing and Population of Pakistan, by *Mubammad Aslam Chaudhry*

*The Population Censuses of Papua New Guinea with Special Reference to the 1990 Census, by *Nick Suvulo*

*Planning of the 1990 Population and Housing Census of Thailand, by *Chintana Pejaranonda and Neramit Dhanasakdi*

China's Population Censuses and Surveys (*Fred Arnold, chair*)

*The 1990 Population Census in China: Preparations and Basic Ideas, by *Sun Jingxin*

*The Utilization of China's 1982 Population Census Data, by *Li Chengrui*

*Features of China's 1987 Inter-Census and a Brief Analysis on Its Results, by *Shen Yimin and Zhang Weimin*

*In-Depth Fertility Survey in China, by *Shen Qiuhua and Chen Runtian*

Demographic Estimation from Census Data (*B. R. Regmi, chair*)

*Measurement of Economic Activity in Sri Lanka, by *R. B. M. Korale*

*Urbanization Index Based on the Census of Population and Housing Results [for the Philippines], by *Nelia R. Marquez*

Census Data for the Estimation of Mortality, by *William Brass*

Advanced Technology for Collecting, Processing, and Disseminating Census Data (*Yuki Miura, chair*)

*Use of Optical Mark Reading Systems in the Census Process, by *Wilbert Riley*

*The Use of Distributed, Low Cost Optical Mark Reading (OMR) for Census Data Collection, by *Stephen Stewart*

*The Use of Microcomputers for Census Processing in Developing Countries, by *Glenn Ferri*

Special Issues in Conducting Censuses (*Daniel Melnick, chair*)

*Use of Sampling in Conjunction with the Census of Population, by *Vijay Verma*

*The Quality of Census Data, by *Yuki Miura*

*The 1991 Census of Canada: Determining the Questions to Be Asked, by *D. Bruce Petrie*

*Proposed Measures for Improving Coverage of the 1990 Population and Housing Census of Malaysia, by *Khoo Teik Huat, Kwok Kwan Kit, and Ng Man San* (presented by *Mike Giles*)

*A Note on the Methodology of the 1990 Population Census of Indonesia, by *Azwar Rasjid* (presented by *Vijay Kumar Verma*)

Mid-Decade Censuses (*R. B. M. Korale, chair*)

*Final Results of the 1985 Population and Housing Census in the Republic of Korea, presented by *Kang-Woo Lee*

*Processing of Data on the 1986 Population Census of Fiji, by *Naibuka Navunisaravi*

*Special Features of the 1985 and 1990 Population Censuses of Japan, by *Akibiko Ito*

Future Regional Cooperation (*Lee-Jay Cho, chair*)

Evolution and Future Directions of the Asian and Pacific Population Forum, by *Sandra E. Ward*

Additional Papers

*Country Statement for the Twelfth Population Census Conference, by *Kang-Woo Lee*

*The Estimation of Fertility from the Fiji Census Data, by *Naibuka Navunisaravi*

*The Estimation of Mortality from the Fiji Census Data, by *Naibuka Navunisaravi*

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1990 CENSUSES . . .

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long forms to data-input forms that can be machine-scanned.

Mike Giles reported that the major change planned for the 1991 Australian census is in the input processing system, which will use OMRs to capture self-coded responses. The Australian Bureau of Statistics is redesigning its census questionnaire for this purpose. There will be a separate page for each household member; the pages will be stapled together during the enumeration, then separated and batched by household members' relationship to household head for OMR inputting and processing.

Increasingly, optical mark readers are replacing keying as a means of processing census returns because of their speed and accuracy.

"To reap the full benefits of OMR," Giles stated, "questions on the census form need to be designed to minimise the coding effort and maximise the data captured by this method. One option for topics such as religion and birth-place is to ask respondents to mark the appropriate box from a short list of the most common responses or to write a response in a sink category of 'other, please specify.' Only the small number of write-in responses to 'other' then require office coding" (Giles 1988:3).

The Australian Bureau of Statistics considered using OCR equipment to process responses written by

respondents in block letters. But scepticism about the ability of OCR equipment to read accurately the wide range of responses and scripts written by individual respondents and the higher cost of this equipment led to its rejection, at least for the 1991 census.

Japan has been using optical mark readers in its censuses since 1965. Akihiko Ito reported that the Japan Statistics Bureau's NEC N7237 OMR systems can process questionnaires printed on both sides of the paper. Responses that respondents write on the forms and the OMRs cannot read (the respondent's name, industry, occupation, and place of work or location of school) are coded by enumerators after the questionnaires are collected and then are processed by OMRs.

For the 1990 census, Japan will use a new questionnaire design that will better protect the confidentiality of respondents' answers. Their names can be cut off the forms after the forms are checked for completeness and before they are fed into the OMRs.

Japan is also developing new OMRs having image-reading capability for its census operations. A prototype optical mark and image reader (OMIR), built in 1988, is being tested for the 1990 census. Unlike optical character readers, which can read only roman characters, Japan's image readers are designed to read hand-written Japanese and Chinese characters, which are far more numerous than the 26-letter roman alphabet.

The OMIRs will read respondents' hand-written answers to the un-

structured questions. With the verbal responses captured electronically and stored on an optical disk drive, clerks will no longer have to refer to the original questionnaires for industrial and occupational information. They will be able to code and edit the information at the terminal and store it in the mainframe computer for further processing.

Japan plans several other equipment innovations for the 1990 census. One is improved self-monitoring by the optical readers of their own conditions; sensors will alert personnel when hoppers that feed the forms into the machines are in need of refilling. The OMIR systems will also make on-line correction of data more efficient and convenient.

Yuki Miura of the Japan Statistical Association suggested that sonic input devices may eventually replace optical scanning technology, at least for census-related sample surveys. Experimentation with voice transmission has not yet reached the field-testing stage, however. Another possibility is to lend small, hand-held computers to enumerators or households involved in the postenumeration survey and other population surveys.

A major disadvantage of OMR machines in many countries has been their reliance on high-quality reflective paper that must be clean and unwrinkled. Actual field conditions are seldom ideal—forms get dirty and wrinkled—and many governments cannot afford to print their census forms on reflective paper. Another drawback until recently has been that few printers outside the developed countries were able to print questionnaires with the precision that OMRs have

required. Concerns have also been raised about the high cost of OMRs and the difficulty of repairing them in some countries.

Rapid technological advances in the last few years have been able to overcome most of these problems. At the census conference Stephen Stewart of DRS Data and Research Services demonstrated a low-cost, hand-fed optical mark reader, the CD200, which was designed specifically for census field operations and can handle forms printed in one color on newsprint-quality paper. Because the CD200 can accept even wrinkled, smudged forms, the actual speed with which census forms

can be processed by such machines may be comparable to that of high-speed OMRs, which jam when fed with wrinkled forms.

For his demonstration, Stewart used copies of a single-color form, developed for a Chinese survey, that had been printed in China on newsprint-quality paper. He told conference participants that several million of the forms had been read successfully by the CD200 in the summer of 1988.

Stewart estimated the cost of keying census forms in a developing country under normal conditions at about eight times the cost of using OMRs (US \$210 per million characters compared with \$25). Moreover, he pointed out that OMRs occasionally fail to read forms but do not substitute one answer for another, unlike key operators and OCRs. By using OMRs in combination with keying, he suggested, census operations can enjoy the speed of OMRs and the flexibility of keying, which is needed for processing hand-written responses.

Wilbert Riley of National Computer Systems compared the advantages of distributed (decentralized) and centralized OMR systems. Distributed systems permit data to be corrected in the field so that only valid data are forwarded to the central census bureau for statistical analysis, and data processing can take place simultaneously at various sites. Such systems, he suggested, are appropriate for countries with large populations and large geographic areas.

The advantages of a central processing system are that all processing takes place at a single location; production dates are easier to predict, monitor, and meet; and



Stephen Stewart demonstrates a low-cost, hand-fed optical mark reader developed by DRS Data and Research Services for processing census and survey forms in developing countries.

down-loading of operational programs is more limited. According to Riley, this type of system is more appropriate for countries with small populations.

A third alternative is a combined system that has distributed scanning stations in heavily populated areas and central scanning stations for remote or lightly populated areas. Its two advantages are that it is sensitive to the volume of processing needed in each area and that the central station can process forms that have been checked and corrected in the field.

Riley asserted that OMR systems "can be very powerful high-speed processing systems that not only verify the presence or absence of data, discriminate between an erasure and a valid response, [and] read both sides of a form on the same pass but, because they are now microprocessor driven, can also perform a large amount of the statistical analysis that was previously done only on the host device" (Riley 1988:2). He added that economically they compete effectively with key-entry systems even in countries where key operators are poorly paid.

Even countries that still use key-entry systems normally make use of computer software to control the data-inputting operation. Such systems can insure that no ineligible or "wild" codes are entered, and they can check to be sure that skip patterns are followed correctly. In addition, checks for consistency among answers to different questions may be programmed to enhance the accuracy of the data-entry operation.

Another advance that an increasing number of census bureaus are



VALERIE C. WONG

Taking a break during the Twelfth Population Census Conference are (first row, left to right) Sandra Ward, Neramit Dhanasakdi, Chintana Pejarononda, Nelia Marquez, B. R. Regmi, and (second row, left to right) Iris Stickley of International Travel Service, Laurence Lewis (obscured), R. B. M. Korale, Naibuka Navunisaravi, Mubammad Chaudbry, Nick Suvulo, and Joseph Lee.

using in the 1990 round is computer-assisted coding (CAC) of written responses to questions that do not lend themselves to the multiple-choice format (e.g., place of birth and occupation) or that permit respondents to add residual categories (in response to such cues as "Other, please specify"). When a keyboard operator enters verbatim a respondent's answer to such a question, the computer tries to match it with a response in its dictionary for that item. If there is an exact match, the computer assigns the appropriate code to the response. If there is no exact match, the computer suggests various possible codes from among which the coder may choose.

New Zealand's Department of Statistics plans to use microcomputers for keying data from the completed census questionnaires, then have the microcomputers format the records for computer-assisted coding and editing. Michael Moore reported that several manual processes formerly needed at this stage can now be done by computer, after which the batched data pass to an automatic editing phase. The CAC system for the 1991 census will include direct file matching by computer, a recall facility that will permit the computer operators to recall codes and descriptions from previous records for individual households, and an on-line news facility to assist operators in handling

processing problems.

Moore cautioned that the success of computer-assisted coding depends on the quality of the definitions (dictionary files) used. His department plans to devote a great deal of attention over the coming years to improving the files, especially for such categories as occupation and religion.

Australia considered using fully automatic computer coding but decided it would be too complicated, costly, and unreliable. Mike Giles stated, however, that the use of some computer-assisted coding in Australia will increase equipment costs but is expected to reduce staff costs. The ABS has calculated that a system of optical mark readers, computer-assisted coding, and computerized editing and emendation, operated by a centralized staff processing the forms in one and one-half work shifts per day over a 12-month period, will be the most cost-effective configuration.

The United States is planning to automate the operation that assigns computer-readable codes to written answers and, in some areas, to have computers review the returned questionnaires for completeness and accuracy. It also plans to use an automated address list that can be updated when the questionnaires are returned. The system will identify for follow-up those housing units that fail to return their questionnaires and will enable the Census Bureau to begin processing returned questionnaires while data are still being collected, thus speeding up the processing schedule by four months.

The growing use of microcomputers for census operations in both developed and developing countries

For many developing and developed countries alike, the advantages of microcomputers over mainframes in processing census data are their lower purchase and maintenance costs and their ease of use by people with limited computer training.

was also discussed at the conference. The popularity of microcomputers is increasing because, compared with mainframe systems,

they are inexpensive to acquire, their simplified hardware makes them easier and less costly to maintain and repair, and recent improvements in software design facilitate their use by people with limited computer training.

Glenn Ferri of the U.S. Census Bureau demonstrated an integrated system of microcomputer software developed by the bureau's International Statistical Programs Center specifically for processing census data in developing countries. Experiments with the system in three developing countries—Senegal, the Federated States of Micronesia, and

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Glenn Ferri of the U.S. Census Bureau (left foreground) demonstrates a new integrated system of microcomputer software developed by the bureau's International Statistical Programs Center for processing census data in developing countries. Looking on are (first row, left to right) Akibiko Ito, N. Rama Rao, Yuki Miura, Joseph Lee, and (second row, left to right) Bruce Petrie and Michael Moore.

Infant Mortality in the Marshall Islands

by Susan J. Levy
and Heather Booth

The infant mortality rate, defined as the proportion of infants born alive who die before reaching the age of one year, is an important indicator of the health status of a population. In most developed countries, infant mortality rates (expressed in this article as the number of infant deaths per 1,000 live births for a given time period) are derived from vital registration data, which are usually sufficiently complete to give accurate estimates.

In developing countries, however, the vital registration system may be inadequate, and other sources of data on infant mortality must be used. Population censuses and sample surveys can provide data that may be used directly or indirectly, with standard demographic techniques, to estimate infant mortality rates.

Our main objective is to present previously unpublished infant mortality rates derived from such data

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sources for a developing Pacific Island nation, the Marshall Islands. We used an indirect method to estimate infant mortality from the 1973 and 1980 censuses, then applied indirect and direct methods of estimation to data from the Marshall Islands Women's Health Survey of 1985. Comparing the results with estimates of infant mortality obtained from vital registration data enabled us to estimate the extent of underregistration of infant deaths. Before presenting the results, we discuss the sources of error in the data and the consequent problems in interpreting the estimates.

■ The Marshall Islands

The two chains of coral atolls that constitute the Marshall Islands are situated in the western Pacific between 160 and 173 degrees east, and 5 and 15 degrees north (see map). The Marshallese are a distinct Micronesian cultural group.

A German protectorate in the late 19th century and a League of Nations mandate to Japan after World War I, the Marshall Islands became part of the United Nations' Trust Territory of the Pacific Islands (TTPI), administered by the United States, in 1947. They became a republic in 1982 and a sovereign nation in 1986, but today the Marshall Islands remains linked with the United States by a compact of free association.

The 1973 and 1980 censuses (TTPI, no date[b]; U.S. Bureau of

the Census 1983; South Pacific Commission 1985) recorded the total population of the Marshall Islands as 25,646 and 30,873, respectively, indicating an annual intercensal growth rate of 2.7 percent. However, this rate is believed to be lower than the true rate of growth, estimated at more than 3.5 percent (personal communication, Hitihamy M. Gunasekara, Office of Planning and Statistics, Majuro, Marshall Islands), suggesting that the Marshall Islands has one of the fastest growing populations in the South Pacific region.

The urbanized administrative center is located on Majuro atoll, where just over one-third of the population lives. The second urban center is on Kwajalein atoll, which in 1980 had a population of more than 6,000, almost all living on tiny Ebeye, the most densely populated island in the Pacific (with more than 20,000 people per square kilometer). The rest of the population lives on the rural outer islands. Economically, the Marshall Islands depends on the export of copra products and on income from employment at the Kwajalein Missile Base, lease payments for Kwajalein atoll, and U.S. grants.

As in many island developing countries, the provision of health services in the Marshall Islands is hampered by financial constraints, the distance between islands and inadequate transport, and a lack of trained health personnel. There are

physicians and hospitals in Majuro and Ebeye. On the outer islands, medical assistants provide primary care in dispensaries, to which physicians make occasional visits.

Health services in the Marshall Islands, as in many island developing countries, are hampered by distance between islands and inadequate transport, as well as by financial constraints and lack of trained health personnel.

In the past, priority has been given to curative services and off-island referrals, at the expense of

preventive and primary health care activities. As a result, elementary public health services, such as the provision of clean water and sanitation, have not been adequately developed. Recent changes in public health policy aim to amend this situation.

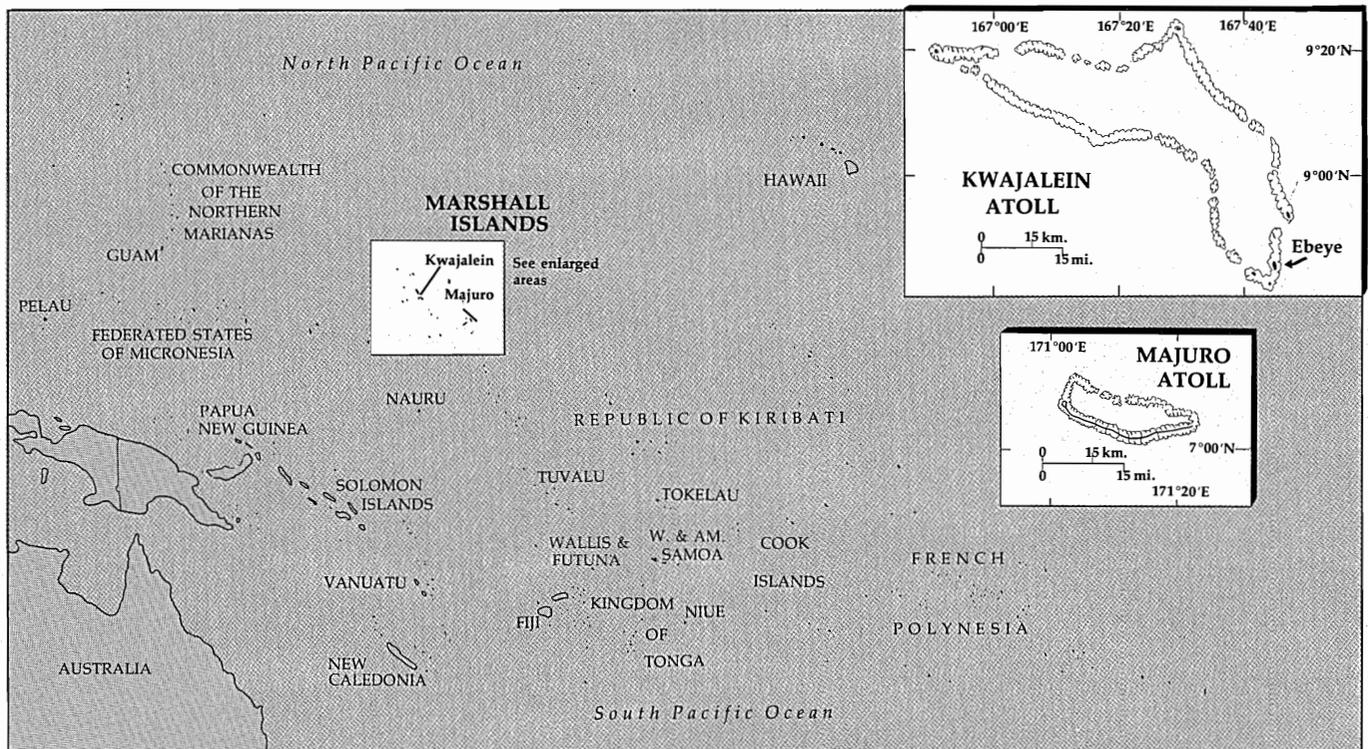
The health status of the Marshallese is typical of that of the population of a developing country. The patterns of morbidity and mortality indicate that the chronic diseases of modernized populations (cardiovascular disease, cancer, hypertension, and diabetes) are becoming increasingly common, whereas the incidence of acute infectious disease is diminishing (Taylor et al. 1989). However, infectious disease—especially intestinal and

respiratory infections—remains a serious problem, particularly among infants and children.

■ Data

1973 census. The 1973 census was part of the 1973 census of the TTPI, which aimed to obtain complete coverage and accurate data on the geographic distribution of the Trust Territory's population. Most of the published tables, including those on fertility, are based on the de facto population.

Fertility information was obtained from every woman born in 1959 or before. Such women were asked whether they had ever given birth to a live-born child and, if so, how many boys and girls she had borne and how many were still alive at



census night. The enumerators were instructed to include women's own children who were living away from home and to exclude foster and adopted children from the section on fertility.

Examination of the census data and comparison of them with data from the postenumeration survey indicate that the population of the TTPI as a whole was no more than 3 percent under- or overenumerated. In the Marshall Islands, responses to the questions on children ever borne and children surviving were obtained from 98 percent of women.

1980 census. The 1980 census was conducted by the U.S. Bureau of the Census and followed the 1980 U.S. census in almost every detail. Women born before April 1965 were asked how many children they had ever borne, excluding stillbirths, and how many were still living. Enumerators were instructed not to count stepchildren or adopted children. The data were edited in accordance with procedures documented in U.S. Bureau of the Census (no date), but information on the extent to which data were corrected or substituted is not readily available.

1985 Women's Health Survey. The Women's Health Survey was organized and conducted by the South Pacific Commission (SPC) and the Marshall Islands Departments of Health and Social Services, with funding from the United Nations Population Fund and the World Health Organization. The SPC is a nonpolitical technical assistance agency with an advisory and consultative role which provides, on request of member countries and its own initiative, technical advice,

training, assistance, and dissemination of information in social, economic, and cultural fields to 22 governments and administrations of the Pacific region. Altogether, the countries contain approximately 6 million people scattered over some 30 million square kilometers. Less than 2 percent of this area is land.

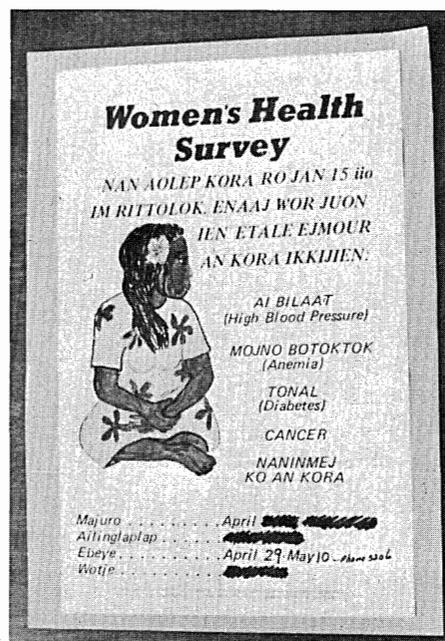
Part of an SPC regional women's health project, the Women's Health Survey took place during April and May 1985. Details of the methodology and results of the survey are given in the survey report (Levy et al. 1989).

Two urban and two outer island populations were studied. Community samples of women were selected from the most urbanized area of Majuro atoll and from Ebeye island in Kwajalein atoll.

Approximately one-fourth of households in Majuro and one-third of households in Ebeye were selected systematically, and all women of ages 15-59 living in the selected households were invited to participate in the health survey, which was conducted at a community health center on the grounds of a local hospital. On the outer islands of Wotje and Ailinglaplap, all eligible women were invited.

The total sample comprised 1,419 women. Response rates for each area were high, ranging from 80 to 96 percent, although they tended to be lower among women in the youngest and oldest age groups. The urbanized populations were overrepresented in the final sample, and the data have been weighted to correct for this.

The health survey questionnaires were administered by Marshallese women in the Marshallese language. Interviewers were women with a



Poster at a community health center encourages participation in the Women's Health Survey.

high school education, some of whom worked in the health sector, but none had had previous experience in survey interviewing.

All interviewers attended several training sessions in which interview techniques, the questionnaire items, and expected difficulties were discussed and they were given the opportunity to conduct practice interviews. Instructors carefully explained to them the distinctions between livebirths, stillbirths, miscarriages, and infant deaths.

The interviewers collected information on each respondent's maternity history, family planning, and health problems, and a detailed physical examination was performed by a physician or trained nurse. Maternity histories included the year of birth for each live birth, whether the child was still living,

and, if he or she had died, the year of death and age at death.

Elsewhere in the questionnaire respondents were asked again to state the total number of live births, how many of these children were still living, and how many had died. Responses to these questions were used to confirm the maternity histories and to calculate indirect estimates of infant mortality.

■ Methods

Indirect technique. The indirect estimation technique developed by Brass (Brass et al. 1968) uses data on the number of children ever born and number of children still surviving at the time of a census or survey, classified by age of women. The technique estimates the probability of children's dying before reaching certain exact childhood ages, $q(x)$, by applying multipliers to the proportion dead among children ever born. The multipliers used in this analysis are those proposed by Trussell (United Nations

1983) and apply to the West model life tables of the Coale and Demeny (1966) regional model life tables.

After checking for consistency by age of women, one uses the value of $q(2)$, the probability of dying before reaching age 2, to select a life table from the West model life tables. The infant mortality rate is then taken as being equal to the value embodied in this life table. The date to which an estimate relates can also be calculated, giving valuable information about past trends. We applied this indirect method to data from the 1973 and 1980 censuses and the 1985 Women's Health Survey.

The choice of the West family of model life tables followed established practice in Pacific Island demography. Of the four patterns of mortality available, the West family best portrays the low levels of infant and child mortality relative to adult mortality commonly found in the Pacific. The practice is also in line with Coale and Demeny's sug-

gestion of "utilizing the West family model in the usual circumstances of underdeveloped countries where there is no reliable guide to the age pattern of mortality that prevails" (Coale and Demeny 1966:29).

For the Marshall Islands data, the effect of using different families of model life tables was negligible. The maximum change for the 1973 data was 5 deaths per 1,000 live births; for the 1980 data, 4 per 1,000; and for the WHS data, 2 per 1,000. The North model life tables gave slightly lower estimates than the West models, whereas estimates based on South and East models were higher.

The indirect technique depends on the ratios $P(15-19)/P(20-24)$ and $P(20-24)/P(25-29)$, where P denotes children ever born, and is thus subject to biases due to inaccuracies in the reporting of children ever born. We examined the effect of this possible source of bias on the estimates based on the 1973 and 1980 census data by using the ratios derived from the WHS data, which appeared to be the most reliable. The effect of birth misreporting on the 1973 estimate was a reduction of 3 deaths per 1,000 and on the 1980 estimate a reduction of only 1 death per 1,000.

Direct technique. The direct technique, which we applied to data from the Women's Health Survey, involved classifying all live births (denominator) and all infant deaths (numerator) by five-year groups of year of birth and year of death. Some data were incomplete, such as births with year of birth unknown, known infant deaths with year of death unknown, and deaths with unknown year and unknown age at death. These did not pose a serious problem, however.



WHS interviewers take maternity histories from two respondents.



SUSAN J. LEVY

WHS respondent bitches a ride from her grandson to the survey site. Barrows are a common form of transportation in the Marshall Islands.

From the data on deceased children with known age at death, we calculated the proportion of infant deaths. We then applied this proportion to the number of deceased children with unknown age at death. This calculation gave us a number of supposed infant deaths with unknown year of death, which we added to the group of known infant deaths with unknown year of death.

Both births and infant deaths with unknown year we then distributed over the five-year age groups, in proportion to the number of births or deaths in each group. Thus, if a five-year period contributed 15 percent of all births with known dates, we allocated 15 percent of births with unknown dates, assuming that misreporting of year of birth or death was evenly distributed over time.

■ Sources of Data Error

A major problem in measuring infant mortality rates for the Marshall Islands is the small number of events involved. Even if all events were reported accurately, their small number would lead to considerable fluctuation in annual rates, thereby impeding the detection of trends over time. Sampling error inherent in sample surveys adds to this variation.

Further, the lower response rates in the Women's Health Survey for the 15-19 and 55-59 year age groups mean that women likely to have experienced higher infant mortality rates were underrepresented. This bias leads to an underestimation of the infant mortality rate when the direct method is used.

Another source of error, which affects the indirect estimation of infant mortality rates, is the misreporting of age, a problem present in all three data sources. During the Women's Health Survey, for example, it was evident that some women were not sure of their exact ages. In the absence of any means of verification, such as a birth certificate or identification card, we classified the women according to the probable age that they gave. Although the effect of age misreporting was reduced by the use of five-year age groups, some bias remained.

A more serious problem is the omission of deaths and the associated omission of births of children who died. Such underreporting affects direct estimates more than indirect ones because the indirect method relies on data for younger women, who generally report births and deaths more accurately than older women.

That parities were lower than expected for older women in the 1973 census (Table 1) is evidence of the underreporting of births by older women. Such omissions are also evident for the 1980 census (Table 2) when it is taken into account that the data for women of ages 35-39 and 40-44 are grouped together. Underreporting of births is not evident in the Women's Health Survey data, however (Table 3).

The underreporting of births in itself is not a source of bias in the estimation of infant mortality if deaths are underreported in the same proportion. But if more births of children who subsequently died are omitted than are those of children who survived, as is likely to be the case especially for older women, infant mortality will be underestimated. The indirect technique minimizes this problem by using data for younger women only.

Nevertheless, examination of the proportion of live-born children now dead, $D(i)$, reveals evidence of reporting error even by younger women. The proportion of children now dead is lower than expected, when compared with adjacent age groups, for women of ages 30-34 in all three sources. There does not appear to be a tendency among women of this age group to omit births of children who died, since their average parities are substantially higher than those of younger women, nor is it likely that deaths should be underreported in greater proportions at this age only. Rather, the anomaly may be due to age misreporting by women unable to give their exact age.

In estimating the ages of women, particularly of those in their middle childbearing years, the interviewers

may have taken into account the number of children in evidence at the time of the interview. Thus, women with a high proportion of children surviving would have been reported as being older than those of equal parity but with fewer children surviving.

Underreporting of births in the 1980 census is evident from a comparison of the 1980 and 1973 census data. For example, women 35-39 years old in 1973 had an average of 7.9 children, whereas ac-

ording to the 1980 census women 40-44 and 45-49 had average parities of only 6.6 and 6.7, respectively. Similarly, the proportions of deceased children as reported in 1980 are too low when compared with the same approximate cohort in 1973, even if one allows for the unlikely possibility that all children born in the seven-year interval survived.

In the Women's Health Survey, it is possible that the maternity history approach concentrated on births

at the expense of deaths. If so, this would have affected the direct estimates. For the indirect estimates, it is possible that deaths were underreported in the supplementary questions on numbers of births and deaths because interviewers modified the answers to be consistent with the respondents' maternity history data, which were already deficient in reported deaths of children.

In general, the direct approach demands greater accuracy of recall than the indirect approach because it requires the dates of births and deaths. The need to specify whether a child died before or after the exact age of 1 year inevitably leads to error. In the Women's Health Survey, respondents could not give dates for about 4 percent of live births and 10 percent of infant deaths. We allocated dates to these events by the method already described.

■ Results

Indirect estimates from the 1973 and 1980 censuses. The 1973 census data and derived indirect estimates of infant mortality are shown in Table 1. The number of children ever born, $P(i)$, the proportions of children dead, $D(i)$, and the probability of dying by age x , $q(x)$, are shown by age group of women, denoted by i . The corresponding life expectancies, $e(0)$, show some fluctuation due to age misreporting in the basic data, especially at ages 25-29 and 30-34. The low value of $e(0)$ for the 15-19 age group was expected, since infant mortality rates are normally high among births to teenage mothers. The best estimate of the infant mortality rate, derived from the generally more reliable data for

Table 1. Indirect estimates of infant mortality, by age of women: Marshall Islands, 1973 census

Age group of women, i	Live births per woman, $P(i)$	Proportion of live-born children now dead, $D(i)$	Exact age of children, x	Probability of dying by age x , $q(x)$	Life expectancy at birth, $e(0)$	Infant mortality rate (per 1,000)	Date
15-19	0.304	.089	1	.087	56.3	87	—
20-24	1.739	.091	2	.095	58.0	79	Oct 1970
25-29	4.025	.109	3	.110	56.9	85	Apr 1969
30-34	5.984	.098	5	.100	59.5	72	Nov 1966
35-39	7.859	.123	10	.127	57.3	83	Nov 1964
40-44	7.879	.134	15	.136	57.1	83	—
45-49	7.241	.165	20	.167	55.2	93	—

Table 2. Indirect estimates of infant mortality, by age of women: Marshall Islands, 1980 census

Age group of women, i	Live births per woman, $P(i)$	Proportion of live-born children now dead, $D(i)$	Exact age of children, x	Probability of dying by age x , $q(x)$	Life expectancy at birth, $e(0)$	Infant mortality rate (per 1,000)	Date
15-19	0.369	.060	1	.059	62.4	59	—
20-24	1.848	.070	2	.072	61.9	61	Apr 1977
25-29	3.461	.073	3	.071	62.8	57	Jan 1975
30-34	5.114	.070	5	.068	64.1	52	Dec 1972
35-39 } 40-44 }	6.623	.086	12.5	.085	63.0	56	—
45-49	6.746	.099	20	.096	63.0	56	—

women of ages 20-24, is 79 per 1,000 live births. This estimate refers to a date, October 1970, 2.9 years before the census.

The estimates derived from the 1980 census, shown in Table 2, suggest at first sight an improvement in infant mortality because life expectancies are higher than in the 1973 census. But the increase in $e(0)$ from women of ages 20-24 to ages 30-34 suggests that infant mortality was actually increasing. In addition, the $e(0)$ values indicate the highly unlikely situation that births to teenage mothers had a lower rate of infant mortality than did births to women 20-24 years old. This odd result thus brings the accuracy of these data further into question.

The 1980 data suggest that for December 1972 the infant mortality rate was as low as 52 per 1,000, compared with the more reliable estimate of 79 per 1,000 for October 1970 from Table 1. It is therefore difficult to make a confident estimate of infant mortality from the 1980 data. The most that can be said is that the rate for April 1977 of 61 per 1,000, suggested by the data for women 20-24 years old, is a minimum. The decreasing trend in infant mortality indicated by the 1973 and 1980 data is thus exaggerated by error in the 1980 data.

Indirect estimates from the Women's Health Survey.

Although direct estimates of infant mortality can be calculated from the WHS data, we also applied the indirect technique. Table 3, which shows the estimation procedure applied to data from the survey, indicates much lower reported proportions of children dead, $D(i)$, than those reported in the two censuses, resulting in lower probabili-

Table 3. **Indirect estimates of infant mortality, by age of women: Marshall Islands, 1985 Women's Health Survey**

Age group of women, i	Live births per woman, $P(i)$	Proportion of live-born children now dead, $D(i)$	Exact age of children, x	Probability of dying by age x , $q(x)$	Life expectancy at birth, $e(0)$	Infant mortality rate (per 1,000)	Date
15-19	0.404	.009	1	.009	75+	9	—
20-24	1.987	.037	2	.037	68.6	34	May 1982
25-29	3.658	.066	3	.064	64.0	53	Mar 1980
30-34	5.440	.046	5	.045	67.8	37	Aug 1978
35-39	6.409	.062	10	.063	65.8	45	Feb 1975
40-44	7.698	.076	15	.075	64.7	50	—
45-49	8.282	.073	20	.072	66.0	44	—

ties of death and correspondingly higher life expectancy values. The results are not consistent over ages, however, and that result casts doubt on the accuracy of the data.

It is certain that the very high value of $e(0)$ resulting from data for women 15-19 years old is in error. Most probably, these young women did not report many of the births of children who subsequently died.

Compared with the results from the censuses, these results suggest that infant mortality has declined considerably in the last 15 years. Accordingly, infant life expectancies would be expected to decline with age of women. The fact that they fluctuate rather than decline indicates the presence of error. Examination of the parities, $P(i)$, suggests the presence of reporting error, especially at ages 35-39 and 40-44, where age-specific parity increments fluctuate considerably. Even in the younger age groups, where data are usually of better quality, there is substantial fluctuation in life expectancy values, probably because women 25-29 years old misreported their ages as 30-34.

When we examined specific time periods, we found considerable discrepancies in the estimates. The 1980 census estimate of a minimum of 61 infant deaths per 1,000 live births in April 1977 is inconsistent with the WHS estimate of 37 per 1,000 for August 1978. The presence of age-reporting errors in the Women's Health Survey data only partly explains the differences.

The infant mortality rate of 34 per 1,000 suggested by the age group 20-24 in Table 3 would seem to be a minimum estimate of infant mortality in the Marshall Islands. This rate, which refers to May 1982, represents a rapid reduction in infant mortality, which is unlikely to be entirely real. It is more likely that a large number of deaths were not reported.

The underreporting of deaths would appear to be a major source of error in the Women's Health Survey. For this reason, it is impossible to determine the true level of infant mortality from these data.

Direct estimates from the Women's Health Survey. In Table 4, which presents infant mortality

rates estimated by the direct method from detailed maternity histories, estimates for the years 1955-69 are of dubious accuracy because of the small numbers. Estimates for the later years are likely to be more accurate because of larger numbers and better recall. Therefore, we adjusted for unclassified births and deaths for the last three five-year groups only. The adjusted infant mortality rates suggest an upward trend, from 24 per 1,000 in 1970-74 to 38 per 1,000 in 1980-84.

The direct estimate of 24 per 1,000 for the period 1970-74 is affected substantially by omissions of infant deaths. This is also seen to be true of the estimate of 37 per 1,000 for 1975-79 when it is compared with the indirect estimates for the same period.

Table 4. **Direct estimates of infant mortality: Marshall Islands, 1985 Women's Health Survey**

Years of infant births or deaths	Infant mortality rate (IMR) ^a (per 1,000)	IMR ^a (per 1,000) adjusted for unclassified births and deaths
1955-59	53	
1960-64	43	
1965-69	31	
1970-74	23	24
1975-79	35	37
1980-84	36	38

a. Rates calculated separately for Majuro, Ebeye, and the outer island group are weighted to correct for overrepresentation of urban women.

Comparison with vital registration statistics. Births and deaths have been registered in the Marshall Islands since 1955, but

coverage is not complete (TTPI, no date[a]; Trust Territory Health Planning and Development Agency and Republic of the Marshall Islands Health Planning Office 1984). As the fluctuation in infant mortality rates from year to year is considerable, we have grouped the data into five-year periods (Table 5).

Table 5. **Infant mortality rates, 1955-79: Marshall Islands, vital registration data**

Years	Live births	Infant deaths	Infant mortality rate (per 1,000)
1955-59	2,527	102	40
1960-64	3,055	121	40
1965-69	3,933	107	27
1970-74	5,066	157	31
1975-79	5,416	189	35

The low levels of infant mortality suggested by these data indicate the degree to which infant deaths are underregistered relative to births. If the estimate from the 1973 census of 79 deaths per 1,000 live births for October 1970 is taken as correct, then infant deaths can be said to have been about 60 percent underregistered in 1970-74 relative to births registered.

Of course, it is likely that births were also underregistered, which would mean an even greater underregistration of infant deaths. The more recent infant mortality estimate from the 1980 census of 60 per 1,000 for April 1977, itself considered an underestimate, suggests that infant deaths were at least 40 percent underregistered relative to births in 1975-79.

These coverage rates indicate that between 1970-74 and 1975-79 the

registration of infant deaths relative to births improved by a factor approaching nearly 50 percent. However, any improvement in the registration of infant deaths has most probably also been accompanied by an improvement in the registration of births, so that the true improvement in infant death registration is greater than that indicated.

This improvement in the coverage of infant death registration masks the trend over time in infant mortality rates. The data in Table 5 indicate only a slight decline in infant mortality since 1955. The true decline is undoubtedly greater than that indicated, although the true infant mortality rates are higher than those derived from vital registration figures.

Given that the registration of infant deaths is unlikely to have become complete by 1980-84, the estimate of 33 infant deaths per 1,000 live births for 1984 obtained from registration data (Secretary for Health, Republic of the Marshall Islands, 1986) can be regarded as an underestimate. This assumption is consistent with our earlier statement that estimates of infant mortality obtained from the Women's Health Survey, which are similar to those obtained from registration, are too low.

Comparison with other countries in the Pacific. Comparison of the Marshall Islands with other countries in the Pacific Island region for which reliable estimates, shown in Table 6, are available suggests that the rate of 61 per 1,000 from the 1980 census is a more reasonable estimate for the Marshall Islands than the rate of 34 per 1,000 in 1982 obtained from the

Women's Health Survey. Although several countries have infant mortality rates below 50, the country most similar to the Marshall Islands in physical environment, and whose population is also Micronesian, is Kiribati, with an infant mortality rate of 82 per 1,000.

Although infant mortality has declined substantially since 1955, the Marshall Islands continues to have the highest incidence of infant mortality, at about 60 deaths per 1,000 live births, of any country in the former Trust Territory region.

Infant mortality rates for the Marshall Islands are higher than those for other countries in the TTPI region. Although the indirect estimates shown in Table 7 may be affected to a greater or lesser extent by errors and biases, they are probably not so different between countries as to influence the relative rankings of the Marshall Islands and Federated States of Micronesia as the highest and second highest in rates of infant mortality in the TTPI region. Only between the Northern Mariana Islands and Palau is there some doubt as to which has the lowest rate.

■ Discussion

The estimates of infant mortality presented in this article must be interpreted with caution. Several sources of error have been identified and shown to be of considerable importance. Of the three data sources examined, the 1973 census

Table 6. **Infant mortality estimates for selected Pacific Island countries: recent years**

Country	Infant mortality rate (per 1,000)	Years
Cook Islands	28	1979-81
Fiji		
Melanesian	30	1981-83
Indian	38	1981-83
Total	33	1981-83
Guam	11	1984
Kiribati	82	1981-85
Nauru	31	1976-81
New Caledonia (Melanesian)	23	1981-83
Papua New Guinea	72	1976-80
Solomon Islands	46	1972-76
Tuvalu	42	1975-79
Western Samoa	33	1982-83

Note: Direct estimates for Cook Islands, Fiji, Guam, Nauru, and New Caledonia are from vital registration. Indirect estimates for Kiribati, Papua New Guinea, Solomon Islands, and Tuvalu are from census data. The estimate for Western Samoa is from survey data.

Sources: Cook Islands: ESCAP and SPC (1983); Fiji: Balkaran et al. (1989) Guam: Guam, Department of Public Health and Social Services, Office of Vital Statistics (1984); Kiribati: Booth (1989); Nauru: Taylor and Thoma (1983); New Caledonia: Booth, unpublished calculations; Papua New Guinea: Bakker (1986); Solomon Islands: Solomon Islands, Ministry of Finance, Statistics Division (1981); Tuvalu: Tuvalu, Government of (1980); Western Samoa: Western Samoa, Department of Statistics (1984).

Table 7. **Indirect estimates of infant mortality from 1973 and 1980 census data for Trust Territory and member countries**

Country	Infant mortality rate	
	1973 census	1980 census
Northern Mariana Islands	47	35
Palau	51	34
Federated States of Micronesia	67	51
Marshall Islands	79	61
TTPI	67	54

appears to be of the best quality.

Data from the 1980 census and the Women's Health Survey were found to be deficient. In the 1980 census, both births and deaths were underreported, so that the infant

mortality rate is not so seriously underestimated as it might have been if only deaths were underreported. In the case of the Women's Health Survey, however, it appears that births were relatively well-reported

whereas deaths were not, leading to a more serious underestimate of infant mortality. The finding that estimates from the Women's Health Survey are similar to those obtained from vital registration data, which are recognized as deficient, supports the conclusion that the WHS estimates are too low.

Comparison of the direct and indirect estimates from the WHS data revealed that the direct estimates

are substantially biased by recall error. The direct estimates suggest that infant mortality has increased since 1970-74, whereas the indirect estimates indicate a decreasing trend in infant mortality rates, converging with the direct estimates in more recent years (Figure 1). In view of the efforts to improve maternal and child health that were instigated in the mid 1970s and other general health improvements, this decreas-

ing trend is plausible, even though its magnitude is exaggerated. Therefore, the indirect estimates are preferable to the direct.

From the available data, it is impossible to estimate accurately the true level of infant mortality in the Marshall Islands during 1980-84. Though the three sources of data have provided estimates that overlap in time, it is not possible to determine the extent of under-reporting in the 1980 census and the Women's Health Survey.

We have shown, however, that infant mortality estimates based on registration data for 1975-79 are at least 40 percent too low. Because the registration of vital events is not believed to have increased markedly since that time, we can assume that the estimate of 33 deaths per 1,000 live births obtained from registration data for 1984 is 40-50 percent too low. The adjusted rate is thus 55-66 deaths per 1,000.

In round figures, a value of 60 per 1,000 may be taken as the final estimate for 1980-84. This estimate is by no means firm, but it provides a better indication of the infant mortality rate than the unadjusted estimates of 33-34 per 1,000.

The conclusion that infant mortality rates are higher than the 34 per 1,000 suggested by the Women's Health Survey is supported by knowledge of the general environmental conditions and the health status of the population of the Marshall Islands. Diarrheal disease and respiratory infections are among the leading causes of illness and death in infants and young children. The high prevalence of these conditions is a reflection of the difficulties of

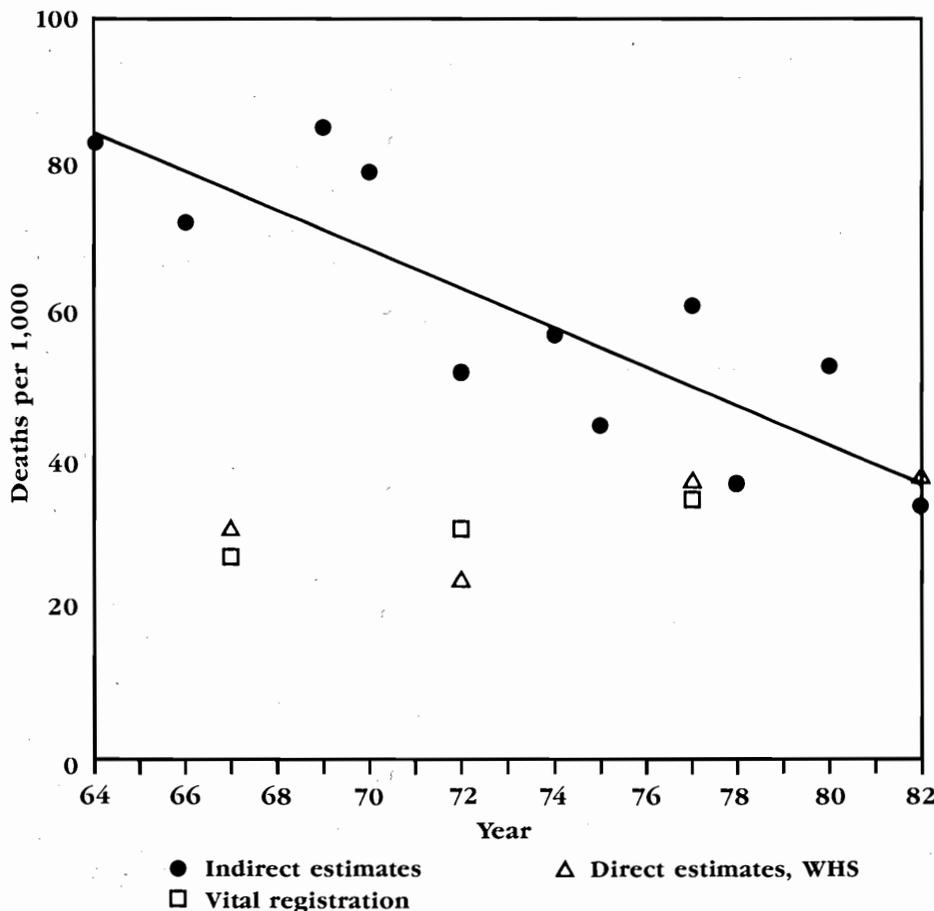


Figure 1. Trend in unadjusted infant mortality rate: Marshall Islands, 1964-82

(continued on page 31)

News from the Region

Editors' Note: The Forum welcomes news items about census activities, population surveys, and vital registration developments in the Asian-Pacific region.

N. Rama Rao, Assistant Registrar General of India, reports that the first pretest of the 1991 Census of India took place between 21 November and 12 December 1988 in selected blocks of the States and Union Territories.

The International Statistical Programs Center of the U.S. Bureau of the Census will conduct four workshops in Washington, D.C., during the summer of 1989 for personnel of ministries and agencies involved in planning and conducting statistical programs. The workshops are:

- **DATA USE AND DISSEMINATION** (10 through 21 July), focusing on appropriate techniques to enhance the capabilities of statistical offices in developing countries to use and disseminate census and survey data. Fee: US \$1,950. Deadline for nominations: 15 May 1989.
- **INTEGRATED MICROCOMPUTER PROCESSING SYSTEM (IMPS)** (17 July through 25 August), which will teach how to process census and survey data using IMPS. Fee: US \$4,650 if participant wants a copy of REALIA COBOL to take home, US \$3,950 if not. Deadline for nominations: 25 May 1989.
- **MANAGEMENT OF STATISTICAL ACTIVITIES** (24 July through 4 August), designed for statistical office

staff who have managerial responsibilities. Fee: US \$1,950. Deadline for nominations: 31 May 1989.

- **THE FUTURE OF FOREIGN TRADE STATISTICS** (7 through 18 August), designed primarily for statisticians responsible for collecting and publishing foreign trade statistics. Fee: US \$1,950. Deadline for nominations: 10 June 1989.

Fees do not include international travel or living expenses. Persons attending more than one of the two-week workshops may pay a reduced fee of US \$1,700 per workshop. The Census Bureau has no fellowship funds for workshop participants, but possible sources of fellowship funds are the U.S. Agency for International Development, the United Nations and its specialized agencies, and the World Bank.

English will be the language of instruction. Participants from countries whose official language is not English should have a minimum language score of 70/70 (ALIGU).

Nomination procedures vary according to sponsorship as follows:

U.S. Agency for International Development (USAID): Program Implementation Order/Participants (PIO/P) form and biographic data should be sent from the USAID mission to AID/Washington for transmittal to the Bureau of the Census.

United Nations: Applications should be sent by the local UN representative to UN headquarters in New York for transmittal to the Bureau of the Census.

Own government or other sponsors: an official letter should be sent to the Chief, International

Statistical Programs Center, stating that the government or sponsor will fund the nominee's participation in the workshop.

The following information is required from nominees: title and date of workshop, nominee's name (family name first), type of sponsor, country of residence, country of birth, date of birth, exact title of current position, name and address of organization, principal duties and responsibilities in present job, previous experience, and education (names of institutions; major fields of study; language of instruction; degrees, certificates, and diplomas; and dates). This information should be submitted to:

Robert O Bartram
Chief, International Statistical
Programs Center
U.S. Bureau of the Census
Washington, D.C. 20233, USA.

The Census Bureau recommends early completion of nominations.

The Urban Institute, a private, nonprofit educational and research organization located in Washington, D.C., publishes a Policy Discussion Paper series, *The Impacts of Immigration in California*, intended for policymakers. In conjunction with the **RAND Corporation** in Santa Monica, California, the Urban Institute has also recently established a nationally oriented Program for Research on Immigration Policy, which has begun issuing policy discussion papers on this topic. Recent

(continued on page 32)

Reviews

Concepts and Procedures in Indian Census: A Reappraisal by Anand Mahatme. New Delhi: Criterion Publications, 1988. 129 pp. (cloth), 100 Rs. Available from Criterion Publications, 136 Raja Garden, New Delhi-110 015, India.

The importance of concepts and procedures in census taking cannot be overemphasized because they influence the quality, utility, and comparability of the census data. The theme of this book is the reappraisal of the concepts and procedures in the Indian censuses, especially of 1961, 1971, and 1981. It could not have been brought out at a more opportune time than this, when the preparations for the 1991 Census of India are just about to begin. What is more, the author of this book is distinguished by his long and devoted service of over three decades to the Indian census and is a competent authority to undertake the reappraisal.

The significance of the book lies not only in the review of the concepts and procedures, but also in the author's recommendations on almost every issue on which the Indian census collects information. The recommendations are usually clear and thoughtful. In most cases they are based on India's past experience, with due recognition of the recommendations of the United Nations and the East-West Population Institute in their publications *Principles and Recommendations for Population and Housing Census* (UN, 1980) and *Censuses of Asia and the Pacific: 1980 Round* (EWPI, 1984). It is hoped that Mahatme's recommendations will

receive the attention they deserve as plans are made for the next Indian census.

The inherent difficulty with the concepts and procedures in any census is that, while on one hand they need to change with changing economic and social conditions, on the other they need to remain unaltered for comparability between censuses. It is hardly ever expected that there will be agreement on the recommendations, because the issues are generally complex. To begin with, the very concept of *de jure* or *de facto* type of enumeration can be a subject of endless discussion, and no one is a clear winner.

Some of the recommendations are necessarily questionable. Occasionally the author places greater emphasis on constitutional and administrative needs than on economic and social issues, for example in the following passage (p.55):

The question on school attendance is relevant only in the context of a constitutional provision for making education free and compulsory for all children until they complete the age of 14 years (vide Article 45). It does not seem necessary to investigate attendance in college, as was done at the 1981 Census of India, since there can be no question of providing facilities for college or university education to any child till the age of fourteen years.

Another such example is the recommendation (p. 74) that the question on current fertility be asked of all ever-married women, including those widowed, divorced, or separated. Some of these recom-

mendations are bound to invite criticism and further discussion.

In general, however, the problems are well discussed and the recommendations are thoughtful. They will be immensely useful in preparation for the 1991 and later censuses of India. On the wider horizon, the book provides a good insight into the problems involved in developing concepts and procedures for census taking in developing countries.

—J. R. Rele

ASEAN-China Economic Relations: Trends and Patterns edited by Chia Siow-Yue and Cheng Bifan. Singapore: Institute of Southeast Asian Studies, 1987. 234 pp., US \$19.50. ISBN 9971-76-3 (paper). Available in English from Institute of Southeast Asian Studies, Heng Mui Keng Terrace, Pasir Panjan, Singapore 0511. Information about Chinese edition available from Institute of World Economics, 15 Shatan Beijie, Dongchengqu, Beijing, China.

The importance of ASEAN, the Association of Southeast Asian Nations, and China in the Asian political and economic arena makes an examination of their relations of particular interest to scholars who follow events in the region. In June 1986 a workshop sponsored by the Institute of Southeast Asian Studies and the Beijing-based Institute of World Economics assessed the economic relations between ASEAN and China. The workshop was part of a three-year project to explore the significance of this growing economic partnership.

This monograph contains the papers from the workshop. Chia

Siow-Yue and Cheng Bifan are joint editors for the project, with Dr. Chai and Mr. Chia being responsible for the English and Chinese editions, respectively. The Ford Foundation and the International Development Research Centre (Ottawa) provided financial support for the collaborative research.

In an overview of past and present ASEAN-Chinese economic relations, John Wong identifies factors in China's past relationships with the countries of Southeast Asia—particularly the large number of overseas Chinese living in the region—that have influenced current patterns of political and economic association.

Immediately after the establishment of the People's Republic of China in 1949, trade was disrupted between China and her neighbors, many of whom felt threatened by the Marxist regime. After U.S. President Nixon's visit to China in 1972 and China's adoption of a new "open-door" policy in the late 1970s, individual ASEAN countries began a course toward normalization of economic relations with China. As Wong states, each country has had to find its own way in reestablishing political and economic relations, and some countries are still slow to do so.

In Chapter 2 Cheng Bifan and Zhang Nansheng discuss the "institutional factors" affecting ASEAN-Chinese economic relationships. These include the need for China and her neighbors to develop lasting cooperative relations, the development of economic cooperation despite different political and economic systems, factors favoring complementarity versus competition in ASEAN-Chinese economic rela-

tions, bilateral trade, the foreign exchange position of ASEAN enterprises in China, and the improved climate for political and economic understanding among China and the other countries involved.

Papers on individual aspects of the ASEAN-China trade relationship follow the chapter by Cheng and Zhang. Three chapters are devoted to trade in food, raw materials, and manufactured goods. The next four are concerned with trade between China and four individual ASEAN countries—Malaysia, the Philippines, Singapore, and Thailand. Numerous tables provide data on the types and volume of trade among the countries during the last 10 to 15 years.

The volume is comprehensive without being too detailed for comfortable reading. The first two chapters provide an excellent summary of the advantages and limitations of ASEAN-Chinese trade relationships. Papers from a second workshop held in Beijing in late 1987 should appear as a complementary volume to the first. It will undoubtedly suggest ways to enhance this important regional economic relationship.

—Alice D. Harris

The Maori Population to 2011: Demographic Change and Its Implications by Ian Pool and Nicholas Pole. New Zealand Demographic Society Technical Paper No. 1. Wellington: New Zealand Demographic Society, December 1987. Available from Secretary, New Zealand Demographic Society, P.O. Box 225, Wellington, New Zealand.

This monograph is the first in a welcome new series of technical reports being produced by the very active New Zealand Demographic Society. The report (and presumably

the series) aims to present discussions of contemporary patterns of demographic change in New Zealand in such a way that it can be used by government and other public policymakers, planners, and interested groups and individuals in the general community. The initiative to disseminate such information beyond the small coterie of demographic professionals is to be applauded.

To launch the series the authors have addressed an extremely complex and thorny but important issue. All projection is fraught with difficulty; but when the base population being projected is not amenable to a simple, universally accepted definition that is consistent through time, as is the case with Maoris, those difficulties are multiplied. Yet in multicultural societies such as New Zealand—and other countries in the Asian and Pacific region as well—the need for such analyses is considerable.

If the goal of equitable access to resources and efficient and fair provision of appropriate services is to be approached for minority groups, sensitive and informed forward planning is necessary. An essential precondition to such planning is a sound knowledge of the population dynamics of those groups.

The Maori Population to 2011 presents ten sets of projections of Maori population growth over the period 1981–2011. It discusses the difficulties of identifying the Maori population in demographic data, summarizes recent fertility and mortality trends among the Maori population, presents the assumptions employed in the projections, describes the major changes in the growth and structure of the popula-

tion presaged by the projections, and discusses some of their implications for policymaking and planning.

The methodology adopted in the projections is a conventional component one. The assumptions are based on the authors' considerable experience in the study of the demography of the Maori population and incorporate a range of scenarios of fertility stability and decline, mortality decline, adjustments for interethnic mobility, net emigration (primarily to Australia), and adjustments for underregistration of Maori-descent births.

Unfortunately, the data base for the population projections is the 1981 census rather than the 1986 census. The latter incorporated for the first time a self-identification ethnicity question, which the authors argue is superior to the 1981 definition, which distinguished between the Maori population (persons who are half or more Maori) and all Maori descendants. Presumably a new set of projections will have to be undertaken when the 1986 ethnicity data are published.

Nevertheless, this is a clearly written and well-produced monograph that will be of considerable assistance not only to New Zealand policymakers and planners but also to Maori community leaders and planners.

—Graeme Hugo
Flinders University
of South Australia

World Population and the United Nations: Challenge and Response by Stanley P. Johnson. Cambridge and New York: Cambridge University Press, 1987. 357 pp. US \$59.50 (cloth); \$22.95

(paper). ISBN 0-521-32207-3 (cloth); ISBN 0-521-31104-7 (paper). Available from Cambridge University Press, The Pitt Building, Trumpington Street, Cambridge CB2 1RP, U.K.

This monograph discusses the role of the United Nations during the late 1960s in confronting the challenge of rapidly growing world population and its contribution to population knowledge and programs over the past several decades. It describes the creation of the United Nations Fund for Population Activities (UNFPA), the principal instrument for UN population activities, and the role of other UN specialized agencies engaged in population work such as the World Health Organization and the World Bank.

Beginning with the United Nations' early work on population, Johnson recounts how, as more and more developing countries joined the world organization in the late 1950s and early 1960s, the need to deal with population issues became evident. The 1966 General Assembly Resolution 2211 (XXI), Population Growth and Economic Development, represented a breakthrough in its recognition of the need for action on population.

With the United States as a major donor, in 1967 the United Nations established a Trust Fund for its work in population. In 1969 the Trust Fund became the United Nations Fund for Population Activities (recently renamed the United Nations Population Fund) under the leadership of Rafael Salas and a staff that included John Keppel, Halvor Gille, and Nafis Sadik.

Johnson provides a detailed account of the 1974 World Population Conference in Bucharest and the

World Population Plan of Action adopted in August 1974. He devotes a chapter to the decline of birth rates in Asia, Latin America, the Middle East, and Africa.

He also examines the evolution in perceptions of population issues and of the United Nations' role in dealing with them. In the 1960s and 1970s population specialists concentrated on the rate of population growth and on the ability of national economies to absorb the annual increase. By the 1970s, however, other themes began to emerge, including the impact of population growth on the environment, the phenomenon of urbanization, women's rights and female emancipation, and interrelations between population and world peace. These new themes made the United Nations' role in population activities even more vital.

In a speech to the delegates at the 1984 UN-sponsored Conference on Population in Mexico City, Rafael Salas presented the most explicit statement of UN population policy. "Our goal," he stated, "is the stabilization of global population within the shortest period possible before the next century." At that conference, despite a new *laissez faire* policy on population growth promulgated by the United States, delegates adopted what came to be known as the Mexico City Declaration on Population and Development, a reaffirmation of the World Population Plan of Action and of the member nations' commitment to its goals.

Assessing China's relationship with the United States and the United Nations on population issues and drawing upon his own experience in China, Johnson refutes the no-

tion that Chinese population policy is coercive and suggests that China's success with family planning may serve as a model for other developing countries. He refrains from chastising the United States for its recent withdrawal of support for UNFPA activities, preferring to recall its enthusiastic support for the agency's establishment and to look forward to a change in U.S. policy.

In the concluding chapter, Johnson summarizes events since the Mexico City conference in 1984, introduces new topics of concern such as population aging and the outbreak of AIDS, and praises the role of the United Nations in coming "to grips with the problems of population growth." He adds, however, that "the problems of population growth in the developing world are by no means resolved" (p. 330) and calls for continued action on population by the UN agencies and programs in the coming years.

World Population and the United Nations contains numerous tables and figures on population and on UN expenditures. It includes a glossary of acronyms and initials, bibliographical notes, and an index.

The author's extensive experience in international organizations and his involvement with the politics of population and the environment have given him insight into a subject requiring objective and balanced analysis. Although his is not the first book to deal with the role of the United Nations in the world population arena, it is the most complete and up-to-date account. It is a thoroughly professional book that should be in all large academic and population collections.

—Alice D. Harris

Status of Civil Registration and Vital Statistics in Asia and the Pacific by Economic Commission for Asia and the Pacific, United Nations. Bangkok: United Nations, 1987. 312 pp. UN Doc. No. ST/ESCAP/465. Available from Chief, Population Information Section, ESCAP Population Division, United Nations Building, Rajdamnern Avenue, Bangkok 10200, Thailand.

In 1985 the Statistics Division of the United Nations Economic and Social Commission for Asia and the Pacific organized two seminars on civil registration and vital statistics. In view of the different problems and varying levels of statistical capability in Asia and the Pacific, seminars were held separately for the two subregions. At both seminars country statements on existing problems and practices involving the collection of vital statistics were aired. The discussions then turned to common problems.

Among the common problems discussed were financial constraints, gaps in the legal process, organizational obstacles to effective supervision and control, the low priority assigned to registration work by administrators and policymakers, public apathy toward registration, lack of trained manpower, and competing legal and statistical requirements. Other problems identified by many countries included the delay in the compilation and publication of statistical data.

Participants of both seminars stressed the importance of improving the existing systems of civil and vital registration as soon as possible. They warned that unless these systems were reorganized and streamlined within the next decade, the implementation and monitoring of development programs, at both the

international and national levels, would be in jeopardy.

Various practical approaches for upgrading services were suggested. They included the wider dissemination and exchange of information on national registration systems, new methodologies for data analysis, more training for statisticians, and the improvement of data collection forms.

The monograph begins with an overview of civil and vital registration systems in the region and follows it with individual chapters on national systems. Readers familiar with the monograph *Censuses of Asia and the Pacific: 1980 Round* by Lee-Jay Cho and Robert L. Hearn (Honolulu: East-West Center, 1984) will recognize and appreciate the parallel organization of the country chapters in this book. Each chapter includes not only a description of the civil and vital registration systems, but also copies of actual data collection forms. By providing a single source of important information in readily comparable format, *Status of Civil Registration and Vital Statistics in Asia and the Pacific* makes a useful reference tool for population and statistical libraries.

Because of deficiencies in vital registration and resulting inadequacies in the data available, many countries in the region have resorted to alternative methods of gathering vital data, such as sample registration, retrospective surveys, and multiround continuing surveys, and to using indirect techniques of estimating vital rates from incomplete or imperfect data. Nevertheless, the prevailing view expressed at the seminars was that governments should resist the tendency to

perpetuate such short-term arrangements. Participants concluded that no wholly satisfactory substitute exists for a good civil registration system for vital statistics, and that every government should strive to develop such a system.

—Alice D. Harris

Berelson on Population edited by John A. Ross and W. Parker Mauldin. New York: Springer-Verlag, 1988. xii, 275 pp., \$28.95. ISBN 0-387-96716-8 (cloth). Available from Springer-Verlag, New York, Inc., 175 Fifth Avenue, New York, NY 10010.

Bernard Berelson's population career began in 1962, when he was recruited by the Population Council to direct its Communication Research Program. Though he had had no previous demographic training or experience, he rapidly established himself as a leader in the emerging international family planning movement. This volume reproduces 14 of Berelson's many publications in the population field.

During his first six years at the Council, Berelson's work focused primarily on the practicalities of designing and implementing family planning programs. With Ronald Freedman and colleagues in Taiwan, he helped design and evaluate the Taichung Experiment, which was one of the first studies to use social science research methods to demonstrate that a well-organized and well-implemented family planning program could succeed in a developing country.

The results of the study not only demonstrated the success of the pilot effort in Taichung, but also showed the relative effectiveness and efficiency of four alternative

communication strategies that were tested simultaneously. "A Study in Fertility Control" (*Scientific American*, May 1984), in which Berelson and Freedman summarized the results of the Taichung Experiment, is included in this volume.

Two other articles in *Berelson on Population* reflect other important aspects of Berelson's early work at the Council. In "National Family Planning Programs: A Guide," he culled lessons learned from the early family planning programs. "Maternity Care and Family Planning as a World Program," coauthored with Howard Taylor, noted the success of the Council's hospital-based International Postpartum Family Planning Program, which Berelson had played a major role in developing, and argued for applying the same concept to rural settings, where the great majority of births in the developing world occur. This article was influential in the widespread shift during the 1970s from clinic-based family planning programs to community-based, integrated health and family planning programs.

In 1968 Berelson became president of the Population Council, and his writings took on a broader scope. In his 1969 article "Beyond Family Planning" his concern shifted from developing and improving family planning programs to considering the alternatives to family planning. The paper was prepared in response to critics who argued that family planning programs were insufficient to affect fertility. His examination of the various alternatives that had been or might be suggested, in comparison with conventional family planning programs, indicated that the family planning

approach was at least as likely to be effective as the proposed alternatives and clearly preferable to some of them.

Berelson's duties during his six years as president of the Population Council limited his publication output, but his writings between the time he stepped down as president and his death in 1979 were impressive in both quantity and diversity. Nine of the 14 papers in this volume were published after 1975.

These papers include most prominently further explorations regarding population policy ("The Great Debate on Population Policy" and "Paths to Fertility Reduction: The 'Policy Cube'"), analyses of the past performance of national family planning programs ("The Record of Family Planning Programs," coauthored with Ronald Freedman; "Conditions of Fertility Decline in Developing Countries," coauthored with Parker Mauldin), and prospects for the future ("Prospects and Programs for Fertility Reduction: What? Where?").

The other papers from this period deal with more specialized topics: "Romania's 1966 Anti-Abortion Decree: The Demographic Experience of the First Decade," "On the Efficient Allocation of Resources for Fertility Reduction" (written with Robert Haveman), "The Impact of New Technology," and "Government Efforts to Influence Fertility: The Ethical Issues" (written with Jonathan Lieberman).

A hallmark of Berelson's writings was his ability to synthesize large numbers of diverse ideas and facts, presenting the results in an organizing framework and discussing them in a highly readable style that made his discussion and conclusions ac-

cessible to decision makers and research specialists alike. His work thus has historical importance as a compendium of the early thinking about and experience with the development and implementation of national population programs.

However, it is also useful as a guide for today's population policymakers, family planning program managers, and researchers concerned with the evaluation of family planning programs. The policy issues of the 1970s are still relevant today, the guidelines for designing and implementing family planning programs set forth in the 1960s are still valid, and Berelson's approaches to evaluation of family planning program efforts continue to provide an excellent model for assessing family planning programs.

By bringing together these 14 papers, John Ross and Parker Mauldin have made Berelson's writings more accessible to today's family planning decision makers and researchers and therefore provided a valuable contribution to the literature on population policy and family planning programs.

—John E. Laing

Basic Data on Fertility in the Provinces of China, 1940-1982 by Ansley J. Coale and Chen Sheng Li. Honolulu: East-West Center, 1987. (Papers of the East-West Population Institute, No. 104.) xviii, 366 pp., US \$5.00. ISBN 0-86638-088-4. Available from East-West Center, Publication Orders, 1777 East-West Road, Honolulu, HI 96848, U.S.A.

Before 1980 detailed statistics on the population of China were difficult to obtain. The release of data from the 1982 census and the One per Thousand Sample Fertility

Survey of 1982 by the State Planning Commission have proved to be a boon to demographers eager for information about China's population. Ansley J. Coale, professor emeritus of public affairs and associate director of the Office of Population Research at Princeton University, joined with Chen Sheng Li, head of Family Planning Statistics, Jilin Provincial Family Planning Commission, to prepare this monograph on fertility in China's provinces for the period 1940-82.

Using the One per Thousand Sample Fertility Survey, Coale and Chen have constructed tables giving the age-specific and marriage duration-specific fertility rates for China as a whole and for each of 28 provinces. Within each province, the rates are shown for total, urban, and rural populations. The basic tables supplement a 1983 publication by the Chinese government, published in English in 1984 by the China Population Information Service, Beijing, as *Analysis on China's One-per-Thousand Population Fertility Sampling Survey*.

During the summer of 1985, computer tapes containing the original data from the survey for the 28 provinces were analyzed at the East-West Center in a collaborative enterprise between experts from China's State Family Planning Commission and consultants at the East-West Population Institute. The tapes constitute a unique data resource. The sample survey was so large that many types of detailed analysis can be produced from the data it collected.

Part I of the monograph contains a brief introduction to the data sources and a summary of the fertility trends revealed by the tables.

Part II contains 166 tables: six tables for each of 26 provinces, two tables each for two provinces (Qinghai and Ningxia) in which the urban sample was very small, and six tables for China as a whole. The tables present age-specific fertility rates for age intervals 15-19 through 45-49 during the years 1940-82. Marriage duration-specific fertility rates for ever-married women are also presented for five-year intervals from 0-4 through 30-34 years since first marriage over the same period.

This publication should be very useful to anyone interested in detailed data about China's recent fertility trends, particularly at the provincial level.

—Alice D. Harris

ALSO NOTED

Recent Literacy Trends in India by O. P. Sharma and Robert D. Retherford. Occasional Paper 1 of 1987. viii, 107 pp. Free. New Delhi: Office of the Registrar General and Census Commissioner, India. Available from Office of the Registrar General and Census Commissioner, Ministry of Home Affairs, Government of India, 2/A Mansingh Road, New Delhi, India. *Demographic libraries may also request single copies from the East-West Population Institute.*

This study describes literacy trends in India, based on data from the 1961, 1971, and 1981 censuses. The study begins with an examination of literacy trends for all India, which is followed by an examination of trends for states and union territories. The section on states and union territories includes an examination of sex differentials and urban-rural differentials in literacy rates. Subsequent sections present an examination of age differentials

in literacy rates, an analysis of the quality of literacy in terms of its changing composition by educational attainment, and an analysis of how female literacy and several development indices covary across 14 major states. The final section presents some rough projections of literacy rates for states and union territories.

—Authors' abstract

Regression Estimates of Fertility for India, 1971 and 1981 by N. Rama Rao, J. R. Rele, and James A. Palmore. Occasional Paper No. 3 of 1987. New Delhi: Office of the Registrar General and Census Commissioner, India. vi, 85 pp. Free. Available from Office of the Registrar General and Census Commissioner, Ministry of Home Affairs, Government of India, 2/A Mansingh Road, New Delhi, India. *Demographic libraries may also request single copies from the East-West Population Institute.*

Estimates of the total fertility rate and crude birth rate are presented for all India, its major states, and urban and rural subdivisions of those states for both 1971 and 1981. These new estimates were prepared using Palmore's regression methods and the 1971 and 1981 Indian censuses. For 1981, the 5 percent sample of the census was used. For 1971, the 10 percent rural sample and the 20 percent urban sample of the census were used. The paper in-

cludes discussion of the Palmore method, compares the results using this method with the results of other estimation techniques, and assesses trends in fertility during the 1971-81 decade.

—Authors' abstract

Australian Bureau of Statistics Publications to be Released in 1989 by W. McLennan. Catalogue No. 1109.0. Belconnen: Australian Bureau of Statistics, 1988. iv, 25 pp., paper. Available from: Publications Mailing service, Australian Bureau of Statistics, P.O. Box 10, Belconnen A.C.T. 2616, Australia.

Broad subjects covered in this catalog of publications are: General, Census of Population and Housing, Demography, Social Statistics, National Accounts and Finance and Foreign Trade, Labour Statistics and Prices, Agriculture, Secondary Industry and Distribution, and Transport. Within each subject are several subtopics.

Glossary of Natural Family Planning Terms by Rosalia Rodrigues-Garcia, Barbara Kass-Annese, Wilma Stevenson, Hann Klaus, and Jeff Spieler. Washington, D.C.: Institute for International Studies in Natural Family Planning, Georgetown University School of Medicine, University of Pittsburgh Graduate School of Public Health, and Los Angeles Regional Family Planning

Council, August 1988. ix, 30 pp. paper. Available in English and to become available in French and Spanish from: The Resource Center, Georgetown University, Institute for International Studies in Natural Family Planning, Department of Obstetrics and Gynecology, 38000 Reservoir Road N.W., Washington, D.C. 20007, USA.

Statistical Supplement to Statistical Report, Department of Health, State of Hawaii, 1987 by John C. Lewin, Calvin T. Masaki, Peter S. Sybinsky, Jerry Walker, and Bruce Anderson. Honolulu: Research and Statistics Office, Department of Health, 1987. Available from: Research and Statistics Office, Department of Health, State of Hawaii, 1250 Punchbowl, Honolulu, Hawaii 96813, USA.

We, the Asian and Pacific Islander Americans by the Bureau of the Census. Washington, D.C.: Bureau of the Census, Department of Commerce, 1988. Paper, 16 pp. US \$1.25 (discount of 25 percent with order of 100 copies or more). Order no. 003 024 06869-9. Available from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

This booklet, part of a series on segments of the U.S. population, presents information on population trends, educational attainment, income distribution, employment statistics, and other characteristics of Asian and Pacific Islander Americans.

1990 CENSUSES . . .

(continued from page 10)

Burkina Faso (formerly Upper Volta)—have produced promising results, indicating that microcomputers are a technologically viable and cost-effective alternative to

mainframe computers for processing census data. Ferri (1988:1) stated that "refinement of microcomputer software should make the use of microcomputers even more advanta-

geous in the future."

Several countries are using microcomputers or minicomputers in combination with mainframe systems for their forthcoming cen-

suses. Indonesia's Central Bureau of Statistics has a large new computer in both its central and Surabaya offices and has acquired minicomputers for most of its provincial offices. The U.S. Census Bureau is acquiring more than 500 minicomputers to handle the increased automation planned for its next census.

In India, however, the Census Organization is taking steps to acquire a mainframe computer system for the 1991 census. Data from the 1981 census were processed on seven computers at various installations, and the lack of an in-house computer proved to be a major handicap.

■ Evaluation

During the evaluation stage of the census, efforts are made to assess the magnitude of coverage errors (improper inclusion or exclusion of respondents) and content errors (inconsistent, inaccurate, or missing responses to questionnaire items). As already indicated, computers are used to do much of the checking, especially of content errors, for they can instantly recognize not only missing information but also internal inconsistencies and improbable answers. Many census bureaus program their computer systems to correct errors and impute missing information in such returns, often basing the changes on statistical probabilities derived from complete and consistent returns.

Census returns may be evaluated also through comparison with the results of a postenumeration survey (PES), taken soon after the census, of a small but representative sample of the national population. The PES

is the primary means of gauging the extent of undercounting, particularly of certain subpopulations. Many applications of computer technology used in census operations can be used in the PES as well.

Other data used for comparison with the census returns include vital registration records, resident registration data in countries having such registration, and other types of surveys.

In concluding his paper on the quality of census data, Yuki Miura of Japan emphasized the importance of formulating, well in advance of the census, appropriate measures to detect errors and their causes, to take steps to prevent them, and, during the census operation, to identify errors in the early stages and "take prompt actions to correct them" (Miura 1988:16). Increasingly sophisticated computer programs are being developed to detect and correct errors.

Another aspect of evaluation is to assess the efficiency and cost-effectiveness of the census operation itself. The U.S. Census Bureau's new automated management information system, mentioned in the section on census preparations, is an example.

A third aspect of evaluation, the monitoring and correction of human error, is less amenable to automation but is nevertheless critical to census quality. Japanese census officials pay careful attention to human performance, adopting the same approach to quality control that is widely used in Japan's private industrial sector. The approach emphasizes careful training and regular review of performance, both by trained evaluators and by the workers themselves.

Yuki Miura described how, in planning for the 1985 census, the Statistics Bureau analyzed the kinds and causes of errors most commonly made in the previous census by respondents, coders, and editors. (Computers played a key role in the analysis.) Training for coders and editors accordingly placed emphasis on prevention of those errors, and every effort was made to reduce errors in the early stages of data processing, to avoid a compounding of errors at later stages.

During the processing of the census data, automation enabled the coding and editing teams to receive prompt feedback on their error rates. The teams held brief weekly meetings to discuss coding problems and solutions, and evaluation teams also offered suggestions for improving the coding work.

■ Analysis

According to Cho and Hearn (1984: xiii), census bureaus should coordinate analytical studies to ensure the fullest use of census data and avoid duplication of effort. The bureaus may conduct some of the studies themselves, but they should also encourage other agencies inside and outside of government to use the census data for their own analyses.

Perhaps because the analysis stage of the 1990 census round is still some years away, little discussion at the population conference dealt with census offices' plans for using automation to analyze their census results.

Joseph Lee told conference participants that Hong Kong's Census and Statistics Department plans to use microcomputers and spread-

sheet software to prepare detailed tabulations for its census reports.

Sun Jingxin reported that China plans some 500 tabulations for the 1990 census, many more than in the last census. The State Statistical Bureau will pay particular attention to the practical usefulness of the tabulations. Cautioning that computer editing and imputation need to be programmed carefully, Sun suggested that computer-generated tabulations be compared with tabulations derived from other sources, such as previous censuses, to ensure consistency and accuracy.

■ Dissemination

Recent developments in computer hardware and software designed for the publishing field offer many advantages for census publications: greater speed and accuracy of production, attractive formats, and lower cost. Several representatives at the census conference indicated that their governments are planning to use the new technology to produce reports from the 1990 census round. Census bureaus are also planning to use nonprint media to communicate the results to various readerships. Some of the computer technologies now available have greatly increased the ease and speed with which users can access census data for their own analyses.

Several countries, including Hong Kong and New Zealand, have either decided to use or are considering the use of desktop publishing software for producing their census reports because of its time-saving capability and high-quality production standards. One such system mentioned by several conference participants is Ventura, which is less

costly and more user-friendly than some other systems.

In Australia, besides publishing standard statistical publications, a special analytical series, and a series of technical and information papers, the Bureau of Statistics will produce magnetic tape files for use on mainframe computers, a series of products on floppy disk with spreadsheet facilities, a compact-disk read-only memory (CD-ROM) with software enabling users to produce their own maps and tables, and tabulations on microfiche.

New Zealand's Department of Statistics intends to make census reports, tabulations, and maps available in print and on magnetic tape, floppy disks, and compact disks. Similarly, Hong Kong will use electronic mail to supplement printed press releases about the census.

Other census offices in the region are exploring some of these alternatives as well, though most of them have not yet formulated their plans for this last stage of the census. Rapidly evolving communications technology may offer them new possibilities before choices must be made.

■ Summary and conclusion

Recent advances in computer automation offer all governments of the Asia-Pacific region opportunities for improving the accuracy, efficiency, and speed of their census operations while reducing the need for clerical personnel and thus permitting savings in personnel costs. The technologies can be used at each stage of the census, from preparation to publications. Most of those discussed at the Twelfth Population

Census are designed to make the planning, editing, processing, analysis, and publication of census data more reliable and efficient.

Of course, technology alone cannot overcome the challenges that census offices face, especially in countries where high rates of illiteracy preclude the labor-saving approach of having respondents complete the census forms themselves. But it enables even the governments facing the most difficult organizational problems—countries such as China, India, Indonesia, and Pakistan, with huge populations and limited financial resources—to make significant improvements in their forthcoming censuses, especially if the technology is combined with attention to quality-control in staff training and performance.

The advice offered by Joseph Lee in the conclusion of his paper (1988:8) sums up the views of many conference participants from developing countries toward the possibilities offered by advances in computer technology: "Although there is a whole range of automation possibilities which can improve efficiency, a word of caution should be added. The systems developed must be simple, because they will be operated by a work force with minimal computer training. They must be fully tested and proven reliable. [Finally,] the equipment must be reasonably priced and should continue to be usable after the completion of the census."

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Thanks are due to Fred Arnold, Linda G. Martin, and Minja Kim Choe for their comments on an

earlier draft of this article. I am also grateful to the conference participants for providing the information on which most of this article is based.

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INFANT MORTALITY . . .

(continued from page 20)

providing clean water and adequate sanitation in an atoll environment, especially in areas of high population density as on Majuro and

Diarrheal disease and respiratory infections remain major causes of death among infants and young children.

Ebeye. These problems are compounded by poor housing and crowded living conditions. In developed countries, reductions in infant mortality rates have usually been as-

sociated with reductions in diarrheal diseases and respiratory infections (Rohde 1983).

The need to improve water supplies, sanitation, and housing conditions is well recognized in the Marshall Islands, and a high proportion of national resources has been allocated recently to address these problems. In addition, greater emphasis has been placed on preventive and primary health care services, which will undoubtedly play an important role in the further reduction of infant mortality in the Marshall Islands.

Given the improvements taking place in sanitation and water sup-

plies in the urban areas of the Marshall Islands, recent estimates of infant mortality are already out of date. Accurate current data are needed to provide the best possible estimate of infant mortality today, particularly if infant mortality rates are to be used as a means of evaluating the effects of the new public health interventions over time.

Improved data quality can be attained only through better field work, which requires well-tested questionnaires containing essential questions only and well-trained field staff. The 1973 census demonstrated that this quality can be achieved.

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NEWS . . .

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papers deal with U.S. immigration policy and the Mexican economy, projected imbalances between labor supply and labor demand in the Caribbean, segregation and residential assimilation of immigrants to the United States, and political adaptation of Hispanic immigrants to the United States. A complete list of papers and order information is available from:

Library/Information Clearinghouse
The Urban Institute
P.O. Box 7273, Dept. C
Washington, D.C. 20044, USA

The Population Council has named **Peter J. Donaldson** as its new Senior Representative to develop and manage regional program activities in South and Southeast Asia. Dr. Donaldson, who will assume his duties at the Council's Bangkok office on 1 July, succeeds Dr. Barnett Baron, who has returned to the Council's New York headquarters after many years in Asia.

A sociologist, Dr. Donaldson is currently Study Director of the Committee on Population of the Commission on Behavioral and Social Sciences and Education at the National Academy of Sciences in Washington, D.C. Earlier he served as Director of Development and Government Relations and Director of International and Special Projects at Family Health International in Durham, North Carolina, and as the Population Council's representative in the Republic of Korea and Staff Associate in Thailand.

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Family Planning Communication between Spouses in Sri Lanka

*Thomas T. Kane
and Siva Sivasubramaniam*

During recent years there has been an increasing recognition of the importance of communication between spouses in successful family planning behavior (Severy 1982; Polit-O'Hare and Kahn 1985). Some recent studies have also examined the inconsistencies in husband-wife fertility attitudes and reporting of contracep-

tive use (Card 1978; Coombs and Chang 1981; Koenig et al. 1984).

Other studies have examined the role of wives and husbands in contraceptive decision making (Hollerbach 1980; Severy 1984; Bean et al. 1984; Sayed et al. 1985; Cook and Maine 1987; Alcantara 1988; Nag and Duza 1988; Warren et al. 1988). Germain (1987) calls attention to the need for greater male responsibility and participation in contraceptive communication and behavior.

The results of these studies have policy implications for family planning programs and efforts to improve the status of women around the world because they demonstrate the important roles played by both sexes in the adoption and effective use of family planning and suggest ways that family planning information and education might be more effectively delivered to couples wishing to practice contraception.

Drawing upon data from a national follow-up survey conducted in Sri Lanka in 1985, this study examines

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The EAST-WEST CENTER is a public, nonprofit educational institution with an international board of governors. Some 2,000 research fellows, graduate students, and professionals in business and government each year work with the Center's international staff in cooperative study, training, and research. They examine major issues related to population, resources and development, the environment, culture, and communication in Asia, the Pacific, and the United States. The Center was established in 1960 by the United States Congress, which provides principal funding. Support also comes from more than 20 Asian and Pacific governments, as well as private agencies and corporations.

patterns of family planning communication between spouses, social and economic factors related to those patterns, and the consistency between spouses in their responses to questions about family planning attitudes and practice. Family planning communication between

Discussion of family planning by married couples is common in Sri Lanka, although the degree varies according to their family size and wives' education, residence, and religion.

spouses is found to be very common in Sri Lanka, although significant differences are observed according to wives' level of education, number of living children, place of residence, and religion.

■ **Data and study design**

In 1982 the Sri Lankan Department of Census and Statistics conducted a national survey, called the Contraceptive Prevalence Survey (CPS), of more than 4,000 currently married women between the ages of 15 and 49 living in all 24 districts of the country. In 1985 the same department conducted a national follow-up survey, known as the Sri Lankan Contraceptive Survey (SLCS). Financial and technical assistance was provided by Westinghouse Health Systems for the CPS and by Family Health International for the SLCS.

Because of political disturbances in the northern and eastern regions of the country, the 1985 SLCS excluded seven of the 24 government districts. The seven excluded districts contained about 15 percent of

the original sample, which included a higher proportion of Sri Lankan Tamils than the national average.¹

A total of 2,310 (76.4 percent) of the original 1982 CPS respondents who were living in the 17 districts included in the 1985 SLCS were successfully reinterviewed, along with a randomly selected sample of 577 (one-fourth) of the interviewed womens' husbands. Wives and husbands were interviewed separately. The interview responses of the 577 husbands were matched to those of their wives for the analysis of husband and wife communication.

All couples in the SLCS had been married for three or more years and the wives were between the ages of 18 and 49. The sample was divided into three residential groups—urban, rural, and those living on tea estates, or plantations.

The 1985 main sample (of wives unmatched with husbands) and the subsample (of wives matched with husbands) were both remarkably representative of women in the 1982 CPS sample of comparable ages and marital durations who had been living in the 17 districts (Table 1). A slightly higher proportion of Indian Tamils, however, was included in the 1985 subsample of husbands. It is possible that husbands living on tea estates were slightly more accessible for interviews than were husbands living in other areas covered in the 1985 survey.

Contraceptive prevalence reported by women in the main 1985 SLCS sample (69.0 percent) and by the wives whose husbands were also interviewed (70.7 percent) was higher than that of the comparable group of women in the 1982 CPS (61.6 percent). This finding suggests that contraceptive prevalence may have

increased during the intervening period (Sri Lanka Department of Census and Statistics and Family Health International 1987), at least among women of ages 18-49, married for three or more years, and living in the 17 districts covered in the 1985 survey.

An important criterion for successful contraceptive behavior is the degree of communication between spouses. Married couples who possess similar attitudes and preferences regarding family size and contraception are more likely than other couples to take joint action to

Spouses who have similar attitudes and preferences regarding family size and contraception are more likely than other couples to take joint action to achieve their fertility goals.

Table 1. Percentage distribution of the 1982 CPS and 1985 SLCS samples, by selected characteristics

Characteristic	1982 CPS ^a	1985 SLCS, all wives	1985 SLCS, wives of male subsample
Age			
<20	1.2	0.3	0.9
20-24	10.8	7.0	9.1
25-29	20.1	16.9	19.9
30-34	22.1	23.1	21.0
35-39	19.4	22.0	20.4
40-44	13.9	16.9	18.7
45-49	12.5	13.8	9.9
All ages	100.0	100.0	100.0
Education			
No schooling	14.7	12.6	15.8
1-9 years	34.1	34.8	31.3
10+ years	51.4	52.6	52.8
All educational groups	100.0	100.0	100.0
Ethnicity			
Sinhalese	85.7	87.3	83.0
Sri Lankan Tamil	2.0	1.1	1.0
Indian Tamil	7.3	7.8	11.1
Moor	4.5	3.6	4.7
Other	0.5	0.2	0.2
All ethnic groups	100.0	100.0	100.0
Religion			
Buddhist	80.6	82.4	78.9
Hindu	7.7	7.7	11.8
Islamic	4.9	3.7	4.3
Catholic	6.3	5.6	4.3
Other Christian	0.6	0.6	0.7
All religious groups	100.0	100.0	100.0
Contraceptive prevalence (percentage currently using)	61.6	69.0	70.7
(Number)	(3,120)	(2,310)	(577)

Note: Percentages may not sum exactly to 100.0 because of rounding.

a. For the purpose of comparison with the 1985 SLCS sample, this tabulation of the 1982 CPS sample consists of respondents who were all living in the 17 districts included in the SLCS, were married for three or more years, and were between 18 and 49 years of age.

achieve their fertility goals. In contrast, couples who have limited communication or do not agree on matters of family planning, especially those using the most temporary methods, are less likely to practice contraception effectively.

Successful communication involves general discussion of family planning, desired family size, which contraceptive method or methods the couple should use, and such specific issues as the cost of the method, how the method works, possible side effects, and how to use the method correctly. Communication between spouses is particularly important for the successful use of temporary methods, both traditional and modern, that require the participation of both partners.

Both the husbands' and the wives' questionnaires from the 1985 survey included questions designed to elicit information about family planning communication between spouses and the degree of agreement between them about desired family size, method preferences, and contraceptive use. Questions about the attitudes, preferences, and behavior of the respondent's spouse were included to shed further light on the degree of communication between spouses. Information (not discussed in this article) was also collected on the actual contraceptive decision-making process.

First, we used cross-tabulations to examine sociodemographic factors related to whether respondents discussed family planning and their family-size preferences with their spouses, and to find out whether their spouses had been a source of information about contraceptive methods.

Next, we used multivariate logistic regression to analyze the determinants of family planning communication between spouses.

Finally, we examined the degree of consistency between spouses in their reports of family planning communication with their marriage partner, their reports of their own and the spouse's desired family size, and their reports of the contraceptive method they were currently using. We also investigated a possible link between inconsistency of spouses' fertility desires and contraceptive use failure.

■ Findings

Cross-tabulations. To explore the bivariate relationship between family planning communication and selected sociodemographic variables, we ran a series of basic cross-tabulations separately for the subsample of 577 wives and their husbands from the SLCS. The sociodemographic variables were wives' current age and age at marriage, number of living children, education, residence, religion, desire for more children, and wives' work status.

Discussion of family planning. Discussion of family planning by spouses often precedes or accompanies their use of contraception. Some couples, however, may discuss family planning without using any method, or they may not discuss

family planning matters although one partner uses a method.

Approximately three-fourths of the women and men in the Sri Lanka sample (76 and 74 percent, respectively) reported that they discussed family planning with their spouses. However, fewer than 10 percent of the wives and husbands

reported that they had discussed family planning with the other spouse before their first child was born. For most couples, therefore, family planning communication and the use of contraception appeared to be for the purpose of spacing or limiting births rather than to delay the first pregnancy after marriage.

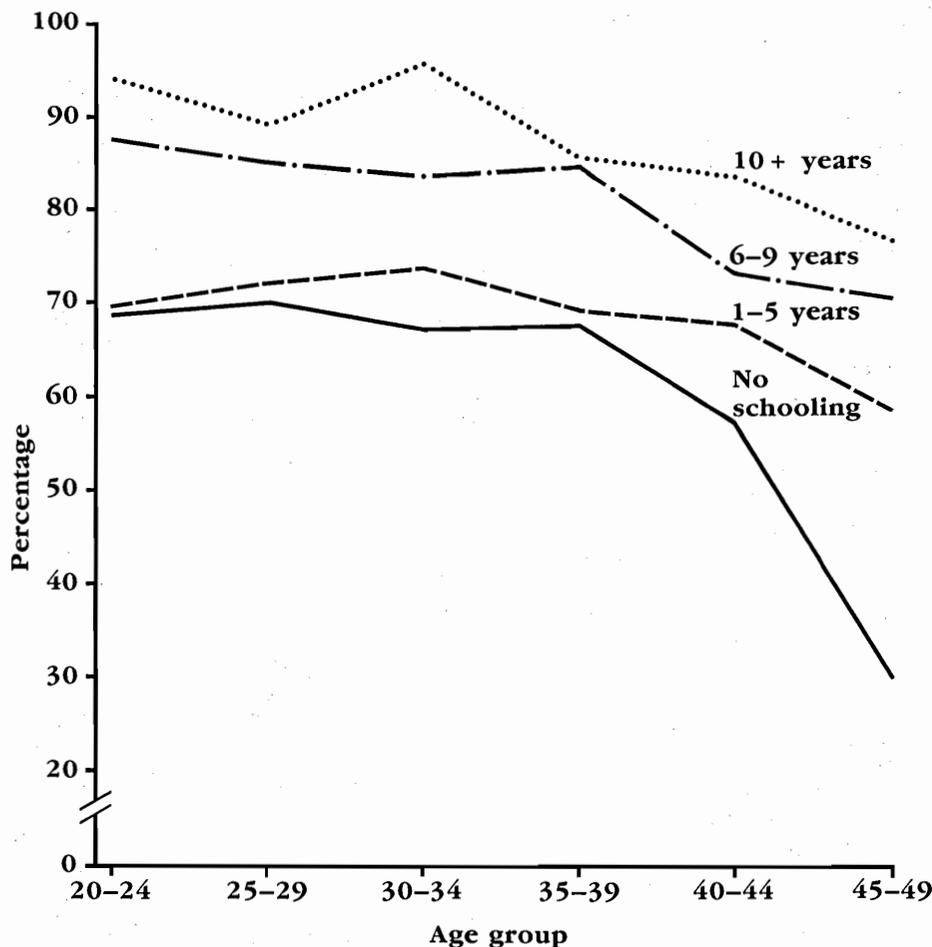


Figure 1. Percentage of wives reporting that they discussed family planning with their husbands, by age and education of women: SLCS

For most Sri Lankan couples, contraception appears to be used for spacing or stopping rather than to delay the first pregnancy.

The proportion of wives who said they discussed family planning with their husbands was positively related to women's educational level and negatively related to women's age. In other words, younger and more educated women were more likely than others to discuss family planning issues with their spouses (Figure 1). A similar pattern was observed from the reports by the husbands.

Younger and more educated women were more likely than others to discuss family planning issues with their spouses.

One would expect family planning communication to be positively related to the strength of spouses' motivation to use contraception. As expected, a higher proportion of wives who did not want any more children reported that they discussed family planning with their husbands than did women who wanted more children, although among both groups the proportions who had such discussions were high. This pattern held for all age groups. Among Sri Lankan women, therefore, the desire to terminate childbearing appears to be related to an increased likelihood of communication with their husbands

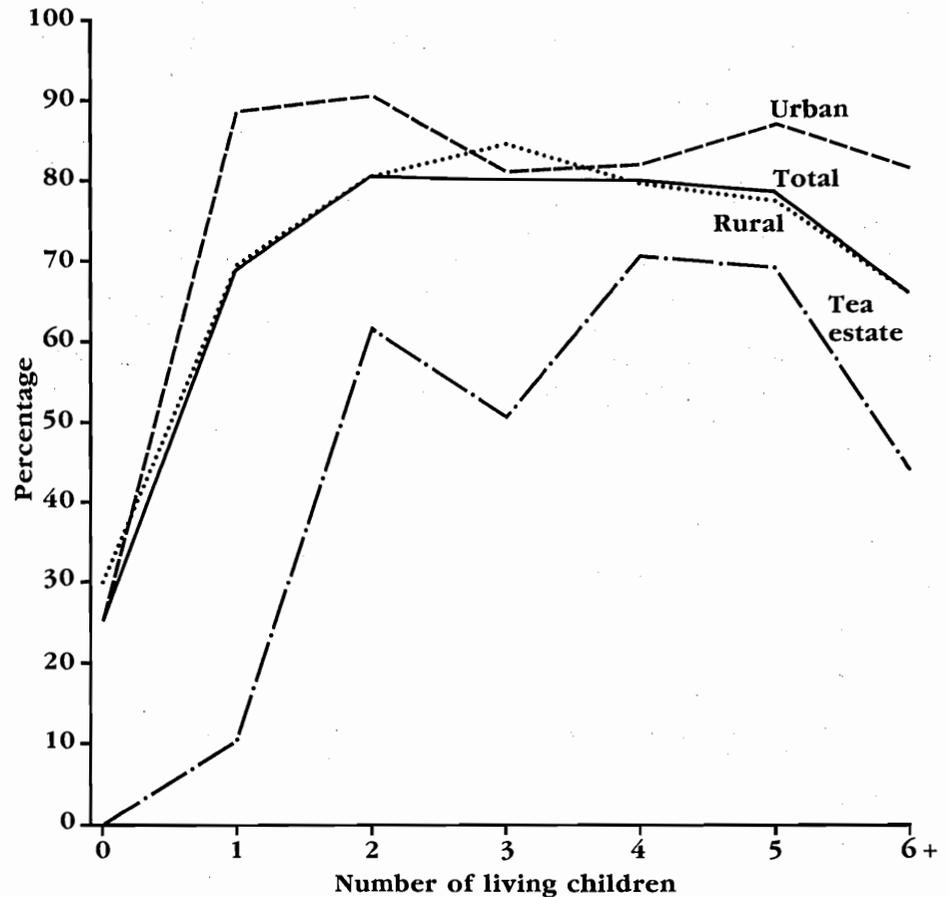


Figure 2. Percentage of wives reporting that they discussed family planning with their husbands, by number of living children and place of residence: SLCS

about family planning.

More than four-fifths (81 percent) of urban wives reported that they had discussed family planning with their husbands, as did a similar proportion (75 percent) of wives living in rural areas. But on tea estates only one-half of the married women said they discussed family planning with their husbands (Figure 2). A similar residential pattern was found among husbands

reporting on whether they had discussed family planning with their wives. Thus, in Sri Lanka it appears that urban couples communicate the most about family planning and couples living on tea estates communicate the least.

The proportion of wives reporting that they discussed family planning with their husbands was lowest among women with no living children and highest among

women with between two and four living children. As shown in Figure 2, discussion of family planning with husbands was less common among women with one child and for women with six or more children than among those of intermediate family sizes, regardless of their place of residence.

It appears that for many couples with one child or no children, discussion of family planning had not yet been initiated. Among those

with the largest number of living children, however, it is possible that some couples made little effort to control their fertility, whereas others may have underreported the degree of family planning communication because childbearing had already been terminated through sterilization or menopause.

Discussion of family planning with husbands was greatest among wives working in nonagricultural jobs (80 percent), followed by non-

working wives (76 percent). It was lowest among wives working in agriculture but even so characterized the majority (61 percent) of that group (data not shown).

Spouse as a source of information about contraception. Often the spouse is an important source of information about contraceptive methods. All respondents who had heard of specific contraceptive methods were asked open-ended questions about how and where

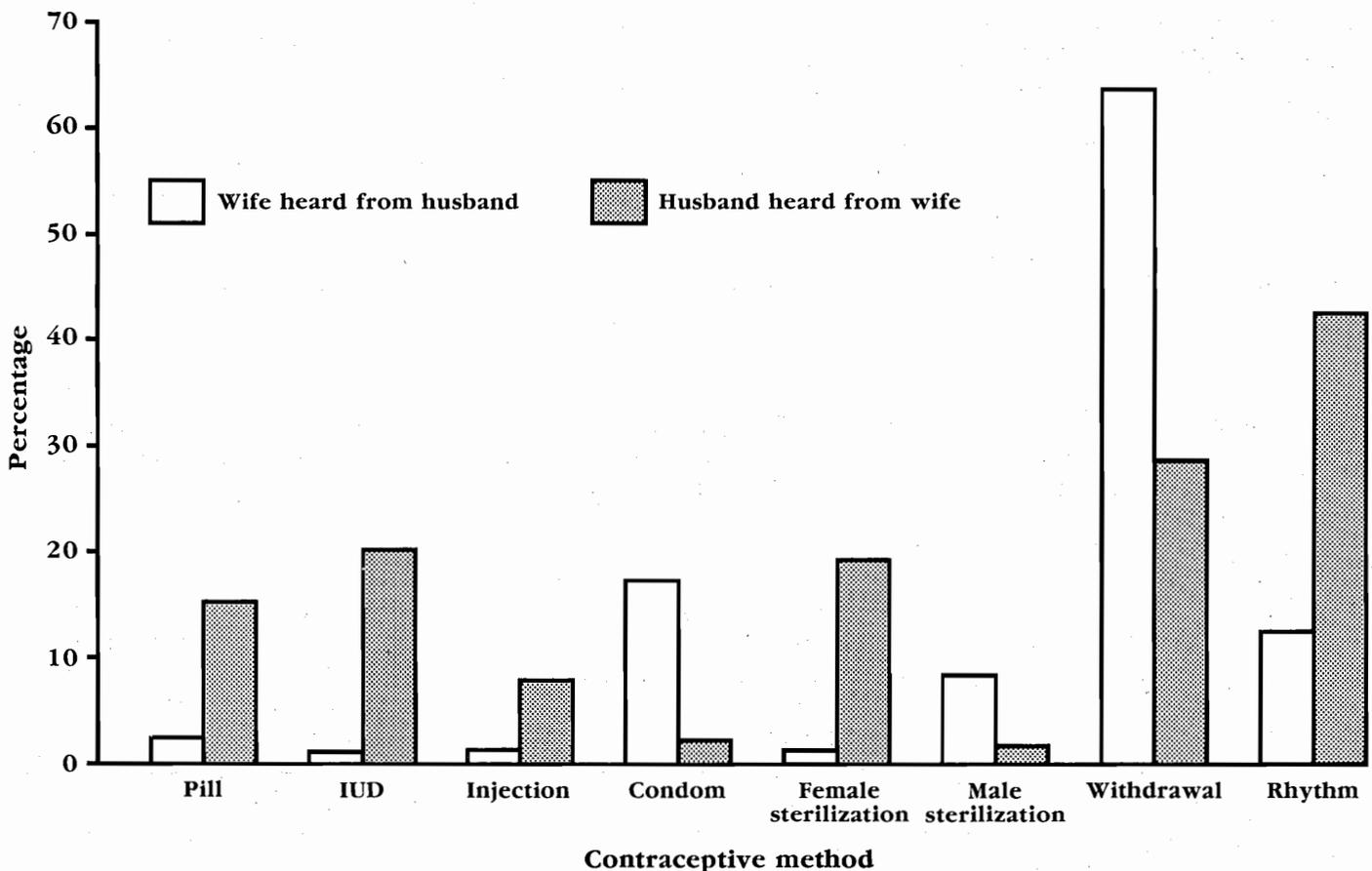


Figure 3. Percentage of wives and husbands reporting that they had heard about a contraceptive method from their spouse, by method: SLCS

they had first heard about the method. For every method mentioned in the SLCS questionnaire, at least some wives and husbands reported having heard about it from the other spouse (Figure 3). Wives were much more likely to have heard about the male methods (e.g., condom, male sterilization, withdrawal) from their husbands than their husbands were to have heard about those methods from their wives. Husbands, on the other hand, were much more likely to have heard about female methods from their wives than their wives were to have heard about those methods from their husbands.

The spouse was a main source of information about withdrawal (more than 60 percent of the wives reported hearing of it from their husbands) and rhythm (more than 40 percent of the husbands had heard of it from their wives). About one-fifth of husbands had heard about the intrauterine device (IUD) and female sterilization from their wives, whereas almost one-fifth of the wives had heard about condoms from their husbands.

Communication about desired family size. More than half of the wives (53 percent) and two-thirds of the husbands reported that they had discussed with their spouses how many children they wanted to have. The proportion of wives who discussed with their husbands the number of children they desired was negatively associated with the wives' age and positively associated with their level of education (Figure 4).

This pattern of variation by education and age was similar to that observed for the discussion of family planning. Among women 20-24

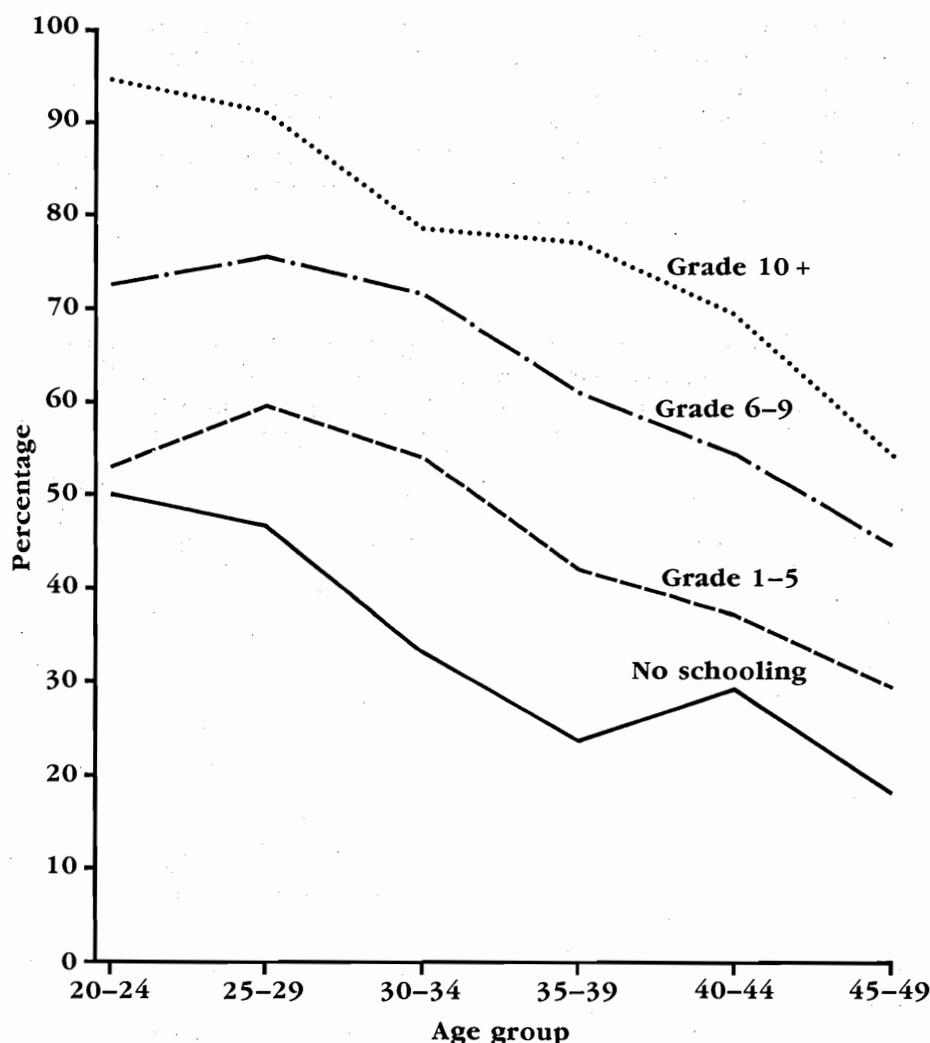


Figure 4. Percentage of wives reporting that they discussed desired number of children with their husbands, by age and education of women: SLCS

years old, only half who had no schooling reported that they discussed their desired number of children with their spouses, compared with 94 percent of women in the same age group with 10 or more years of education. Similar patterns were observed for the husbands.

Multivariate logistic regression analysis. We developed two multivariate logistic regression models to determine which sociodemographic factors were associated with communication between spouses about family planning and their desired number of children. In the

first model the dependent variable was the dichotomous (yes/no) variable of "wife's discussion of family planning with husband," and in the second model it was the dichotomous variable of "wife's discussion

of the desired number of children with husband." In both models wife's age, number of living children, education, desire for more children, religion, age at marriage, and the couple's place of residence

served as the independent variables. For the regression analysis we used the entire 1985 female sample of 2,310 women.

The effect of each independent variable on the dependent variable is indicated by the odds ratios for each variable category relative to the reference category (odds ratio of 1.0). These ratios and the 95 percent confidence intervals for each are shown in Table 2. The odds ratios show the likelihood of women in each category discussing family planning or number of desired children with their husbands relative to the same likelihood among women in the reference category, while controlling for all other variables in the model. Odds ratios of less than 1.00 imply a lower likelihood of discussion than that reported by each reference group, whereas those greater than 1.00 indicate a higher likelihood.

Discussion of family planning.

The analysis revealed that number of living children, education, place of residence, and religion were significant predictors of whether women had discussed family planning with their husbands, but that women's current age, age at marriage, and desire for more children were not. Women with two or three living children were nearly twice as likely as women with one or no children to have discussed family planning with their spouses. Those with 10 or more years of education were two and a half times more likely than women with no schooling to have had such discussions.

Both urban and rural women were much more likely to have discussed family planning than were women living on tea estates (most of whom, as we have already men-

Table 2. Likelihood of wife's discussing family planning with husband, by sociodemographic characteristics of women: results of multivariate logistic regression analysis, SLCS

Characteristic	Discussed family planning with spouse		Discussed number of children with spouse	
	Odds ratio ^a	Confidence interval	Odds ratio ^a	Confidence interval
Current age				
18-29 ^b	1.00	—	1.00	—
30-39	0.81	0.56-1.18	0.66*	0.51-0.86
40-49	0.65	0.42-1.01	0.38*	0.27-0.51
Number of living children				
0-1 ^b	1.00	—	1.00	—
2-3	1.93*	1.12-3.31	1.00	0.70-1.43
4+	1.48	0.82-2.67	0.45*	0.30-0.67
Education				
No schooling ^b	1.00	—	1.00	—
1-5 years	0.85	0.56-1.29	1.50*	1.07-2.11
6-9 years	1.52	0.96-2.40	2.38*	1.69-3.37
10+ years	2.55*	1.36-4.80	3.49*	2.29-5.32
Desire more children				
No ^b	1.00	—	1.00	—
Yes	1.16	0.74-1.80	0.95	0.71-1.27
Age at marriage				
<20 years ^b	1.00	—	1.00	—
20-24 years	1.24	0.92-1.70	1.20	0.97-1.49
25+ years	1.26	0.80-1.99	1.18	0.86-1.61
Residence				
Tea estate ^b	1.00	—	1.00	—
Urban	3.75*	1.80-7.81	3.51*	1.89-6.55
Rural	2.68*	1.37-5.24	2.50*	1.37-4.58
Religion				
Christian ^b	1.00	—	1.00	—
Buddhist	0.78	0.41-1.49	1.22	0.81-1.83
Hindu	0.67	0.28-1.60	0.51	0.25-1.02
Islamic	0.32*	0.13-0.78	0.52	0.23-1.20
(Number of cases)	(2,310) ^c		(2,310) ^c	

*Significant at .05 level (95 percent confidence interval).

a. Obtained from a multivariate logistic regression model that controls for other variables included in the table.

b. Reference category.

c. Logistic regression is based on the total female sample.

Table 3. Consistency of wives' and husbands' responses about family planning communication with spouse (percentage distribution): SILCS

Response	Did respondent discuss family planning with spouse?	Did respondent discuss desired number of children with spouse?
Consistent responses	81	65
Both say yes	78	43
Both say no	3	22
Inconsistent responses	19	35
Husband says yes, wife says no	11	24
Husband says no, wife says yes	8	11
All responses	100	100
(Number of respondents)	(458) ^a	(577)

a. Excludes cases in which one or both spouses were not asked the question because of screening questions and skip patterns. It was assumed, however, that wives and husbands who were not asked the question about discussing family planning did not in fact discuss it, judging from their responses to earlier screening questions.

tioned, were Indian Tamils). Islamic women were much less likely to have discussed family planning with their husbands than were Christian women, the religious reference group. Buddhist and Hindu women also showed a lower likelihood of discussing family planning with their spouses compared with Chris-

Both urban and rural women were much more likely to have discussed family planning with their husbands than were women living on tea estates.

tians, but these differences were less pronounced than for the Muslim group and were not significant at the 95 percent confidence level. Other differences between subgroups shown in the first column of Table 2 were also not statistically significant.

Discussion of number of children desired. The significant predictors of whether women had discussed their desired family size with their spouses were the women's current age, number of living children, education, and residence. Women of ages 30 and over were less likely than younger women to have talked about their family-size preferences, as were women with four or more children (compared with women having one or no children). Women with some education and urban and rural women were more likely than women with no education and women living on tea estates to have discussed their family-size preferences.

Consistency between wives' and husbands' reports. One indication of how good the communication is between spouses about family planning and their family-size preferences is to compare husbands' and wives' responses to

questions on these topics. We matched and cross-classified responses of the 577 husbands in the 1985 subsample with those of their wives to determine how well one spouse knew the other's fertility preferences and behavior and to measure the extent of agreement and consistency between spouses.

Consistency in reported communication about family planning and fertility preferences. Both husbands and wives were asked whether they discussed family planning matters and whether they discussed their desired number of children with their spouses. Four-fifths of the couples gave consistent responses to the question about discussing family planning, whereas only two-thirds gave consistent responses to the question about discussing the desired number of children (Table 3). In most of the inconsistent cases the husband reported that they discussed the topic and the wife reported that they did not.

Consistency in reported fertility desires. Respondents were asked how many children they desired to have. Among half (51 percent) of the couples, both spouses expressed the same desired family size (Table 4). For slightly more than one-fourth (28 percent) of the couples, the wives' desired family size was greater than their husbands', whereas for slightly less than one-fourth of the sample (22 percent), the wives wanted fewer children than their husbands.

The overall mean number of children desired by both wives and husbands who stated a numerical preference was approximately 3.4, although the mean was slightly higher for wives than for husbands.

Among spouses who stated a numerical preference, the overall mean number of children desired by both wives and husbands was about 3.4.

Wives were about three times more likely than husbands (9 versus 3 percent) to give an open-ended response, such as "as many as possible" or "as many as God sends," to the question about number of children desired. The open-ended responses were excluded from the calculations of desired family size.

We also examined each spouse's knowledge of the other spouse's desired family size (data not shown). Although for a majority of couples the husband or wife cor-

rectly stated the other's desired family size, wives tended to overestimate slightly their husbands' desire for more children, whereas husbands tended to underestimate slightly their wives' desire for more children.

Consistency in reported current contraceptive use. About four-fifths of the couples gave consistent responses to a question about the contraceptive method they were currently using (data not shown). More husbands than wives, however, reported current use of condoms, rhythm, withdrawal, and abstinence (Table 5). Possible explanations for this difference are that some women forgot or were too embarrassed to report male methods (condoms and withdrawal), that some women did not know that their husbands were practicing

periodic abstinence for contraceptive purposes, and that some husbands may have reported some past use of traditional methods as current use, thus producing an overestimate of contraceptive prevalence reported by the husbands.

Consistency of fertility desires and incidence of contraceptive failure. Couples with inconsistent fertility desires who relied on temporary methods requiring male involvement (condoms, withdrawal, or rhythm) were much more likely to have experienced an accidental pregnancy (reported by wives) than were couples with consistent fertility desires using those methods (Table 6). The difference in accidental pregnancy rates between the two groups, however, was not statistical-

(continued on page 33)

Table 4. Consistency of wives' and husbands' reported fertility desires (percentage distribution): SLCS

Consistency/inconsistency of responses to question about desired number of children	%
Wife's reported number equals husband's	51
Wife's reported number is greater than husband's	28
Wife's reported number is fewer than husband's	22
Total	100
(Number of respondents)	(510) ^a

a. Excludes 67 cases in which either the husband or the wife (or both) gave a non-numerical response to the question on desired family size (e.g., "as many as possible," "up to God").

Table 5. Consistency of wives' and husbands' reports of current contraceptive use, by method (percentage reporting use): SLCS

Method	Husbands	Wives	Difference between husbands and wives
Pill	3.8	2.6	1.2
IUD	3.3	3.5	-0.2
Condom	6.8	3.8	3.0
Injection	1.4	0.9	0.5
Female sterilization	32.6	32.9	-0.3
Male sterilization	9.7	8.5	1.2
Withdrawal	14.9	10.7	4.2
Rhythm	21.5	13.9	7.6
Abstinence	7.1	3.8	3.3
All methods ^a	80.6	70.7	9.9
(Number of respondents)	(577)	(577)	

Note: Couples had been married for three or more years.

a. Total contraceptive prevalence is less than the sum of method-specific prevalence estimates because persons using several methods in combination were counted more than once.

The Use of Sampling in Conjunction with Population Censuses

by Vijay Verma

IN MOST COUNTRIES today the decennial census of population is the primary source of geographically detailed information on the basic demographic and related characteristics of the population. Many demographers agree that a population census need not gather all demographic and housing information on a 100 percent basis. According to the United Nations (1971:2), "The use of sampling actually saves a good deal of time and money; and, furthermore, in certain circumstances, only the sampling approach ensures data of acceptable accuracy."

As elsewhere, in Asia and the Pacific the practice of governments is increasingly to collect information on their populations' size, age and sex composition, geographic distribution, and certain other basic demographic and socioeconomic characteristics on the basis of a complete (100 percent) enumeration, and to supplement this basic information by collecting information on a larger range of variables on a sample basis. The additional information, which is gathered as

part of the census operation, may be related to such population characteristics as migration, employment, fertility, and health.

For example, among the 19 countries of the Asian and Pacific region (including the United States) for which information is available about the 1980 census round, as many as 12 employed complete and sample enumerations in combination, whereas in the remaining seven only complete enumeration was used (Cho and Hearn 1984). In the 1990 round the use of sampling to supplement complete enumeration can be expected to be even more widespread.

The purpose of combining the census with a sample is to exploit comparative advantages of each of the two schemes. These relative advantages tend to be complementary: one method is strong where the other is weak, and vice versa.

By combining the census with a sample survey it is possible to exploit the advantages of each.

A complete census is generally indispensable for obtaining information about small domains and local areas, and also for obtaining politically important data, which, for legal and political reasons, must be

seen to be free from sampling variability. Furthermore, a census can often secure more complete coverage of the population than that usually achieved with samples. These are the fundamental reasons for using sampling in combination with, rather than as a substitute for, complete enumeration.

However, enumeration of the entire population requires mobilization of financial and human resources on a huge scale. This need, combined with the difficulties of maintaining high quality of training and supervision, means that the type of information collected in a census, while extensive in coverage, must be simple and brief in content. Simplicity is also necessary to keep the volume of the data to be processed within manageable limits.

A complete census, therefore, is typically confined to obtaining a detailed picture of the number (size) and basic structural characteristics of the entire population, with as much detail as possible about small domains and especially about local areas. This generalization applies to all types of censuses, whether of human populations, economic establishments, or agricultural holdings.

In contrast, sample surveys of a population, by virtue of their smaller size, can be designed to obtain—and to obtain more quickly

and more frequently—a wider variety of more complex data. They can be tailored to fit a variety of needs and methods of collection. And they can be much less expensive than censuses.

Such complex data are not gathered in a complete census; to attempt to do so would result in very high costs and, more seriously, in low quality and major delays. The disadvantage of surveys, in turn, is that generally they cannot yield reliable data for small domains or local areas.

These contrasts between complete censuses and sample surveys tend to be more striking for larger populations, less so for smaller ones.

Combining data collection on a 100 percent and a sample basis during the census is just one way (albeit the most important) that sampling is used in conjunction with the census. Complete census and sampling can be used in combination or in related ways with the objective of capturing the advantages of each. These applications include:

- using sampling in the *design and control* of census operations, such as in planning, testing, controlling, and evaluating the census
- using sample enumeration to *supplement* the items covered in the complete census
- sampling the census results for *processing*, with the objective of making the results available more quickly and at lower cost
- extracting samples of microlevel files of detailed census data so as to facilitate *dissemination of primary data* more widely for analysis by other users
- using the census as a *basis for sample surveys* by enhancing its

statistical capability and resources and by providing baseline data, population controls for estimation, and sampling frames for surveys in the postcensal period; also using the census and postcensal sample survey data in combination to provide estimates for local areas and small domains

- in certain circumstances substituting one or a series of sample enumerations for a complete enumeration

In considering the general issues involved in these uses of samples and censuses, my major focus will be on the second use—that is, combining complete enumeration and sampling at the data collection stage (Kish and Verma 1986; Murthy 1980). The discussion draws upon illustrations from recent practices of Asian and Pacific countries.

■ Sampling for the design and control of census operations

Pilot studies are needed to test the adequacy of census questionnaires, instructions, training programs, enumeration procedures, field organization, etc. They provide not only practical training for the core staff and supervisors, but also information on operational aspects (costs and time) of the enumeration.

For pilots, it is usually difficult to insist on good samples of the entire country. The common practice is to choose areas that are convenient but are also expected to yield a good test of questions and techniques in diverse circumstances. This approach assumes that the diverse circumstances, and especially areas of particular difficulty, are identifiable.

To yield full benefits, the tests should be conducted through all stages of collection, processing, and examination of results. For such a large undertaking as the census, accurate operational information on the conditions and requirements of the enumeration is essential for proper planning and execution.

Statistical quality control techniques are sometimes used to assess and control the work of individual operators and operations. Various sampling plans have been developed with the objective of reducing the cost of verifying the operatives' work and ensuring a specified quality level for the outcome. Procedures should be developed for each situation, suited to actual field conditions and procedures of supervision.

As distinct from quality and operational control measures, evaluation surveys are designed to check the average quality of the census and its major components. In designing sample surveys to check and evaluate census work, census planners need to consider a number of choices.

One is the timing of the supplementary operation (or operations) in relation to the main census operations of listing and enumeration. These may be separate or combined in various ways. Another is whether the test is to use ordinary census enumerators or a specially trained group of enumerators. A third decision is whether the test procedures (which are normally more elaborate than the enumeration itself) are to augment or instead replace the ordinary census operations in the selected sample areas. If the former course is chosen, a related consideration is

whether the test is to be conducted independently of or on the basis of the results already obtained. The size and design of the test sample (or samples) must also be determined, as must the relationship between different samples attached to the census for different purposes.

Census-check operations are of two types: those that help census personnel assess coverage errors related to the duplication and omission of households and persons, and those that detect content errors related to the accuracy of responses.

Checks of coverage completeness usually take place immediately after the regular census as a separate and additional operation, and involve enumerating all households, individuals, or other units within a sample of enumeration areas (EAs). The standards of supervision in the test are usually more strict than in the census itself. Check enumeration is typically done by referring to the first enumeration. For example, check enumerators are given previously prepared lists of units in the sample areas and instructed to find missed units. An alternative approach is to use what are called "dual coverage techniques" for estimating undercoverage. In this approach the check enumerators use lists of households (or other units) from entirely independent sources.

Checks on content tend to be more varied in design. One may use a postenumeration survey (PES), which is usually done shortly after the census, or a sample enumeration of high quality done simultaneously with the census. In the latter case, a sample of EAs is covered (possibly after subsampling is done within the EAs) with better and more intensive methods than those

used elsewhere. This arrangement entails less additional expense and respondent burden than does double coverage of sample areas, but it measures only net differences at the aggregate level and does so with greater sampling variance.

Whatever the method chosen, it is generally advisable to use special procedures designed to identify individual coverage and content errors and their sources so as to assess gross errors, including bias, and identify measures necessary to minimize their effects. The results of the census-check operations should be used, to the extent possible, in conjunction with information available from other sources, such as past censuses, surveys, and administrative data, as well as from substantive and analytical relationships between various demographic parameters.

The objectives of the test should be clearly specified and sufficiently modest to be attainable with given resources. In too many cases quality checks have failed to yield data of sufficient quality to be useful, despite the high costs involved.

It is often too difficult and expensive to use good samples of the entire country for quality checks. It may be necessary to draw inferences from selected areas of the population in the expectation that the results can be generalized. This requires carefully controlled sample selection. The results will be convincing only if differences observed between different areas in the sample, or at least within major domains, are not too great. In any case the samples need to be larger and more objective than those typically required for the precensus pilot surveys. Furthermore, the

sampling requirements are more stringent when the objective is to adjust (improve) the census results than when it is merely to identify the kinds and sources of major errors.

■ Using sample enumeration to supplement complete censuses

Sample surveys attached to censuses have special functions and advantages that distinguish them from ordinary sample surveys. They are often substantially larger than ordinary surveys and share the basic census objectives of providing detailed data for small domains. Their large size is facilitated by the cost-effectiveness of these operations and the resources they command as a result of their connection with the census.

Sometimes, however, smaller and more detailed surveys may be used to explore more difficult topics for national statistics and large domains. These may entail special arrangements and enumerators but keep the basic link with the census. In designing samples attached to the census, demographers need to consider a variety of interrelated issues. These include:

- whether it is necessary to add sample enumeration to the census and, if so, how the data to be collected should be divided between the complete and sample enumerations
- the appropriate sample size and the allocation of the sample to various reporting domains
- choice of the sample structure, in particular the type of units and sampling stages to be used
- the relationship of sample

enumeration and its field organization and interviewing operations to complete enumeration, and the relationship between different samples if more than one are used to obtain different types of data

Whether it is necessary to add a sample enumeration to the census is the most fundamental decision to be made in this context. One may begin to resolve the issue by asking two basic questions in relation to each item to be collected.

The first is whether it is *necessary* to collect information on the item on a 100 percent basis, in view of the precision requirements and detail (in particular, geographical detail) with which the results have to be tabulated. Here it should be remembered that complete enumeration can be subject to all sorts of nonsampling errors, and that certain items are useful and meaningful only if they are estimated for reasonably large population bases. Examples are certain demographic rates and absolute numbers of events.

The second question is whether it is *desirable and feasible* to collect the information on a 100 percent basis. One has to consider the associated costs, delays, data processing constraints, burden on census staff and respondents, and effect of the increased burden on data quality—particularly on responses to other, perhaps more essential, items.

One should consider an item for complete enumeration only if the answer to both questions is positive. If either answer is negative, the item is a candidate for sample enumeration. It may even be that such an item does not belong in the census at all.

A questionnaire item should be considered for complete enumeration only if information about the subject is needed on a 100 percent basis and it is also desirable and feasible to collect it on a 100 percent basis.

If the substantive content of the census is fixed, one still has to consider whether restricting part of the interview to a sample achieves a saving big enough to compensate for the inevitable cost and complexity of introducing two types of operations. The saving from enumerating less than the complete population is not at all proportionate to the reduction in the number of households enumerated because the costs of planning, selecting, implementing, and analyzing the sample remain constant. If the required sampling rates are large or if only a few items require sample enumeration, it may be more reasonable to cover them all in the complete census, rather than to introduce a separate sample enumeration. The actual balance between costs and benefits depends on numerous factors, as is indicated by the great variation in practices among countries of the Asian and Pacific region.

With sample enumeration the size and allocation of the sample also depends on specific data requirements, circumstances, and available resources, both material and technical. Few generalizations can be made. Critical factors are the number, type, and relative sizes of the domains for which separate estimates are to be produced. If esti-

mates are required for many small domains and areas, the attached sample would have to be large. Similarly, great variation in sizes or importance of domains would require disproportionate allocations (unequal sampling rates). The sample should not be allowed to fall below a certain minimum size in any domain, irrespective of domain size. Too often choices are discussed in terms of sampling rates; the more relevant issue, however, is the actual sample size.

The sample may be extended to all EAs, or a sample of EAs may be selected for complete enumeration in the survey. Alternatively, sampling may involve two or more stages—e.g., selection of EAs and then of households.

For conventional censuses involving door-to-door enumeration the choice of sample design is influenced by such interrelated factors as the size of the operation and degree of detailed classification required for the results; the complexity of the supplementary information to be collected; the characteristics of the EAs; travel conditions; the types of enumerators available for the census and the type required for the attached sample; how often the households can be visited and the related considerations of time, cost, and respondent burden; and whether the attached survey replaces or is additional to the ordinary census operations in the sample areas. Other census arrangements, such as self-enumeration by mail, in place of the conventional door-to-door enumeration, may introduce radically different considerations in the design.

For simpler items that can be combined with the basic census

enumeration during a single visit of ordinary census enumerators, the sample can be more easily spread over all census areas, though even in this case the size of the undertaking will still pose operational difficulties. The more complex and specialized the inquiry, and especially if specialized enumerators are involved, the more it becomes preferable to restrict the inquiry to a sample of EAs.

The selection of complete (compact) EAs has the advantage of simplicity and lower cost; it is particularly appropriate when specialized procedures and enumerators are used, or when the survey replaces the ordinary census operations in the sample areas. Its disadvantage, however, is that it increases the variances of the estimates. This is most serious for small geographic domains, though it may not be critical for estimates for major domains or for cross-classes well distributed over different areas.

A two-stage selection of households within EAs can result in effective compromises and is particularly suitable for samples that form the basis of a continuing program of postcensal surveys. Subsampling within EAs may introduce serious selection biases, however, unless it is operationally separated from prelisting and is carefully controlled. The use of appropriate ratio estimates, which adjust the sample values to population control totals as, for example, obtained from the complete count, can overcome a part of the increase in variance due to clustering of the sample, and it may also remove some of the effects of selection biases when EAs are subsampled.

In principle, more than one sam-

ple may be attached to the census, each to get a different set of data. There will be conflicts about spreading the various samples over different sets of units versus concentrating them in the same units. Several arrangements are possible: (a) separate EAs for each sample, (b) a common set of EAs but different households for different samples, (c) common households for different samples, and (d) intermediate degrees of overlap in relation to the first three arrangements.

Option (c) reduces costs and yields more information on relationships between survey variables, but it increases the respondent burden and requires that each enumerator cover all the topics in households common to the various samples. This scheme differs from the ordinary case of a single attached sample only to the extent that different sample sizes are used for different sets of variables.

When different samples are required for different purposes, option (a) is operationally the simplest, especially if different groups of enumerators handle different topics. For a given cost, however, it can severely limit the number of EAs that can be included in each sample and hence reduce the efficiency of the design.

Option (b) permits each sample to be more spread out. But administering this scheme may be much more complicated.

■ Sampling for census processing and data dissemination

Census data may be sampled for processing, either to expedite the

release of broad census results or to produce detailed tables. In the second case the objective may also be to save time, as well as resources. Whether sampling for processing is done and how it is done depends on various factors. For instance, sampling at the processing stage may be worthwhile in countries with large populations but not in those with small or even medium-size populations. Such sampling may be confined to items collected on a 100 percent basis, subsampling of items collected on a sample basis being unnecessary. The decision will also depend on whether processing is done manually or by computer.

For the quick release of broad census results, a common practice has been to produce manual summaries proceeding in stages from lower to higher administrative levels, each level consolidating the summaries from the preceding level. Usually this process uses the established census structure, and sampling is neither necessary nor convenient. But if manual summaries must be compiled as a separate operation, perhaps using special clerical staff, then it may be necessary to compile them on a sample basis so that the results can be released according to schedule.

For example, the sampling operation may need to be done well before the data from all EAs can be checked and edited for processing. For this purpose it is usually appropriate to sample at the level of complete EAs. Subsampling within EAs, particularly selecting households or individuals directly in a single stage, is likely to be operationally inconvenient. These considerations are even more applicable

when computers are used to produce broad preliminary results. Sampling at the EA level permits the work to proceed as soon as data for the selected areas have been keyed and edited.

For the production of detailed tables, it can be assumed that in most situations the data are processed by computer. Sampling may be introduced to ensure that detailed and nearly final results can be released within one or two years rather than after a longer period, which is the case when all the data have to be processed. The sample size should be as large as possible, given the mandated time constraints.

Usually it is possible to select a sample of households directly from all the census EAs. Sampling of individuals can be less efficient and is often unnecessary because of the demographic heterogeneity within households. Direct sampling of households, as opposed to selecting EAs, can be particularly desirable if these so-called intermediate results are also required for local areas. But confining the processing to a sample of EAs has some operational convenience.

Sampling for early tabulation should be seen as an undertaking additional to, rather than as a substitute for, the processing of the whole data set at a later stage. Occasionally, however, it has been used as a substitute for complete processing, as for example in the Indian census of 1981. It is an option if insurmountable difficulties develop unexpectedly at the data processing stage. But to use this option by design can be justified neither on efficiency nor on moral grounds: why collect data that are never intended to be processed? In

Sample Enumeration Practices in the Asia-Pacific Region

Of the 19 countries compared in Cho and Hearn's (1984) review of the 1980 round of censuses in Asia and the Pacific, seven—Australia, China, Fiji, Japan, Malaysia, Nepal, and New Zealand—did not use sample enumeration (although, as a major departure, China is expected to do so in its census of 1990). Among the 12 countries that used sample enumeration to supplement their complete counts there was considerable variation in the sample sizes and designs used.

For example, the Indian census of 1981 used a large sample: 20 percent in most major states and 100 percent in smaller states and union territories, yielding a total sample size exceeding 25 million households. The United States also used a large sample, exceeding 10 million households (about 20 percent of the total). In other large or medium-size countries—Indonesia, the Republic of Korea, Pakistan, the Philippines, Sri Lanka, and Thailand—sample sizes were much smaller than in India or the United States but quite similar to each other, mostly in the range of 1–2 million households. The major exception to this pattern was in Bangladesh, where a sample of only 100,000 (1 percent) was used. Smaller countries or territories—Hong Kong, Papua New Guinea, and Singapore—also used sample sizes of approximately 100,000–200,000, though the corresponding sampling rates were much larger.

Most countries adopted the simpler and more practical single-stage design, involving direct selection of EAs with no subsampling of households within EAs. Exceptions were the United States and Hong Kong, which for the most part selected dwellings directly in a single stage, and Bangladesh, where a two-stage design involving subsampling within EAs was used. The total sample size in Bangladesh was small, and subsampling within EAs permitted greater geographical dispersion of the sample.

Despite the variation among countries in the substantive items included in the complete and sample enumerations, it is possible to discern a general pattern in country practices in the Asia-Pacific region during the 1980 round of censuses. The topics are conveniently summarized in Cho and Hearn's (1984:xvii–xvix) table, which is reproduced at the end of this article. I have identified with daggers at the beginning of the table those countries that used sampling for supplementary data collection in conjunction with complete enumeration. For brevity only broad groups of commonly encountered topics are discussed here.

Place of residence, relationship to head of household, sex, age, and marital status were covered universally and on a 100 percent basis in the 19 countries included in the table, irrespective of whether sample

enumeration was also used. These topics are essential for determining the size and basic characteristics of a population. Certain "legal" items, such as registration status, included in only a few censuses, were also covered on a 100 percent basis irrespective of the use of sample enumeration. The same was true, with some exceptions, of variables defining social categories, such as ethnic group, citizenship, religion, and language. Such items are of interest only in some countries; but where they are relevant, usually complete enumeration is considered desirable so as to obtain census results with full geographic detail.

Rather surprisingly, some countries had questions on physical disability on a 100 percent basis, including several (India, Indonesia, the Republic of Korea, and Sri Lanka) that had introduced sample enumeration for other items. Other countries (Bangladesh, Hong Kong, Pakistan, and the United States) covered this item on a sample basis. In my view, such characteristics, which are especially prone to large response errors, are more appropriately collected on a sample basis, where the data quality can be better controlled.

Characteristics that are especially prone to large response errors or are expensive to obtain are more appropriately collected on a sample basis, where the quality and costs can be better controlled.

Number of children born alive and, to a lesser extent, number of children currently alive were covered in most countries, invariably on a sample basis where sample enumeration was used and on a 100 percent basis elsewhere. Similarly, economic characteristics, such as economic activity and employment status, occupation, and industry, were covered practically in all countries, on a sample basis in those using sample enumeration and on a 100 percent basis otherwise. The censuses of India, Thailand, Sri Lanka, and Singapore are exceptions to this rule, in that they covered economic characteristics on a 100 percent basis, despite using sample enumeration for other items.

There is considerable debate as to whether the information on economic activity should be obtained on a 100 percent basis or on a sample basis. On the one hand, these items are difficult to obtain and code, favoring sample enumeration. On the other, to obtain full geographic detail for numerous unequal and unevenly distributed categories of occupation and industry, it may be considered necessary to resort to complete enumeration. The use of heavily clustered samples may prove inadequate owing to the large intracluster correlations

addition, the practice may be unconstitutional in some countries.

For more complex analyses, as well as for the release of microdata for public use, it is usually much more desirable to select samples of households or individuals directly from the entire census and avoid their clustering into samples of EAs. Random selection simplifies the analysis and prevents individual households and persons from being identified. Sampling of intact households rather than of individuals directly is generally preferred.

Probably the most convenient and efficient technique for sampling households (and individuals, if applicable) is their systematic selection from lists. The order or arrangement of units in the lists must be operationally convenient and suitable for the large number of characteristics to be estimated. For areas and households, ordering by administrative and geographic location is usually the most appropriate.

■ The census as a basis for sample survey design and estimation

The census can provide impetus to the development of national statistical capability and particularly of sample surveys. It forms the basis of subsequent surveys by providing the sampling frame, by providing auxiliary information for improved estimation—especially estimation of population totals through regression and ratio estimates—and by mobilizing resources to develop infrastructural facilities for conducting subsequent sample surveys.

In addition, large-scale surveys attached to the census can provide a convenient and efficient basis for

launching continuing survey programs. Later surveys can be smaller in scale and more varied and complex in content, or they can be specially designed to monitor changes, as for example in multiround demographic surveys. The large baseline survey can also provide a "master sample" for efficient and convenient subsampling and for estimation from subsequent, smaller surveys. It will be good if, in future rounds of the population census, greater attention is paid to these varied roles of the census in relation to postcensal sample surveys.

Good samples are based on sampling frames provided by census data, especially in countries where alternative sources such as population registers are not available. This applies in particular to sampling frames for household surveys of the general population covering a variety of demographic, social, and economic topics.

The population census can be a primary source of sampling frames for other types of surveys as well, such as agricultural surveys of farming households and holdings, and economic surveys of establishments, particularly in the informal sector. Special surveys in these areas can also be attached to the census in design, even as operations that are logistically and temporally separated from the census itself. Such extensions in the uses of the population census to nonhousehold sectors depend primarily on using opportunities available, normally at a marginal or affordable cost, during the census house-listing operation.

The Indian census of 1981, for instance, incorporated the compilation of an enterprise list along with the house listing in each area. A

to which the economic variables are usually subject. Sampling directly at the household or individual level may be more satisfactory, but often it is not feasible because of the serious operational difficulties involved in conducting a census. A design with two stages of sampling may in many situations offer an acceptable compromise.

I think that, on balance, it is preferable to confine the coverage of economic topics to a sample basis—unless the very detailed geographical breakdown that only a 100 percent enumeration can provide is considered indispensable. This point applies with particular force to the census in a country such as India because of its enormous size.

Simple migration-related questions such as place of birth, previous residence, and duration of residence were covered in the 1980 round largely on a sample basis if sample enumeration was used. Such questions were included less commonly in countries that did not have sample enumeration.

With one or two exceptions, age at marriage, births, survivorship of children during the previous 12 months, and some other demographic items were covered only on a sample basis and hence mainly in countries using sample enumeration. It is plausible that the need to gather information on fertility, mortality, and marriage was an important consideration in the decision by those countries to supplement the complete census with sampling.

The pattern of coverage for housing characteristics was more complicated. These items may be obtained during a separate housing census, during prelisting for the main population census, or as part of the population census itself, the last arrangement being the most common. Among the countries using sampling, some (e.g., India, Pakistan, and the Republic of Korea) covered housing topics on a 100 percent basis, whereas others (e.g., Sri Lanka, Thailand, and the United States) covered them only on a sample basis.

As for the sample allocation among domains, most countries followed proportionate allocation (i.e., uniform sampling rates) in the main part of the sample. Common exceptions were the use of the long form on a 100 percent basis in urban or special areas (India, the Republic of Korea, Papua New Guinea, Sri Lanka, and Thailand), oversampling of urban or other small domains to ensure the required minimum sample size (Bangladesh and Pakistan), and special treatment of EAs containing an institutional population (included on a 100 percent basis in the Republic of Korea but entirely excluded in the Philippines and Singapore).

Only two countries (the Republic of Korea and Papua New Guinea) reported a more general variation in sampling rates among subnational domains. In Papua New Guinea, for example, the sample was allocated in proportion to the square root of the domain population, as a

compromise between the requirement of national-level estimation (suggesting proportional allocation) and the requirement to produce separate estimates for individual domains (basically suggesting equal allocations). (See Gilbert 1986.) Perhaps this or some similar compromise allocation will be used more commonly in future censuses because of the increasing emphasis on producing national as well as subnational estimates for many domains of various sizes.

A good illustration is provided in this respect by the contrast between the 1980 and the planned 1990 censuses of Indonesia. In 1980 the attached sample was selected at a uniform rate of 5 percent throughout: a single-stage sample of compact clusters in rural areas and a direct sample of households in urban areas. The 1990 census will use a two-stage design, with overall allocation proportional to the square root of province size so as to allow sampling of smaller provinces at higher rates. This is because individual provinces constitute the primary domains for reporting census results. Furthermore, within each province the secondary reporting domains, namely the urban sector and major subdivisions (*kabupaten*) of the provinces, will each receive at least a certain minimum sample size. Apart from this constraint, the sample within each province will be kept self-weighting to the extent possible because of the simplicity such a scheme offers at the tabulation stage.

Few countries reported separate arrangements for recruitment, training, or field work for the more complex sample enumeration, and none reported using multiple samples or multiple versions of the long (sample) form to collect different types of information from different sets of households. Typically the more detailed sample enumeration replaced the briefer census enumeration in the sample areas, but in two countries (Pakistan and Sri Lanka) the sample enumeration appears to have occurred along with the census enumeration in sample areas.

An interesting case is provided by the 1980 census of Papua New Guinea, which was that country's first complete census. The government judged the requirement of conducting simultaneously two types of enumeration (using the short and long forms respectively) to be too complex. The pilot test revealed various operational problems and indicated that field workers in rural areas could not manage the operation involving two types of questionnaires, two sets of training materials, and two field plans. Furthermore, people were missed in the border regions between sample and nonsample areas because the boundaries could not be clearly defined. Consequently, three procedures were adopted: to use only the long form in urban and non-traditional rural settlements on a 100 percent basis, rather than the short form (which was incorporated into it); to use only the short form in traditional rural areas during the 1980 census itself; and to

The census house-listing operation can be used to develop sampling frames not only for population surveys but also for other types of surveys, such as of farming activities and of economic activities in the informal sector.

similar proposal is under consideration in relation to the 1990 census of Indonesia. This practice should be considered by other governments interested in developing frames and surveys for small-scale establishments. Similarly, the listing operation can be used to identify farming and nonfarming households—and also rural landless and agricultural-worker households, which many conventional agricultural surveys and censuses unfortunately have failed to cover adequately.

In addition to the usefulness of the census as a source for the sampling frame, it can also be used to construct master samples from which samples for various surveys or survey rounds in the postcensal period can be drawn readily and in relationship to one another. A master sample is a more limited form of the sampling frame, constructed with special applications in mind.

Specifically, in any survey with a multistage design, each stage of the sampling process involves the task of frame preparation and sample selection, until finally a sample of the required ultimate, or lowest-stage, units is obtained. For economy and convenience, one or more stages of this task may be combined or shared among several surveys.

conduct a sample (long-form) operation in the traditional rural areas during the subsequent year, as an undertaking separate from the main census.

Similarly, Pakistan, in its 1972 census, introduced sample enumeration on a small scale (about 0.25 million households were involved), and a year later conducted a separate housing, economic, and demographic survey. With more experience, the 1981 census of Pakistan combined a larger-scale sample enumeration with the complete census in a more conventional manner.

The sample resulting from the shared stages is called a master sample.

As an illustration, consider a three-stage design with EAs, segments (smaller areas within EAs), and households as the first-, second-, and third-stage units respectively. A large sample of EAs may be selected, each sample EA divided into segments, and some or all of the segments retained in the sample. The resulting large sample of segments can serve as a master sample from which smaller samples of segments and households can be drawn for individual surveys. Thus the task of frame preparation and sample selection up to the stage of segments is shared among different surveys using the master sample.

The master sample therefore provides a common sample of units up to a certain stage, from which further sampling can be done to serve the needs of individual surveys. Its purposes are to minimize the costs of developing sampling frames and materials and of sample design and selection, by combining these operations for different surveys; to facilitate substantive as well as operational linkages between different

surveys and survey rounds; and to facilitate, as well as to restrict and control when necessary, the drawing of multiple samples for various surveys from the same frame.

Often there is a close relationship between the large sample attached to the census for supplementary data collection and the master sample required for subsequent surveys. Hence a close relationship can exist between the design of these two. For instance, if special attention and resources have been devoted to staff deployment and training or to the development of maps, other materials, and data for the areas included in the attached sample, it will be efficient to ensure that the master sample overlaps with the attached sample as much as possible; and the design of the latter will have to take this requirement into consideration.

Sometimes the attached sample can itself serve as a master sample for subsequent surveys—in which case it should be designed as such, with replications and other features that will facilitate subsampling from it at a later stage. In general, however, because of their differing objectives, the two sample systems may not fully coincide.

For example, to provide acceptable estimates for the whole country, as well as for numerous large and small census domains, the attached sample may have to involve greatly varying sampling rates among domains. For ordinary sample surveys, however, the reporting domains will be typically larger, fewer, and probably with less extreme variations in size. Consequently, more uniform sampling rates will be appropriate for the master sample. For similar reasons, it is likely that a master sample may not have to be as large as the attached sample, and therefore it may not be necessary to undertake the taxing and expensive operations of maintaining and updating the full attached sample for future use. Both of these examples imply that in many situations the master sample itself requires sampling, often at variable rates, of areas in the attached sample; and this requirement too has to be considered in the design of the attached sample.

Conversely, the master sample may be especially intensive or large (for instance, to serve intensive cost-of-living surveys in a few urban centers or surveys to monitor the effects of intensive programs confined to particular areas) and therefore have to go outside the areas included in the attached sample. Whether either or both of the sample systems should or even can be modified to minimize their incompatibility depends on circumstances.

Careful consideration must be given during the planning and execution of the census to its function as a source of sampling frame for diverse surveys. The EAs of the

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Is the Fertility of Asian and Pacific Islander Americans Converging to the U.S. Norm?

by Robert D. Retherford
and Michael J. Levin

CURRENT FERTILITY theories view differences in fertility among populations as caused by a complex interaction of social, economic, political, and cultural factors (see, for example, Bulatao and Lee 1983). An implication for studies of the fertility of migrants is that the process of social, economic, political, and cultural assimilation should lead to assimilation in the realm of fertility behavior as well.

In this article we examine the process of assimilation in fertility behavior for Asians and Pacific Islanders in the United States, using census-based estimates of recent fertility trends for the period 1965-80. We examine fertility trends for all Asians and all Pacific Islanders, and separately for Asian Indians, Chinese, Filipinos,

Japanese, Koreans, Vietnamese, Guamanians, Hawaiians, and Samoans. We also examine, for each of these groups, differential fertility by urban-rural residence, educational attainment, nativity, and year of immigration if foreign-born.

■ Data and methodology

We identify groups of Asians and Pacific Islanders in accordance with the 1980 U.S. census question on race. Answers to this question were based on self-identification. (For some groups the term "ethnic group" may seem more appropriate than the term "race" or "racial group"; however, we retain the U.S. Census Bureau's terminology.)

Asians and Pacific Islanders include persons who selected from the census questionnaire one of the specified race categories of Chinese, Filipino, Japanese, Asian Indian, Korean, Vietnamese, Hawaiian, Samoan, or Guamanian, as well as persons who selected the category of "other" and then provided written entries such as Kampuchean, Cambodian, Cantonese, Laotian, Pakistani, or Tongan. Where appropriate, these written entries were recoded into the specified categories; for example, Cantonese were recoded as Chinese.

If an entry for race was missing on the questionnaire for a member of a household, an answer was assigned by computer according to reported entries for race for other household members, using a set of rules of precedence of household relationship. If race was not entered for anyone in the household (excluding paid employees), race was assigned by a variant of the Census Bureau's general allocation process for missing entries. In the census as a whole, 1.5 percent of race entries were allocated.

Although the race question was asked of all persons, questions about educational attainment, nativity, and period of immigration if foreign-born were asked only on the census sample long form, covering about 19 percent of the population. Therefore, the present analysis is based on the 19 percent sample.

The own-children method of fertility estimation was applied to the 19 percent sample tape to generate estimates of fertility trends and differentials for the above-mentioned groups of Asians and Pacific Islanders in the United States. For comparison purposes, a 1 percent sample tape was used to generate estimates for the United States as a whole and for Blacks and Whites separately. Also for comparison pur-

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poses, a 19 percent sample tape of American Indians was used to generate estimates for American Indians.

The own-children method has been described in earlier publications (see especially Cho et al. 1986) and needs to be recapitulated only briefly here. The method is a reverse-survival technique for estimating age-specific birth rates for years previous to a census or household survey. Enumerated children are first matched to mothers within households on the basis of responses to questions on age, sex, marital status, relationship to householder, and, in the present application, number of children ever born. The matched (i.e., "own") children, classified by own age and mother's age, are reverse-survived to estimate numbers of births by age of mother in previous years. Reverse-survival is also used to estimate numbers of women by age in previous years.

After adjustments are made for incorrect enumeration (undercount and age misreporting) and unmatched (non-own) children, age-specific birth rates are calculated by dividing the number of births by the number of women. Estimates are computed for each previous year or group of years back to 15 years before the census.

In the present application no corrections for incorrect enumeration are made. Calendar years are grouped into three periods, 1965-69, 1970-74, and 1975-79. Because the census was taken on 1 April, these periods run from 1 April to 31 March. For example, 1975-79 means 1 April 1975 to 31 March 1980. Age-specific birth rates are aggregated to total fertility rates (TFRs), and only the latter are

reported here. It has been shown previously that own-children estimates of TFRs for the United States agree closely with corresponding estimates derived from vital statistics sources (Retherford and Cho 1978). Methodological details about this particular application of the own-children method to 1980 U.S. census data are contained in the Appendix.

■ Profile of the base populations

The 1980 U.S. census enumerated 3,726,440 Asians and Pacific Islanders in the United States, of whom about 90 percent were Asians. Chinese were the largest group, followed by Filipinos (Table 1). Both groups exceeded Japanese, who were the largest group in 1970 but third largest in 1980. Each of these groups constituted more than one-fifth of the U.S. Asian population in 1980. Asian Indians (labeled simply as Indians in this article) ranked fourth, followed by Koreans and Vietnamese. "Other Asians" constituted about 5 percent of all U.S. Asians. The largest groups in this category were Laotians, Thais, Cambodians, and Pakistanis.

The surpassing of Japanese by Chinese and Filipinos between 1970 and 1980 reflects a selective surge of increased immigration during the 1970s, following changes in U.S. immigration law after 1965. The increased flow of new immigrants was especially great from the Philippines, the Republic of Korea, China, India, Pakistan, and Thailand. In addition, more than 400,000 Indochinese refugees entered the United States between 1975 and 1980 under a series of parole authorizations granted by the Attor-

ney General (U.S. Department of Justice, various years).

Among Pacific Islanders, Hawaiians constituted the largest Pacific Islander group in 1980. Samoans, including both American and Western Samoans, were next largest, followed by Guamanians. No other Pacific Islander group had more than 10,000 persons in 1980.

Table 2 shows the base populations of females underlying the estimates of differential fertility. Since most immigrants settle in urban areas, rural populations tend to be very small. As calculated from Table

Table 1. Asians and Pacific Islanders in the United States: 1980

Group	Population size
Asians	3,466,874
Chinese	812,178
Filipino	781,894
Japanese	716,331
Indian	387,223
Korean	357,393
Vietnamese	245,025
Laotian	47,683
Thai	45,279
Cambodian	16,044
Pakistani	15,792
Indonesian	9,618
Hmong	5,204
Other Asians	27,210
Pacific Islanders	259,566
Hawaiian	172,346
Samoan	39,520
Tongan	6,226
Other Polynesian	2,186
Guamanian	30,695
Other Micronesian	4,813
Melanesian	3,311
Other Pacific Islanders	469

Source: United States, Bureau of the Census (1988:table 1).

Note: By comparison, the total U.S. population numbered 226,545,805 in 1980 (U.S. Department of Commerce, Bureau of the Census 1986).

Table 2. Asian and Pacific Islander women aged 15-64 in the United States, by selected characteristics: 1980

Group	Residence		Education (in years)			Nativity			
						Foreign-born			Native-born
	Urban	Rural	<12	12	>12	1965-80	pre-1965		
Asians	1,159,685	78,798	345,349	332,007	561,127	349,987	888,496	742,434	146,062
Chinese	273,421	8,358	84,324	62,185	135,270	75,794	205,985	162,520	43,465
Filipino	260,558	19,532	73,496	53,206	153,388	56,882	223,208	192,519	30,689
Japanese	268,785	25,411	53,616	114,185	126,395	185,872	108,324	56,342	51,982
Indian	106,703	9,479	28,833	22,803	64,546	18,990	97,192	92,080	5,112
Korean	129,000	9,356	43,160	46,565	48,631	8,199	130,157	118,244	11,913
Vietnamese	69,892	3,554	35,812	21,491	16,143	1,405	72,041	71,506	535
Pacific Islanders	71,725	11,457	29,704	34,879	18,599	71,564	11,618	8,987	2,631
Hawaiian	47,155	9,717	18,902	25,220	12,750	55,936	936	567	369
Samoan	10,482	484	4,839	4,182	1,945	5,618	5,348	3,649	1,699
Guamanian	9,161	883	3,683	3,972	2,389	8,814	1,230	950	280

Source: Unpublished tabulations from the 1980 U.S. census. The population estimates in this table are derived from the census long form, covering about 19 percent of the population.

2, among women aged 15-64, 6 percent of Asians and 14 percent of Pacific Islanders were rural in 1980. By comparison, 26 percent of the total U.S. population were rural in 1980 (U.S. Department of Commerce, Bureau of the Census, 1983:table 98).

Table 2 also shows that there is a correlation between the time of peak immigration and the proportion of foreign-born women in particular racial groups. For example, since Japanese immigration slowed to a trickle some time ago, the current proportion of foreign-born among Japanese is comparatively low. The proportion of foreign-born among Koreans and Vietnamese, on the other hand, is much higher.

Substantial proportions of Samoans and Guamanians were foreign-born in 1980. The foreign-born include many Samoans in the United States who were born in Western Samoa and Guamanians who were born in the Philippines.

Table 3. Estimated trends in total fertility rates for Asians and Pacific Islanders in the United States, derived from the 1980 U.S. census

Group	1965-69	1970-74	1975-79
Asians	2399	2179	1948
Chinese	2331	1869	1597
Filipino	2574	2319	2148
Japanese	1880	1651	1409
Indian	2155	2115	2239
Korean	2404	2391	2183
Vietnamese	5435	4395	2671
Pacific Islanders	3711	2847	2531
Hawaiian	3331	2513	2296
Samoan	6143	4494	3765
Guamanian	4002	2946	2074
United States	2601	2070	1810
White	2488	1959	1714
Black	3182	2487	2115
American Indian	3398	2722	2409

Source: Unpublished tabulations from the 1980 U.S. census.

Notes: Rates are per 1,000 women. The aggregated categories of "all Asians" and "all Pacific Islanders" include all subcategories, not just the specific subcategories shown.

Persons born in American Samoa and Guam are classified as native-born.

Findings

Table 3 shows estimated trends in total fertility rates (TFRs) for Asians

and Pacific Islanders, with comparison figures for the United States and the major racial groups of Whites, Blacks, and American Indians.

Asians as a whole show a modest fertility decline, from about 2.4 children per woman in 1965-69 to about 1.9 children per woman in 1975-79. Because fertility was already fairly low to start with, the decline of about half a child was sufficient to bring fertility below replacement by 1975-79. The pattern was similar for each of the specific groups shown, except for Vietnamese, who began with a comparatively high TFR of 5.4, which declined by 50 percent to 2.7 by 1975-79. By 1975-79, Chinese and Japanese had total fertility rates that were well below replacement, at 1.4 to 1.6 children per woman. Indians, Filipinos, and Koreans had close to replacement-level fertility, which at 1980 mortality levels would correspond to a TFR of about 2.1 children per woman.

Fertility levels for Pacific Islanders were generally higher than those for Asians. For Pacific Islanders as a whole, the TFR declined from 3.7 children per woman in 1965-69 to 2.5 children per woman in 1975-79. The TFR of Guamanians dropped precipitously over the same period, from 4.0 to 2.1. Hawaiians experienced a more modest decline, from 3.3 to 2.3. Samoans experienced a decline from 6.1 to 3.8. Among the specific groups shown in Table 3, Samoans were the only group with a TFR greater than three children per woman by 1975-79.

By comparison, total fertility for the United States as a whole fell from 2.6 to 1.8 children per woman between 1965-69 and 1975-79. To-

tal fertility fell from 2.5 to 1.7 for Whites, from 3.2 to 2.1 for Blacks, and from 3.4 to 2.4 for American Indians. Fertility levels and declines therefore do not differ much between Asians and the total U.S. population—with the exception of Vietnamese, who experienced a major fertility decline during the estimation period considered here, but whose fertility remains high.

In contrast with the Asian pattern, Pacific Islanders started with considerably higher fertility and experienced larger fertility declines than either Asians or the United States as a whole. Thus Pacific Islanders show some evidence of convergence toward the U.S. fertility norm, whereas Asians were largely assimilated in their fertility behavior to start with, except for Vietnamese.

Fertility trends by selected characteristics of Asian and Pacific Islander groups (Table 4) reveal that rural fertility exceeded urban fertility for both the United States as a whole and the Asian and Pacific Islander groups, except among Samoans in 1970-74 and 1975-79. Within urban and rural categories, fertility fell over the three periods for all groups, except for urban Indians and rural Koreans, whose fertility increased slightly. The rural-urban difference in the TFR sometimes increased and sometimes decreased, with no general tendency either way.

For the United States as a whole the rural-urban difference in the TFR was about 0.3 to 0.4 child in each of the three periods. By 1975-79 Chinese, Japanese, Indians, and Vietnamese had rural-urban differentials that differed little from the U.S. average. The rural-urban

differential increased somewhat for Chinese and Japanese, however, owing to the achievement of extremely low fertility among urban Chinese and Japanese. The fertility of the latter fell to well below replacement level, lower even than the fertility of urbanites in the United States as a whole.

Among Filipinos, Koreans, Hawaiians, and Guamanians, the rural-urban fertility difference in 1975-79 was higher than that for the United States as a whole, owing to the maintenance of moderately high rural fertility among the former groups. Among Samoans fertility was higher in urban than in rural areas in 1970-74 and 1975-79, possibly because recent Samoan migrants with higher fertility are heavily concentrated in urban areas.

Fertility declined in the three educational categories shown in Table 4 for the United States as a whole and in the Asian and Pacific Islander groups, except among Koreans with less than 12 years of education, for whom it increased slightly. Fertility was lower among those with more education than among those with less, except for Koreans in 1965-69. Vietnamese and Guamanians had considerably larger fertility differentials by education than did the United States as a whole; the other groups tended to have differentials that were about the same or smaller than those for the United States as a whole.

Among the various race-education groups, the lowest TFRs were attained by Japanese and Guamanians with more than 12 years of education, at 1.3 children per woman. This extremely low fertility implies a net reproduction rate

Table 4. Estimated trends in total fertility rates for Asians and Pacific Islanders in the United States, by selected characteristics, derived from the 1980 U.S. census

Group	Residence		Education (in years)			Nativity			
						Foreign-born			Native-born
	Urban	Rural	<12	12	>12	1965-80	pre-1965		
Asians									
1965-69	2378	2709	3090	2447	2202	2196	2484	2574	2677
1970-74	2143	2744	2988	2243	1947	1576	2335	2490	1787
1975-79	1918	2455	2451	1978	1763	1345	2133	2207	1595
Chinese									
1965-69	2321	2614	3131	2414	2067	2093	2384	2335	2646
1970-74	1857	2184	2583	2014	1689	1306	2005	2098	1706
1975-79	1584	2001	1983	1722	1529	1161	1737	1800	1415
Filipino									
1965-69	2516	3353	3018	2926	2409	2910	2523	2376	3601
1970-74	2268	3026	2844	2396	2167	2112	2323	2388	2252
1975-79	2100	2820	2325	2152	1988	1788	2177	2228	1843
Japanese									
1965-69	1858	2148	2239	2085	1808	1987	1787	1860	2090
1970-74	1615	2083	2267	2028	1481	1426	1929	2181	1429
1975-79	1377	1851	1683	1698	1299	1209	1761	1831	1432
Indian									
1965-69	2124	2561	2671	2340	2060	2172	2216	2209	2536
1970-74	2104	2363	2422	2162	2126	1803	2176	2204	1899
1975-79	2226	2455	2357	2207	2209	1478	2302	2343	1322
Korean									
1965-69	2365	3026	2258	2370	2632	1834	2412	2427	2637
1970-74	2311	3465	2478	2300	2425	1765	2408	2473	1845
1975-79	2117	3104	2262	2099	2154	1519	2216	2238	1695
Vietnamese									
1965-69	5406	5965	6251	4942	4410	3739	5473	5513	3154
1970-74	4353	5186	5584	3977	2899	3638	4408	4440	1642
1975-79	2671	2738	3474	2473	1739	1812	2687	2699	1256
Pacific Islanders									
1965-69	3646	4112	4760	3661	2803	3539	4904	4778	5233
1970-74	2798	3153	3590	2967	2175	2676	3825	3923	3836
1975-79	2486	2835	2892	2628	2071	2360	3443	3702	2611
Hawaiian									
1965-69	3180	4067	4268	3464	2629	3347	*	*	*
1970-74	2391	3095	2999	2773	1971	2531	*	*	*
1975-79	2189	2825	2472	2464	1853	2306	*	*	*
Samoan									
1965-69	6126	7647	7415	5435	4181	5623	6522	6764	6306
1970-74	4471	4417	5281	4399	3624	4162	4807	5226	4426
1975-79	3795	3222	4062	3758	3205	3609	3922	4483	2895
Guamanian									
1965-69	3913	4885	4210	4201	3641	4235	2561	2466	2972
1970-74	2940	3050	3408	3245	2080	3018	2443	2563	1982
1975-79	1984	3072	2485	2333	1287	2055	2126	2244	1885
United States									
1965-69	2514	2847	3311	2676	2231	NC	NC	NC	NC
1970-74	1978	2361	2805	2185	1668	NC	NC	NC	NC
1975-79	1727	2090	2150	1880	1473	NC	NC	NC	NC

Source: Unpublished tabulations from the 1980 U.S. census.

Note: Rates are per 1,000 women.

* Numbers of foreign-born are too small to tabulate.

NC-Not calculated.

of about 0.6 and a long-run stable population rate of decline of about 40 percent per generation. Fertility differences by education tended generally to contract over the three periods.

Among the foreign-born, some past fertility may have occurred in the country of origin, not in the United States (last three columns of Table 4). Because applications of the own-children method tabulate TFRs by characteristics evaluated at the time of the census, not at the time the births occurred, the assumption is not always correct that the characteristic at the time of the census is unchanged throughout the entire 15-year estimation period.

The fertility of both native-born and foreign-born Asians and Pacific Islanders declined over the three time periods, except among foreign-born Indians, whose fertility increased very slightly. The fertility of the native-born was lower than the fertility of the foreign-born, as expected, except for Filipinos and Japanese during 1965-69, among whom the difference was slightly reversed. The fertility difference between native-born and foreign-born did not show any consistent trend, in some cases increasing and in others decreasing. Native-born Chinese and Japanese achieved an extremely low fertility of 1.2 children per woman by 1975-79.

Fertility declined during 1965-80 among both pre-1965 and post-1965 immigrants, except post-1965 Indian immigrants, whose fertility increased very slightly (last two columns of Table 4). The fertility of post-1965 immigrants was higher than that of pre-1965 immigrants, as expected, except in 1965-69, during which the difference was usual-

ly reversed. This reversal, which characterized all groups except Vietnamese and Samoans, is puzzling, and we are unable to explain it. Some of the pre-1965 immigrant groups had very low fertility by 1975-79; TFRs were 1.3 for Indians, 1.4 for Chinese, 1.4 for Japanese, and 1.3 for Vietnamese.

■ Summary and conclusion

The fertility of most Asian and Pacific Islander groups in the United States fell substantially between 1965 and 1980, as did the fertility of the U.S. population as a whole. The fertility of most Asian groups was initially lower than that of most Pacific Islander groups. Most Asian groups experienced fertility trends not much different from those of the United States as a whole. In contrast, most Pacific Islander groups experienced faster than average fertility decline, thereby showing some evidence of assimilation toward the U.S. fertility norm.

Differential fertility conformed to familiar patterns: urban fertility tended to be lower than rural fertility; the fertility of the more-educated tended to be lower than the fertility of the less-educated; the fertility of native-born tended to be lower than the fertility of foreign-born; and the fertility of established migrants tended to be lower than the fertility of recent migrants. Fertility tended to fall not only for each racial group as a whole, but also for each socioeconomic category of urban-rural residence, educational level, and nativity. These generalizations are confirmed not only for the all-Asians category and the all-Pacific Islanders

category, but also for virtually every specific racial subcategory.

Although many of the racial groups considered here have fertility patterns that do not differ greatly from those for the United States as a whole, moderate fertility differences nevertheless persist in most cases, indicating that the assimilation process in fertility behavior is not yet complete.

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We are grateful to Robert Gardner for helpful comments and to Judith Ann Tom and Robin Loomis of the East-West Population Institute and Diana Smith of the U.S. Bureau of the Census for computer programming and research assistance.

APPENDIX: DETAILS OF APPLICATION OF THE OWN-CHILDREN METHOD

The first stage of the own-children method of fertility estimation involves matching children to mothers within the same household. Children are computer-matched on the basis of responses to questions on age, sex, marital status, relationship to householder, and number of children ever born. In the present application, race of mother was used as the classifier. Children were matched to mothers by means of the census questions, irrespective of the children's own identified race.

Race of mother could not be used, however, in the computation of adjustment factors for non-own (unmatched) children, since mothers of these children could not be identified. To deal with this problem,

(continued on page 35)

Reviews

Perspectives on Development and Population Growth in the Third World by Ozzie G. Simmons with a foreword by Dudley L. Poston, Jr. New York and London: Plenum Publishing Corp., 1988. xvi, 277 pp. (cloth), US \$32.50. ISBN 0-306-42941-1. Available from Plenum Press, 233 Spring Street, New York, NY 10013, USA.

In his preface Ozzie G. Simmons states that the purpose of his book is "to bring together in one discussion a review of the relevant bodies of literature and a systematic treatment of the principal questions and issues that need to be addressed in this field [of population and development], as well as to provide a historical perspective on how they have been addressed" (p. xi). Simmons intends his audience to include scholars and students in the social sciences, and also those who make up the "international development assistance community"—not only representatives of donor governments and multilateral agencies, but also policymakers and development planners in developing countries who manage development funds and perform vital roles in the development process.

Simmons begins by considering the various definitions of "development" and providing a historical context for the examination of development approaches that follows. In Chapter 2 he reviews the major perspectives that have influenced development thinking over the past 35 years, including the modernization model, underdevelopment and dependency, redistribution with growth, and the basic-needs approach.

Next, in Chapter 3, he discusses equity-oriented development, its problems and prospects, observing that "growth with equity" is hampered by such constraints as urban bias, trade barriers, the need for poorer countries to become politically committed to poverty-focused development and necessary structural reforms, and the need for coordination between donor agencies. He suggests that a better knowledge base is needed if equity-oriented development policies are to be implemented—for example, more information about the gap between rich and poor nations, about who the poor are and how they live, and about the impact of aid and its effects on development.

In Chapter 4 Simmons analyzes the links between development and population growth. After showing how demographic transition theory has changed since its first exposition in the 1940s, he explains why it is not an appropriate framework for the fertility experience of the less developed countries. Although "fertility can decline under a variety of cultural, social, and economic conditions, and it is misleading to assume that convergence with the experience that characterized some of the Western countries must precede such a decline," Simmons finds "no broad consensus on a conceptual framework that could replace transition theory as a guide to cumulative research on the determinants of population change that could strengthen the policy value of such research" (p. 100).

Chapter 5 provides an overview of other conceptual frameworks and approaches concerned with fertility and development. Simmons focuses on Davis and Blake's model of intermediate variables; Bongaart's work on primary proximate determinants of fertility differences among populations or subgroups within a population; Becker and Easterlin's microeconomic approaches to fertility; and the two-volume work *The Determinants of Fertility* edited by R. Bulatao and Ronald Lee. He concludes that none of those approaches "has specified a particular combination of economic and sociocultural variables that could constitute, in a given instance, threshold levels of economic and social development that would precipitate a fertility decline" (p. 145).

The next two chapters are devoted to key development sectors that affect and are affected by population growth: natural resources, health and nutrition, the status and employment of women, education, and income distribution. Simmons summarizes them one by one but cautions that they do not operate independently and can be understood only in the larger context.

In the concluding chapter Simmons specifies the priorities for research on the interrelationships between population and development and for methodological approaches. If the view persists that population growth is detrimental to development, then, asserts Simmons, there is an urgent need for "developing appropriate middle-range theories that will facilitate

asking the right questions" in research on the causes and the consequences of population growth (p. 224). He emphasizes the need for studies at the village, household, and individual levels, for cross-sectional surveys, and for bringing to the attention of planners and policymakers the policy relevance of what is already known.

In this, his last book—Simmons died last March—he has written an excellent review of the past approaches and attitudes toward population and development. His suggestions for future research and methodological inquiry are thoughtful and cogent, and his writing lucid, making reading the book enjoyable. A extensive bibliography and an index add to its value. This book belongs in every demographic collection.

—Alice D. Harris

Staying On: Retention and Migration in Peasant Societies edited by José Havet. Ottawa: University of Ottawa Press, 1988. xviii, 220 pp. (paper), US \$22.50. ISBN 0-7766-3312-0. Available from University of Ottawa Press, 550 Cumberland St., Ottawa, Ontario K1N 6N5, Canada.

Retention of rural populations, or "how to keep them down on the farm," has not been a favorite topic of social scientists. Instead they have focused on urbanization and rural-to-urban migration. For several decades urbanization has been regarded as an integral part of socioeconomic development. Such topics as return migration and retention have taken second place, despite increasing concern about problems associated with urbaniza-

tion in the Third World.

"This volume intends to make a contribution to the institutionalization of retention as a legitimate area of specialization; by showing that such a field of research is productive and of interest, one can strengthen the claim that it should have a better academic representation" (xviii). These are the words of editor José Havet, who in 1981 organized a colloquium dealing with rural development and retention of rural populations in the countryside of developing countries, at which the first drafts of the papers in this volume were presented.

Sponsored by the Institute for International Development and Cooperation (IIDC) of the University of Ottawa, the Canadian International Development Agency, and the Social Sciences and Humanities Research Council of Canada, the colloquium brought together some 80 specialists from all continents and disciplines, representing many schools of thought.

The papers selected for the volume reflect the same diversity. Three of the 11 are by economists, three by anthropologists, two by sociologists, and one each by a communications specialist, a political scientist, and a geographer. (Havet himself is a sociologist specializing in the study of rural development.) Two papers deal with less developed countries in general, two and part of a third with Asia, three and part of a fourth with Latin America, one with Africa, and one with Eastern Europe.

The body of the volume is divided into an introductory chapter and four parts. The first part, containing two chapters, reviews the major issues in the retention/migration

debate. Michael Lipton's chapter addresses the issues in broad terms and is central to the understanding of other chapters.

Lipton makes four points: (1) that the rate of rural migration is smaller than is usually believed; (2) that migrants normally gain from voluntary migration, whereas the losers are among the urban populations that the migrants join; (3) that townward migration depletes the rural population of young, dynamic leaders, congests cities, and leads to the inefficient and inequitable allocation of national resources; and (4) that rural-urban inequality is the most promising target for corrective actions to curb rural-to-urban migration. He discusses how policy toward the urban-rural balance should be effected, given the special difficulties facing the developing countries in the 1980s.

F. Tomasson Jannuzi, author of the next chapter, concentrates on the social environment that conditions peasant behavior and sets limits on innovation, thus perpetuating rural poverty. He sees no reason why Bangladesh cannot produce enough food to feed its people and posits that rural economic development can be achieved through transformation of the traditional land system.

Elio Masferrer Kan's study is an in-depth analysis by a social anthropologist of a diffusion of innovations and retention processes in a peasant community in the northern highlands of Puebla, Mexico. The area's main cash crop is coffee; the community has experienced remarkable population retention and even witnessed return migration in the late 1970s and early 1980s. Critical factors have been

two state corporations that guarantee stable coffee prices and sell subsidized staple foods to the peasants, thus providing the economic security that keeps them in their community.

A. A. Aboagye describes a successful diffusion of innovations into a rural area of Ghana, which also led to rural development and retention. He shows that the introduction of appropriate technology increased the peasants' productivity and improved their living standards.

Antonio Ugalde suggests locating capital-intensive and high-productivity industries in rural areas as a means of improving the quality of life and retaining rural populations. Using data from West Malaysia, he contends that part-time industrial workers could continue to work in agriculture and invest some of their industrial earnings in modernizing their farms. He believes such dual employment would be particularly appealing to socialist economies of the Third World and in countries with a political commitment to rural development.

Rudolf Strobl analyzes the relationship between rural development and computer communications, viewing new technologies such as microcomputers as a means for transforming remote areas into developmental enterprises by linking them with urban centers and decentralizing job opportunities. However, there is one drawback. If the socioeconomic and political conditions in rural areas remain unchanged, the effect of computer telecommunications may be to crystallize underdevelopment in the countryside and lead to increased out-migration.

The third section of the book focuses on the political and cultural dimensions of retention and migration. Anthropologist Alfredo Méndez-Domínguez, analyzing Guatemalan data, discerns three patterns of migration, the most important of which is the movement of Indian peasants to cities. This movement cannot be explained solely by social and economic variables; rather, it is related to changes in the migrants' world view, ethnic boundary crossing, and the dual rural-urban nature of small Indian towns. Although the migrants cited economic reasons for moving, the author believes they were trying to become non-Indian by moving to urban areas.

Looking at the rural county of Paranaíba in the Brazilian hinterland, Elisa Pereira Reis, a Brazilian political scientist, argues that extending full citizenship to rural dwellers is crucial to the success of strategies aimed at curbing rural-to-urban migration in Brazil. Full citizenship involves a more active role for local government and assuring access to public goods by rural communities, she suggests.

The third and last chapter in this section analyzes the impact of an elementary school on a Peruvian peasant community. According to the author, Jorge P. Osterling, rural retention is a key goal of the Peruvian government. To make education more accessible to rural families, the government introduced educational reform in the early 1980s. The experiment was not successful because neither the education authorities nor the rural schoolteachers were rural-oriented. Osterling contends that the failure of reform has contributed to Peru's

inability to stem rural-to-urban migration.

The two remaining chapters assess retention efforts in communist countries. In the first, Alan B. Simmons looks at China and Cuba, which offer major contrasts in size, resources, and development history. Both have pursued the objectives of rural development and rural population control through policies enforced through highly centralized state control. In both cases the policies have been shown to reduce large-city growth while favoring the growth of small and intermediate cities. They have also reduced social-class and rural-urban inequalities and tensions.

The second chapter, by Georges Frélastre, illustrates how Eastern European countries have handled the propensity to migrate with retention policies that vary in their authoritarian tone. Frélastre considers the countries in decreasing order of authoritarianism: Albania, the USSR, Bulgaria, Romania, Czechoslovakia, the German Democratic Republic, Poland, Yugoslavia, and Hungary. Major features of these policies are administrative constraints on travel, control on housing, industrial scattering in the countryside, and special help for poorer agricultural regions.

Havet makes a strong case for more studies of retention, urging that research on migration and retention be carried out in parallel. A greater recognition of the importance of retention as a legitimate field of research, he concludes, would result in more local-level analyses and a reassertion of the value of "soft" social sciences, such as anthropology, sociology, and political science.

This is a thought-provoking collection of studies with an excellent introductory chapter by Havet, bibliographical notes, and an index. Social scientists, economists, and development planners should find it worthwhile reading.

—Alice D. Harris

Urbanization in Asia: Spatial and Policy Issues edited by Frank J. Costa, Ashok K. Dutt, Laurence J. C. Ma, and Allen G. Noble. Honolulu: University of Hawaii Press, 1989. x, 412 pp. (cloth), US \$44.00 ISBN 0-8248-1151-8. Available from University of Hawaii Press, 2840 Kolowalu St., Honolulu, HI 96822, USA.

The 19 studies presented in this volume were selected by the editors from those of some 70 scholars from 14 countries who participated in an international conference on Asian urbanization, sponsored by the University of Akron in Akron, Ohio, in May 1989. The conference attempted to fill a gap in knowledge about urbanization and urbanism in Asia. The papers were chosen because of their broad geographic scope or their implications for urban policy development.

The editors begin by summarizing the trends and prospects of Asian urbanization. Norton Ginsburg then reviews the literature of Asian urbanization. The ensuing chapters are organized into four parts focusing on national trends and processes, the regional and metropolitan effects of urbanization, case studies of individual cities, and policies for urban development.

In their introduction the editors describe some of the features common to both Western and Asian urbanization. These include rural-to-urban migration, high-density urban

clusters, social heterogeneity, inadequate economic infrastructures, and social stress. Other features are uniquely Asian, however. Among them are the compactness of settlement; the greater reliance on public transportation; the greater mixing of land uses, leading to less clearly defined spatial components; and the residual effects of colonialism. To these differences must be added the sheer magnitude of the populations of such countries as China, India, Bangladesh, Indonesia, South Korea, and Japan. In those countries large urban centers are developing amidst densely populated countryside.

Part II shows that the Asian nations have followed a variety of paths toward urban growth. Neither India nor Pakistan, described by V. Nath and Akhtar Husain Siddiqi, respectively, has achieved much success in restricting rural out-migration to already overburdened cities. China, however, presents a sharp contrast because, as Shunzan Ye explains, the government has emphasized both urban-based industrial development and the restriction of urban growth through cityward migration. Because of "economic takeoff" in Taiwan, accompanied by the development of efficient transportation networks to and from urban centers, a new kind of periurban development has occurred there. These periurban regions perform both urban and rural functions.

Discussing those functions, T. G. McGee uses the Indonesian word *kotadesi* (from *kota*, town, and *desa*, village), to describe a situation in which rural and urban activities occur in the same geographical territory. McGee suggests

that national governments could encourage the successful development of *kotadesi* activities through careful public investment in transportation links between small and intermediate cities, thereby achieving several planning objectives: the creation of balanced systems of urban places, reduced migration to the largest cities, and more efficient use of public revenues in stimulating economic activity.

Part III contains chapters on some of the problems associated with high levels of population concentration. Pradyamna P. Karan and Thomas K. Chao assess pollution in Taiwan and how people there perceive their environment. They contrast Taiwan with Calcutta and conclude that perceptions of environmental problems are largely culture-bound. They suggest that more needs to be known about how decision makers perceive urban problems and their solutions.

David H. Kornhauser's study of prefectures in Japan presents a methodology for determining urban density. Swapna Banarjee-Guha uses the case of New Bombay as an example of planned population dispersal in India. Although the new community is a success, it does not meet the needs of lower-income people.

In Part IV several case studies discuss various aspects of urban development in individual countries. Analyzing the relationship between resource exploitation and urbanization in East Kalimantan, Malaysia, William B. Wood suggests the need for resource management policies to protect the environment. Jinggan Zhang chronicles the tension that emerged in Beijing as the government tried to preserve traditional

landmarks and simultaneously facilitate city growth. Other studies are concerned with rural-to-urban migration in Delhi (C. S. Yadav); India's north-south and rural-urban correlates for urbanization (Ashok K. Dutt et al.); Jaipur and Jaisalmer, India, as models of the preindustrial city (Ramesh Tiwari); and the transformation of China's cities into industrial centers (Clifton W. Pannell).

"The lack of a coherent national urbanization policy in most Asian countries is one of the factors contributing to Asia's current urban problems. This policy failure is due to shortcomings associated with an even broader issue: the lack of a national development policy. Urban development and rural development are two sides of the same coin" (p. 15). These words by the editors prepare the reader for the concluding chapters on issues and policies for urban development in Part V.

Yue-man Yeung compares the strategies for physical control, regional planning, and policy development employed by Asian planners, especially in Tokyo, Shanghai, and Seoul. Bruce Taylor cites the accomplishments and failures of urban planners in Hong Kong. Amrit Lall examines the daily lives of migrants in the squatter settlement of Chandigarh, India. He suggests that "migrant colonies" should be established since squatters have become a reality of the Asian urbanization process. Yong Kyo Cho and Young Sup Kim discuss rising urban land prices in South Korea and the need for effective land tax policies. In the concluding chapter, Roland J. Fuchs and Ernesto M. Pernia look at the spatial patterns of Japanese investments in Asian cities and rural areas.

The issues discussed in this volume should be of interest not only to geographers and others in the social sciences, but also to development planners. All of the chapters are well written. Three have already appeared elsewhere. The volume contains excellent maps and figures prepared by Margaret Geib of the University of Akron. Most chapters are followed by bibliographical notes, and there is a brief index.

As a sidelight, the editors of this volume are also responsible for another book based on the Akron conference, *Asian Urbanization: Problems and Processes* (Berlin: Gebruder Borntraeger, 1988), which contains a different set of papers, but on the same theme of Asian cities.

—Alice D. Harris

ALSO NOTED

Family Planning and Child Survival: 100 Developing Countries by John A. Ross, Marjorie Rich, Janet P. Molzan, and Michael Pensak. New York: Center for Population and Family Health, Columbia University, 1988. vi, 247 pp. (paper), US \$5 (free to those in developing countries). ISBN 0-9620952-0-6. Available from Center for Population and Family Health, Columbia University, 60 Haven Avenue, New York, NY 10032, USA.

This volume presents statistics on family planning and child survival programs, with stress on time trends and broad geographic coverage. Included are 100 developing countries with populations of over 1 million, representing 98 percent of the developing world. For the three most populous countries—

China, India, and Indonesia—provincial data are also given.

The data, which are organized in tabular format, have been grouped into three major sections: on the demographic and social setting, on family planning programs, and on child survival programs. Topics range from government policies on population growth and specific forms of intervention, such as sterilization and abortion, to program characteristics and outcomes.

The information is drawn from the 12 editions of Dorothy Nortman's *Population and Family Planning Programs: A Fact Book* (New York: The Population Council, 1969-85); responses to a questionnaire addressed to the 100 countries in 1987; compilations by international agencies, notably the World Health Organization, the United Nations Children's Fund, and the United Nations Population Division; and the general literature.

This valuable reference work is expected to be updated approximately every two years.

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News from the Region

Editors' Note: The Forum welcomes news items about demographic activities in the Asian-Pacific region, including census plans, population surveys, vital registration developments, and training programs.

Jolikasthira Chosen to Head Population Survey Division of Thailand's NSO

Mrs. Sasithorn Jolikasthira has been appointed director of the Population Survey Division, National Statistical Office of Thailand. She replaces Mrs. Wiwit Siripak, who resigned in April 1989.

Computer-Assisted Coding the Subject of Recent ESCAP Workshop

A Workshop on Computer-Assisted Coding, organized by the Statistics Division of the Economic and Social Commission for Asia and the Pacific (ESCAP), was held at Christchurch, New Zealand, in April 1989. Thirty-two participants from 13 countries in the region attended the workshop, which was financed by the United Nations Population Fund and hosted by the government of New Zealand.

Discussions focused on the transfer of technology for improving the processing of population and housing censuses. A major part of data processing is the coding of responses, which affects the quality and timely release of census data. Computer-assisted coding (CAC) combines automatic coding with the provision for human intervention. Its advantages over manual

coding are cost efficiency, more accurate and consistent coding, improved data quality, more efficient updating of code lists, and more interesting work for the coders.

Some developed countries have experimented with fully automated coding procedures, with mixed results. The statistically advanced countries of the ESCAP region have shown interest in adopting CAC technology for various applications. In other countries, especially those where preparations for the 1990 census round are already well advanced, it is less likely that CAC will be used in the current round.

Topics in Japan's 1990 Census Identified

The next Population Census of Japan, to be taken on 1 October 1990, will include 22 questionnaire items, according to Michio Matsumura of the Population Census Division, Management and Coordination Agency, Japan. They are: name, sex, year and month of birth, relationship to the head of household, marital status, nationality, place of residence five years earlier, educational background, labor force status, name and kind of business, kind of work (occupation), employment status, place of work or location of school, transportation to work or to school, transportation time to work or to school, type of household, number of household members, sources of household income, type and tenure of dwelling, number of rooms in dwelling, floor-space area, and type of building and number of stories.

The item about place of residence five years earlier replaces two items in the 1980 census that asked when the respondent had moved into his present home and what was his previous address. Also new is the item about transportation time to work or school.

Ozzie Simmons, Sociologist, Dies at 69

Ozzie G. Simmons, Ph.D., distinguished lecturer and professional affiliate of Fordham University's Hispanic Research Center and former chair of the Department of Sociology and Anthropology, died in March at age 69 in Westwood, New Jersey, after a short illness.

Simmons joined Fordham University in 1981 after a distinguished career in sociology and anthropology, working with the Smithsonian Institution, Harvard University, the University of Colorado, Brandeis University, and the Ford Foundation.

During his years with the Ford Foundation (1968-81) he worked in Santiago, Chile; Bangkok, Thailand; Manila, the Philippines; and New York City. A major contributor to the Ford Foundation's population efforts, he developed various important programs.

Simmons was the author of numerous books and monographs and more than 80 articles. His book *Perspectives on Development and Population Growth in the Third World* (Plenum Publishing Corp., 1988), reviewed in this issue, was selected by *Choice* as "one of the outstanding academic books of 1988-89."

FAMILY PLANNING COMMUNICATION . . .

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ly significant at the 95 percent confidence level, partly because of the small number of cases in each category. As expected, inconsistent fertility desires were not related to a higher frequency of accidental pregnancies among women who had been sterilized and those whose husbands had been sterilized.

The bivariate analysis of the link between the consistency of spouses' fertility preferences and accidental pregnancy while using a particular method suggests that inconsistent fertility desires may result in the failure to use properly temporary methods requiring the cooperation of both partners. A multivariate analysis would help to eliminate the possible confounding effects of other variables such as age, education, and duration of method use, but would probably require combining some method categories to

achieve an adequate number of cases for a multivariate model. We have not attempted such an analysis here.

■ Summary and conclusion

The results of our analysis indicate a high degree of family planning communication between spouses in Sri Lanka. The communication, however, varied according to couples' number of living children and to wives' age, education, place of residence, religion, and work status. Multivariate logistic regression generally confirms that older women, those with little or no education, those living on tea estates, and Muslims were less likely to communicate with their husbands on family planning matters than were women in other age, education, residence, and religion categories.

These findings suggest the existence of social and cultural obstacles to communication between spouses about family planning matters in Sri Lanka.

Among the 577 pairs of spouses whose answers we compared for consistency, a large proportion of wives reported hearing about male contraceptive methods directly from their husbands, and a large proportion of husbands reported hearing about female methods from their wives. These findings are a reminder that both spouses are potentially important sources of information about contraception.

The bivariate analysis revealed a high degree of consistency between spouses in their reports of whether or not they discussed family planning with each other, but there was somewhat less agreement about whether they discussed their desired family size with each other. Among half of the matched couples the spouses expressed the same desired family size. The remaining couples were nearly equally divided between those in which the wives desired more children than the husbands, and those in which the husbands' family-size preferences were greater.

More husbands than wives reported that they were currently using condoms, rhythm, or abstinence. For about four-fifths of the couples, wives and husbands gave consistent responses about the current method they were using.

For a developing country Sri Lanka is well advanced in its level of education for both sexes and in the wide acceptance of family planning

Table 6. Percentage of wives reporting an accidental pregnancy while using a temporary method, by consistency in the desired number of children reported by spouses: SLCS

Method	Percentage having accidental pregnancy while using method		B/A
	Husband's desired family size same as wife's (A)	Husband's desired family size different from wife's (B)	
Condom	3.1 (32)	4.5 (22)	1.45
Withdrawal	9.3 (54)	18.8 (48)	2.02
Rhythm	12.8 (78)	18.6 (70)	1.45
Oral contraceptive	9.4 (32)	11.8 (17)	1.25
IUD	0.9 (19)	* (13)	*
Injectable	* (9)	* (7)	*

*Fewer than 15 observations; percentages not shown.

as an important and positive aspect of marriage and family life. These conditions make family planning communication and joint decision making in family planning matters possible and should help couples to achieve their desired family size safely and effectively.

Nevertheless, improvements in the status of women, such as increasing their education and employment opportunities, would most likely have a positive effect on communication and cooperation between marriage partners in family planning matters. Greater exposure of husbands to family planning information, education, and communication (IEC) programs and to counseling and service delivery should also be encouraged. Likewise, enlisting the support of religious leaders for encouraging greater communication between spouses about family life and family planning could help to remove some of the remaining social and cultural barriers to couples' achievement of their desired family size and improve the quality of marital relationships.

NOTE

1. About one-fifth of Sri Lanka's 15 million inhabitants are Sri Lankan Tamils (mostly Hindus) and three-fourths are Sinhalese (mostly Buddhist). Other ethnic minorities include Moors (who are Muslims) and Indian Tamils, most of whom are migrant workers living on tea plantations, called tea estates, in central Sri Lanka.

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FERTILITY OF ASIAN AND PACIFIC ISLANDER AMERICANS . . .

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the normal procedure would be to compute the non-own adjustment factor for children of a specified age as the ratio of all children of that age to all matched children of that age, irrespective of race, and to assume that the non-own adjustment factor was the same for each race.

In the present instance, we were able to improve somewhat on this procedure by computing non-own adjustment factors by child's race. In effect, unadjusted fertility estimates were first calculated by mother's race and then adjusted upward for non-own children by means of adjustment factors by child's race.

Reverse-survival requires life tables. Because mortality data for the racial groups considered here are incomplete and sometimes unreliable, we uniformly used life tables by sex

for the entire United States for 1980. The absence of race-specific mortality estimates introduces some error in the fertility estimates, but previous research indicates that this error is very small (Retherford et al. 1980). This is so because at prevailing low levels of mortality, reverse-survival factors are necessarily close to 1 and quite insensitive to errors of even several years of life expectancy.

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USE OF SAMPLING . . .

(continued from page 20)

Careful consideration must be given during the planning and execution of the census to its function as a source of sampling frame for diverse surveys.

census have multiple functions: to partition the population into geographic areas with clear, stable, and identifiable boundaries, which can be mapped and described; to facilitate complete and unique coverage

of the units in the population; to create reasonably equitable and feasible workloads; to facilitate the organization and control of census operations; to provide a flexible basis for the production of areal statistics at various levels of disaggregation; and to provide a basis for scientific and efficient sample selection for subsequent surveys. Although these requirements cannot all be satisfied simultaneously, they indicate desirable characteristics of census EAs.

EAs should be small (containing a few hundred people on the average) as well as reasonably uniform in population size. However, the requirement of clear boundaries is more important than uniformity in size. EAs should be areal units covering the entire country exhaustively and should be mapped and described for clear identification of boundaries; they should not usually cut across administrative subdivisions. They should be geographically ordered with proper identifi-

cation systems, to facilitate the production of results at different levels of aggregation. Information on their size and other basic characteristics should be collected, coded, and tabulated for individual areas.

The census generally provides sampling frames or master samples only of areal units for subsequent surveys. Lists of housing units, households, and individuals from the census are usually not allowed because of confidentiality concerns. Such lists are also too difficult to arrange, and individual households are too mobile to be used for subsequent surveys, except perhaps in surveys attached to or conducted soon after the census.

Apart from the use of the census for constructing the sampling frame and for sample design and selection, census data are also useful for improving the precision of survey estimates, especially of population totals and aggregates from small samples. For example, it is often possible to estimate totals more precisely by first obtaining sample proportions, means, or ratios, and then inflating them with complete count figures from the census, updated to the extent possible with auxiliary information.

Similarly, census information can be used to obtain poststratified, or "standardized," estimates. Basically this means that the sample data are weighted so that the distribution of cases in the resulting (weighted) sample by age, sex, location, and other such characteristics agrees with the corresponding distribution available from more reliable sources such as the complete census.

The estimation problem becomes more critical in connection with current estimates for small domains

in the postcensus period. Special estimation procedures are required for this purpose. The need for detailed statistical data and for ever more varied and current data for local areas and other small domains has grown with the increased mobility and diversity of populations. Census data have been used for this purpose where they have been available, but they tend to be obsolete and limited in content.

Population registers and other administrative records supply the needed data only in rare cases, and sample surveys cannot generally be made on a large enough scale to yield data for small population groups or for small administrative areas. Consequently, several methods have recently become available and are being developed for providing estimates detailed both in space and in time, by combining the spatial details of censuses with the timeliness of sample data or, less commonly, with registers. It is not possible to review here these developments in the combined use of censuses, sample surveys, and other sources of data, but several good references have become available (e.g., Platek et al. 1987).

■ Sampling in place of the complete census

A final consideration is whether complete enumeration on a 100 percent basis is indispensable, or whether in certain circumstances it may be replaced by sample enumeration or even by some other source such as continuous registration. Outside the population field the term "census" or "sample census" is often used to refer to operations that are in fact not a complete

enumeration of all units in the study population.

For example, most agricultural "censuses" are conducted on a sample basis, albeit often on a large scale. Similarly, although censuses of economic establishments cover large and medium-size units on a 100 percent basis, it is often reasonable as well as practically unavoidable for them to cover the numerous small establishments only on a sample basis.

The sampling method may replace complete enumeration when the information to be collected is complex and cannot be simplified sufficiently to make it suitable for complete enumeration. This will also be the case if the study objectives are adequately served by sample enumeration despite the sampling variability to which the results are subject, or if the larger coverage errors and variances typically encountered in sample surveys (especially in estimating population totals) can be reduced to acceptable levels by appropriate estimation techniques using more accurate control data from some external source. Enumeration on a sample basis can also be suitable if the units vary greatly in size and if the contribution of the numerous small units to the population totals being estimated is small in proportion to their numbers.

One or more of these considerations may apply to the enumeration of agricultural holdings, economic establishments, or other units of that type. In my view, however, these are not valid reasons for substituting a sample survey for the complete coverage of the human population, especially as concerns its total count, distribution, and

basic demographic characteristics. Population census data—even though they can be collected only at infrequent intervals, suffer from various errors arising from numerous sources, and are often published with lamentable delays—remain the basis of all planning and perhaps of all statistics on our social existence.

Some northern European countries may be in a position to consider using population registers to compile so-called administrative record censuses in place of the conventional direct enumeration census, but such an alternative is available to only a few countries having reliable vital registration systems. It is an option for practically none of the developing countries, now or in the foreseeable future. And replacing a complete count by sample enumeration in a population census, whether by choice or through lack of resources, has been found to yield inadequate results, especially as concerns coverage errors.

A suggestion has been made, perhaps with greater merit, that large-scale periodic surveys with largely non-overlapping samples could greatly enhance the usefulness of conventional censuses and may be better suited than censuses for meeting certain objectives (Kish 1979). These objectives include providing current estimates for local areas and other small domains, monitoring trends and other temporal changes, and providing data that not only are spatially representative but also, through averaging over seasonal and haphazard variations, are more representative (more objectively extrapolatable) in the time dimension. The samples can

be cumulated over an extended period of time to yield greater geographic detail.

This alternative to the census is a possibility for the future. At present, however, the likely high cost and the administrative and logistical difficulties that such a scheme would entail—in particular the long-range planning and large-scale mobile operations it would involve over a prolonged period—make it unfeasible in developing countries.

■ Summary and conclusion

Periodic enumeration of the whole population and its basic characteristics remains an indispensable source of statistical information in most countries. However, the scope and efficiency of the census operation can be greatly enhanced by using sampling in conjunction with complete enumeration in various ways.

Sampling is useful in the design and control of census operations, in checking the accuracy of the census's coverage and content, and in timely processing and dissemination of its results. Most importantly, large-scale samples can be attached to the census to collect a much greater variety of information than that feasible or desirable on a complete count basis. The countries of Asia and the Pacific are increasingly making a judicious use of this combined census-survey arrangement to meet their diverse data needs.

The census also serves as the basis for subsequent sample surveys. Apart from generally enhancing the capability and resources for statistical work, it provides baseline data and, above all, frames from which representative samples can be select-

ed. Increasingly, census and survey data are being used to generate estimates that combine the spatial detail of the census with the diversity and timeliness of sample surveys.

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Topics Covered in 1980-Round Censuses (continued)

		Aus 1981	Bangl 1981	China 1982	Fiji 1976	HK 1981	India 1981	Indo 1980	Japan 1980	Korea 1980	Mal 1980	Nepal 1981	NZ 1981	Pak 1981	PNG 1980	Phil 1980	Sing 1980	SL 1981	Thai 1980	US 1980
Educational Characteristics																				
			†			†	†	†		†				†	†	†	†	†	†	†
Educational attainment ⁵	ER	—	•	•	•	○	•	○	•	•	•	•	•	•	•	○	•	•	•	○
Literacy	ER	—	•	•	—	—	•	○	—	—	•	•	—	•	—	○	•	•	○	—
School attendance	ER	•	•	—	—	—	•	•	•	•	•	—	—	○	•	○	•	•	○	○
Educational qualifications ⁶ (Professional/vocational education)	EO	•	—	—	—	—	—	○	—	—	•	•	•	•	—	○	—	—	—	—
Age when left school	•	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Field of education	—	○	—	—	—	○	—	○	—	○	—	•	•	○	—	○	—	—	—	—
Economic characteristics																				
Activity status ⁷	ER	•	•	•	•	○	•	○	•	○	•	•	•	○	•	○	•	•	•	○
Occupation	ER	•	○	•	•	○	•	○	•	○	•	•	•	○	○	○	•	•	•	○
Industry	ER	•	○	•	•	○	•	○	•	○	•	•	•	○	○	○	•	•	•	○
Status in employment ⁸	ER	•	○	—	•	○	•	○	•	○	•	•	•	○	—	—	—	•	•	○
Time worked	EO	•	—	—	—	○	—	○	—	—	•	—	•	—	—	—	—	—	—	○
Income	EO	•	—	—	—	○	—	—	•	—	—	—	•	—	—	—	○	—	—	○
Sector of employment ⁹	—	—	—	—	—	○	—	—	—	—	—	—	—	—	○	—	—	•	—	○
(Number of dependents) ¹⁰	EO	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Place of work/school	•	—	—	•	—	•	—	•	—	○	•	•	•	—	○	○	•	•	—	○
Means of travel to work	•	—	—	—	—	—	—	•	—	○	—	—	—	—	—	—	○	•	—	○
Cottage industry	—	•	—	—	—	—	—	—	—	—	—	H	—	—	•	—	—	—	—	—
Secondary occupation	—	—	—	—	—	○	•	○	—	—	—	—	—	—	—	—	—	—	—	—
Whether seeking more work	—	—	—	—	—	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Social Security benefits	—	—	—	—	—	—	—	—	—	—	—	—	•	—	—	—	—	—	—	○
Activity 5 years ago	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	○
Military service	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	○
Agricultural activity	—	—	—	—	—	—	H	•	—	—	—	H	—	—	•	—	—	—	—	○
HOUSING TOPICS																				
Building in Which Living Quarters Are Located																				
Type of building, structure	ER	•	○	—	—	—	—	○	•	•	H	—	H	—	○	H	•	○	○	•
Material of outer walls	ER	•	•	—	—	—	H	○	—	•	H	—	H	H	—	H	—	○	○	—
Year of period of construction	ER	—	—	—	—	—	—	—	—	•	H	—	—	H	—	H	—	○	—	○
(Material of roof or floors)	EO	—	•	—	—	—	H	○	—	•	H	—	H	H	—	H	—	○	—	—
(State of repair)	EO	—	—	—	—	—	—	—	—	—	H	—	—	—	—	—	—	—	—	—
Builder of structure	—	—	—	—	—	—	—	—	—	—	H	—	—	—	—	—	—	—	—	—
Use of building/living quarters	—	—	—	—	—	—	—	H	—	—	—	—	—	H	—	—	—	—	○	•
Living Quarters																				
Location	ER	•	•	•	—	•	H	H	H	•	H	H	H	H	○	H	•	○	•	•
Type of living quarters ¹¹	ER	•	•	•	—	•	H	H	•	•	H	—	H	H	—	H	•	○	•	•
Type of ownership ¹²	ER	•	—	—	—	—	—	—	•	—	H	—	H	—	○	—	—	—	○	—
Occupancy status ¹³	ER	•	—	—	—	—	—	—	—	—	H	—	—	H	○	—	H	—	—	•
Number of rooms	ER	•	○	—	—	—	H	—	•	•	H	—	H	H	—	H	—	○	○	•
Source of lighting	ER	—	○	—	—	—	—	○	—	—	H	—	—	H	—	h	—	○	○	—
Toilet facilities	ER	—	○	—	—	—	H	○	—	•	H	—	—	H	—	h	—	○	○	○
Water supply	ER	—	•	—	—	—	H	○	—	•	H	—	—	H	—	○	—	○	○	• ¹⁴
Bathing facilities	EO	—	—	—	—	—	—	○	—	•	H	—	—	H	—	—	—	—	○	○
Cooking facilities	EO	—	—	—	—	—	—	—	—	•	H	—	—	H	—	—	—	—	○	○
(Type of cooking fuel)	ER	—	○	—	—	—	—	○	—	•	—	—	H	H	—	h	—	○	○	○
(Useful or living floor space)	EO	—	—	—	—	—	—	○	•	•	—	—	—	—	—	H	—	—	—	—
(Outdoor space)	EO	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
(Temperature control)	EO	—	—	—	—	—	—	—	—	•	—	—	H	—	—	—	—	—	—	○

Topics Covered in 1980-Round Censuses (continued)

		Aus 1981	Bangl 1981	China 1982	Fiji 1976	HK 1981	India 1981	Indo 1980	Japan 1980	Korea 1980	Mal 1980	Nepal 1981	NZ 1981	Pak 1981	PNG 1980	Phil 1980	Sing 1980	SL 1981	Thai 1980	US 1980
<i>Separate storage for paddy</i>			†			†	†	†		†				†	†	†	†	†	†	†
<i>Electricity</i>			o				H					H								
<i>Hot water supply</i>												H								o
<i>Ethnicity of owner</i>											H									
<i>Type of entrance</i>																				
<i>Connected to public sewer</i>																				o
<i>Utility costs</i>																				o
<i>Real estate taxes on house</i>																				o
<i>Value of property</i>																				o
<i>Mortgage on house</i>			•																	o
<i>Insurance on living quarters</i>																				o
<i>Character of marine living quarters</i>						o														
Occupants																				
Conjugal family nucleus ¹⁵	ER						H													
Character of household head ¹⁶	ER						H			H										
Households ¹⁷	ER					o	H			•	H			H	H	•		o	•	
Occupants	ER		o	•		•	H	•	•		H	H	H	H	H	•		o	•	
Tenure of living quarters ¹⁸	ER		•	•		o	H	o	•	•	H	H	H	H	o	h	•	o	o	•
Rent paid	EO		•			o						H							o	•
(Income level of household)	EO										H									
(Tenure of land)	EO		•				H	o							h				o	
(Household appliances)	EO		o					o		•	H	H	H		h				o	o
<i>Number of motor vehicles</i>			•								H		•							o
<i>Means of transportation</i>			•							o	H		•							o
<i>Own agricultural land</i>			•					•												
<i>Own holiday residence</i>												H								

Source: Cho and Hearn (1984:xvii-xix).

KEY: Topics in roman type not enclosed in parentheses are from the 1980 global recommendations from the UN Statistical Office.

Topics in parentheses are ESCAP topics that were not among the global recommendations.

Topics followed by the letters ER were included in the ESCAP "recommended" topics; topics followed by EO were ESCAP "other useful" topics.

Topics in italic type were in neither the global nor the ESCAP recommendations.

† Countries in which sampling was used in conjunction with complete enumeration.

• Asked of all persons/households on population questionnaire.

o Asked of a sample of persons/households on population questionnaire.

H Asked of all persons/households on housing questionnaire only.

h Asked of a sample of persons/households on housing questionnaire only.

— Not asked.

1. Or date of birth.
2. Sometimes asked in combination with children who died.
3. Or last live birth.
4. Identification of natural parents if in household. For fertility tabulations by own parent, e.g., for own-children fertility estimation.
5. Highest grade completed.
6. Degrees or certificates obtained; sometimes includes field of study.
7. Employed, looking for work, housekeeper, student, etc.
8. Self-employed, employer, employee, etc.
9. Mainly public (government) or private.
10. As shown by source of livelihood of each individual.
11. Permanent, temporary, institutional, etc.
12. Mainly government or private.
13. Occupied or vacant.
14. Refers to all plumbing facilities: hot and cold piped water, flush toilet, and bathing facilities.
15. Identification of couples and their children (usually this information can be derived from the population census questions and is not asked for separately).
16. Usually this information is available from the population census questions and is not asked for separately.
17. Households identified separately (usually this information is available from the population census questions).
18. Own, rent, occupy without paying rent, etc.

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The 1990 U.S. Census: How Good Is Good Enough?

The 1990 U.S. census is likely to be the most accurate in the nation's history, but it may miss two or three million people, most of them poor and many of them black or Hispanic. Because the population census is the basis for political apportionment and determines the allocation of a growing share of federal funds to localities and public programs, undercoverage is of great concern to cities, states, and the groups most affected. The statistical methods developed to measure the extent of undercounting in the census have become increasingly reliable, but the official census count has never before been adjusted on the basis of these methods. This article describes plans for the 1990 census and examines a growing controversy over adjustment for an undercount.

by Bryant Robey

1 APRIL 1990 is census day in the United States, marking two hundred years of census taking in America. As the country has grown from a young agrarian nation of 3.9 million people clus-

tered along the eastern seaboard to a complex postindustrial nation of 250 million spread across the continent and beyond, the census has charted its growth and development.

For the 1990 census, the U.S. government will print about 250 million census questionnaires and

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The EAST-WEST POPULATION INSTITUTE, a unit of the East-West Center, conducts research, training, and related activities in the field of population, with emphasis on economic, social, psychological, and environmental aspects of population problems in the region of concern to the East-West Center.

The EAST-WEST CENTER is a public, nonprofit educational institution with an international board of governors. Some 2,000 research fellows, graduate students, and professionals in business and government each year work with the Center's international staff in cooperative study, training, and research. They examine major issues related to population, resources and development, the environment, culture, and communication in Asia, the Pacific, and the United States. The Center was established in 1960 by the United States Congress, which provides principal funding. Support also comes from more than 20 Asian and Pacific governments, as well as private agencies and corporations.

label and assemble over 100 million mailing packages. At the peak of activity, 200,000 enumerators will be in the field visiting more than 30 million households, and another 100,000 office workers will be supporting them. Seven million maps will help the enumerators find their way.

The Constitutional purpose of the U.S. census is to provide an enumeration to determine how many seats each state will fill in the House of Representatives, but the census has always been more than a head-count. The modern census provides data that are used to allocate billions of dollars of government benefits to states, cities, and counties. Many government assistance programs use census data as part of their allocation formulas. The private sector of the economy depends on the census for efficient corporate planning, marketing, and forecasting consumer demand. Local governments, school systems, universities and colleges, hospitals, and community service agencies all use information from the census.

The 1990 census is likely to be the most accurate in the nation's history. Nevertheless, it may miss counting two or three million people. Even though they may represent only a small percentage of the total population, these few million people are the center of a public controversy that has split the U.S. statistical and political communities and has already resulted in a lawsuit against the government.

The issue is whether the government should be required to make a statistical adjustment that would add people to the census count to compensate for the failure of the actual enumeration to include peo-

ple that postenumeration surveys demonstrate actually exist (Robey 1989). At the crux of the controversy is disagreement about both the quality of the undercount estimate itself and the appropriateness of altering actual census counts after the fact.

■ The causes of error

The Constitutional requirement for a census was drawn up long before the era of the computer or the development of demographic methods or sampling techniques. The Founding Fathers could not have expected an errorless census. The 1790 census, which took 18 months to complete, yielded a total of 3,929,326 persons, but the government suspected an undercount.

"I enclose you also a copy of our census, written in black ink so far as we have actual returns, and supplied by conjecture in red ink, where we have no returns; but the conjectures are known to be very near the truth," wrote Thomas Jefferson to George Washington in 1791 (Kaplan et al. 1980:12). "Making very small allowance for omissions (which we know to have been very great), we are certainly above four millions."

In the nation's early days, censuses were far less precise than today. For the first nine censuses, U.S. marshals tallied the population. It was not until 1880 that special enumerators were hired. The Bureau of the Census was established as a permanent department of government only in 1902. Over the years, technological advances in sampling techniques, operational methods, tabulation technologies, and information systems have been adopted.

The 1990 census is relying heavily on modern computer technology.

These improvements have enabled the Census Bureau to increase the accuracy of the enumeration with each successive census in recent decades. Its estimates place the net undercount at 4.4 percent of the population in 1950, 3.3 percent in 1960, 2.9 percent in 1970, and 1.4 percent in 1980 (Fay et al. 1988: Appendix A).

In any nation, despite the use of modern methods, enumerating the final few percentages of the population is extremely difficult. Canada's estimated undercount in its 1986 census was over 3 percent, a level of undercounting some 50 percent higher than was achieved in either its 1981 or 1976 census. Improving accuracy is Canada's top priority for the 1991 census (Petrie 1988:3).

Japan's rate of census accuracy is estimated to be higher than in either Canada or the United States, in part because the population is more homogeneous and less mobile. The Japan Statistical Association reports that the 1985 census achieved a net undercount rate of only 0.35 percent (Miura 1988:14).

In China, even with its highly centralized government and a well-developed household registration system, census planners are concerned that the social and economic reforms launched since the most recent Chinese census in 1982 may have lessened people's incentive to register and therefore made accurate enumeration more difficult. Moreover, "because of the practice of the system of rewards and penalties in family planning in China, a number of people have become more reluctant to declare faithfully the number of their family members,"



Most U.S. households will receive and return their 1990 census forms by mail. The Postal Service will handle the return of approximately 70 million census questionnaires during the first two weeks of April 1990.

the deputy director-general of China's State Statistical Bureau, Sun Jingxin, has reported (Sun 1988:1, 6).

It may also be too much to expect that every group in society will be counted with exactly the same degree of accuracy. In the United States, it is relatively easy to enumerate middle-class households in their suburbs, because they live at easily-identified addresses and are likely to receive and return their census questionnaires. But it is much more difficult to enumerate the poor and the alienated because it is both harder to locate them—they live disproportionately in isolated rural areas and in inner city slums—and more difficult to enlist their cooperation when they are located.

Census Bureau studies after the 1980 census showed that 99 per-

cent of whites had been enumerated but only 94 percent of blacks. The bureau's studies showed the highest undercount rates were for black males between the ages of 25 and 54, fully 15 percent of whom were missed (Fay et al. 1988: Appendix A). The undercount of the Hispanic population was slightly lower than the rate for blacks.

Ultimately, of course, the quality of any census depends not only upon the efforts of the statistical agencies, no matter how competent and hard working, but also upon the cooperation of the people. In an effort to increase awareness of the 1990 census and enlist the public's cooperation, the Census Bureau will conduct an intensive public relations campaign. It will assure the American people that personal identities are kept confidential and argue that answering the census

questionnaire is in the public interest.

Such public appeals improve the response rate, studies show, but they have their limitations. Many Americans do not believe the government's assurance of confidentiality, or concern themselves with the public interest. The mobility of Americans and the lack of any household registration system compound difficulties for the Census Bureau. People do not stand still to be counted, and some even go out of their way to avoid being counted.

These problems are much greater in developing nations and are a major cause of census error in those countries. Pakistan, for example, must enumerate Baluchistani tribespeople, who move from place to place in different seasons; deter-

mine which people are Afghan refugees, who are not to be included in the census count; and attempt to locate nomads and other people who have no fixed residences at all (Chaudhry 1988:11).

The quality of any census depends not only upon the efforts of the statistical agencies, but also upon the cooperation of the public. The mobility of Americans and the lack of a household registration system complicate those efforts in the United States.

For many reasons, not all of which are easy to change, the census is an imperfect instrument. According to Kang-Woo Lee, director general of the National Bureau of Statistics in the Republic of Korea, "Even with a greatly increased budget and manpower, an accurate count of the entire population and the determination of its characteristics within a limited time span are extremely difficult to calculate. Any census conducted in an ever mobile society is usually subject to many errors, including coverage and content inaccuracies" (Lee 1988:5).

■ Achieving accuracy

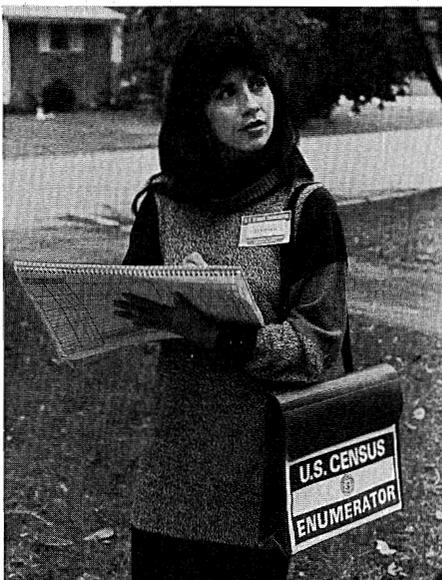
The objective of the U.S. census is ambitious—to locate all living quarters in the United States, deliver a census questionnaire, and receive back the completed questionnaire. The 1990 census will cost over \$2.6 billion. Even after inflation is accounted for, that is more than twice

as much as the previous census, which itself was the most expensive in history. Most of this cost increase results from efforts to improve census accuracy, according to the Census Bureau (Bounpane, n.d). In 1970 the cost per housing unit (in 1980 dollars) was below \$7; in 1980 it rose to over \$12, and the cost is expected to be over \$18 in 1990 (Dodaro 1988).

The Census Bureau's enumeration methods are designed to use as few personnel and dollars as possible in counting the majority of households so that more resources can be deployed in those areas where it is difficult to locate housing units and enumerate residents. The great majority of Americans will never talk to a census enumerator because they will receive and return their census forms by mail.

Taking the census by mail depends on having complete and accurate address lists. Wherever it can, the Census Bureau buys mailing lists from commercial list vendors and then, in cooperation with the Postal Service, checks the accuracy of the lists at several points before census day by canvassing neighborhoods and comparing lists with Postal Service records. Obtaining a high mail-response rate is vital, because the higher the response by mail, the fewer the enumerators needed.

To improve further the mail-return rate, the Census Bureau is also delivering census questionnaires to households five days earlier than in 1980 to give households more time to complete their responses. Persons who need help completing their questionnaires will be able to call a toll-free telephone number listed on the questionnaire



Census enumerators will visit those housing units that do not respond to the census questionnaire. Like all census employees, enumerators take an oath to protect the confidentiality of individual census responses.

BUREAU OF THE CENSUS

forms. In areas where there are language or other barriers, the bureau will mail a brochure in several languages to each housing unit, alerting people to the approach of the census questionnaire and urging them to fill it out and return it.

The mailed census package itself will contain a message about the purpose of the census, because research conducted after the 1980 census showed that the first time some people heard of the census was when the questionnaire arrived in the mail.

Despite these exertions, bureau planners expect the mail response rate in 1990 to fall below the 1980 rate of 83 percent by about 5 percentage points (Jones 1988).

To help achieve an accurate count, between April and June 1990 hundreds of thousands of enumerators will be contacting the housing units that did not return a questionnaire by mail. Census staff will telephone households and make up to three visits in person, if necessary, to find someone at home. Failing to find anyone after three visits, enumerators will try to obtain information about the missing household residents by asking the neighbors, who often know at least the number of people living next door.

In some cases, census enumerators may not be able to learn anything about the inhabitants of a particular housing unit. If all else fails but it is clear that the housing unit in question should not be identified as vacant, the Census Bureau has developed a computer program that assigns people and characteristics to that household on the basis of responses obtained from the nearest similar housing unit. Testing has shown that these imputation

How the Census Bureau will assess the accuracy of the 1990 census

The Census Bureau uses two main methods to measure census coverage: demographic analysis, and recanvassing of a sample of households soon after the census, called a postenumeration survey (PES). For the 1990 census, the bureau is also planning a program of participant observation to investigate the causes of undercount in selected hard-to-enumerate areas.

Demographic analysis. This method involves the development of an estimate of the population by age, race, and sex from administrative records essentially independent of the census. The estimated population is then compared with the census count to measure net coverage by the census. Sources used for the demographic analysis include birth and death records, records from Medicare (a government-sponsored medical insurance program for the elderly), immigration data, and estimates of emigration. The analysis involves the comparison of aggregate data sets rather than case-by-case matching. This method can provide national estimates for the total population, blacks and nonblacks, age groups, and the two sexes; but it cannot provide defensible estimates for subnational areas or for Hispanics, nor can it provide information about the characteristics of people missed by the census.

Still, for broad racial groups, at the national level, demographic analysis estimates may be the most reliable data available. Demographic analysis also provides important information on the structure of the population. Thus, even if there is uncertainty about the exact number of births, the ratio of males to females is considered to be highly accurate.

The components of error and the total error in the estimates from demographic analysis will be evaluated through analyses of the data used in making the estimates. The analyses of the components of error will assess how well the assumptions of the methodology hold. Those components are errors in the birth registration completeness estimates, in the estimates of net immigration of undocumented aliens, in the estimated births from 1915 to 1935, in the estimates of the population over age 65, in the estimated number of emigrants, and in other smaller components combined. The analyses of the components of error will provide information required to assess the total error in the estimates based on demographic analysis.

Postenumeration survey. The PES actually consists of two surveys. One, which measures census omissions, entails a sample of people who should have been counted in the census. The sample, which must be representative of the population as a whole, is matched with

procedures provide surprisingly accurate information. According to the Population Reference Bureau's William P. O'Hare (1988:6), "the imputation procedure accounted for approximately 761,000 persons out of a final count of 226.5 million in the 1980 Census (0.34 percent of the total)."

The Census Bureau will attempt to enumerate the homeless population, whose numbers are believed to have grown greatly since the 1980 census, and include them in the 1990 enumeration. This effort will be prone to inaccuracies, because of

Special efforts will be made to locate and enumerate the homeless population, believed to have increased greatly since the 1980 census.

the enormous difficulties in locating a population without any regular residence. A "shelter and street night" enumeration will begin the evening of 20 March 1990, counting people in hotels and motels identified beforehand as shelters for the homeless or that cost \$12 or less per night. It will include "emergency shelters (public or private) and open locations in the streets, parks, and other areas not intended for habitation" (Jones 1988).

■ Accounting for undercount

Throughout two centuries of census taking in the United States, individual states and localities have periodically complained that their areas were undercounted by the census. From time to time, evidence of seri-

the census records to see whether everyone in the sample was actually counted. The second sample is used to measure erroneous inclusions in the census. The advantage of the PES is its ability to provide estimates for subnational areas and data on the characteristics of persons missed by the census.

Plans for the 1990 PES call for a sample size of 150,000 housing units, drawn from approximately 5,000 census blocks. The sample size is allocated to give a coefficient of variation of 0.7 percent in each of 54 major geographic areas. The sampling strata represent a geographic partition of the United States into areas that are thought to be homogeneous with respect to the undercount mechanism. In developing the strata, the Census Bureau has considered the following factors: race; place size (small, medium, and large primary metropolitan statistical areas, plus areas outside the central cities); differences among general geographical areas; and tenure in the area where enumerated, with renters serving as a proxy for movers, a group believed to be associated with the undercount.

The bureau also plans to divide the country into estimation strata, or poststrata, representing the finest level of detail for which direct PES estimates of the 1990 undercount will be produced. In developing the poststrata, the bureau is looking at age and sex in addition to the sampling factors, since in the past both demographic analysis and the PES have suggested differential undercount by sex and by age.

The PES will exclude institutional populations and military barracks, for both of which administrative records are used to collect the census data, making an independent evaluation of the census difficult; rural Alaska, where the census is conducted by enumerators who fly into remote areas; and street and shelter populations, for whom matching is made impossible by the decision to accept census enumerations based on observation—that is, without obtaining the names or characteristics of the persons enumerated.

The Census Bureau will employ some 30 ethnographers as participant observers in areas where hard-to-count groups are thought to be concentrated. The observers will be persons familiar with the neighborhoods.

The components of error and the total error in the estimates from the PES will be evaluated through analyses of data collected during the PES and in two special operations involving reinterviewing of PES respondents and independent rematching of sample blocks. The evaluations of the components of error will assess the validity of assumptions underlying the PES methodology. Their results will provide information required for assessing the total error.

Final combined estimate. The final estimates of the census undercount will be based on both the demographic analysis estimates and the PES. The PES will provide the geographic distribution and charac-

teristics of the people missed in the census. Demographic analysis will enable the Census Bureau to validate the results and improve the estimates. From both sources it will derive one combined estimate that will take into account not only the measured undercount for an area, but also what is known about the error structure, both variance and bias, of the PES and demographic analysis.

[Adapted with permission from Hogan and Wolter (1988) and Keane (1987).]

ous undercounting has appeared. For example, the 1870 census was thought to have seriously undercounted the population of the South. "Interpolation back from the 1880 figures indicates a potential total undercount of 1.2 million in the South and a black undercount of .5 million—over 10 percent of the black population," according to social historian Margo J. Anderson (1988:89).

Although error has been part of every enumeration for 200 years, and occasionally the errors have been major, until recently the nation has always agreed to abide by the findings of the actual enumeration. That tacit agreement, followed in practice though unembodied in law, ended with the 1980 census.

The 1980 census figures were challenged in more than 50 lawsuits alleging that localities with a higher-than-average share of black and Hispanic residents were injured by the undercount. In each of these cases, some of which took nearly the entire decade to complete, the courts found in favor of the government position not to adjust for undercount (U.S. Bureau of the Census 1988).

Despite winning all of the lawsuits related to the 1980 census, the Census Bureau began a research

program to determine whether the 1990 census results could be adjusted, using improved statistical methods, to come closer to the true population of the United States than could be achieved by the enumeration itself. If the research program concluded that developing and using better statistical adjustment techniques could achieve a more accurate count of the U.S. *de facto* population than not adjusting, then the nation's political leaders and the courts would have the option of adjusting for undercount.

Testifying before the Congress in July 1986, the Census Bureau's associate director for statistical standards and methodology, Barbara A. Bailar, said of the bureau's 1990 census efforts: "We will attempt to take the best census possible and to count everyone, but we also will do what is necessary to be prepared to adjust the counts if we determine that adjustment will improve them" (Bailar 1986).

The Census Bureau began its adjustment research in 1984. By the summer of 1987, the researchers concluded that it might be technically possible to make statistical adjustments to the census counts that would come closer to the true number of inhabitants than not making an adjustment. Many operational

and policy questions remained, however.

Because the bureau appeared to be making progress in developing satisfactory adjustment methods, advocates of adjustment began to take heart. But late in October 1987, the Department of Commerce, the Census Bureau's parent agency, announced that the government had decided not to adjust the results of the 1990 census. "Adjustment may create more problems than it solves, and may divert resources needed for enumeration," stated the undersecretary for economic affairs, Robert Ortner (1987:2).

Additional reasons offered by Ortner included the likely controversy that adjustment would generate, the suspicion it might create about the reliability and integrity of census statistics, and the fact that, even without adjustment, the Census Bureau expected to achieve a 99 percent accuracy rate. According to Ortner, "Adjustment is a threat to the customary process of reapportionment which has been one of the foundations of our political system. The census count has traditionally been accepted as the best count available regardless of the political consequences. Adjusting the count may create the appearance of changing the numbers to achieve a desired political outcome by the party in office."

In reaction to that decision, the Census Bureau's Barbara Bailar, who had guided the research on adjustment methodology, resigned from the government in protest. And early in November 1988, a group of states, cities, and interest groups filed a lawsuit against the Commerce Department in Brooklyn's Federal District Court to force the

Census Bureau to adjust the 1990 census results by using statistical methods to compensate for an anticipated undercount by race. Dr. Bailar, now the executive director of the American Statistical Association, filed an affidavit to accompany the suit charging that the Commerce Department's decision was arbitrary, secretive, and "substantively flawed" (*New York Times*, 4 November 1988).

The U.S. government's argument, that adjusting the census results to compensate for an undercount may cause more problems than it cures, has been challenged in court as arbitrary and flawed.

Then, in July 1989, the plaintiffs and the Commerce Department reached an out-of-court settlement, according to which the bureau will conduct the 1990 census as usual, reporting the results to Congress and the states, but with the proviso that "the counts are subject to possible correction" (Population Reference Bureau 1989:3).

By March 1990, before census day itself, the bureau will publish guidelines for consideration of a possible adjustment. By 31 December 1990, state-by-state unadjusted census counts will be released, as in past censuses. Afterward a panel of statistical experts will examine the census results and recommend whether adjustment is necessary, leading to a government decision whether or not to adjust. By mid-July 1991 either official adjusted statistics will be released or the

government will issue a statement explaining why no adjustment will be made.

Although this approach may succeed in yielding a more accurate result than that obtained without the use of statistical adjustment, it is unlikely to satisfy those groups who believe adjustment will not be in their interest—just as the practice of not adjusting the actual count has not satisfied those urging adjustment because they believe adjustment will benefit them.

The two sides of the undercount issue have persuasive proponents. Although both would agree that the nation should obtain as accurate a count of the population as possible, they disagree about the extent to which the government should attempt to compensate for the failure of the census to count the American underclass as well as it counts the great majority.

The Census Bureau has been a leader in measuring the degree to which the census has fallen short of perfection. Not every country's census, and not every government program, is as forthcoming about its shortcomings. The bureau has pioneered statistical techniques to improve census taking, and in recent years it has spent increasing sums of money to enumerate the U.S. population with a degree of accuracy never before imagined. Its computerized programs that impute residents and their characteristics, when such residents are known to exist but information cannot be gathered directly, are statistically sound and proven to be effective.

Some may find it ironic that as the decennial census has reached unprecedented levels of accuracy, the cries have become louder for

even greater—and perhaps unachievable—perfection.

Knowing that censuses are imperfect, and that statistics contain inaccuracies, legislators have nevertheless placed more responsibility on the statistics collected in the census. Pressures for statistical ad-

As the census has reached unprecedented levels of accuracy, the cries have become louder for even greater—and perhaps unachievable—perfection.

justment of census counts have grown as more federal money is allocated to states, cities, and local governments through benefit programs on the basis of those statistics.

Eventually the U.S. courts may have to decide whether the government is required to statistically add people to the census count. That decision will be historic and will influence census taking in the United States, and perhaps throughout the world, for decades to come.

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Urban-Rural and Educational Differentials in Marital Status in China

Since 1950, laws aimed at delaying marriage have been one of the major means of slowing population growth in China, where marriage is nearly universal. Age at marriage has risen in recent decades, but not to the same extent in all localities. This article uses cross-tabulated data from China's 1982 census to assess the effects of urban-rural residence and educational level on the ages at which men and women have been marrying. The data also reveal the effects of residence and education on widowhood, divorce, and current marital status. As expected, exposure to development, indicated by urban residence and higher education, is associated with later marriage, but it also increases the likelihood of ever marrying, especially for men. Women's tendency to seek social mobility by marrying men from economically more developed areas results in bachelorhood for a substantial percentage of rural men, especially those who are illiterate.

*by Liu Zheng,
Sidney Goldstein,
and Alice Goldstein*

RECOGNIZING THE importance of the family as the basic social unit and a potential instrument of social change, the government of the People's Republic of China adopted the Marriage Law of 1950 as one of its first major reforms. By legislating against arranged marriages, treating the

sexes as equal partners, abolishing betrothal gifts (bride price) and dowries, and setting minimum ages at marriage for men and women, the new law sought to redefine marriage in terms compatible with the state's ideology. Marriages between equal partners were intended to eliminate the importance of continuing lineages, arrangements based on land ownership, social stratification, and the subjugation of women, all of which had been traditional components of Chinese marriage.

The law also prohibited interference in the remarriage of widows and permitted divorce by mutual consent (1950 Marriage Law; see also Parish and Whyte 1978). Provisions affecting divorce in particular were designed to abolish the stigma attached to divorced women and the strong bias favoring males in the division of property and the custody of children. Nonetheless, universal marriage was considered both "necessary and 'natural'" (Croll 1981: 2). Adoption of the various provisions of the law varied considerably, however, and was generally more widespread in urban than in rural areas.

The 1950 Marriage Law set the legal minimum age at marriage at 18 for females and at 20 for males. Education programs were mounted to promulgate the new law and to persuade young people to adhere to its prescriptions. The early success of these efforts is documented by data from the government's 1982 One-per-Thousand Fertility Survey. In 1950, 41.2 percent of all women had married before age 18, but by 1963 this was true of only 22.2 percent of all women (Coale 1984: 82).

China has continued to experience a gradual rise in women's ages at marriage. According to data from the same fertility survey, their average age at marriage had risen nationally from 18.7 in 1950 to 22.8

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by 1981 (China Population Information Center 1984). Throughout that period, average age at marriage was consistently higher in urban than in rural places.

The rise in age at marriage among women was particularly sharp in the 1970s, when it increased overall from 20.2 years at the beginning of the decade to 23.1 years by the end (Coale 1984: 40-42). The changes were from 22.4 to 25.2 years in urban places and from 19.9 to 22.5 years in rural areas (China Financial and Economic Publishing House 1988: 137). The proportion of women who had ever married before age 24 indicates the dramatic change that took place during the decade, when it dropped

from 89 percent to 76 percent in rural areas and from 68 percent to only 20 percent in urban places.

Over the several decades since the inception of the 1950 Marriage Law, the provision setting the minimum age at marriage has been closely related to the nation's family planning program. Beginning in the 1970s, the state intensified its family planning efforts through the "later, sparser, fewer" policy, in which "later" meant later age at marriage. In conjunction with the policy, many rural areas adopted age 23 for women and age 25 for men as appropriate "later ages" for marriage. In some cities, particularly the larger ones, the age was raised to 25 for women and 28 for men.

Because of a shortage of contraceptives during the early family planning campaigns, the need for late marriage was seen as critical in reducing fertility. The changing regulations for age at first marriage did play an important role in controlling fertility levels, although no reliable data are available with which to document the success of those efforts. Marriage registration data are unreliable because age was often misreported and many marriages were not registered until the couples had reached the legal ages. Some localities calculated a "late marriage rate" indicating the proportion of all persons marrying who married after they had reached the legal age. Since minimum ages for marriage varied from one locality to another, these rates are not comparable.

By 1980, policymakers recognized that marriage customs and patterns, while ostensibly regulated at the national level, continued to show considerable local variations, and that various forms of arranged marriage still existed (Croll 1983). Urban-rural differences were especially pronounced. These differences reflected differences in levels of modernization and readiness to give up traditional forms of behavior, as well as constraints in urban areas on the formation of new households, caused by housing shortages, and the more stringent regulation of minimum age at marriage in the cities.

Not only is entrance into marriage affected by these factors. Levels of divorce and widowhood (nonremarriage) are also affected by various aspects of modern behavior and attitudes.

In 1980, the Chinese authorities



These urban university students, whose palm-reading may be the first step in courtship, are likely to postpone marriage longer than less educated, rural couples.

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revised the national Marriage Law. The new law reiterated the right of young people to choose their own marriage partners and stipulated legal age at marriage as 20 years for women and 22 years for men. It also spelled out the legal requirements for divorce. Although the new legal minimum marriage ages were higher than those of the 1950 law, they were lower than the ages (23 and 25, respectively) promoted by the family planning program. As a result, the marriage rate increased suddenly, leading also to an increase in the total fertility rate, from 2.31 children per woman in 1980 to 2.86 in 1982.

Until the 1982 census, national-level data for assessing differentials in marital status, especially as the differentials are affected by economic development, were unavailable in China. This article uses special tabulations from the 1982 census, provided by the State Statistical Bureau, to analyze marital status differentials, controlling for urban-rural status as defined by city or town (urban) and county (rural) residence.¹

The initial analysis controls for age and sex. We then introduce education as an additional variable on the assumption that higher levels of education are associated with more modern behavior, including later age at marriage. In doing so, we recognize that, in China, educa-

1. Both cities and towns are urban places, but most government tabulations distinguish between the two. The State Statistical Bureau data had been cross-tabulated by age and controlled for sex, residence category, and education. No other characteristics had been cross-tabulated, nor did we have a raw data tape, which would have allowed more extensive analysis.

Table 1. Percentage never married, by age, sex, and place of residence

Age group	Males			Females		
	City	Town	Rural	City	Town	Rural
15-19	99.6	99.4	98.8	98.6	98.0	94.7
20-24	88.9	77.2	68.2	67.0	57.6	40.2
25-29	30.8	22.3	22.1	14.0	8.2	3.0
30-34	7.0	4.5	9.6	2.2	1.0	0.3
35-39	3.3	2.5	7.9	0.7	0.3	0.2
40-44	2.2	2.1	7.0	0.7	0.2	0.2
45-49	1.9	1.5	5.2	0.2	0.2	0.2
50-54	1.7	1.6	3.7	0.3	0.2	0.2
55-59	1.6	1.7	2.9	0.3	0.3	0.2
60-64	1.5	1.9	2.8	0.5	0.4	0.2
65-69	1.7	1.8	2.7	0.6	0.6	0.3
70+	2.2	1.9	2.8	0.7	0.8	0.3
SMAM	26.3	25.1	24.8	23.5	23.2	21.9

tional level is not necessarily related either to higher income (laborers may earn more than professors) or to access to power. Nonetheless, education has important effects on attitudes and behavior, influencing marriage, childbearing intentions, life values, and social concerns.

The more educated people in China, as elsewhere, are thus more likely to have modern attitudes and values than those with little or no education. Educational differentials in marital status are therefore expected to be apparent in rural as well as urban places. Education, while of interest in its own right, may also serve as a proxy for, or supplement to, other indicators of modernization, especially when combined with rural-urban status.

The data from the 1982 census are particularly valuable because, unlike data from fertility surveys, they cover both sexes and all the adult age ranges. They can thereby provide insights into how marriage patterns differ for men and women and how they vary by age. Marital

status in the 1982 census was categorized as single (never married), married, widowed, and divorced.

■ Differences in percentages single by residence

The data show that lower percentages of rural young (under age 30) men were single in 1982 than were town or city males (Table 1). The younger age at marriage in rural areas that has been documented for the 1950s, 1960s, and 1970s has apparently persisted into the 1980s. The major absolute differential appears for the age group 20-24, among whom only 68 percent of rural males were single in 1982 compared with 89 percent of men in the cities. The differential favoring earlier marriage in rural places also characterizes the 25-29 age group; 22 percent of the rural men were still single, compared with 31 percent of those in cities.

By contrast, at ages above 30, city males are considerably less likely to be single than those in rural

places. The differentials are sharpest for the 35–54 age groups. For most age groups, town residents appear to have marriage prospects more like those of their city counterparts than those of rural men.

The higher percentages of single older males in rural areas reflect not only the socioeconomic differentials between rural and urban areas but also the propensity of women to marry urban men. The marriage migration streams of women flow heavily from less to more developed areas, from villages to towns, and from suburbs to city centers. The effects of this movement are apparent in the high proportions of rural

Marriage migration by women from less to more developed areas has resulted in large proportions of rural men who are unable to find a marriage partner.

men who are unable to find a marriage partner. These difficulties seem to have been exacerbated during the period of greatest economic and political change in China (1950–67), when those who were 35–54 years old at the time of the 1982 census would have been most likely to marry.

The pattern for women varies somewhat from that of men. As with men, the percentages single among women in the younger ages were lower in rural than in urban places, and substantially so in the 20–29 age group, but this pattern of differentials persists throughout the age range. It is negligible from age 45 on because only a very small

percentage of women at the older ages had never married. Such almost universal marriage among women contrasts to the experience of men, especially those living in rural areas.

These rural–urban differences are reflected as well in the singulate mean age at marriage (SMAM) for men and women, an estimate of the mean age at marriage based on data on current marital status by age. Because SMAM is a synthetic cohort measure, it may not accurately describe the situation when age at marriage is undergoing rapid change. The rural–urban differentials found for China may therefore be somewhat misleading if the pace of change differs between the two types of places. Nonetheless, SMAM is a useful summary measure of the

rural–urban differentials in age at marriage in China. (The method for deriving SMAM is discussed in Shryock and Siegel 1976: 167–168.)

SMAM in 1982 ranged from a high of 26.3 years for city males to a low of 24.8 years for those in rural areas. SMAM for women was consistently lower than that of men, but it also varied by about 1.5 years across the residence categories.

Urban–rural residence thus affects the proportion single, but some of the differentials may also be due to differences in the educational characteristics of the populations in cities, towns, and rural areas. Higher education, for example, especially college education, is likely to lead to later age at marriage. Because a greater proportion of city residents have such high levels of



Increased development in rural areas should raise age at marriage for men and women, reduce illiteracy among men, and improve men's opportunity to marry.

schooling than do town and rural residents, city populations can be expected to have a higher average age at marriage and greater proportions single at ages 15–24.

The published statistics from the 10 percent sample of the 1982 census show substantial differences in the percentages illiterate and semi-literate in cities as compared with towns and rural areas combined (Sidney Goldstein 1985). Among males, 8.9 percent in cities were illiterate, compared with 21.1 percent in towns and rural areas; corresponding percentages for females were 24.6 percent and 49.1 percent.

High levels of illiteracy were most pronounced among older age groups; but among females, even at ages 12–14 more than 15 percent of town and rural women were illiterate, as were more than 10 percent of town and rural men from age 25 on. Given these residential differences in literacy, as well as differentials in levels of education among the literate, our attention turns next to an examination of the percentages never married in cities, towns, and rural areas by educational level.

For males in urban places, the percentages never married at the younger ages, 15–29, were directly related to level of education, although for both cities and towns the percentages never married among those in the 25–29 age group were sharply lower than for younger males at all educational levels (Table 2). By ages 35–39 in cities and ages 30–34 in towns, educational differentials had virtually disappeared.

The sole exception to this pattern is among illiterate men. As early as ages 20–24, illiterate men had higher percentages never married

Table 2. Percentage never married, by age, education, and place of residence: males

Age group	College	High school	Middle school	Primary school	Illiterate
Cities					
15–19	99.9	99.8	99.7	99.2	97.5
20–24	98.2	88.8	79.2	71.9	72.5
25–29	55.2	40.8	27.6	20.5	35.2
30–34	8.7	5.6	7.1	5.5	20.5
35–39	1.6	2.6	2.2	3.3	15.0
40–44	0.8	1.8	1.4	2.0	8.8
45–49	1.2	0.8	0.9	1.5	6.6
50–54	1.0	1.2	0.7	1.2	4.6
55–59	1.3	0.7	0.6	1.0	3.7
60–64	1.1	0.8	0.6	0.9	3.0
65–69	0.5	0.7	0.6	0.7	3.4
70+	1.2	0.9	1.0	0.0	3.3
SMAM	28.0	26.8	26.8	24.9	29.2
Towns					
15–19	99.8	99.6	99.4	98.7	97.7
20–24	93.2	81.3	74.4	67.8	72.5
25–29	32.3	25.4	20.4	19.6	32.4
30–34	4.4	3.0	3.3	4.6	18.1
35–39	1.1	1.5	1.5	2.5	13.2
40–44	1.1	1.2	1.2	2.0	8.9
45–49	0.6	1.2	0.6	1.3	4.8
50–54	1.9	0.7	0.5	1.0	5.1
55–59	1.8	0.9	0.6	1.2	3.7
60–64	0.8	0.6	0.3	1.3	3.6
65–69	1.8	0.6	0.4	1.0	2.9
70+	5.6	1.6	0.0	1.0	2.8
SMAM	26.3	25.3	24.9	24.5	26.2
Rural					
15–19	100.0	98.9	99.0	98.8	95.6
20–24	88.3	68.1	68.0	68.2	69.3
25–29	27.9	16.4	18.3	22.8	38.0
30–34	4.8	3.8	4.4	8.7	22.9
35–39	1.3	2.1	3.0	7.2	19.1
40–44	1.3	2.1	2.8	5.5	13.4
45–49	1.9	2.0	1.5	3.4	8.6
50–54	2.3	1.3	1.2	1.9	4.3
55–59	3.4	1.4	1.1	1.4	5.7
60–64	1.1	1.7	0.9	1.2	3.9
65–69	4.0	1.1	0.9	1.2	3.6
70+	1.1	1.1	1.2	1.0	3.5
SMAM	25.8	24.2	24.4	25.1	26.9

than did those with some education. The differences became especially pronounced from age 30 on.

In rural areas, the differences by educational level were not so pronounced as in cities and towns, except for the small number who had a college education. In fact, among those with only primary schooling, somewhat higher percentages had never married than among men with somewhat more education; this was true for age groups 20-24 through 45-49. As in urban places, illiterate men were the exception. In each age group from 25-29 on, even higher percentages of them had never married than had their counterparts in cities and towns.

That illiterate men are less likely than better educated men to marry is quite likely a reflection of their poor economic situation and prospects. They are undoubtedly among the poorest segments of the Chinese population and may well be unable to afford a bride gift, which—in spite of the Marriage Law abolishing such practices—is commonly expected by a young woman's family before a marriage can take place (Parish and Whyte 1978). Lack of bride price may be one reason why about one-third of the illiterate men in the 25-29 age group and about one-fifth of those 30-34 years old had never married.

These proportions never married among illiterate men 25-34 years old were substantially higher than among men with any level of education in each residence category (except high school- and college-educated 25-29 year olds in cities and college-educated 25-29 year old men in towns). The disadvantage of such illiterate men in being

Table 3. Percentage never married, by age, education, and place of residence: females

Age group	College	High school	Middle school	Primary school	Illiterate
Cities					
15-19	99.9	99.6	98.9	96.3	89.0
20-24	97.3	79.8	60.2	39.9	28.5
25-29	44.1	26.0	12.6	4.9	3.0
30-34	10.1	3.9	3.0	0.8	0.6
35-39	2.4	1.3	0.8	0.3	0.3
40-44	0.5	0.6	0.4	0.1	0.2
45-49	0.5	0.5	0.3	0.1	0.1
50-54	1.1	0.7	0.6	0.3	0.2
55-59	1.6	0.9	1.0	0.4	0.2
60-64	4.9	1.9	1.5	0.7	0.1
65-69	9.0	4.7	2.5	1.2	0.4
70+	17.2	9.1	6.1	2.0	0.3
SMAM	27.6	25.4	23.6	22.0	21.0
Towns					
15-19	100.0	99.2	98.5	95.0	89.9
20-24	90.8	69.5	53.0	38.1	30.9
25-29	20.7	14.8	7.7	4.6	2.9
30-34	5.2	1.8	1.2	0.5	1.0
35-39	0.0	0.5	0.3	0.2	0.3
40-44	0.5	0.2	0.1	0.1	0.2
45-49	0.5	0.0	0.2	0.2	0.2
50-54	1.4	0.6	0.4	0.2	0.1
55-59	9.4	1.3	0.9	0.3	0.2
60-64	5.6	0.0	2.3	1.2	0.3
65-69	0.0	5.1	5.8	1.9	0.3
70+	37.9	21.7	8.9	2.6	0.5
SMAM	25.7	24.2	23.0	21.9	21.2
Rural					
15-19	97.4	97.6	97.0	94.7	88.4
20-24	75.9	62.9	51.1	32.9	25.7
25-29	15.2	13.1	5.7	1.0	1.5
30-34	4.4	1.4	0.7	0.2	0.3
35-39	1.4	0.5	0.3	0.1	0.3
40-44	1.4	0.2	0.1	0.1	0.2
45-49	0.0	0.0	0.3	0.1	0.2
50-54	0.0	0.4	0.5	0.2	0.2
55-59	0.0	2.1	0.9	0.5	0.2
60-64	0.0	2.1	0.8	1.0	0.2
65-69	0.0	2.1	2.8	1.4	0.2
70+	25.1	9.5	4.0	3.0	0.2
SMAM	24.8	23.8	22.7	21.4	20.8

unable to afford a suitable bride price is likely compounded by their poor economic prospects, which would make them much less desirable as marriage partners in the eyes of young women's parents, and probably to the young women themselves.

The singulate mean age at marriage reflects these differentials and also documents the effect of urban-rural differences even when education is controlled. Not surprisingly, SMAM was generally a year or more higher for college-educated men than for those with less education.

On the other hand, for illiterate men, SMAM was at least as high as that of the college-educated and more than a year higher in both cities and rural areas. At each educational level, SMAM in the cities was generally higher than in either towns or rural places, the one exception being the lower SMAM of men with primary education in cities compared with those in rural areas. A similar difference obtained between towns and rural areas for men with more than primary schooling.

The patterns for women are somewhat different (Table 3). For them, illiteracy does not seem to be a barrier to marriage, whereas college education does seem to be, especially among older women. Thus, in cities, the percentage never married in 1982 was directly related to educational level—from illiterate to college—at each age group.

The differences in probability of ever marrying between men and women at varying levels of education are in large part related to the traditional expectations about the roles of women and men. Despite a considerable improvement in the

Table 4. Percentage widowed, by age, sex, and place of residence

Age group	Males			Females		
	City	Town	Rural	City	Town	Rural
15-19	0.0	0.0	0.0	0.0	0.0	0.0
20-24	0.0	0.0	0.1	0.0	0.1	0.1
25-29	0.1	0.1	0.3	0.1	0.2	0.2
30-34	0.3	0.3	0.7	0.4	0.5	0.4
35-39	0.5	0.5	1.5	1.3	1.4	1.2
40-44	1.1	0.9	2.7	2.6	2.7	2.9
45-49	1.9	1.8	4.8	5.3	6.2	6.3
50-54	3.6	3.7	7.8	11.0	11.5	12.7
55-59	6.7	6.7	11.7	20.3	22.2	23.0
60-64	11.2	12.8	17.9	34.7	35.9	37.8
65-69	18.8	21.2	25.4	52.0	54.0	54.3
70+	35.7	37.8	42.3	77.6	79.2	77.6

employment status of women (Alice Goldstein 1989), traditional attitudes about gender roles within marriage are still widespread.

The ideal Chinese couple has traditionally consisted of a well-educated and talented husband and a pretty, obedient wife. The educa-

In contrast with men, college education for women rather than illiteracy seems to be a barrier to marriage, especially among older women, because of the persistence of traditional attitudes about women's role in marriage.

tional attainments of the wife are less important than the attitudes and skills that will allow her to fit easily into her husband's family. Women who spend their teens and early 20s advancing their education will therefore have considerable difficulty finding suitable husbands, ones whose educational attainment

is at least as high as theirs. By contrast, a man will usually seek a wife with an educational level lower than his. As a result, women with few or no years of schooling will be more likely to marry than the more educated.

Because of the time involved in obtaining an education, it is not surprising that SMAM increases with level of schooling. Almost a seven-year differential characterized the mean age at marriage of college-educated and illiterate women in cities. The same general pattern, although not quite so sharp, characterized women in towns and rural places.

Within specific age groups, however, the percentage never married varied more irregularly across educational levels. The more erratic patterns for the college- and high school-educated are undoubtedly related to the small number of women at those educational levels in towns and rural areas, especially at the older ages. For both towns and rural places, the educational differences in mean age at marriage

were not so great as for cities; but for both the mean declined with decreasing educational achievement, and a four-year difference characterized the educational extremes of college-educated and illiterate.

As with men, residence had an effect on the percentages of women never married and on SMAM. At almost every educational level, SMAM was higher where the level of urbanization was higher, but the differences tended to be greater at the higher educational levels. And among women under age 35, the proportion never married also varied directly with level of urbanization for each age group within each educational level.

■ Differences in percentages widowed

The percentage of widowed men and women is, of course, directly related to their age. Within age groups, however, we found differences by place of residence, reflecting in part differentials in mortality rates and possibly also some differentials in remarriage (Table 4). Because the census data on widowhood are cross-sectional, they reflect status at the time of the census rather than total rates of widowhood, because previously widowed persons who have remarried would record their current marital status as married.

For men, the levels of widowhood in 1982 were quite similar among city and town residents but considerably higher among rural dwellers. These differences may have had several causes. Widowers may find it easier to remarry in cities and towns than in the countryside. Men may move to the coun-

Table 5. Percentage widowed, by age, educational level, and place of residence: Males

Age group	College	High school	Middle school	Primary school	Illiterate
Cities					
15-19	0.0	0.0	0.0	0.0	0.3
20-24	0.0	0.0	0.0	0.1	0.0
25-29	0.1	0.0	0.1	0.2	0.3
30-34	0.1	0.1	0.2	0.5	0.7
35-39	0.1	0.2	0.4	0.7	1.2
40-44	0.3	0.6	0.8	1.4	2.4
45-49	0.5	0.9	1.4	2.3	3.7
50-54	1.2	1.8	2.5	3.8	6.3
55-59	3.3	3.7	4.8	6.8	9.4
60-64	4.9	9.0	7.8	11.0	14.2
65-69	9.4	12.0	14.7	18.0	22.0
70+	18.4	28.1	30.3	0.0	40.0
Towns					
15-19	0.0	0.0	0.0	0.0	0.2
20-24	0.0	0.0	0.0	0.0	0.0
25-29	0.0	0.1	0.2	0.2	0.2
30-34	0.4	0.1	0.2	0.4	0.6
35-39	0.3	0.2	0.4	0.6	1.5
40-44	0.5	0.7	0.4	1.0	2.3
45-49	1.3	0.8	1.1	2.0	3.7
50-54	2.9	1.6	2.5	3.9	6.3
55-59	2.2	4.3	5.1	6.5	9.6
60-64	7.0	7.4	9.7	11.7	16.4
65-69	6.5	16.4	18.4	20.0	23.9
70+	38.9	40.9	32.9	34.3	40.6
Rural					
15-19	0.0	0.0	0.0	0.0	0.0
20-24	0.0	0.0	0.1	0.1	0.1
25-29	0.2	0.2	0.3	0.4	0.4
30-34	0.3	0.3	0.5	0.8	1.0
35-39	0.4	0.7	1.1	1.6	2.1
40-44	0.8	1.1	1.9	2.7	3.7
45-49	1.0	2.3	3.3	4.5	5.7
50-54	1.6	4.7	5.6	7.2	12.8
55-59	8.8	8.8	9.6	10.7	8.9
60-64	11.4	15.3	14.9	16.6	18.9
65-69	17.0	27.0	23.0	23.9	26.1
70+	24.0	41.9	42.8	40.6	43.0

tryside to live with relatives after their wives die. Yet another possibility is that somewhat higher mortality in the countryside may result

in more widowers. For example, the average life expectancy in 1981 in Chinese cities was 70.8 years, compared with only 67.0 years in rural

Table 6. Percentage widowed, by age, educational level, and place of residence: Females

Age group	College	High school	Middle school	Primary school	Illiterate
Cities					
15-19	0.0	0.0	0.0	0.0	0.0
20-24	0.0	0.0	0.0	0.0	0.2
25-29	0.1	0.1	0.1	0.3	0.2
30-34	0.2	0.2	0.3	0.5	0.7
35-39	0.6	0.7	1.0	1.4	1.8
40-44	1.1	1.5	2.2	2.8	3.5
45-49	1.3	2.1	3.9	4.9	6.8
50-54	5.6	8.0	8.6	9.8	12.0
55-59	10.0	13.3	16.1	18.5	21.6
60-64	20.6	23.2	27.1	31.2	36.2
65-69	30.3	39.0	45.6	48.6	53.0
70+	26.2	57.8	56.6	70.8	78.6
Towns					
15-19	0.0	0.0	0.0	0.0	0.0
20-24	0.0	0.0	0.0	0.0	0.2
25-29	0.0	0.1	0.1	0.3	0.3
30-34	0.0	0.1	0.4	0.8	0.7
35-39	0.8	0.9	1.3	1.5	1.8
40-44	1.1	1.8	2.2	2.8	3.5
45-49	2.6	3.4	4.5	5.5	7.6
50-54	4.1	8.9	7.9	10.2	12.6
55-59	15.6	12.7	15.3	18.8	23.8
60-64	22.2	37.7	25.4	31.2	36.9
65-69	100.0	33.3	43.5	52.3	54.8
70+	13.8	47.8	68.9	74.8	79.8
Rural					
15-19	0.0	0.0	0.0	0.0	0.0
20-24	0.0	0.0	0.0	0.1	0.1
25-29	0.0	0.1	0.1	0.4	0.2
30-34	0.4	0.3	0.4	0.4	0.5
35-39	0.0	1.0	1.1	1.1	1.3
40-44	0.5	1.1	2.0	2.4	3.2
45-49	2.3	3.0	4.9	4.8	6.6
50-54	0.0	10.7	10.6	9.4	23.3
55-59	15.8	14.7	19.2	17.5	13.0
60-64	25.0	25.0	30.7	32.3	38.0
65-69	40.0	56.3	45.5	47.6	54.5
70+	20.0	57.1	68.5	69.0	77.9

women. In general, levels of widowhood in 1982 varied very little for women by place of residence. On the other hand, they were uniformly higher among women of ages 40 and over as compared with men. This pattern undoubtedly reflects the greater longevity of women, the greater propensity of men to remarry, and some residual prohibitions against the remarriage of women. That the last is likely only a minor factor is suggested by the very small differences in the percentages widowed by place of residence.

Further insights into the differences between male and female widowhood are provided by the data on educational differentials. Patterns of widowhood for men are affected by education as well as by residence. Percentages of widowed men in 1982 were inversely related to education within each residence-age category (Table 5). College-educated men who lived in cities or towns were much less likely to be widowers than either men of the same educational level living in the countryside or men of lower education regardless of where they lived.

For example, among 60-64 year old men, only 4.9 percent of those with a college education living in cities were widowed, compared with 7.0 percent of the college-educated in towns and 11.4 percent of the college-educated in rural areas. Moreover, the low percentage of widowers in that age group among college-educated living in cities contrasts sharply with the percentages of widowers among illiterate men of the same ages living in cities, towns, and rural areas (14.2, 16.4, and 18.9, respectively).

Higher education seems to pro-

areas (China Financial and Economic Publishing House 1988: 47). Which one or several of these factors account for the differences can-

not be determined with the data being analyzed here.

The urban-rural differences found for men do not pertain to

mote longevity and enhance the likelihood of remarriage among men. This is true in both urban and rural places. Within the rural 60–64 age group, for example, almost one of every five illiterate men was widowed, compared with just over one in 10 of the college-educated.

Similar patterns characterize women at higher educational levels, but with some slight variations, related in part to the small number of older women with higher education. Thus, among women in the 60–64 age group in 1982, 21 percent of the college-educated living in cities were widows, compared with 25 percent with similar education in rural areas; 36 percent of illiterate city women were widows, in contrast to 38 percent of the illiterate women in the countryside (Table 6). Again, the male–female differences in levels of widowhood are striking even with education controlled, and the effect of urban residence remains evident.

■ Differences in percentages divorced

Divorce in China is rare. Although the 1950 and 1980 Marriage Laws emphasized the shared responsibilities of both partners to the marriage and liberalized somewhat the procedure for obtaining a divorce, they did not spell out the grounds for divorce. Moreover, every effort—both informal and formal—is made in China to settle the differences between estranged spouses to preserve a marriage. Divorce proceedings may therefore be quite prolonged, with the most important judgments being made at the village or neighborhood level (Parish and Whyte 1978: 192–194). Thus, even

in the most modernized (urban) sector, divorce levels remain below those that might be expected on the basis of the Western, developed-nations model (Stacey 1983).

Most noteworthy about China's divorce statistics is the very low prevalence of divorce, reflecting the strongly held belief that marriages are to last for the lifetime of the partners (Croll 1981). As with the census data on widowhood, the census data on divorce do not give a true picture of divorce rates, however, because they reflect status at the time of the census. Because some remarriage occurs after divorce, the percentages reported here are lower than the actual divorce level.

Furthermore, divorced women are still subject to disapproval, and therefore some of them may have reported themselves as either currently married or widowed. The amount of misreporting is likely to have been small, however, because census enumerators were generally

familiar with individuals' situations and also checked responses to census questions against household registration records.

Reflecting the belief that marriages are to last for the lifetime of the partners, the prevalence of divorce is very low.

Despite the underestimate of divorce rates suggested by the census, China's divorce levels in 1982 were low, not exceeding 2.3 percent of any age–residence group of either men or women (Table 7). For males, the percentage was generally correlated with age, but it peaked in the 55–59 age groups in urban places (cities and towns) and in the 45–59 age groups in rural areas. Slightly higher percentages of rural

(continued on page 28)

Table 7. Percentage divorced, by age, sex, and place of residence

Age group	Males			Females		
	City	Town	Rural	City	Town	Rural
15–19	0.0	0.0	0.0	0.0	0.0	0.0
20–24	0.1	0.1	0.7	0.1	0.2	0.2
25–29	0.3	0.5	0.5	0.3	0.5	0.2
30–34	0.7	0.7	0.9	0.6	0.6	0.2
35–39	0.9	0.9	1.2	0.7	0.7	0.2
40–44	1.1	1.1	1.6	0.6	0.6	0.2
45–49	1.2	1.3	2.2	0.7	0.6	0.2
50–54	1.4	1.4	2.3	0.7	0.6	0.3
55–59	1.5	1.8	2.1	0.9	0.6	0.4
60–64	1.6	1.7	1.9	0.9	0.8	0.4
65–69	1.4	1.7	1.6	0.7	0.4	0.3
70+	1.0	1.4	1.3	0.6	0.4	0.2

News from the Region

Editor's Note: The Forum welcomes news items about demographic developments and activities in the Asian-Pacific region.

India Prepares for Houselisting and Census

N. Rama Rao, Deputy Registrar General of India, reports that between April and September 1990 India plans to conduct its houselisting operation in preparation for the 1991 census. The operation will take approximately one month to complete in each state. During the operation, enumerators will attempt to fill gaps in the house numbering system, which is maintained by the local administration departments and is essential to the conduct of the census. Information will also be collected on housing conditions. During the houselisting, a separate schedule called the Enterprise List will be filled in by enumerators as part of the Third Economic Census of the Central Statistical Organisation of India.

The Population Census itself, India's fifth since Independence, will take place between February and March 1991, with 1 March 1991 as the reference date. Some 1.5 million enumerators will be employed in the census, each responsible for gathering information on 120-150 households, or 600-750 people. Homeless persons will be counted on the night of 28 February 1991.

The second pretest for the census has just been completed. Directors of census operations in the states and union territories will meet in November 1989 to discuss organiza-

tional matters at the state and union territory level. They will also receive training for conducting the houselisting operations. Their role is critical to the success of the census nationwide.

Under an agreement between the Indian government and the U.S. Agency for International Development, India is acquiring a main-frame computer to help with the enormous task of data tabulation. Census forms require editing and coding before they can be input for computer processing. To meet its deadline for publishing basic population data at the village and town level within about two years after the enumeration, the government may tabulate the basic data manually. It plans to use the computer for preparing sample tabulations on such variables as economic and cultural conditions, fertility, and migration.

There will be increased effort to gather information about the economic activities of women. Women have voiced concern that, because many of them, especially in rural areas, are not paid for their work, their economic role has not received sufficient recognition. Census enumerators are being instructed to record as economic activity the unpaid work performed by women on farms and in family enterprises.

Forum Editor Joins National Academy of Sciences . . .

In August Linda G. Martin, Research Associate at the East-West Population Institute, Associate Professor of economics at the University of

Hawaii, and editor of this publication, assumed the position of Director of the Committee on Population, National Academy of Sciences, in Washington, D.C. She is succeeded as *Forum* editor by Sandra E. Ward, Senior Editor at the East-West Population Institute since 1972 and the *Forum's* former managing editor.

Dr. Martin, who is taking a two-year leave of absence from the Population Institute and the University of Hawaii, has earned the high regard of her Hawaii colleagues by virtue of the intelligence and energy she has brought to bear on her research, teaching, writing, and editorial responsibilities. The *Forum* wishes her well in her new position.

. . . and Forum Editorial Board Gains Two Members

Minja Kim Choe, Research Associate at the East-West Population Institute (EWPI) and Adjunct Assistant Professor of Public Health at the University of Hawaii (UH), and Robert C. Schmitt, Hawaii State Statistician, have joined the Editorial Board of the *Forum*. Dr. Choe, who became a member of the EWPI research staff in 1985, is a biostatistician whose work has focused on mortality, fertility, and demographic estimation. Mr. Schmitt has held the post of State Statistician since 1963 and is the author of several books on historical and demographic statistics of Hawaii.

Editorial Board member Fred Arnold is on a two-year research assignment with the Demographic and Health Surveys Department of IRD/Westinghouse in Columbia,

Maryland. Although not due to resume his duties as EWPI Research Associate and Affiliate Graduate Faculty in the UH Population Studies Program until late 1990, he continues to offer his assistance on *Forum* matters.

Robert D. Retherford is the *Forum's* fourth Editorial Board member. A frequent contributor to the *Forum*, he is Assistant Director for Graduate Study and Research Associate at EWPI and also holds an affiliate graduate faculty post at the UH Department of Sociology.

Adhikari Appointed Secretary of Population Commission, Nepal

Shyam Prasad Adhikari was appointed by His Majesty's Government of Nepal to the post of Secretary of the National Commission on Population (NCP) in November 1988. Since its establishment in 1978, the NCP has formulated and correlated population policies in accordance with Nepal's national development goals.

New Software Packages Available from East-West Population Institute

EASWESPOP-PARITY PROGRESSION PROJECTION, the third module of the East-West Population Institute's EASWESPOP microcomputer library, is a software package for projecting population by disaggregating data on women by parity and duration in parity. The program, which is based on the work of EWPI Research Associate Griffith Feeny, offers an alternative to the usual method of projection based on period age-specific birth rates and distribution of women by age.

EASWESPOP-CONSISTENT CORRECTION, the fourth module of the microcomputer library, is a package for the simultaneous and consistent correction of two or three decennial censuses and of intercensal births, deaths, and migration data. The program is based on the work of Research Fellow Norman Luther of the institute.

Minimum system requirements for both programs are an IBM or compatible PC, 256K RAM memory, two disk drives, and MS-DOS 3.0 or higher.

A single copy of each software and documentation is available without charge to institutions engaged in population work in developing countries of Asia and the Pacific. Requests should be written on letterhead stationery. Other organizations and individuals may purchase each package for US \$10 per copy. Please send checks or international money orders only, made payable to the East-West Center.

Address requests and orders to: Data Analysis Office, East-West Population Institute, 1777 East-West Road, Honolulu, Hawaii 96848, USA.

Philippine Aim: Total Fertility Rate of Three Children per Woman

The goal of reducing total fertility in the Philippines from 4.53 to 3.0 children per woman by the year 2000 was announced by Manila's delegate to a May 1989 conference of the United Nations Economic and Social Commission for Asia and the Far East (ESCAP). Since 1960, the delegate reported, the annual population growth rate in the Philippines has dropped from 3.06

to 2.3 percent. He added, however, that upgrading the quality of life for women, children, the elderly, and the nation's disadvantaged will be given priority even while efforts to further reduce the population growth rate continue. (*International Dateline*, June 1989.)

Census Director's Job One of Toughest in U.S. Government

According to a book that describes the 116 most difficult jobs in the U.S. federal bureaucracy, the Director of the Bureau of the Census is one of those jobs. According to its author, John H. Trattner, *The Prune Book* "is an attempt to improve the selection of the men and women who fill the crucial—but often vaguely understood—senior positions in the critical management and policy-making area just below Cabinet level." Those positions range in pay from \$75,000 to \$89,500, and many of them require Senate confirmation.

The entry for the Census Director states: "The census count is crucial to truly representative government, and raw politics—the drawing of lines for congressional and state legislative districts—is never far away. Requires a strong executive sensitive to the integrity of statistics collected by bureau employees."

The title of the book alludes to another publication, *U.S. Government Policy and Supporting Positions*, listing 5,342 policymaking and patronage jobs that a new president may fill, which is known throughout the federal bureaucracy as "The Plum Book." Trattner defines a prune as "a plum with experience."

Reviews

Strategic Management of Population Programmes edited by Gayl Ness and Ellen Sattar. Kuala Lumpur: International Council on Management of Population Programmes (ICOMP), 1989. Management Contributions to Population Programmes Series, Vol. 7. xxix, 326 pp. (paper). Available from ICOMP, 141 Jalan Dahlia, Taman Uda Jaya, 68000 Ampang, Kuala Lumpur, Malaysia.

The Kuala Lumpur-based International Council on Management of Population Programmes (ICOMP) was established in 1974 to provide management assistance to population programs in developing countries. Its members are heads of population and management agencies. During its 15 years of existence, ICOMP has published several major books on management of population programs, workshop and conference reports, a bimonthly newsletter entitled *Feedback*, the journal *Population Manager*, and annual reports of its activities.

This volume, the seventh in the series Management Contributions to Population Programmes, contains 18 papers originally presented at ICOMP's International Biennial Conference held in Beijing, China, in May 1988. Included are an introductory chapter by coeditor Gayl Ness, six papers on the topic of strategic management, and 12 papers on country experiences with management techniques.

In his overview, Ness explains that strategic management and long-range planning were first made popular by Robert McNamara, who employed them as head of the Ford Motor Company and then as U.S. Secretary of Defense in the adminis-

tration of President John F. Kennedy. The initial luster of strategic management as a corporate tool was dimmed with the recession of 1970-71, but it became institutionalized and, in recent years, has spread to program management in the fields of education, health, and natural resource administration. Ness asserts that, although the use of strategic management does not always guarantee success, it is a necessary element in success and, in the area of fertility limitation and maternal and child health programs in developing countries, "its potential for promoting human welfare is immense" (p. xiv).

The first part of this book discusses the meaning and purpose of strategic planning and strategic management. Ness suggests that strategic management is no more than good management. It involves paying attention to the environment and organizational tools under the manager's control, and working to achieve the aims of the organization. He sees it as having an added dimension in today's world, that of raising awareness of management problems and how these can be addressed to improve program performance.

The first four papers, by Rushikesh N. Maru, Ness, G. Giridhar, and Henry Gomez-Samper, approach the topic in somewhat different ways. Each pays homage to the work of management pioneer Samuel Paul.

Maru draws heavily upon Paul's notion of congruence, which holds that, for successful management, the four elements of environment,

strategy, structure, and process must be in congruence with one another. Achieving congruence is one of the critical tasks of strategic management, and Maru points out that this implies constant adaptation and adjustment of the four elements to one another. He also stresses the ideal of client orientation, a characteristic found in public service organizations such as family planning programs.

In his paper, Ness argues that strategic management should be implemented at all levels of an organization. He advocates participative management as critical for mobilizing human resources in any agency.

Giridhar then discusses the difference between service delivery systems in private market organizations and family planning programs. He cites the value of community-based versus clinic-based delivery systems and says that this switch occurred in many world nongovernmental organizations even before it was recognized as strategic planning.

Gomez-Samper raises two questions about the application of strategic planning in the Third World: Can it be implemented in developing countries, and are there barriers to the use of strategic management in family planning and maternal and child health programs? He concludes that strategic management is a viable solution, however hard it may be to implement with inadequate resources, and that the barriers can be overcome by good leadership. He suggests that this is where ICOMP can be of assistance.

In a related article, Anrudh Jain raises the important issue of quality

of services given by family planning programs. He proposes a practical and efficient way of measuring the quality of examining method mix and continuation rates. According to Jain, the broadest range of contraceptive methods will increase continuation rates. These rates should be monitored on a regular basis, and the program should provide high-quality, client-oriented services to retain its effectiveness.

Anne Firth Murray calls for more recruitment of women into the management structure of family planning programs, since women are predominantly the client population, whereas men seem to dominate the managerial roles.

Part II contains 18 country case studies of varying length and quality. It is easy to see from the different studies of management why some countries have more successful family planning results than others. The most comprehensive studies are those by Manzoor-ul Karim for Bangladesh; T. Anthony, K. Srinivasan, and P. C. Saxena for India (with case studies from various regions); and Haryono Suyono and Merrill Shutt for Indonesia.

This volume, like the others in the ICOMP series, is a worthy addition to the population literature. For a list of the other volumes and information about how to acquire ICOMP materials, readers should contact ICOMP at the address given above.

—Alice D. Harris

Population Growth and Socioeconomic Progress in Less Developed Countries: Determinants of Fertility Transition by Peter N. Hess. New York: Praeger Publishers, 1988. xiv, 166 pp. (cloth), US \$39.95. ISBN 0-275-92979-5.

Available from Praeger Publishers, 1 Madison Avenue, New York, NY 10010, USA.

Drawing upon the diverse socioeconomic experiences of 49 countries over a period of two decades, Hess, an associate professor of economics at Davidson College and visiting scholar at the Carolina Population Center of the University of North Carolina at Chapel Hill, presents a comprehensive model of the determinants of aggregate fertility change in contemporary developing countries. He intends his methodology and the results of testing the model to be of use "not only for scholars in the field, but for policymakers, students, and citizens interested in population growth and development" (p. xiv). Without a firm grounding in econometrics, however, the reader may find it difficult to follow the author's use of simultaneous equations and two-stage least-squares regression analysis.

Hess poses four questions, which he proposes to answer as the model of fertility determinants unfolds: 1. Are there identifiable characteristics or consistencies for the contemporary developing nations that have successfully reduced fertility? 2. Has development been "the best contraceptive," as was argued at the first International Conference on Population in Bucharest in 1974? 3. Have some development strategies or orientations been more conducive than others to lowering fertility? In particular, have those nations emphasizing economic growth differed from those emphasizing basic needs in their fertility trends? and 4. Do family planning programs, independently of the level of socioeconomic de-

velopment, have significant impacts on fertility?

He next reviews the major explanations of the fertility transition, beginning with demographic transition theory, economic interpretations, and cultural factors conditioning the acceptance of birth control. He points out, as others have before, that the experience of Western Europe and North America is not applicable to all developing countries. In the following chapter he outlines the empirical model after reviewing the literature on fertility determinants in contemporary developing countries. Some of those determinants are infant mortality and the general health of the population, education, family planning programs and contraception, urbanization, income, and culture.

He also addresses several methodological issues involved in aggregate studies of fertility. One of these concerns the validity of drawing inferences about the dynamic process of fertility transition from cross-national studies on fertility levels. Another is how best to model the effects of socioeconomic development on fertility change, considering data constraints, multicollinearity, interaction effects, thresholds, and asymptotic tendencies. The regression analysis that follows (in Chapters 4-7) pays careful attention to these methodological issues.

Hess begins the construction of the formal empirical model with two simultaneous equations, one for the percentage change in the national total fertility rate (TFR), and the other for the percentage change in real per capita gross domestic product (GDP). The data used to test the model consist of aggregate

information from 49 developing countries for two periods. In an appendix he discusses the criteria used in assembling the model and elaborates on its construction.

He extends the model thus far developed by endogenizing the family planning effort. This extension allows for the possibility that family planning activity, as found by W. Parker Mauldin and Bernard Berelson in a 1978 study, is highly correlated with socioeconomic development.

In Chapter 8 Hess analyzes the residuals from the two-stage least squares regressions to identify outliers, "those developing nations whose fertility performances have deviated considerably from what would have been expected under the given socioeconomic conditions" (p. 8). This analysis is followed by more detailed cross-country comparisons and country-specific studies. He finds a correlation between fertility transition and family planning program efforts.

In Chapter 9 he presents the now revised eclectic model of fertility. In his basic premises he seems to agree with Ansley Coale that fertility behavior depends on, first, the range of alternatives perceived; second, the relative desirability of the options available; and third, the feasibility of attaining the desirable alternatives. His model incorporates elements of Becker's microeconomic framework along with Harvey Leibenstein's social reference group standards. Hess then echoes the Easterlin framework by stating that "the demand for births, the potential supply of births, and the cost of contraception jointly determine the fertility of the representative female—with the relative impor-

tance of the supply and demand factors changing during the course of economic development" (p. 8).

Hess predicts that a demographic vanguard of younger females, consisting of the elite, the better-educated, and the economically mobile, will be the first to break from tradition and modify their fertility through delayed marriage and discretionary fertility. As modern contraception becomes more available and acceptable, fertility control becomes easier.

In his concluding chapter Hess reassesses the methodological issues raised at the outset and presents the policy implications of the study. He also answers the questions posed in the introductory chapter, makes suggestions for future population policy directions, and outlines areas for future interdisciplinary research on fertility.

The book contains chapter notes, a complete bibliography, and an index. It is not a book for the general reader but should merit the attention of demographers whose work includes the modeling of fertility behavior. Large academic libraries and institutions with population libraries will want to acquire *Population Growth and Socioeconomic Progress in Less Developed Countries*.

—Alice D. Harris

Choosing a Contraceptive: Method Choice in Asia and the United States edited by Rodolfo A. Bulatao, James A. Palmore, and Sandra E. Ward. Westview Special Studies in Science, Technology, and Society. Boulder, San Francisco, London: Westview Press, 1989. xxvi, 347 pp. (paper), US \$34.95. ISBN 0-8133-7728-5. Available from Westview

Press, 5500 Central Avenue, Boulder, CO 80301, USA.

Although evidence exists for the contraceptive choices people usually make, systematic treatment of the factors underlying choice has been inadequate. Such factors vary from person to person, from place to place, and from time to time. Knowing what affects the choice of methods by potential users is of immense value to the success of any contraceptive program.

Choosing a Contraceptive provides evidence from the most recent investigations of contraceptive method choice in many countries, focusing especially on Asia and the United States.

The significance of contraceptive method choice is summarized in an introductory chapter by editors James A. Palmore and Rodolfo A. Bulatao. The framework they present to investigate this issue and their overview of contraceptive prevalence and method choice in Asia and the United States provide a context for the chapters that follow.

Part I examines various perspectives for interpreting individual method choice. Andrew R. Davidson, in Chapter 2, examines possible models of individual decision making for contraception and stresses the inclusion of husbands' attitudes and values in such models. In Chapter 3 Lawrence J. Severy investigates the influence of contraceptive providers (physicians) on method choice in Mauritius, Peru, the Philippines, and Sri Lanka. Physicians show multifaceted perceptions of contraceptive methods. The Billings method is perceived to be the most modern of the natural methods, vasectomy the most modern of artificial methods.

In Chapter 4 Elise F. Jones discusses the effects of accessibility as a determinant of method choice. She is confident that travel time and cost are not the only elements of accessibility, and that their effects may be obscured by other factors not controlled for. J. Brad Schwartz et al., in Chapter 5, show the effects of economic factors on method choice in the Philippines, Jamaica, and Thailand. Separate analyses of the three countries in general indicate a negative association between these factors—as price increases, consumers are less likely to use a method—but the effect is not large for many efficient methods.

Part II focuses on Asia. The focus is appropriate: since culture, psychology, and economy vary widely among Asian countries, the success of Asian family planning programs ranges from extremely successful to ineffective.

Minja Kim Choe and Insook Han Park, Julie DaVanzo et al., and Aphichat Chamrathirong and Elizabeth Hervey Stephen, in Chapters 6, 7, and 8, respectively, devote their research agendas to the Republic of Korea, Malaysia, and Thailand. An overview of trends in contraceptive method mix is given, together with a detailed analysis of method choice including contraceptive accessibility and side effects. Findings are specific to each country but share common features. The desire to have no more children is the most powerful reason for accepting sterilization.

Chapters 9, 10, and 11 focus on South Asia, where there is even more diversity. Indra Gajanayake, in Chapter 9, examines the continued popularity of traditional methods in

Sri Lanka, despite widespread knowledge and availability of modern methods. She believes that most rhythm users, the largest segment of traditional contraceptors, depend on the personal advice in the matter of choice. In Chapter 10 J. R. Rele et al. use attitudinal responses to examine determinants of method choice and also the influence of contraceptive protection on fertility decline in India. In Chapter 11 James F. Phillips et al. discuss the possibility of improving contraceptive behavior by raising the quality of field work in Bangladesh.

Part III of *Choosing a Contraceptive* is devoted to the United States. Chapter 12 by Ronald R. Rindfuss et al. examines contraceptive determinants and change, leaving out couples previously sterilized. Complementing Chapter 12, Chapter 13 by Warren B. Miller et al. presents a model for understanding the choice of sterilization as the most popular contraceptive method in the United States among white, ever-married women; the writers investigate different paths between such decisions and attitudinal and socio-demographic variables.

In Chapter 14 Rodolfo A. Bulatao condenses most of the findings of the earlier chapters and proposes an additional framework to examine factors influencing method choice. This framework consists of four major components; contraceptive goals, contraceptive competence, contraceptive evaluation, and contraceptive access. He offers various useful insights about why individuals choose particular contraceptive methods.

In an appendix chapter Minja Kim Choe describes the validity of

using multinomial logit analysis, adopted by most authors in the volume for their analysis, where the multicategory dependent variable could be accommodated.

This comprehensive monograph is, as Lee-Jay Cho writes in the Foreword, policy-relevant but technically sophisticated; it also contains references for each chapter and an index. It is certainly a welcome addition for academics, policymakers, and all population collections.

—W. I. DeSilva
Department of Demography
Australian National University

Perspectives on Population: An Introduction to Concepts and Issues edited by Scott W. Menard and Elizabeth W. Moen. New York: Oxford University Press, 1987. xix, 487 pp., ISBN 0-19-504092-9 (cloth), US \$39.95; 0-19-504190-9 (paper), US \$24.95. Available from Oxford University Press, 200 Madison Avenue, New York, NY 10016, USA.

As stated by the editors (p. ix), "this reader is intended to be used as a textbook in undergraduate or graduate courses." With 46 selections, including both whole published articles and many abstracts, this book succeeds rather well and deserves serious consideration as a principal text for many basic courses in population studies.

The selections are organized into seven sections: population growth and decline in history; population theory and policy—poverty, pollution, resources, and development; mortality; fertility; population location—migration, distribution, urbanization, and density; popula-

tion structure; and population research. Overall, the balance of coverage is good and the material included readable. An introductory section on how to use the book, a list of references, and two indexes (of names and subjects) contribute to the book's value. The editors' section introductions are also useful and provide information not found in the readings as well as summarizing what is covered.

The faults? It is easy to criticize any reader for omitting topics. Examples of notable omissions here are sufficient coverage of recent literature on childspacing, psychosocial research, and issues related to levels of analysis (micro-, macro-, levels in between) and their integration in research. Also noticeable is infrequent reference to the major National Academy of Sciences compendium on fertility and family planning research published well before this reader.

More important from the perspective of this journal's readership is the ethnocentric bias of the book. Far too much is included about the United States and far too little about most of the world's population. While this may have been excusable two decades ago because so little reliable information was available for Asia, the Pacific, and other regions, a great deal is now known and the quality of many studies done outside the United States is excellent, so that an overemphasis on U.S. population studies seems misplaced. Even if one rationalizes the emphasis on the basis of the likely market for the book, it still seems unjustified, given today's interdependent world and the fact that many of the most interesting developments in population studies

are taking place in other countries.

These criticisms aside, this is a sound reader, and the instructor can easily supplement its contents through lectures and other readings.

—James A. Palmore

Looking at Population Literature by David Lucas, Christine McMurray, and Kim Streatfield. Canberra: National Centre for Development Studies, Australian National University, 1989. Demography Teaching Notes, No. 6. xii, 155 pp. (paper). ISBN 0-7315-744-4. Available from BIBLIOTECH, Australian National University, GPO Box 4, Canberra, A.C.T. 2601, Australia.

This is the sixth in a series of Demographic Teaching Notes prepared by the Graduate Program in Demography of the National Centre for Development Studies, Australian National University. Intended for graduate students, particularly those from Africa, Asia, and Oceania, it is a guide to doing library research.

Chapter 1 explains the art of searching for subject materials in reference collections and suggests ways to keep records of data found in books and journals. Chapter 2 describes the numerous printed indexes and bibliographies that can help readers locate information on a given subject. Among those suggested are the printed versions of *Population Index*, *Social Science Citation Index*, *Current Contents*, and *Dissertation Abstracts International*.

Chapter 3 discusses the use of online computerized bibliographies. Some libraries perform subject searches for their clients at a modest cost; in other libraries students can perform their own searches. A variety of databases ap-

propriate for searching on population topics is available, including FAMILY (the Australian Family Studies Data Base); DIALOG, with its more than 300 separate files; and POPLINE, the Johns Hopkins University database, which incorporates POPULATION INDEX online.

The major journals in the population field are listed in Chapter 4 with descriptions of what can be found in typical issues. Since journal titles change frequently it is best to consult a library for recent publications in any area of interest.

Chapter 5 lists some of the key publications on population in the countries of Africa, Asia, and the Pacific. Population institutions and government agencies are the publishers of many country studies, bibliographies, and journals. Other important sources for country data are censuses, surveys, official yearbooks, dissertations and theses, World Fertility Survey volumes, and the publications of nongovernmental international organizations such as the World Bank, the United Nations, The Population Council, and the Ford Foundation.

The last chapter, "Publishing Your Work," provides information on how to make the finished paper or dissertation appear well-organized and properly documented with footnotes and bibliography. The authors caution against "cloning," or repetitive publishing of the same article, and plagiarism, which, in this context means using someone else's material as one's own. Although it may be considered respectful in some countries to repeat large sections of others' work, the practice is condemned in Western institutions. All direct quo-

tations should be placed in quotation marks and all discussion of others' research should be fully referenced in the text.

Appendix I illustrates, with three examples of population subjects, how to analyze a topic and develop a research strategy for searching the literature. Appendix II suggests a style for brief bibliographic citations in a paper or dissertation. Full references to the works cited are given in a bibliography placed at the end of the paper. Although the suggestions given here are appropriate in many social science journals, this reviewer suggests checking a journal's "Notes to Contributors" section for its preference on styling bibliographic citations and references before submitting a manuscript to it.

The authors of *Looking at Population Literature* have produced a well-written and useful manual for graduate students, especially those unfamiliar with Western library organization. Population libraries should have this book on hand for anyone needing help in getting started on library research. There are other works that can be useful to more advanced researchers, but this one makes an excellent beginning reference tool.

Other titles in the Demographic Teaching Notes series of interest are *Basic Mathematics for Demographers* by S. K. Jain; *Beginning Population Studies* by David Lucas, Peter McDonald, Elsbeth Young, and Christabel Young; and *Asking Demographic Questions* by David Lucas and Penny Kane. Each volume costs about Australian \$7.00, but it is advisable to write to BIBLIOTECH for a price list.

—Alice D. Harris

ALSO NOTED

Diffusion, International Forum for Census Dissemination, No. 6, July 1989 edited by Michael Moore. Christchurch, New Zealand: Department of Statistics. 19 pp. Available from Department of Statistics, Private Bag, Christchurch, New Zealand.

This newsletter, written by and for census and statistical-office personnel in Australia, Canada, New Zealand, the United Kingdom, and the United States, reports on activities of the participating agencies. Michael Moore, Senior Manager of Population Census and Geostatistics for the Government Statistician of New Zealand, was responsible for editing the latest issue.

The issue reviews the results of field-testing programs of several countries in preparation for the 1990–91 census round and examines output strategies for both the 1986 and the 1990–91 censuses. An article from Canada describes that country's 1986 census output program and the impact that cost-recovery measures have had on it. Another from the United States reports on technical aspects of the 1990 census, including the sampling scheme, plans to enumerate the homeless, and the prelisting operations currently under way. There is also a section on recent publications and other product news.

Levels and Trends of Contraceptive Use As Assessed in 1988 by United Nations Department of International Economic and Social Affairs. Population Studies, No. 110. New York: United Nations, 1989. viii, 129 pp. (paper), US \$15. Available as No. E.89.XIII.4 from Sales Section, United Nations, New York, NY

10017, USA, and from major booksellers worldwide.

An updated overview of contraception throughout the world, containing data from 97 countries and areas. A reference table shows levels of use of specific methods, based on nationally representative sample surveys.

Among its findings: about 45 percent of couples of childbearing age in developing countries and about 70 percent in industrialized countries use contraception; average contraceptive use level in Asia is 50 percent, as compared with 56 percent in Latin America and 14 percent in Africa; in most industrialized countries use prevalence is between 65 and 80 percent; the gap in use levels between developing and developed countries is closing, owing to rapidly increasing use in the former and slow population growth in the latter; and although both access to and use of contraceptives has been increasing, there are still many countries, mostly in Africa and Asia, where large proportions of couples are unfamiliar with any method of contraception.

Annual Report [of Taiwan Provincial Institute of Family Planning], July 1987 – June 1988. Taichung: Taiwan Provincial Institute of Family Planning: 1989. vi, 50 pp. (paper). Available from Taiwan Provincial Institute of Family Planning, P.O. Box 1020, Taichung 40099, Taiwan.

This report, which covers the second year of Taiwan's current four-year family planning plan (in effect during fiscal years 1987–90), reviews the program's accomplishments, information and education,

training, field work and supervision, population research and studies, and budget. Among its findings: acceptance of family planning exceeded the plan's target by 12.5 percent, with 78 percent of married women of reproductive age currently practicing contraception. The rate of natural increase in Taiwan by the end of June 1988 was 11.36 per 1,000, far ahead of the target set by the Ten-Year Economic Development Plan and making Taiwan the most advanced in curbing population growth among developing countries and areas.

Future efforts will concentrate on reaching unmarried couples and men, promoting birth spacing, improving program services in remote areas, and further integrating the family planning program with other public health services.

1988 India Population Data Sheet prepared by the Madras Communications Institute. Rs. 12 plus postage in India; US \$2.00 plus postage outside India; bulk rates apply for orders of 10 or more copies. Available in India from The Secretary, Madras Communications Institute, 230 21st East Street, Kamaraj Nagar, Madras 600 041, India (telephone 418910); available outside India from Dr. S. B. Mani, 216 Kelly Blvd., Slippery Rock, PA 16057, USA (telephone 412 794-5217).

This 24 × 18 inch multicolor wall chart, modeled on the Population Reference Bureau's World Population Data Sheet, contains the most recent demographic data available for all the States and Union Territories of India. Included are demographic graphs, fertility and mortality indicators, and information on gross national production and food grains consumption.

POPNET: Population Network Newsletter. Laxenburg, Austria: International Institute for Applied Systems Analysis (IIASA), 1982-. Available from IIASA, A-2361 Laxenburg, Austria.

IIASA is an international research institution that draws on the scientific and financial resources of member organizations in 16 countries (mostly in Europe but including Japan and the United States) to address problems of global significance. POPNET, published twice a year, contains short articles on innovative approaches to demographic questions, news of IIASA-related schol-

ars, and announcements of projects, meetings, and publications. Its readership consists mainly of demographers in IIASA-member countries but includes many in the Third World. Editor of POPNET is Wolfgang Lutz, deputy leader of IIASA's Population Program.

Issue No. 16 (Fall 1989) contains an article by Charles A. Calhoun on desired family size and excess fertility in Europe and the United States, and another by Nathan Keyfitz on the impact on pension programs of early retirement, a growing phenomenon in many developed countries.

1990 U.S. Census . . .

(continued from page 8)

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U.S. Bureau of the Census. 1988. Chronological listing of 1980 lawsuits. Washington, D.C., 20 July. □

... DIFFERENTIALS IN MARITAL STATUS IN CHINA

(continued from page 18)

males were divorced than were those in cities and towns, possibly reflecting higher remarriage rates in urban places.

Among women, the percentages fluctuated less by age and slightly lower percentages of rural women were divorced than were women living in urban places. This pattern may reflect the somewhat greater ease with which women can obtain a divorce in urban locations.

When educational level is controlled, the data indicate that illiterate men and the older men who were college-educated were more likely to be divorced than those with primary to high school education (Table 8). This general pattern characterized all residence categories but was particularly pronounced in rural areas.

Among women, divorce rates were more directly related to educational level, the high school-educated having higher levels of divorce than those with less education or even those with college education in many age groups (Table 9). This was especially true among women town residents.

■ Differences in percentages currently married

Given the age-related patterns of never married and widowed, the percentages currently married in 1982 formed an expected inverted U-shape pattern (Table 10). For both males and females, higher percentages were currently married at early ages in rural areas than were in cities and towns, reflecting the

Table 8. Percentage divorced, by age, educational level, and place of residence: Males

Age group	College	High school	Middle school	Primary school	Illiterate
Cities					
15-19	0.0	0.0	0.0	0.0	0.0
20-24	0.0	0.0	0.1	0.3	0.5
25-29	0.0	0.2	0.3	0.5	0.5
30-34	0.5	0.5	0.6	0.7	1.5
35-39	0.6	0.9	0.9	0.9	1.8
40-44	0.8	1.1	1.1	1.0	2.2
45-49	1.0	1.1	1.1	1.1	2.3
50-54	1.1	1.5	1.0	1.4	2.2
55-59	2.0	1.5	1.3	1.3	2.0
60-64	2.5	2.4	1.4	1.2	2.0
65-69	1.3	1.6	1.1	1.2	1.7
70+	1.4	0.4	1.1	0.0	1.1
Towns					
15-19	0.0	0.0	0.0	0.0	0.0
20-24	0.0	0.1	0.1	0.2	1.1
25-29	0.3	0.3	0.4	0.6	1.7
30-34	0.4	0.6	0.5	0.9	1.5
35-39	0.3	0.6	0.8	1.1	2.2
40-44	0.7	0.7	0.8	1.3	2.5
45-49	0.4	1.0	1.0	1.2	2.5
50-54	1.9	0.4	0.7	1.3	2.4
55-59	2.5	3.3	1.1	1.4	2.6
60-64	2.3	2.5	1.5	1.3	2.1
65-69	1.6	4.4	1.6	1.4	1.9
70+	5.6	1.6	2.5	1.1	1.2
Rural					
15-19	0.0	0.0	0.0	0.0	0.1
20-24	0.0	0.1	0.1	0.2	0.7
25-29	0.1	0.3	0.4	0.6	0.6
30-34	0.7	0.5	0.6	0.9	1.5
35-39	0.8	0.9	1.2	1.2	2.1
40-44	0.9	0.7	1.0	1.5	2.4
45-49	1.6	1.5	1.3	1.9	2.9
50-54	3.9	2.1	1.8	1.9	2.5
55-59	5.0	2.2	1.9	1.7	2.8
60-64	4.0	3.0	1.8	1.4	2.2
65-69	8.0	3.2	1.1	1.1	1.8
70+	50.3	1.4	1.0	0.9	1.2

generally earlier rural age at marriage. For men above age 30, the pattern was reversed, indicating the greater difficulty that older rural

men have in finding a spouse. For women above age 35, almost no differences existed by place of residence in the percentages married.

Marriage is nearly universal in China between ages 30 and 49, after which the death of a spouse begins to take its toll.

Table 9. Percentage divorced, by age, educational level, and place of residence: Females

Age group	College	High school	Middle school	Primary school	Illiterate
Cities					
15-19	0.0	0.0	0.0	0.1	0.0
20-24	0.0	0.0	0.1	0.3	0.4
25-29	0.1	0.2	0.4	0.4	0.2
30-34	0.5	0.6	0.8	0.5	0.3
35-39	1.2	0.9	1.0	0.6	0.2
40-44	0.8	0.8	0.9	0.7	0.2
45-49	1.2	1.4	1.2	0.7	0.4
50-54	1.7	2.0	1.5	1.0	0.4
55-59	1.9	3.4	3.2	1.1	0.5
60-64	3.6	3.0	2.6	1.8	0.6
65-69	1.1	5.8	2.8	1.6	0.5
70+	18.9	4.6	9.0	0.8	0.3
Towns					
15-19	0.0	0.0	0.0	0.1	0.4
20-24	0.0	0.1	0.2	0.6	0.4
25-29	0.2	0.3	0.5	0.6	0.4
30-34	0.0	0.8	0.7	0.5	0.4
35-39	0.8	1.0	0.7	0.7	0.4
40-44	0.5	1.0	0.6	0.5	0.4
45-49	1.6	0.8	0.9	0.6	0.4
50-54	4.1	1.0	1.5	0.6	0.5
55-59	0.0	2.0	1.8	0.8	0.5
60-64	5.6	7.3	3.5	1.4	0.6
65-69	0.0	2.6	2.9	0.6	0.4
70+	10.3	8.7	0.0	0.2	0.4
Rural					
15-19	0.0	0.0	0.0	0.1	0.1
20-24	0.9	0.1	0.1	0.2	0.2
25-29	0.0	0.3	0.3	0.2	0.2
30-34	1.8	0.6	0.3	0.2	0.2
35-39	0.5	0.5	0.3	0.2	0.2
40-44	0.0	0.6	0.4	0.2	0.2
45-49	1.1	0.8	0.5	0.3	0.2
50-54	0.0	2.8	1.3	0.5	0.4
55-59	5.3	3.7	1.5	0.5	0.3
60-64	8.3	2.1	2.1	0.6	0.4
65-69	0.0	0.0	1.1	0.5	0.3
70+	19.7	4.8	0.7	0.3	0.2

Marriage is nearly universal in China between ages 30 and 49, after which the death of a spouse begins to take its toll.

Not surprisingly, the data on percentages currently married by educational level (Table 11) show both the delay in marriage among those who obtained higher education and the disadvantageous position of illiterate men with regard to marriage. For men with some education, the percentage married was inversely related to level of schooling for city and town residents under age 30; thereafter, the reverse relation held. Urban men with more education apparently find it easier to marry or remarry than their counterparts with less schooling. The patterns are less clear in rural areas for younger men; but after age 35, the direct relation between level of education and percentage married is clear for all but the two oldest age groups.

For women, similar patterns are observed. Education delayed marriage up through the 30-35 age group in all residence categories, although the effect was most pronounced in the youngest ages (Table 12). Thereafter, percentages married were generally directly related to level of education, although the pattern is less regular than for males. Moreover, for reasons already mentioned in the discussion of persons never married,

Table 10. Percentage currently married, by age, sex, and place of residence

Age group	Males			Females		
	City	Town	Rural	City	Town	Rural
15-19	0.4	0.6	1.2	1.4	2.0	5.2
20-24	16.1	22.7	31.6	32.8	42.2	59.6
25-29	68.8	77.1	77.1	85.6	91.1	96.6
30-34	92.0	94.5	88.8	96.8	97.9	99.1
35-39	95.3	96.1	89.4	97.4	97.6	98.4
40-44	95.6	95.9	88.7	96.5	96.6	96.7
45-49	94.9	95.4	87.8	93.8	93.0	93.3
50-54	93.9	93.3	86.3	88.0	87.7	86.7
55-59	90.3	89.8	83.2	78.6	76.9	76.3
60-64	85.7	83.6	77.4	63.9	62.8	61.5
65-69	78.1	75.3	70.3	46.6	45.1	45.1
70+	61.1	58.9	53.6	21.2	19.6	21.8

illiteracy for women seems not to be the drawback to marriage that it is for men.

Yet, within particular education



Among older Chinese, more women than men are widowed, and fewer widowed women than men remarry. Here a three-generation family enjoys a meal together.

categories, the effect of residence on marriage is evident. For example, within the 25-29 age group, only 56 percent of college-educated in cities were currently married, compared with 79 percent in towns and 85 percent in rural areas. Although the differentials tended to be less at lower educational levels, even among the primary school group and the illiterate, slightly fewer of the city and town women residents were married than were those in rural areas.

■ Conclusions

Since 1949, Chinese policymakers have instituted various laws affecting marriage, both to define marriage in accordance with state ideology and to delay marriages among young couples as a means of achieving a slower rate of population growth. The success of the laws in deferring marriages has been pronounced, although not consistently so in urban and rural areas.

Levels of development, as indexed by both place of residence and education, have had strong effects on marital status in China. Residence in a more urban, or developed, place raises the age at marriage but, especially for men, also increases the likelihood of ever marrying. Women's tendency to seek social mobility through marriage, especially in marrying men who live in economically more developed areas, results in bachelorhood for a substantial proportion of rural men.

This quest for mobility on the part of women also reduces the chances of marrying for illiterate men; more of such men marry later (if they marry at all) and a greater proportion of them remain unmarried than do the more educated. Illiterate women do not exhibit similar patterns, because traits other than education tend to be more valued in wives. With the exception of illiterate men, we found, as expected, level of education to have a direct relation to average age at marriage.

Although urban residence and higher education are related to delayed marriage, these factors for men are also associated with less likelihood of being widowed. Patterns of widowhood among women are generally related to residence and education in a similar way, but levels of widowhood among women are higher than among men. These gender differentials in China are quite similar to those found in other countries. Most noteworthy about the data on divorce is the very low level that characterizes every residence and education category for men and women.

These patterns of singlehood, widowhood, and divorce are

reflected in the inverted U-shaped pattern in the percentages currently married. The later age at marriage in cities and the near universality of

marriage in the middle ages are clearly indicated by these data. Again, the difficulties rural men have in finding spouses are docu-

mented by the somewhat lower levels of currently married for this group at all ages but the youngest. At the higher ages, the greater prevalence of widowhood among women also results in much lower percentages of older women than of older men being currently married.

Table 11. Percentage currently married, by age, educational level, and place of residence: Males

Age group	College	High school	Middle school	Primary school	Illiterate
Cities					
15-19	0.1	0.2	0.3	0.8	2.2
20-24	1.8	11.2	20.7	27.8	26.9
25-29	44.7	59.0	72.1	78.8	63.0
30-34	90.7	93.9	92.1	93.3	77.3
35-39	97.7	96.2	96.6	95.1	82.1
40-44	98.1	96.5	96.7	95.7	86.6
45-49	97.3	97.1	96.6	95.2	87.4
50-54	96.7	95.5	95.9	93.6	87.0
55-59	93.4	94.1	93.4	90.9	85.0
60-64	91.5	87.8	90.2	86.8	80.8
65-69	88.8	85.7	83.7	80.1	72.9
70+	79.0	70.6	67.7	0.0	55.6
Towns					
15-19	0.2	0.4	0.6	1.3	2.1
20-24	6.8	18.7	25.5	31.8	26.4
25-29	67.3	74.2	79.0	79.6	65.8
30-34	94.9	96.3	95.9	94.1	79.8
35-39	98.3	97.7	97.3	95.8	83.2
40-44	97.7	97.5	97.6	95.8	86.3
45-49	97.7	96.9	97.3	95.5	89.0
50-54	93.4	96.5	96.2	93.8	86.2
55-59	93.5	91.5	93.2	91.0	84.1
60-64	89.9	89.5	88.4	85.6	77.9
65-69	90.3	78.6	79.7	77.7	71.3
70+	50.0	55.9	64.6	63.6	55.4
Rural					
15-19	0.0	1.1	1.0	1.2	4.3
20-24	11.7	31.8	30.8	31.5	29.9
25-29	71.7	83.1	81.1	76.3	60.7
30-34	94.3	93.6	94.5	89.6	74.7
35-39	97.5	96.4	95.2	90.1	76.7
40-44	97.0	96.1	94.3	90.3	80.5
45-49	95.5	94.2	93.4	90.2	82.8
50-54	92.1	92.0	91.4	89.1	80.5
55-59	81.8	87.7	87.5	86.1	82.7
60-64	83.4	79.9	82.5	80.8	75.0
65-69	71.0	68.7	75.0	73.8	68.5
70+	24.7	55.6	55.1	57.5	52.4

From the patterns revealed by these data, it is clear that the provisions of the Marriage Law and, perhaps more importantly, the guidelines set by the family planning program, have served to reduce marriage at the very young ages (below age 20), but that development level, as indicated here by urban-rural residence, has also had an important effect on age at marriage. Further modernization and rising educational levels should continue to raise the age at marriage, especially in rural areas.

These changes should also reduce the number of illiterate rural men and thereby reduce the percentage of men who never marry. At the same time, as education and modernization serve to mitigate gender differences in many aspects of life, they may also serve to increase the proportion of persons who are divorced, especially among women.

In the past, divorced women have been at a social disadvantage, and traditional divorce practices have heavily favored men. Although those practices have been supplanted by the more equitable provisions of the Marriage Law, traditions are slower to disappear in less developed areas and among the less educated. The 1982 census data on marital status thus provide a valuable benchmark against which to judge marital change as China continues its modernization efforts.

Table 12. Percentage currently married, by age, educational level, and place of residence: Females

Age group	College	High school	Middle school	Primary school	Illiterate
Cities					
15-19	0.2	0.4	1.1	3.7	11.0
20-24	2.7	20.1	39.7	59.8	70.9
25-29	55.8	73.7	86.9	94.4	96.6
30-34	89.3	95.2	95.9	98.2	98.4
35-39	95.8	97.2	97.2	97.7	97.7
40-44	97.6	97.2	96.5	96.4	96.1
45-49	96.9	96.0	94.6	94.3	92.6
50-54	91.7	89.3	89.2	88.9	87.2
55-59	86.5	82.4	79.7	80.0	77.8
60-64	70.9	71.9	68.9	66.3	62.9
65-69	59.6	50.5	49.1	48.7	46.1
70+	37.7	28.6	28.3	26.5	20.6
Towns					
15-19	0.0	0.8	1.5	5.0	10.1
20-24	9.2	30.4	46.9	61.2	68.5
25-29	79.1	84.8	91.6	94.5	96.4
30-34	94.8	97.5	97.7	98.3	97.9
35-39	98.4	97.6	97.7	97.6	97.4
40-44	98.0	97.1	97.2	96.6	95.9
45-49	95.3	95.8	94.4	93.7	91.9
50-54	90.5	89.5	90.3	89.0	86.8
55-59	75.0	84.0	82.1	80.2	75.7
60-64	66.7	55.1	68.8	66.3	62.2
65-69	0.0	59.0	47.8	45.2	44.9
70+	37.9	21.7	22.2	22.4	19.4
Rural					
15-19	2.6	2.4	2.9	5.2	11.5
20-24	23.3	37.0	48.7	66.9	74.0
25-29	84.8	86.5	93.9	97.0	98.1
30-34	93.5	97.8	98.6	99.2	99.1
35-39	98.1	98.1	98.4	98.7	98.2
40-44	98.1	98.1	97.5	97.4	96.4
45-49	96.6	96.2	94.3	94.8	93.0
50-54	100.0	86.1	87.7	90.0	76.0
55-59	79.0	79.5	78.4	81.5	86.5
60-64	66.7	70.8	66.5	66.1	61.4
65-69	60.0	41.7	50.4	50.6	44.9
70+	35.1	28.6	26.9	27.8	21.7

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Monitoring the Education Gap in Thailand: Trends and Differentials in Lower and Upper Secondary Schooling

Educating its future labor force to meet the needs of its developing economy is a major goal of the Thai government. Extending secondary and higher education to larger proportions of children is considered crucial, but more knowledge of current trends and differentials in educational attainment is needed. Using 1980 census and 1987 survey data on birth cohorts to examine recent primary and secondary school enrollment trends, this study reports that primary enrollment is nearly universal but secondary enrollment is much less prevalent. The study assesses several factors thought to influence enrollment and finds that urban residence, parents' completion of primary school, the mother's positive attitude toward education, and the family's being comfortable economically to be associated with children's enrollment in secondary school. It also indicates that, for moderately well-off families, proximity to schools has a major influence on secondary school attendance. For the wealthiest families, however, distance is not a hindrance to attendance, and for the poorest families, having a school nearby is not sufficient to ensure attendance.

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by John Knodel
 and Malinee Wongsith

IN VIRTUALLY all countries of the developing world, efforts are under way to improve educational levels. Ensuring that new generations of children receive at least a primary education and that sufficient proportions of them continue schooling to secondary and higher levels is a common goal and broadly viewed by governments as a critical component of the social and economic development process they seek to bring about.

As employment shifts toward nonagricultural jobs, higher levels of education are required to meet the increasing needs for skilled manpower. Moreover, as production techniques within agriculture become more complex, the need for modern education becomes compelling even within the agricultural sector.

In Thailand, where economic development has been proceeding rapidly and where status as a newly industrialized country seems imminent, providing secondary and higher education to increasing proportions of school-age cohorts is considered crucial if the momentum is to be maintained. Accurate monitoring of trends and differentials in educational attainment is therefore essential for assessing past

progress and planning the future course of the educational system.

Few precise studies exist of trends in educational attainment in Thailand. Most that do are based on annual continuation ratios, which relate the number of students enrolled in a particular grade in a given year to the number enrolled in the prior grade in the previous year.

Even if one assumes that enrollment data are accurately reported, continuation ratios must be interpreted with caution. This is so because, in addition to the proportion of students who continue to the next grade, continuation ratios are influenced by the proportions repeating and skipping grades and, if the data are for local areas, by transfers of students in and out of the areas to which the ratios refer. (For a detailed discussion of the problems associated with the use of continuation ratios for determining trends in education in Thailand, see Wongsith and Knodel 1989.)

Moreover, the majority of studies have not adequately taken into account changes in the educational system in Thailand that complicate interpretation of continuation ratios.

For most purposes, measures of educational attainment for birth cohorts, defined as age groups at a given time, are the best indicators for determining educational trends and differentials. They do not suffer from the weaknesses of continuation ratios just mentioned. Such measures can be derived from information on the highest grade completed for various age groups as reported in censuses or surveys.

The main limitation of cohort educational attainment measures is that the final completed level of

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education will not be known for persons still in school. Some persons may drop out of the educational process temporarily and, if they are not enrolled at the time of the census or survey, will appear to have completed their education. Hence, their current completed education will not reflect their eventual completed level. This group would include those who later participate in adult education programs to earn equivalency diplomas.

When determining the percentage of persons who achieve a particular level of education, therefore, one must limit consideration to those who are above the age at which the level in question would normally be completed. Provided that information about educational attainment is reported correctly either for the entire cohort or for a representative sample, cohort educational attainment measures are free from the types of problems that characterize continuation ratios and their interpretation is relatively straightforward.

■ Data and method

The present study assesses recent trends and differentials in Thai educational attainment at the primary and lower secondary levels, using cohort educational attainment indicators. The data come from the 1987 Thailand Demographic and Health Survey (TDHS) and, in the case of trends, also from the 1980 census. The TDHS is based on a nationally representative sample of 6,775 married women 15–49 years of age. Although its primary purpose was to collect data on fertility, health, and family planning practices, a special set of questions was incorporated to determine the



This rural secondary school complex in Suphanburi Province, Thailand, has both a lower and an upper secondary level.

JOHN KNODEL

educational achievement of each of the respondents' living children of ages 6 and over. The total number of such children was 12,246, of whom 3,031 were 15–19 years old in 1987 and 1,849 were 20–24, the two age groups on which the analysis of educational differentials is based.

The TDHS sample was designed to provide independent estimates for the four major regions of Thailand and the Bangkok Metropolitan Area, as well as for the urban and rural sectors collectively. Nationally representative results can be obtained by applying the appropriate statistical weights. All results presented in the present study are weighted. (For further details about the methodology and sample design, see Chayovan et al. 1988.)

Both the TDHS and the census data permit calculation of the percentages completing or starting various educational levels among successive cohorts of children. The analysis focuses on three such measures: the percentages completing grades 4 and 6, respectively, of elementary school and the percentage starting secondary school. In addition, it pays special attention to the effects of the recent restructuring of the educational system on both trends and differentials.

■ The Thai system of primary and secondary education

Since 1921, when the Thai government enacted universal compulsory education into law, the educational system and its implementation have

undergone numerous changes. The present discussion focuses on the two systems that have prevailed since 1960 because the period covered by the study is not affected by the earlier systems.¹

Between 1960 and 1977, the educational system required children to enter school between the ages of 6 and 8 years. Primary education was divided into lower and upper levels. The lower level consisted of the first four grades (*Pratom* 1-4) and was compulsory throughout the country, as it had been previously. The upper level consisted of three grades (*Pratom* 5-7). The 1960 educational plan called for the gradual extension of compulsory education from four to seven years (i.e., through the upper primary level), with the timing of the change depending on the resources and readiness of the locality.

Implementation began in 1963 and proceeded slowly at first. By 1971 compulsory education had been expanded to only 18 percent of all subdistricts (*tambol*). By 1978, when the current educational system was first implemented, 57 percent of the subdistricts had expanded the compulsory level to seven years.

Secondary education, according to the 1960 scheme, consisted of a general and a vocational stream. The general stream was divided into a lower level consisting of three years (*Maw Saw* 1-3) and a higher level consisting of two years (*Maw*

Table 1. Percentages of birth cohorts completing grades 4 and 6 and starting secondary school: Thailand

Birth cohort	Percentage completing grade 4		Percentage completing grade 6		Percentage starting secondary school	
	1980 census	1981 TDHS	1980 census	1987 TDHS	1980 census	1987 TDHS
1955-56	93.7	—	25.6	—	20.8	—
1956-57	93.9	—	26.7	—	21.7	—
1957-58	93.9	—	29.3	—	23.8	—
1958-59	94.3	—	32.4	—	26.3	—
1959-60	93.9	—	33.5	—	26.7	—
1960-61	94.5	—	37.4	—	29.2	—
1961-62	94.7	—	40.0	—	30.5	—
1962-63	94.6	96.3	41.1	45.0	30.4	29.5
1963-64	94.6	94.5	42.7	47.8	31.0	32.9
1964-65	—	94.5	—	53.7	—	34.0
1965-66	—	93.7	—	57.1	—	33.0
1966-67	—	95.2	—	66.5	—	34.5
1967-68	—	94.8	—	72.7	—	37.8
1968-69	—	96.8	—	80.5	—	37.8
1969-70	—	95.7	—	82.4	—	37.2
1970-71	—	96.4	—	89.5	—	42.1

Note: Results exclude children still in school at grades below the grade in question. For details on how the measures were calculated, see Appendix.

Saw 4-5). The vocational stream in principle also had two levels, the number of years in each level depending on the particular vocational area. In actuality, few students entered the vocational stream at the lower secondary level, and for the most common types of vocational training it was necessary first to finish lower secondary schooling in the general stream.² Thus, for practical purposes, the vocational stream can be considered to start with the higher secondary level.

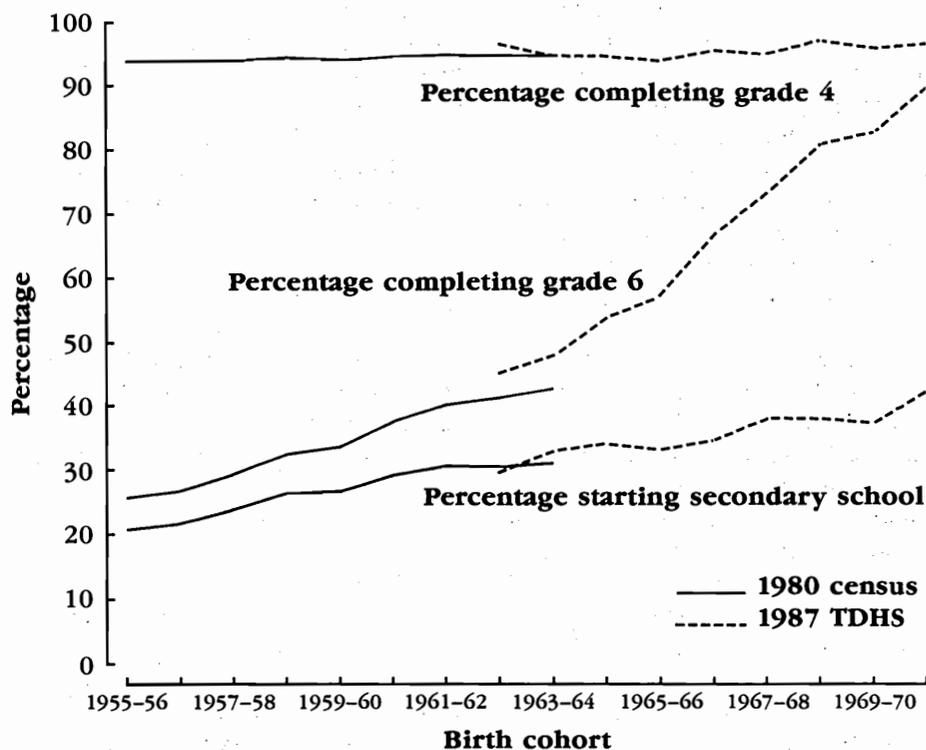
Starting in 1978, primary education was redefined to consist of one level covering six grades (*Pratom* 1-6), and it is now compulsory for the entire country. The new system was implemented rapidly, as is evident from the fact that, by 1980, 94 percent of the subdistricts had complied with the change. The age at which children are required to enter school remains at between 6 and 8 years.

Secondary education is divided into two levels. The new lower level consists of a single general stream and covers three grades (*Maw* 1-3). Upper secondary is divided into a general stream comprising three grades (*Maw* 4-6) and a vocational stream consisting of

1. Much of the discussion in this section is based on the descriptions of the Thai educational system provided in the *Statistical Yearbook* and the series entitled *Final Report on Educational Statistics*, both published by the National Statistical Office.

2. According to enrollment figures for 1975, only 1.7 percent of vocational students were enrolled in the lower secondary level. This declined to 0.4 percent by 1978, the last year for which a lower secondary level existed for the vocational stream.

Figure 1. Trends in percentages of birth cohorts completing grades 4 and 6 and starting secondary school: Thailand



two levels. The lower vocational level generally takes three years to complete. The upper vocational level takes an additional two to four years and is considered to be higher education parallel to the university system.

In practice, proceeding through the Thai educational system involves a sequence of several critical transitions between levels or sublevels. The most important, because it screens large numbers of children out of the system, occurs between the completion of the compulsory level and the start of the next level. In the current system, this is the transition from the primary to the lower secondary level (i.e., from Pratom 6 to Maw 1). In the prior

system, the timing of the transition depended on whether the com-

By 1980, six years of primary education were compulsory in all school districts of Thailand. The most critical transition, because it screens large numbers of children out of the system, occurs between the compulsory level and secondary education.

mune had extended the compulsory level from four to seven years and, if so, when that change had occurred.

For most communes, during most of the period between 1960 and 1978 the critical transition between compulsory and noncompulsory schooling occurred after completion of the lower primary level (i.e., from Pratom 4 to Pratom 5). However, in those situations where compulsory education had been extended to include the upper elementary level, the critical transition occurred between the upper primary and the secondary levels (i.e., from Pratom 7 to Maw Saw 1).

■ Trends in educational attainment

Trends in the percentages of students completing primary grades 4 and 6 and starting lower secondary school are shown in Table 1 and Figure 1 for birth cohorts corresponding to single-year age groups based on the 1980 census and the 1987 TDHS.³ For each source, the measures are limited to cohorts at least 16 years of age at the time of data collection since by this age the vast majority of those who will complete primary school or continue to lower secondary will

3. Persons of the same age at any given time can have been born in either of two calendar years, depending on the given month in relation to the month of birth. Thus, someone of age A at last birthday at time T could have been born either in year $T-A$ or in year $T-(A+1)$. For example, a person of age 20 at the time of the 1980 census could have been born in either 1960 or 1959, depending on whether the person's birthday was before or after the census date. For this reason the birth cohorts corresponding to single years of age in Table 1 and Figure 1 span two calendar years. Because the census and the TDHS took place at roughly the same time of year, the cohorts corresponding to single years of age match reasonably well once allowance is made for the seven-year time difference between the two data sources.

have already done so.⁴ Nevertheless, even by this age, a small percentage is still enrolled in primary school, largely in the higher primary grades and confined mainly to the youngest few age cohorts.

As many of those who are currently enrolled in primary school will eventually graduate and some will continue on to secondary school, the percentages of these younger cohorts completing grades 4 and 6 or starting secondary school will be slightly understated if those still at or below those grades are treated as not completing the grades.

To avoid this bias, for the purpose of the calculations on which Table 1 and Figure 1 are based, we treat cohort members who were currently enrolled in Pratom 4 and Pratom 6 as having completed those grades. Cohort members who were currently studying in the grades below the level being considered (Pratom 4, Pratom 6, and Maw 1, respectively) are excluded from the calculations. In effect, this is equivalent to assuming that cohort members currently enrolled below those grades would attain those grades in the same proportions as cohort members included in the calculations. A detailed account of the calculations of the educational attainment measures and associated problems is provided in the Appendix.

4. Information in the 1980 census on completed education actually refers to the end of the 1978-79 school year, when most persons would have been one year younger. The calculations, however, incorporate information on school attendance for the 1979-80 school year and hence to the situation at the time of the census. See the text and Appendix for details.

It is reassuring that both sources, the 1980 census and the 1987 TDHS, yield generally similar results for the two cohorts for which measures from both sources are shown (i.e., the 1962-63 and 1963-64 cohorts).⁵ Only small differences exist between the two sources in the percentages completing grade 4 as well as in the percentages starting secondary school.

For both cohorts, however, the percentages completing grade 6 are somewhat higher for the TDHS than for the census. The higher TDHS figures may reflect in part a genuine increase in the educational attainment of the cohorts that could have resulted from a return to school by some members or their participation in adult education programs to obtain primary education equivalency diplomas during the seven years between the 1980 census and the 1987 TDHS.

Together, the results from the 1980 census and the 1987 TDHS provide educational attainment measures for a series of cohorts whose experience spans the major recent changes in the Thai educational system. Since most children are 10-11 years old when they complete Pratom 4 and 12-13 when they complete Pratom 6 and start

5. Whereas the census data are based on a complete enumeration of the population and refer to all persons in a given age group, the TDHS is based on a sample survey of women of ages 15-49 and the educational data used in this study refer to their living children. However, because the TDHS sample is nationally representative and a high proportion of persons of ages 16-24 (i.e., those for whom cohort measures from the TDHS are being presented) have mothers 49 or younger, the two sources should be reasonably comparable for examining educational attainment.

Maw 1 (or were 13-14 when they started Maw Saw 1 in the former system), the 1966-67 and 1967-68 birth cohorts would have been the first to be affected by the 1978 restructuring of the educational system. Earlier birth cohorts, however, would have been affected by the expansion of compulsory education from Pratom 4 to Pratom 7 that was taking place under the former educational plan.

The percentage completing grade 4 was not directly affected by changes in the compulsory level because Pratom 4 was within the compulsory range throughout the entire period during which the various cohorts were receiving their primary education. Thus, it is not surprising that this percentage was very high for all birth cohorts and only a slight increase is evident, from 93 to 97 percent. In contrast, a dramatic increase in the percentages completing grade 6 is apparent, from 25 to 90 percent, undoubtedly reflecting in large part changes in the compulsory level.

The slower pace of increase evident up through the cohorts born in the mid-1960s is probably attributable in the main to the steady but moderate expansion in the number of communes in which the compulsory level was being raised from Pratom 4 to Pratom 7 under the 1960 educational plan. The more rapid increase for later cohorts reflects the nationwide change making Pratom 6 compulsory from 1978 onward. Although the percentage completing grade 6 for even the most recent cohort shown (90 percent) was not yet as high as the percentage completing grade 4 for the earliest cohort shown (93 percent), the difference was small and

the trend was approaching a level close to universal attainment.

The percentage starting secondary school (i.e., starting Maw Saw 1 in the earlier system or Maw 1 in the current system) was not directly affected by the redefinition of compulsory levels during the period under scrutiny because secondary education at any level has never been mandatory. (As already discussed, however, the number of years of primary school required before students may enter the lower secondary level was reduced from seven to six with the 1978 restructuring. All else being equal, this would make entrance into secondary school slightly easier.)

Although young Thais who had entered secondary school were still in a minority by the late 1970s, the percentage had doubled (from 20 to 42 percent) in one generation. Most of those who began lower secondary education completed it.

The results show steady, if moderate, progress in the percentage of Thai children who started secondary school (from 20 to 42 percent). As most students who start the lower secondary level continue for at least the three years required to complete it, the percentages starting will be only modestly higher than the percentages who complete lower secondary education. In fact, the high levels of completion within particular sublevels of the educational system are evident from continuation ratios (Wongsith and Knodel 1989).

■ Differentials in educational attainment

Cohort educational attainment measures are useful not only for measuring trends but also for studying educational attainment patterns among various groups within the Thai population. The resulting information about educational differentials can be as important as that about trends for monitoring and managing educational change. Identifying the characteristics of leading and lagging groups in the process of raising educational levels overall not only helps to identify where interventions are needed but also provides insights into the determinants of educational attainment.

In this section we focus on differentials in educational attainment at the primary and lower secondary levels according to family background and several other potentially important characteristics, as well as accessibility to schools. The analysis is based exclusively on data from the 1987 TDHS.

Although differentials are examined with respect to the three measures of educational attainment used in the foregoing discussion of trends, here we pay particular attention to the percentage starting lower secondary school. The reason is that, whereas attendance at the compulsory primary level is high in Thailand, secondary school attendance is low in comparison with other countries of the region and has been a matter of concern for some time (Chutikul 1989; TDRI 1989).

As we have already noted, one limitation of cohort educational attainment measures is that the final completed level of education is not known for persons still in school.

For that reason, when determining the percentage of persons who achieve a particular level of education, one must limit consideration to those who are above the age at which the level in question would normally be completed. Our analysis of differentials is therefore limited to persons 15–24 years old at the time of data collection. By those ages the vast majority of students who will complete primary school or continue to lower secondary will have already done so.

Family background and demographic and socioeconomic characteristics. Table 2 indicates the percentages of children who, by the ages of 15–19 and 20–24, had completed grades 4 and 6 and had started lower secondary education, tabulated by characteristics that could potentially exert an important influence on educational achievement. Entry into primary education has been nearly universal in Thailand for some time, and completion of the compulsory level has also been the norm. The proportion of persons with at least a grade 4 primary education, the minimum level that has been compulsory since the start of compulsory education, has been high among those who passed through primary school age in the last several decades. According to the TDHS data, 96 and 95 percent, respectively, of the 15–19 and 20–24 year olds under study finished at least a grade 4 education.

In contrast, the proportions with at least a grade 6 education is sensitive to the recent changes in the educational system, in particular to the earlier rise in the compulsory level to seven years in some com-

munes and more recently to the switch to six years of compulsory schooling everywhere. The percentage with at least a grade 6 education is far higher among those who were of primary school age recently than among those who passed through that age group somewhat earlier. This is evident in the TDHS data, which show that a far higher percentage of 15-19 year olds than of 20-24 year olds had completed grade 6.

As we noted earlier, because continuing beyond primary school has never been compulsory, the proportions entering the lower secondary level have not been directly affected by changes in the educational system but rather have been subject to a steady, if slow, increase in the proportions of successive cohorts continuing education into the secondary level. In the total TDHS sample, the percentage of 15-19 year olds who had started lower secondary school was modestly higher than that of 20-24 year olds (Table 2).

Given the high levels of completion of grade 4 overall, few pronounced socioeconomic differentials are evident at this level of education. Only among children whose mothers or fathers had fewer than four years of schooling or, among 20-24 year olds, who were from the poorest households were the proportions completing grade 4 noticeably lower. Considerable differentials in the percentages completing grade 6 or starting secondary school, however, are evident in relation to most variables shown.

Boys were somewhat more likely than girls to have completed grade 6 or to have started lower secondary school. Gender differences in

Table 2. Percentages of children completing grades 4 and 6 and starting secondary school, by selected background characteristics and age in 1987: TDHS

Background characteristic	Percentage completing grade 4		Percentage completing grade 6		Percentage starting secondary school	
	15-19	20-24	15-19	20-24	15-19	20-24
Total	96	95	83	56	38	33
Sex						
Male	96	95	85	60	42	37
Female	96	95	81	52	35	29
Rural-urban residence ^a						
Rural	95	94	81	52	32	28
Urban	98	97	93	80	78	68
Region						
Bangkok	98	96	93	79	77	64
Other Central	97	94	86	58	43	35
North	89	88	73	44	33	26
Northeast	98	98	84	52	28	26
South	96	95	83	64	47	40
Mother's education						
Less than 4 years	88	87	67	40	23	20
4-7 years	98	98	87	60	39	36
Secondary or above	100	99	99	98	97	90
Father's education						
Less than 4 years	84	84	64	36	21	17
4-7 years	97	97	84	55	34	30
Secondary or above	99	99	97	94	86	81
Household wealth level						
Lowest	90	84	70	34	13	12
Low	96	96	82	47	26	21
Middle	97	96	82	61	44	37
High	99	97	94	78	69	62
Highest	98	98	94	84	75	69
Father's work						
Agricultural	95	94	79	48	26	21
Nonagricultural, no wage or salary	97	95	86	69	58	50
Nonagricultural, with wage or salary	98	96	91	81	73	72

Note: Results based on fewer than 20 unweighted cases are not shown; results based on 20-49 unweighted cases are enclosed in parentheses. The results shown are based on weighted calculations.

a. The TDHS defines as urban the Bangkok Metropolis and areas officially designated as municipalities; all remaining areas are defined as rural. Residence refers to the current residence of the child's mother, not to the child's current residence. A child attending school in an urban area but whose mother lives in a rural village is therefore classified as having a rural residence.

the proportions finishing grade 6 appear to be diminishing, judging from the small difference between boys and girls among those of ages 15–19. This finding undoubtedly

Although boys are somewhat more likely than girls to have begun secondary school, in recent years gender differences have been diminishing.

reflects the recent universal extension of compulsory school to grade 6, which applied to many in this younger age group but to fewer in the age group 20–24 owing to the timing of the change.

Pronounced rural–urban differences are evident in educational attainment of children beyond grade 4. Much higher proportions of children from urban families started lower secondary school than did children from rural families. Higher proportions of urban children also completed grade 6, but the difference was far less for 15–19 year olds than for 20–24 year olds. Again this finding reflects the rapid spread of compulsory schooling to grade 6 after the 1978 restructuring of Thailand's educational system.

In the years just prior to 1978, grade 7 was far more likely to have been made compulsory in urban areas than in rural areas (where in many communes the compulsory level would have remained at grade 4); and the far greater tendency for urban children to proceed to secondary school would have led them to complete grade 6 even when it was not compulsory.

The TDHS data indicate that children from Bangkok families were

considerably more likely to have entered lower secondary school than were children from other regions in both age groups, although Bangkok children were not more likely to have done so than urban children overall. Likewise, among the 20–24 year olds, those from Bangkok were far more likely to have finished grade 6 than were those from other regions. The differences in this latter respect were substantially diminished for the 15–19 year olds as a result of grade 6 becoming compulsory. Regional differences in starting secondary school are also apparent even after Bangkok is excluded, as higher proportions of

children from the Central Region and the South had entered the lower secondary level than children from the North and Northeast.

Children's prospects for secondary education are much better if their parents achieved that level.

A clear positive association between children's education and the education of both the mother and the father is apparent. Particularly pronounced is the difference in per-



Enjoying a recess are girls in Maw 1, the first grade of the lower secondary level.

centages who had started secondary school between children whose mother or father had attended secondary school and those whose mother or father had completed only primary school (i.e., 4–7 years of schooling). This difference was slightly greater in the case of the mother's than the father's education, probably reflecting the fact that fewer women than men in the parental generation went beyond primary school. Under such circumstances, families in which the mother attended secondary school are more selective than families in which the father did.

To measure the economic status of a household from information collected in the TDHS, we devised an index of the household's wealth level based on the types of vehicles possessed by the household, the type of flooring in the house, and the type of toilet facility the family had. (Electric appliances were deliberately excluded from the index because their possession is dependent on the availability of electricity in the community and thus would not necessarily reflect the household's ability to buy them.)

The wealth index reflects the situation of the household at the time of the survey and not necessarily the situation at the time decisions were made about the children's educational careers. This drawback should not be serious in the present analysis because wealth levels are likely to be stable over time and the household's possession of particular items included in the index may not change much.

For purposes of presentation, we grouped the households into five categories according to their wealth

scores. As the results show, the percentages of offspring in both age groups who had started lower secondary school as well as the percentage of those in the 20–24 age group who had finished grade 6 are quite sensitive to this simple index of current wealth, revealing a clear direct relationship.

The better off a family is economically, the better are the children's chances of completing grade 6 and starting secondary school, especially in rural areas.

On the basis of information collected in the TDHS about the type of work of the respondent's husband, it is possible to distinguish those engaged in agriculture from those having other occupations. If the respondent was not currently married, she was asked about her most recent husband's work at the time they lived together. Generally the indicators of the husband's work refer to the time of the TDHS survey and do not necessarily reflect the situation at the time when critical decisions were made about a child's education. Nevertheless, given the likelihood of continuity in at least the broad type of work done by a couple, the work indicators are probably of considerable potential relevance.

Husbands not in agriculture are further subdivided according to whether or not they received a regular wage or salary. Presumably many of the latter group were own-account (self-employed) workers.

Although the classification of type of work based on such information is crude, it reflects several dimensions that may exert influence on decisions concerning the children's pursuit of education. In particular, the type of education provided in formal schools may be perceived as less relevant to agricultural households or to nonagricultural own-account households in the informal sector than to others. Higher opportunity costs associated with a child's school attendance and the consequent loss of the child's labor on the farm or in own-account activities could be another factor discouraging education for children in such families.

Sharp differentials in both age groups in the percentages of children who had started lower secondary school as well as in the percentages of those in the 20–24 age group who had finished grade 6 are apparent according to the type of work done by the father. Nonagricultural work was associated with considerably higher proportions of children completing grade 6 and starting secondary school than was nonagricultural work. Moreover, children whose fathers worked outside agriculture and received a regular wage or salary were more likely to have completed grade 6 and to have started secondary education than were those whose fathers did not receive regular wages or salaries.

Overall, the results in Table 2 indicate that in both the age groups under study, socioeconomic differences were minor in the proportions completing grade 4 but quite pronounced in the proportions who had started secondary school. The

(continued on page 25)

U.S. Bureau of the Census: Facing the Future Labor Shortage

The U.S. labor force is expected to undergo major changes over the next several decades. Jobs will grow faster than the labor force, and most of the new jobs will require skilled workers. The labor force will contain greater proportions of minorities and especially of women, who will make up nearly half of workers by the year 2000. Employers are finding that many new workers lack the education and skills required in today's increasingly sophisticated job market. The shortage of qualified workers is being felt throughout the federal government, but it is particularly problematic for the Census Bureau, which has traditionally relied upon a large force of temporary workers to conduct the decennial census. These and other findings of studies conducted by the 21st Century Staff, a group in the Census Bureau charged with long-range planning and research, will help bureau managers make appropriate operational changes in regard to the labor force and other issues of the future.

by David L. Browne

How does an organization prepare for change? As the turn of the century approaches, that question has led to increased long-range planning in both public- and private-sector organizations. One such organization, the U.S. Bureau of the Census, has created a small group to study the future and advise the bureau on how to prepare for it. The group,

the 21st Century Decennial Census Planning Staff, or 21st Century Staff for short, has as its twofold mission to stimulate debate on the future of decennial censuses and to get an early start on the year 2000 census.

This article begins with a brief overview of the Census Bureau's preparations for the future, then discusses the demographic and social changes that are affecting the national labor force, from which the Census Bureau hires its workers.

The final section considers how the bureau and its mission are affected by these changes.

■ Census Bureau Preparations for the Future

The activity of taking a census is one of the oldest tasks of the federal government and one of the few specifically mandated by the U.S. Constitution. As such, the process of census taking has been changing, along with the country, for 200 years.

The bureau has been a leader in technology and changes in the work place throughout its existence, introducing mechanical tabulation more than 100 years ago and the computer nearly 40 years ago. More recently it began widespread office use of mini and micro computers, computer-assisted telephone interviewing (CATI), a computerized digital map data base called Topologically Integrated Geographic Encoding and Referencing (TIGER), and a host of other technologies that have had wide-ranging effects on the bureau's work.

In April 1990, the Census Bureau performs the twenty-first decennial census. It is expected to be the most thorough and accurate count of the people of the United States to date. Yet there is a growing senti-

ment within the bureau that changes in the current process must be made. Charged with guiding the bureau through an examination of prospective changes and alternatives, the 21st Century Staff regards the main challenge of the decennial census as unchanged: achieving improved coverage at acceptable costs.

Given the overall goal of enhancing the bureau's ability to achieve improved coverage at acceptable cost, the current study has focused on labor force issues, in particular the labor demands of the Census Bureau in its operations and the supply and quality of labor available to meet those demands. The study has involved a review of the current literature on the U.S. population and its labor force, including analyses of the federal government work force and its management. The review has been augmented by some 20 interviews with Census Bureau analysts, internal bureau reports and memoranda, and anecdotal accounts from field operations staff.

One recent trend the study by the 21st Century Staff has identified, the shrinking availability of capable census workers, threatens the bureau's ability to achieve its goals and to respond to other changes in its environment. That trend is related to changes in the national labor force.

■ The National Labor Force

The Census Bureau is a nationwide employer, and therefore the demographic and social trends that shape the national labor force create the environment in which the bureau must work.¹ Among the demograph-

ic and social factors that are shaping the national labor force are the following.

Demographic factors. The average annual population growth rate for the United States has been 0.7 percent during 1985-90 and is projected to decline to 0.4 percent during 1995-2000. At these rates the U.S. population is projected to be between 237,028,000 and 243,513,000 in 1990 and to grow to between 248,372,000 and 260,378,000 by the year 2000 (Council on Environmental Quality and Department of State 1980: 22, 24).

The U.S. labor force is expected to grow by 23 million workers between 1986 and the year 2000, but the rate of growth will slow from about 2.2 percent per year to 1.2 percent. The future labor force will have increased representation by minorities and especially by women.

The labor force will grow from 118 million in 1986 to 141 million in the year 2000, but it will be growing at a much slower rate than in the past. The labor force's average annual rate of growth will

1. The labor force is defined as "persons [of] age 16 and over who are currently employed and persons who have no job and are currently looking for work or on layoff, or the unemployed" (U.S., DOL, BLS, 1988: 176). In this article the terms "labor force" and "work force" are used synonymously, although technically there are differences between them.

decline from about 2.2 percent in the 1972-86 period to about 1.2 percent in the 1986-2000 period (U.S., DOL, BLS, 1987: 5.)

By the year 2000, 67.8 percent of the eligible population will be in the work force, as compared with 65.3 percent in 1986. This will be the consequence of larger numbers of working women and minorities, although participation rates for those over age 55 will decline (Table 1). The overall labor force participation rate for women in the 25-54 age group is expected to rise to about 80.8 percent, while for men it will decline slightly, to 92.6 percent.

The female share of the work force is expected to rise from 44.5 percent in 1986 to 47.3 percent in the year 2000 (Table 2). Of the

Table 1. Civilian labor force participation rates, by sex, race, ethnicity, and age: United States, 1986 and 2000 (percentages)

Characteristic	1986 (actual)	2000 (projected)
Both sexes, 16 +	65.3	67.8
Men, 16 +	76.3	74.7
16-24	73.0	74.3
25-54	93.8	92.6
55 +	40.4	34.1
Women, 16 +	55.3	61.5
16-24	64.3	69.5
25-54	70.8	80.8
55 +	22.1	21.4
Whites, 16 +	65.5	68.2
Blacks, 16 +	63.5	66.0
Asians and others, 16 +	64.9	65.8
Hispanics, ^a 16 +	65.4	68.7

Source: Fullerton (1987).

a. Persons of Hispanic origin may be of various races.

projected increase of 25 million workers in the 1985–2000 period, 63.2 percent will be female.

Whites are expected to continue being the predominant group in the labor force in the year 2000, but minorities will have increased their representation owing to their faster growth rates. Average annual labor force growth rates are projected to be 4.1 percent for Hispanics, 3.9 percent for Asians and others, 1.9 percent for blacks, and 1.0 percent for whites (Fullerton 1987: 22).

With the aging of the baby boomers, about 72.6 percent of the labor force will be in the 25–54 age group in the year 2000, up from 67.5 percent in 1986. The percentage of 16–24 year olds and those

55 and older in the labor force will decline somewhat, reflecting smaller birth cohorts for those age groups.

Despite the fact that more people are in the work force today than

ever before, the American job-creation machine needs even greater numbers of qualified workers. According to a 1988 study by the American Society for Personnel Administration, 43 percent of 707 per-

Table 2. Percentage distribution of the civilian labor force, by sex, race, ethnicity, and age: United States, 1986 and 2000

Characteristic	1986 (actual)	2000 (projected)
Both sexes, 16+	100.0	100.0
16–24	19.8	16.3
25–54	67.5	72.6
55+	12.6	11.1
Men, 16+	55.5	52.7
16–24	10.4	8.3
25–54	37.7	38.2
55+	7.4	6.2
Women, 16+	44.5	47.3
16–24	9.4	8.0
25–54	29.8	34.4
55+	5.2	4.9
Whites, 16+	86.4	84.1
Blacks, 16+	10.8	11.8
Asians and others, 16+	2.8	4.1
Hispanics, ^a 16+	6.9	10.2

Source: Fullerton (1987).

a. Persons of Hispanic origin may be of various races.



Traditionally the Census Bureau has relied upon a large force of temporary field workers, many of them women, to conduct the decennial census.

sonnel managers surveyed reported having moderate to very great problems finding qualified executives and 66 percent had problems finding technical help (Karr 1989: A1). Labor force observers predict

Despite the continued entry of baby boomers into the labor force, observers predict major shortages of office help, skilled workers, and unskilled workers to begin occurring in several regions of the country over the next five years.

that shortages of 20–40 percent for office help in the West, 62–70 percent for skilled workers in the Northeast, and 21–27 percent for unskilled workers in the Midwest will begin to occur in the next five years (Bennett 1989: A1).

Social factors. The tightness of the labor market and the diversity of the potential workers will put new demands on employers. Corporations that previously considered worker benefits to be limited to insurance and retirement pensions are beginning to find themselves concerned with such issues as education, child care, illiteracy, care for the elderly, broken homes, drug and alcohol abuse, and teen pregnancy.

Madelyn Jennings, a senior vice-president at the Gannett Company, states that this expansion of interest to issues that were previously considered personal “has nothing to do with altruism or concern about society. . . , it has to do with survival” (Bennett 1989: A1). In the words of a Honeywell International

executive, “Before, we made people fit into a corporate mold filled with majority white male incumbents; now the corporations are going to have to change” (Bennett, p. A1).

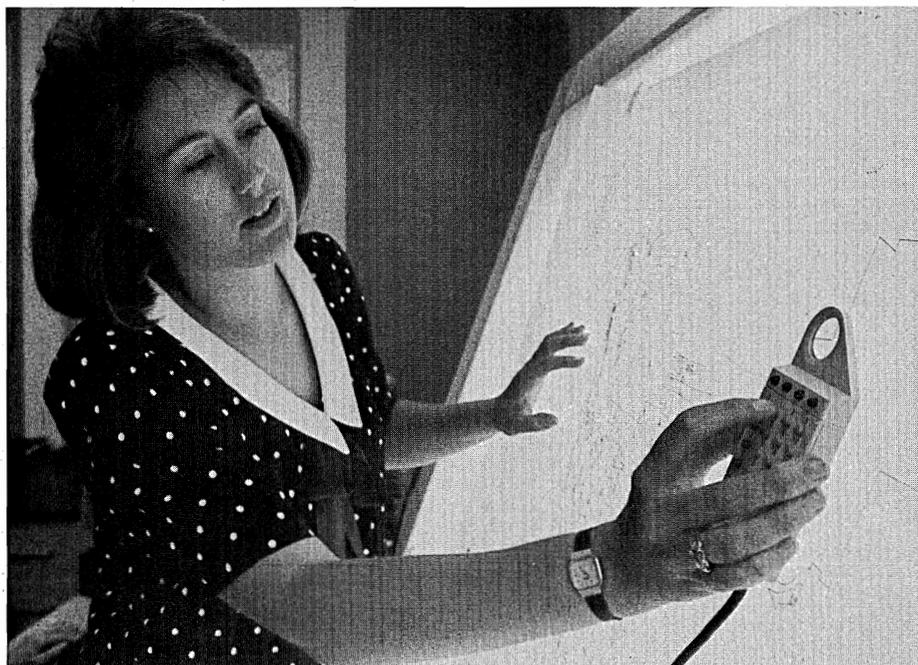
As the work force becomes more competitive and more diverse, work itself is changing. The majority of jobs created in the past decade have been in the service sector, and projections by the Bureau of Labor Statistics indicate that this trend will continue (U.S., DOL, BLS, 1987: 5). The bureau projects that the three fastest-growing occupations in the 1986–2000 period will all be in the service sector: para-legals, medical assistants and aides, and data-processing equipment repairers (p. 31).

The Bureau of Labor Statistics also reports that jobs in the service

sector are being created at opposite ends of the earnings spectrum. Strong growth is expected in the number of professional and technical workers and, at the other end

Most of the new jobs of the future will be in the service sector, at the two ends of the earnings spectrum. According to the Department of Labor, the fastest growing occupations require math, language, and reasoning skills.

of the wage scale, among such workers as janitors, retail sales workers, and food servers (U.S., DOL, BLS 1987: 31).



As the Census Bureau's operations become more automated, bureau personnel must have greater technical expertise. Here a cartographer uses a computerized digital map data base called TIGER to prepare maps for the 1990 census.

Whatever the wage level, the jobs being created increasingly require more education. The Department of Labor has determined that the "fastest growing occupations demand higher math, language and reasoning capabilities (U.S., DOL, 1989: 4).

Increasing demand for skilled workers will significantly alter up to 45 percent of existing U.S. jobs by the first decade of the twenty-first century (Best 1982.) The General Motors Corporation, the archetypical bastion of "manual labor," predicts that 50 percent of its work force in the year 2000 will consist of skilled tradespersons (technicians, inspectors, monitors, etc.), compared with only 16 percent in 1980 (Wingo 1987: 68).

The growing demand for skilled workers runs ominously counter to another trend: the increasingly inadequate qualifications of labor force entrants. The Department of Labor (1989: 1) reports that in recent surveys "two-thirds of employers consulted find the current pool of entry-level applicants insufficiently prepared in basic skills. . . . Applicants are found to be weak in spelling, writing, mathematics, oral communication, flexibility and adaptability, problem solving, self-direction and initiative and attitudes and work habits."

Another report, this one issued jointly by the U.S. Departments of Labor, Education, and Commerce, states that employers have found that the competencies of entry-level workers are deficient in reading, writing, mathematics, and communication. The report also cites deficiencies in the areas of problem solving, teamwork, initiative, and adaptability (U.S., Departments of

Business leaders canvassed in one study are almost unanimous in their concern that entrants to the U.S. work force do not and will not have the skills necessary to perform the tasks required of them.

Labor, Education, and Commerce, 1988: 4).

The deficit in basic skills described by the joint report is costing employers wasted time, lost productivity, increased remediation, reduced product quality, and loss in competitiveness, the study concludes. Business leaders cited in the report are almost unanimous in their concern that the current and near-future entrants to the work world do not and will not have the skills necessary to perform the tasks required of them (p. 4).

■ The Census Bureau Labor Force

The demographic and social factors shaping the national labor force also affect the work force of the Census Bureau. As in most of the federal government, the bureau's work force is divided between permanent and temporary employees. Temporaries play a more crucial role in the bureau than in other agencies, however, for it is the temporary worker, hired for a short period and then let go, who does most of the field work for the decennial census.

Because of its need to hire a large number of temporary workers, the Census Bureau is sometimes described as an accordion, expanding

every 10 years for the decennial census and then contracting after its completion. For the 1990 census, the bureau expects to hire more than 565,000 temporary workers, the majority of them lower-paid enumerators and clerks who will be working in the field. This enormous group of workers constitutes the core of the decennial operation as it is currently executed.

Even with greatly increased automation involving a distributed computer network with more than 450 sites, the conduct of the decennial census remains highly labor-intensive. Census field work, most of which is not well paid, is

The Census Bureau relies heavily on temporary workers to conduct the decennial census. Although the skills required of census field workers have become more complex, wages for this group are low and many qualified workers are no longer interested in temporary employment.

predominately a person-to-person, labor-intensive task. In the past, the skills required by the job included the ability to read and write, to read a map, and to deal with people, usually people not unlike the enumerator. Women homemakers interested in a part-time, civic-minded job made up a large portion of the field workers.

Today the skills required of census workers, like those required of most workers in the national labor force, are changing. More and more technology is being introduced into

the field. Although it may simplify many tasks, technology requires some computer literacy, deductive and inductive reasoning, and the ability to interact in an increasingly fast-paced environment.

In addition, the population that is being enumerated today is increasingly diverse, sometimes hostile or uncooperative, and in some cases even dangerous to enumerate. Interaction with the general population of today has become psychologically more complex, requiring a sophistication and knowledge of people often different from oneself.

Census field workers are paid lower wages than other federal workers, from \$5 to \$8 per hour. As in the national work force, the lower-paid workers generally have less education and fewer skills than higher-paid workers. Yet in both the national and the census work force, it is these workers who are at the front line in implementing new technology and new tasks. The educational studies cited in the first section of this article call into question whether these workers will be prepared to work productively with technology and tasks requiring increasingly sophisticated, interactive, analytical, and deductive skills.

Women still constitute a significant proportion of temporary field staff. However, the woman working for the Census Bureau in 1990 is probably more interested in a full-time, permanent position offering competitive wages than was the female homemaker of 1960, who generally worked for the census as a civic contribution. This change necessitates a different approach to both recruitment and management.

In the 1980 decennial census, roughly 65 percent of the field staff

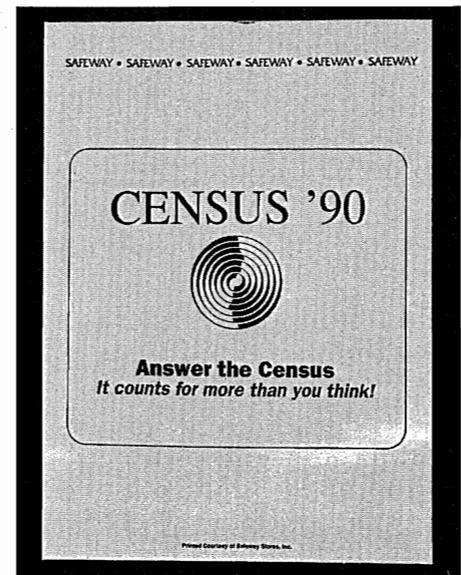
were women, 19.6 percent were black, 5.8 percent were Hispanic, and 1.6 percent were from Asian and other races. Women and blacks were overrepresented in relation to their share of the total population, whereas Hispanics and Asians and others were slightly underrepresented (Ryscavage 1988: 7).

Although the composition of the temporary work force is expected to be similar in 1990, the question of the continued ability of the Census Bureau to compete for temporary workers arises. People will not remain with employers simply because they worked for them in the past if those employers do not offer competitive wages.

The Census Bureau has found that its major competitor for temporary workers is the fast-food franchise. In a job market where a worker at McDonalds is being paid \$5 or more per hour, receives benefits, and has the possibility of working periods longer than six to eight weeks, the Census Bureau is not an attractive alternative. The bureau has recognized its financial disadvantage and raised the pay of temporary field workers, adjusting the scale for geographic areas with higher average pay. But pay continues to be a problem and will increasingly be one.

Another problem for the bureau is that many potential field workers who are not primarily concerned with the level of pay are hesitant, however, to do work that may jeopardize their retirement benefits or public assistance. The U.S. Congress has passed legislation allowing retired federal workers to work on the census without losing their retirement benefits. This legislation

(continued on page 35)



With the approach of the 1990 censuses in many countries, governments are enlisting the help of the private sector in promoting awareness of the census and its importance. Above: a shopping bag produced by a U.S. supermarket chain and a breakfast cereal box produced for the Mexican market. The slogan above the map states "Here we all count."

News and Follow-up

International Statistical Programs Center Announces 1990 Summer Workshops in Statistical Methods

The International Statistical Programs Center (ISPC) of the U.S. Bureau of the Census is offering seven workshops on statistical methods in Washington, D.C., during the summer of 1990. The workshops are open to personnel of organizations engaged in statistical and other relevant programs.

Sample Design for Surveys (9–20 July) is directed mainly to nonsampling statisticians having knowledge of basic statistical concepts and algebra. Program fee: \$1,950. Deadline for nominations: 15 May 1990.

Integrated Microcomputer Processing System (IMPS) (English: 9 July to 17 August; French: 16 July to 24 August) is designed for systems analysts and computer programmers responsible for the data processing of censuses and surveys. Program fee: \$4,750, which includes a copy of REALIA COBOL for the participant, or \$3,950 if a copy is not desired. Deadline for nominations: 15 May 1990.

The Development and Improvement of a Foreign Trade Statistics Program (23 July to 3 August) is designed primarily for statisticians responsible for collecting and publishing foreign trade statistics. Program fee: \$1,950. Deadline for nominations: 31 May 1990.

Implementing an Intercensal Survey Program (23 July to 10 August 1990) is intended for statisti-

cians responsible for the design or execution of household surveys and for planners who use survey data in their work. Program fee: \$2,700. Deadline for nominations: 31 May 1990.

Mapping for Censuses and Surveys (6–17 August) is designed for supervisors and drafters responsible for the actual preparation of the maps used during data collection and in the publication of results. Program fee: \$1,950. Deadline for nominations: 15 June 1990.

Microcomputers for Demographic Analysis (13–31 August 1990) is intended primarily for demographic statisticians who have or will have access to an IBM or IBM-compatible microcomputer. Participants should have knowledge of basic methods of demographic analysis, including techniques of indirect estimation, life tables, and population projections. No previous experience with computers is necessary. Program fee: \$2,700. Deadline for nominations: 15 June 1990.

English is the language of instruction for all workshops except the second session of the IMPS Workshop, which is conducted in French. Participants whose primary language is not English should have a minimum language score of 70/70 (ALIGU).

Program fees exclude travel and living expenses. Fees for participants attending more than one workshop will be reduced by \$200 per workshop. Possible sources of fellowship funds for the workshops include the U.S. Agency for International Development (USAID), the

United Nations and its specialized agencies, the Organization of the American States, the World Bank, and applicants' host governments. Applicants must identify a funding organization.

For USAID nominees, a PIO/P form and biographical data should be sent from the USAID mission to AID/Washington for transmittal to the Census Bureau. For UN nominees, applications should be sent by the local UN representative to UN Headquarters in New York for transmittal to the bureau. For applicants sponsored by their host government or another organization, an official letter should be sent to:

Thomas C. Walsh
Chief, International Statistical Programs Center
U.S. Bureau of the Census
Washington, D.C. 20233,
Telex 9102509167 (ISPC CENSUS WSH)
Fax (301) 763-7589

Application forms can be obtained from the same address. As class size is limited, persons interested in attending the workshops are encouraged to apply early.

MIT Plans June 1990 Workshop on International Shelter

The Massachusetts Institute of Technology (MIT) has announced a two-week Biennial International Shelter Workshop entitled "Changing Roles? Urban Management and Housing in the Third World." The seminar is directed toward experienced practitioners and those

interested in urban development issues from international agencies, government, and professional fields. It is structured as "active, participatory, and challenging." Week 1 will consist of the seminar; week 2, of technical workshops.

Tuition for each week separately is US \$800; for both weeks the total is \$1,500. Travel and living expenses are extra.

For more information, contact:

Nabel Hamdi and Reinhard Goethert
Seminar Directors

The Biennial International Shelter
Workshop at MIT

Massachusetts Institute of
Technology

Room N52-491

Cambridge, MA 02139, U.S.A.

Tel. (617) 253-8376

Telex 92-1473 MIT CAM

Fax (617) 253-8000

Two New Periodicals Welcome Manuscripts and Readers

The Institute for Population and Social Research at Mahidol University, Thailand, plans to begin publishing a Thai-language quarterly *Newsletter of Social Sciences Research on AIDS*. The newsletter, which will report information about ongoing and completed research on the social and behavioral aspects of acquired immune deficiency syndrome (AIDS), will be circulated among Thai researchers, academicians, policymakers, and other interested persons in government and nongovernmental organizations. The institute, which intends to serve as a clearing house for information about AIDS, encourages persons do-

ing research on the disease to bring their work to its attention. Articles and news items accepted for publication will be translated into Thai and edited, and original sources will be credited. For more information about the newsletter, write to:

Aphichat Chamrathirong, Ph.D.
Director, Institute for Population
and Social Research
Mahidol University
25/25 Phutthamonthon 4 Road
Salaya, Nakornchaisri
Nakhon Pathom 73170, Thailand

The Pacific Basin Medical Officers Training Program in Kolonia, Pohnpei, has announced the publication of *Pacific Health Dialogue*, a quarterly journal of community health and clinical medicine for the Pacific Islands. Its purpose is to provide a platform for the international exchange of experiences and opinions on all aspects of health in the Pacific. The journal is intended primarily for health professionals but should also be of interest to academics working in the social sciences, agriculture, economics, and other disciplines related to the health of the peoples of the Pacific.

Editorials, original articles, case reports, reviews, comments on health issues, annotated bibliographies, and letters are all welcome and will be peer-reviewed. Articles may be published in any of the major Pacific languages. Those in English should be written at a level appropriate to health professionals who use English as a second language. For more information, write to:

The Editor
Pacific Health Dialogue

C/o Pacific Basin Medical Officers
Training Program
P.O. Box 1298
Kolonia, Pohnpei
Federated States of Micronesia 96941

Audio Tapes on Population Issues Are Available for Radio Stations

Population Update is a series of two bi-weekly 90-second radio programs for the United States and a monthly 10-minute radio program for abroad produced in English on audio cassette tapes with support from the United Nations Population Fund. Topics covered include population problems, the environment, and women's issues. Currently the U.S. edition is sent to 170 radio stations and the foreign edition goes to stations and networks in some 60 countries. French and Spanish language editions of the 10-minute programs are also about to be produced.

The tapes are produced by Fred Hift. Radio stations interested in receiving the tapes may contact Mr. Hift, who makes the broadcasts available without charge as a community service. He also welcomes news releases and publications on population topics. When using information provided by others, he credits the sources.

Mr. Hift's address is:

17 East 89th Street
New York, NY 10128, U.S.A.
Telephone 212 860-4859
Fax 212 966-9003

Association for Voluntary Surgical Contraception Announces New Appointments

Eileen McGinn has been appointed as program manager for Asia in the New York headquarters of the Association for Voluntary Surgical Contraception (AVSC), replacing **Georgeanne (Jan) Neamatalla**.

Ms. Neamatalla in turn has been posted as assistant director to the organization's Asian office, which was recently relocated from Dhaka, Bangladesh, to Bangkok, Thailand.

John M. Pile has been named assistant director of the association's North African/Middle East regional office in Tunis, Tunisia. AVSC is a not-for-profit health organization working in more than 40 countries to make safe and voluntary sterilization available to men and women.

The Executive Board of the World Federation of Health Agencies for the Advancement of Voluntary Surgical Contraception has appointed **Lynn Bakamjian** as the federation's new executive director. Based in New York City, Ms. Bakamjian will continue to work half-time at AVSC as Deputy Director for Technical Development and Support, a department in the International Programs Division established to provide technical assistance to AVSC's international field staff in the areas of counseling, training, and technologies introduction.

Populations of U.S. Pacific Continue Rapid Growth

The population of the Pacific Islands under U.S. jurisdiction grew at a considerably faster rate than the U.S. rate of about 9 percent be-

tween 1980 and 1988, according to the U.S. Bureau of the Census. The Northern Mariana Islands' population grew by 26 percent to 21,200 over the period. The population increases for Guam (26 percent) and American Samoa (22 percent) were also substantial during the decade, resulting in populations of 133,000 and 39,500, respectively.

In American Samoa the high birth rate was offset somewhat by net outward migration, but in Guam net inward migration contributed to the population growth:

Area	Births	Deaths	Net migration
Amer. Samoa	11,200	1,300	-2,700
Guam	25,900	3,700	4,900 ¹
N. Mariana Is.	5,900	900	²

1. Includes movement of members of Armed Forces and their dependents.

2. Because residual migration reflects under-registration of vital statistics, migration figures are not shown.

1986 Fijian Census Reveals Fertility Decline

Vilmaina L. Naroba, Acting Principal Statistician of the Fijian Bureau of Statistics, prepared the following summary of a report analyzing the 1986 Population Census of Fiji. The full report, copies of which are available from the Government Printer, was prepared by the Bureau of Statistics.

Population growth and composition.

Fiji's most recent census, taken on 31 August 1986, enumerated 715,375 persons, representing an annual intercensal population growth rate of 1.97 percent during the decade of 1976-86.

The two major ethnic groups in Fiji are Fijians, accounting for 46.0 percent of the total population, and Indians, comprising 48.7. (By religion, Christians represent 52.9 percent of the population, Hindus 38.8 percent, and Muslims 7.8 percent.) During the intercensal period, Fijians had a higher annual population growth rate than Indians, 2.37 percent compared with 1.75 percent.

The percentage of people under age 15 and the young dependency ratio (the proportion of those under 15 to those 20-64) continued a secular decline. In contrast, the old dependency ratio (the proportion of those 65 and over to those 20-64), although much lower, continued a rising trend. Owing to ethnic differences in the rates of change, the total dependency ratio was higher for Fijians than for Indians in 1986, reversing the pattern in 1966:

Measure	1966	1976	1986
% under 15			
Total population	46.7	41.1	38.2
Fijians	44.4	41.5	39.3
Indians	49.5	41.1	37.7
Young dependency ratio			
Total population	91.9	72.9	65.3
Fijians	84.1	75.0	68.8
Indians	101.5	71.8	62.7
Old dependency ratio			
Total population	4.7	4.2	5.0
Fijians	5.4	5.5	6.1
Indians	3.7	2.8	3.9
Total dependency ratio			
Total population	96.6	77.1	70.3
Fijians	89.5	80.4	74.9
Indians	105.2	74.6	66.6

Marital structure. The proportion of never-married males 15 years old and older remained almost unchanged, at 35 percent, between 1966 and 1986. The proportion of never-married females, though

much lower than that of males, also remained static, at 25 percent. Nevertheless, mean age at marriage rose for both sexes, from 24.6 to 25.3 years between 1966 and 1986 among males, and from 21.1 to 22.5 among females.

Mean age at marriage for both sexes was higher among Fijians than among Indians in both 1966 and 1988, but by 1988 the Indians were narrowing the gap. For Fijian males, age at marriage rose slightly over the period, from 26.1 to 26.6; but for Fijian females the amount of increase was a full year, from 22.4 to 23.4. Among Indian males, age at marriage rose nearly a year, from 23.4 to 24.3, and among Indian females it rose more than a year, from 20.3 to 21.6.

Fertility. Fiji's crude birth rate in 1986 was 27.0 births per thousand population. Among Fijians and Indians it was 30.0 and 24.3 respectively. The census has recorded a steady decline in the country's total fertility rate (TFR) since 1966, with the Indian rate declining faster than the Fijian. The Indian TFR fell from 5.4 children per woman in 1966 to 2.8 in 1986; the comparable decline among Fijians was from 5.6 to 4.1.

Not only the TFR but also the age pattern of fertility distinguishes the two major ethnic groups. Although fertility declined in every age group among both Fijians and Indians between 1966 and 1976, during the most recent intercensal decade Fijian fertility seems to have actually increased in the younger (15-19) and older (35-49) age groups, though it fell somewhat among women 20-34. In contrast, among Indian women the TFR declined in all age groups, and sub-

stantially so in age groups 20-44. For Fijians, peak fertility occurs at ages 25-29, whereas for Indians it occurs at ages 20-24; this pattern has been consistent since 1966.

Mortality. Infant mortality has declined for both sexes and among both major ethnic groups since 1966. Correspondingly, life expectancy at birth has risen for both sexes, the total population, and Fijians and Indians:

Measure	1966	1976	1986
Deaths per 1,000 infants			
Total population	61	NA	NA
Males	NA	45	24
Females	NA	37	20
Fijians	50	37	NA
Males	NA	38	23
Females	NA	35	24
Indians	69	54	NA
Males	NA	NA	26
Females	NA	NA	18
Life expectancy at birth			
Total population			
Males	NA	NA	61.0
Females	NA	NA	65.2
Fijians			
Males	55.9	60.7	63.1
Females	58.6	63.9	65.3
Indians			
Males	52.8	59.5	59.6
Females	54.8	62.4	65.1

Urbanization and population

mobility. In 1986 the urban population constituted 38.7 percent of Fiji's total population. By then slightly more than half of the urban population was residing in the capital city of Suva. Despite this high level of primacy, the urban population growth rate slowed between 1976 and 1986, to 2.4 percent per annum, down from 3.2 percent per annum during 1966-76.

The population continued to be highly mobile during the last intercensal period, with most migration being to towns from rural areas. Substantial urban-to-rural migration also occurred, however, reducing the impact of in-migration to urban areas. In general, Fijians are more mobile than Indians, and their rate of urbanization is also substantially higher.

Literacy. Persons who have completed four or more years of primary education are considered to be literate. The literacy rate among adults (those 15 and older) has improved steadily since 1966 but remains considerably higher among Fijians and males than among Indians and females:

Adults literate (%)	1966	1976	1986
Total population	72	79	87
Males	79	84	90
Females	66	74	84
Fijians	86	87	93
Males	89	89	94
Females	83	84	92
Indians	57	71	80
Males	67	79	85
Females	45	63	74

Economic activity. Since 1966 an increasing proportion of the adult population has been reported as economically active, largely because of a change in the definition of economic activity to include "unpaid home duties." This change has resulted in an increasing proportion of females who were categorized as economically active between 1966 and 1986, from 7.5 to 23.3 percent, and a corresponding decrease in the proportion of females categorized as economically inactive, from 85.5 to 60.7 percent.

Population projections. The Bureau of Statistics has projected population growth in Fiji between the years 1986 and 2011 using three assumptions—of high, medium, and low rates of growth.

For the high variant, age-specific fertility rates (ASFRs) and TFRs for the base year 1986 are assumed to remain constant throughout the projection period. For the medium variant, the Indian TFR is assumed to decline linearly from 2.8 children per woman in 1986 to 2.0 in the year 2001 and remain constant thereafter. For Fijians the TFR is assumed to decline linearly from 4.1 in 1986 to 2.4 in the year 2011. For the low variant, the same trend as for the medium variant is assumed for Indians, but for Fijians the TFR is assumed to decline linearly from 4.1 in 1986 to 2.0 in the year 2001 and thereafter remain constant.

In view of the already high expectation of life at birth for both Fijians and Indians, further increases in life expectancy are assumed to be moderate. For all three variants, therefore, the Fijian e_0 is assumed to increase linearly from 63.1 years for males and 65.3 years for females in 1986 to 68 and 72 years respectively in the year 2011. Similarly, the Indian e_0 is assumed to increase linearly from 59.6 and 65.1 years to 66 and 70 years for males and females respectively over the same period.

International migration during the period 1986–91 is assumed to remain at the 1986 rate in all three variants. For the high variant, net migration is assumed to be nil after 1991. For the medium variant, a net loss of 70 percent of the 1986 figures is assumed to occur during 1991–96 and an annual net loss of

60, 55, and 50 percent of the 1986 figures is assumed during 1996–2001, 2001–06, and 2006–11 respectively. For the low variant, the 1986 rate is assumed to continue throughout the projection period.

Under the high variant, the total population is projected to increase to 1.1 million, or by 60.5 percent. Under the medium and low variants, the projected growth is 31.7 and 16.9 percent, resulting in a population size of 900,000 and 800,000 respectively.

The high variant would produce an increase of 83.8 percent in the Fijian population and of 39.6 percent in the Indian population. Under the medium variant, the Fijian and Indian populations would increase by 57.1 and 8.5 percent respectively; and under the low variant, the projected increase is 39.0 and 3.3 percent.

Consensus Reached on Antifertility Effects of Breastfeeding

The following item by Kathy I. Kennedy, Research Associate at Family Health International in Research Triangle Park, North Carolina, updates information that appeared in an earlier Forum article ("Breastfeeding Women and Family Planning Programs: Special Needs and Opportunities" by Nancy E. Williamson, Vol. 1, No. 5, November 1987).

In August 1988 a group of scientists meeting in Bellagio, Italy, to compare their findings on lactational anovulation reached a consensus on the possibilities for using breastfeeding as a contraceptive. Their report concludes that "the maxi-

mum birth spacing effect of breastfeeding is achieved when a mother 'fully' or nearly fully breastfeeds and remains amenorrheic.... When these two conditions are fulfilled, breastfeeding provides more than 98 percent protection from pregnancy in the first six months." The meeting was convened by Family Health International with support from the U.S. Agency for International Development, the World Health Organization, and the Rockefeller Foundation.

The full report cites data from 11 studies in eight countries, representing nations at all stages of development and women with vastly different breastfeeding styles.

In effect, the Bellagio consensus improves upon the degree of contraceptive protection that scientists believe can be achieved during lactational amenorrhea. The onset of vaginal bleeding during breastfeeding is a correlate of fecundity. Likewise, the beginning of supplemental feeding has an association with the recovery of fecundity. Finally, time itself is a correlate of the return of fecundity. The Consensus Statement calls for the association of bleeding, supplementation, and time post partum (with the return of fecundity) to be used in additive fashion to reduce the chance of unintended conception.

Demographers have long been aware of the antifertility effect of breastfeeding. In traditional societies, breastfeeding accounts for a significant segment of the birth interval. The research literature has shown repeatedly that lactating women are significantly slower to return to fecundity than nonbreastfeeding postpartum women. Yet health and family planning workers

discourage mothers from relying upon breastfeeding to space their pregnancies.

Until now, this advice has been appropriate because it has not been easy to predict when the antifertility effect of breastfeeding will expire. In fact, many women do become pregnant during lactation.

Since vaginal bleeding is usually a reflection of ovarian activity and fecundity, many researchers have turned their attention not to lactation, but to the period of lactational amenorrhea as the time of natural contraceptive protection. Population-based studies provide support for this perspective. Pregnancy rates of between 3 and 10 percent during lactational amenorrhea have been reported in populations around the world.

These rates have seldom been reported according to length of time post partum, but it is likely that the 10 percent figure applies when women have long durations of amenorrhea (say, greater than 12-18 months) and the 3 percent figure applies earlier. Indeed, if an individual woman becomes one of the 3-10 percent who experience conception when her breastfeeding baby is only a few months old, the consequences could be serious for them and the unborn child.

Motivated by the population-based studies, biologists have looked more closely at the neuroendocrinology of lactational infertility. Although the mechanisms responsible for lactational infertility are not fully understood, research in the past decade has revealed several phenomena. For example, during breastfeeding, if the first vaginal bleeding episode occurs early in the postpartum period (say, in the first

4-6 months), it is less likely to be preceded by ovulation than if the first bleed occurs at a later time post partum. Moreover, when the first ovulation occurs early in the postpartum, it is likely to be characterized by a short luteal phase or inadequate progesterone production, so that a conceptus could not be maintained by the uterus.

The four specific conclusions of the Bellagio conference were:

1. Breastfeeding should be regarded as a potential family planning method in all maternal and child health programs in developing and developed countries.

2. Postpartum women should be offered a choice of using breastfeeding as a means of family planning, either to help achieve optimal birth spacing of at least two years, or as a way of delaying the introduction of other contraceptives. They should be informed of how to maximize the antifertility effects of breastfeeding to prevent pregnancy.

3. Breastfeeding provides more than 98 percent protection from pregnancy during the first six months post partum if the mother is "fully" or nearly fully breastfeeding and has not experienced vaginal bleeding after the 56th day post partum.

4. Guidelines specific to a particular country or population for using breastfeeding as a postpartum family planning method can be developed on the basis of this consensus. Local infant feeding practices, the average duration of amenorrhea, and the ongoing changes in women's status and health practices should be considered in adapting these general guidelines.

A complete copy of the Bellagio conference report is available from

Kathy I. Kennedy, Family Health International, P.O. Box 13950, Research Triangle Park Branch, Durham, NC 27709, USA.

Earth Faces Possibly Irreversible Environmental Deterioration

According to ecologist Lester R. Brown, president of the Washington, D.C.-based Worldwatch Institute, time is running out for saving the earth from irreversible degradation. In the 256-page book *State of the World 1989* published by the institute, Brown warns: "Time is not on our side. We have years, not decades, to turn the situation around," adding that if the situation can still be reversed, it will have to be done during the 1990s.

The authors of *State of the World 1989* assert that failure to halt such dangers as climate change, ozone depletion, soil erosion, and excessive population growth is undercutting Third World living standards. Advocating population stabilization as the only acceptable demographic goal, they calculate that with effective action at national levels, it would be possible to cut world population growth in half within ten years by lowering the birth rate from 28 per thousand population to 19 per thousand, assuming the death rate remained at roughly 10 per thousand. To achieve that goal will require "heavy additional investments in family planning by governments and international agencies, along with the adoption of financial incentives that encourage couples to limit family size." (*International Dateline*, November 1989.)

Reviews and Publication Notes

Asking Demographic Questions edited by David Lucas with Penny Kane. Canberra: National Centre for Development Studies, Australian National University, 1985. Demography Teaching Notes, No. 5. vii, 220 pp. (paper). ISBN 0-86784-577-5. Available from BIBLIOTECH, Australian National University, GPO Box 4, Canberra, A.C.T. 2601, Australia.

This volume is the fifth in a series of Demographic Teaching Notes prepared by the National Centre for Development Studies at the Australian National University (ANU). It was written primarily for graduate students, particularly for students from developing countries enrolled in ANU's demography program. The chapters are based on seminars given in the Demography Department of ANU in 1982. Most of the examples used to illustrate specific points are from surveys in Asia, Africa, and Oceania, the three primary areas of geographical interest to the staff of the Demography Department. Recommendations on how to ask demographic questions are based largely on the experience of the World Fertility Survey and other surveys in those regions.

Each chapter focuses on a single topic that would normally be included in any comprehensive demographic survey. In all, there are 15 chapters covering all the standard demographic variables (fertility, mortality, nuptiality, and migration) and common socioeconomic indicators (e.g., education, occupation, and ethnicity). The chapters are written by an impressive list of demographers, and they provide a wealth of useful hints to help read-

ers avoid some of the problems that have plagued demographic and social surveys.

The material is not overly technical, and it is easily accessible to nondemographers who may wish to incorporate demographic and socioeconomic questions into their own surveys. The discussion is elementary, however, and the recommendations are therefore most useful to those who have never before designed a survey questionnaire.

According to the editors, "a major justification for the series was the feeling that when demographic questions were included in an interview schedule or questionnaire, researchers were often unaware of all the advantages and disadvantages related to particular forms of these questions" (p 3). This consideration probably guided the establishment of a common framework for the chapters.

Every chapter begins with a selection of suggested questions on the topic of interest (a particularly useful feature of the book), and then discusses the need for such questions, their advantages and disadvantages, and attendant problems related to sampling, coding, editing, and analysis.

The standard format enhances the readability of the book and can be considered one of its strengths. It is also, regrettably, the book's main weakness. The chapters are too short (only 12 pages of double-spaced text on the average) to allow anything more than a cursory treatment of each topic. The short, uniform chapters may account for the

curious lack of attention to some important topics, such as the definition of household head or the importance of follow-up questions about the presence of other persons who may not have been listed as household members, such as small children or infants. Another oversight is the lack of any discussion in the occupation chapter of how to collect occupational data from women, many of whom do not consider their economic activity to constitute work.

For topics that are covered, the text is often frustratingly brief. For example, one paragraph on family planning service availability questions or the use of dual registration systems for estimating vital events hardly suffices, especially when no references are cited for readers who may want to follow up on these topics. Some chapters do manage to cram a surprising amount of useful information into just a few pages, such as the chapter on breastfeeding by Valerie Hull, but most are too short to do justice to the topic under discussion. This is not the fault of the chapter authors, some of whom explicitly mention the lack of space as a constraint on the completeness of their discussions.

The topical chapter framework also results in either the omission or the repetition of topics. For example, there is no discussion of the use of a life history matrix or of a calendar format for collecting inter-related information on fertility, marriage, contraception, breastfeeding, migration, and other topics. In contrast, the topic of age errors is dealt with redundantly in the chapters on

fertility, birth intervals, and age.

Students or researchers involved in designing demographic questionnaires have always found the literature on this topic to be inadequate. Excellent published sources exist that include discussions of how to ask survey questions in general but do not provide much guidance on asking demographic questions in particular. These publications usually focus on such nitty-gritty issues as how to avoid leading or biased questions and the optimal length and ordering of questions. In addition, one can turn to the core questionnaires from such international projects as the Demographic and Health Surveys, the Contraceptive Prevalence Surveys, and the World Fertility Survey for excellent examples of model questions.

The ANU volume fills an important niche in this area by providing a basic analysis of the art of asking demographic and socioeconomic questions. The demographic profession, however, still does not have the comprehensive book on designing demographic questionnaires that is so sorely needed.

—Fred Arnold

*Demographic and Health Surveys
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ALSO NOTED

Directory of Cities and Towns in India (Based on the 1981 Census Data) by O. P. Sharma. New Delhi: Kar Kripa Publishers, 1989. Foreword by Abid Husain. xx, 197 pp., Rs. 180; US \$36. ISBN 81-85414-00-9. Available from Kar

Kripa Publishers, Flat No. 98, Pocket No. 12, Block No. C2C, Janakpuri, New Delhi, India.

This volume presents data on the 4,023 cities and towns of India and its urban agglomerations. Place names are arranged alphabetically. For each city, town, and urban agglomeration, its civic status, district and state, geographic area, and population size and growth rate for the decade 1971-81 are included. According to D. S. Meshram, chief planner of the Town and Country Planning Organisation, Ministry of Urban Development in India, the *Directory* "provides ready reference about the urban settlements [and] will prove indispensable to a wide variety of users like urban planners and managers, administrators, executives, teachers, research workers and the like."

Catalogue of Publications of the National Centre for Development Studies. 12 pp. Available from National Centre for Development Studies, Research School of Pacific Studies, Australian National University, GPO Box 4, Canberra ACT 2601, Australia. Telephone (062) 494705; Telex AA6134-AJRC; Fax (062) 572886.

The catalogue lists books, journals, and papers published by the National Centre for Development Studies. Among the publication series included are Pacific Policy Papers (ISSN 0817-6301), Pacific Research Monographs (ISSN 0155-9060), DSC Monographs (ISSN 0157-5767), Teaching Note Series (ISSN 0157-6232), Australian Development Studies Network Monographs, Islands/Australia Working Papers (ISSN 0816-5165), NCDS Working Papers (ISSN 0816-5165), China Working

papers (ISSN 1030-360X), and the journals *Pacific Economic Bulletin* (ISSN 0817-8038) and *Asian-Pacific Economic Literature* (ISSN 0818-9935).

Statistics Canada Catalogue 1989 by Statistics Canada Library Services Division. Ottawa: Minister of Supply and Services Canada, 1989. Catalogue 11-204E (ISSN 0838-4223). 196 pp., \$10 in Canada; \$12 elsewhere. Also available in French.

The catalogue describes publications of Statistics Canada in print as of 30 June 1989 except those containing data more than 10 years old. It also lists out-of-print 1981 census publications and, in an abbreviated format, 1986 census publications released after 1 July 1989.

The table of contents lists the following topics: general; primary industries; manufacturing; transportation, communications, and utilities; commerce, construction, finance, and prices; employment, unemployment, and labour income; education, culture, health, and welfare; census and intercensal studies; 1981 census publications; 1986 census publications; maps; and author, title, subject index.

NOTE TO OUR READERS:

Alice D. Harris, Research Information Specialist at the East-West Population Institute for 20 years and a frequent contributor to the Reviews section of the *Forum*, plans to retire in March 1990. She has promised, however, that we may continue to count on her for reviews in the future.

Forum Manuscript Reviewers

The following persons reviewed manuscripts for the *Asian and Pacific Population Forum* over the period from April 1988 through December 1989. The editor greatly appreciates their participation in the peer review process, which is intended to ensure a high editorial standard for *Forum* articles.

Dr. Rodolfo A. Bulatao, Research Division, Population, Health, and Nutrition Department, The World Bank, Washington, D.C.

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Prof. Toni Falbo, Population Research Center, University of Texas at Austin

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Dr. Geoffrey Hayes, South Pacific Commission, Noumea, New Caledonia

Prof. Kenneth H. Hill, Population Dynamics, Johns Hopkins University, Baltimore

Prof. William R. Lavelly, Department of Sociology, University of Washington at Seattle

Prof. Gary H. McClelland, Institute of Cognitive Science, Center for Research on Judgment and Policy, University of Colorado at Boulder

Dr. Warren Miller, Transnational Family Research Institute, Palo Alto, California

Mr. Joel Montague, The Enterprise Program, Arlington, Virginia

Dr. Richard Penny, Department of Statistics, Christchurch, New Zealand

Dr. Ernesto M. Pernia, Economics Office, Asian Development Bank, Manila

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Monitoring the Education Gap in Thailand . . .

(continued from page 10)

socioeconomic differences in the percentages completing grade 6, however, were considerably sharper for the 20-24 age group than for the 15-19 age group. This finding suggests a rapid process of contraction in differentials associated with the establishment of grade 6 as the new universal compulsory level after the restructuring of the educational system implemented in 1978.

Although differentials in the completion rate for grade 6 will not disappear completely in the immediate future, as younger cohorts pass

through primary school age and are uniformly subject to the new compulsory level, the differentials are likely to become as insubstantial as those currently evident for grade 4. In contrast, pronounced socioeconomic differentials in the proportions of children starting the secondary level of education are likely to persist among new cohorts, changing only slowly unless compulsory education is extended to the secondary level.

The results presented in Table 2 reveal a major difference between

rural and urban areas in the percentages of children continuing to secondary school. Regardless of the gender and other background characteristics considered, urban children were more likely to have entered secondary school than were rural children, and in most cases the rural-urban difference was substantial (Table 3). Only for children whose mothers had a secondary or higher education was the rural-urban difference small, over 90 percent of both rural and urban children in this category having started

secondary school.

Also evident from the results shown in Table 3 is the finding that most background differentials in the percentages starting secondary school were more pronounced among rural than among urban families. For example, differences between boys and girls were clearly evident among rural families but negligible for children from urban families. Parents' education and the household wealth level were both clearly associated with the percentage of children starting secondary school regardless of whether the

children were from rural or urban families.

In Thailand, therefore, socioeconomic factors have a substantial influence on the chances for a child to study at the secondary school level. Nevertheless, the differences between children from the lowest and highest parental education or household wealth categories is considerably less pronounced for urban than for rural children.

This is likely to be the result of a variety of factors, including a greater availability of schools in urban areas, a greater need for at least a

Although socioeconomic factors affect a child's chances of attending secondary school, such factors as parental education and family economic standing are less important in urban areas, where the opportunity cost of continued schooling is lower and the need for secondary education in the job market is greater.

Table 3. Percentages of children starting secondary school, by selected background characteristics and rural-urban residence: ages 15-24 in 1987

Background characteristic	Rural	Urban	Total
Sex			
Male	35	75	40
Female	26	73	32
Region			
Bangkok	na	72	72
Other Central	37	75	40
North	27	79	30
Northeast	25	71	27
South	39	84	44
Mother's education			
Less than 4 years	16	63	22
4-7 years	34	71	38
Secondary or above	92	97	95
Father's education			
Less than 4 years	14	69	19
4-7 years	29	63	32
Secondary or above	78	92	84
Household wealth level			
Lowest	12	(45) ^a	13
Low	22	52	24
Middle	37	70	41
High	60	84	66
Highest	61	95	73

na—not applicable.

a. Based on fewer than 50 unweighted cases.

secondary education to obtain employment in urban areas, and probably lower opportunity costs for parents of urban children who continue their schooling into their early teens as compared with costs to parents engaged primarily in agriculture. The normative pressure on parents to send their children beyond the primary level is also likely to be greater in urban environments simply because it is the common thing to do.

The results show a strong association between the likelihood of a child's starting lower secondary school and the educational attainment of both the mother and the father. Given a substantial correlation between the mother's and father's education, it is of interest whether each is independently associated with the child's education and which of the two parents exerts a greater influence.

The results shown in Table 4 indicate that both the mother's and the father's education exerted independent influences on the percentage of children starting lower secondary school. For each level of the father's education, the likelihood of the child's starting secondary

school increased with higher levels of the mother's education. Likewise, for each level of the mother's education, the likelihood of the child's starting secondary school increased with higher levels of the father's education. The influence of each appears to have been approximately equal in terms of the increase in the percentage of children starting secondary school observed for each increment in the education of either parent for a given level of education of the other parent.

One interesting feature of the results is the clear effect of either parent's having received an education at the secondary level or beyond. A far higher proportion of children started lower secondary school if at least one parent had studied beyond the primary level than if neither had. The incremental increase in the percentage of children obtaining a lower secondary education associated with both parents' having at least a secondary education versus only one parent was modest compared with the incremental increase associated with one parent's having at least a second-

dary education versus neither parent.

There also appears to have been a distinct negative effect on children's education associated with at least one of the parents not completing four years of primary school. If both parents had a complete primary education (four to seven years of schooling), the proportion of their children starting secondary education was noticeably higher than if one or both had not completed primary school. These differences, however, were considerably less than between children with at least one parent who had obtained a secondary education and those with both parents having completed only the primary level.

Parental preference for education. Given that primary school attendance is compulsory in Thailand, parental preferences regarding education have little bearing on whether a child receives primary schooling. In contrast, parents' attitudes toward the value and necessity of secondary education are likely to have an important influence on

whether a child continues schooling beyond the primary level.

In an attempt to gain a rough measure of parental attitudes toward secondary education, the TDHS asked respondents (i.e., ever-married women of reproductive ages) the following question: "Do you think that completing lower secondary school is sufficient for children nowadays, or should they study beyond this level?"

Responses to this question were likely to reflect respondents' desire to rationalize their children's actual educational outcomes. Nevertheless, in many cases responses were at variance with children's actual attainment, suggesting that the question tapped a general opinion about the importance to parents of education in present-day Thailand and therefore could serve as a rough indicator of parental preference for children's education.

The results presented in Table 5 show the extent to which attitudinal differences toward the importance of lower secondary education related to variations in the children's likelihood of entering secondary school. Overall, children of mothers who believed lower secondary education was insufficient were twice as likely to have entered secondary school as were children whose mothers believed a lower secondary education was sufficient.

A strong association between children's likelihood of having entered secondary school and the mother's educational opinion was evident for both rural and urban children and regardless of the wealth status of the household. With only the exception of the highest wealth category, the percentages who had entered secondary school were in-

Table 4. Percentages of children starting secondary school, by educational level of mother and father: ages 15-24 in 1987

Education of mother	Education of father			Total ^a
	0-3 years	4-7 years	Secondary or above	
0-3 years	16	21	(75)	22
4-7 years	22	34	79	38
Secondary or above	—	(85)	98	95
Total	19	32	84	36

Note: Results in parentheses are based on 20-49 unweighted cases; results based on fewer than 20 cases are omitted. The results shown are based on weighted calculations.

a. Includes cases in which the father's education is unknown.

intermediate for children whose mothers gave a conditional answer to the question about the sufficiency of lower secondary education. The strong positive association between the mother's attitude and the child's education probably reflects some combination of rationalization

A mother's view of the importance of secondary education is associated with her children's likelihood of entering secondary school, regardless of urban-rural residence or the family's economic means.

by the mother of actual educational outcome and the effect on that outcome of her prior attitude toward education.

The pronounced rural-urban and wealth level differentials in the likelihood of having entered second-

ary school persisted even after we controlled for the mother's opinion about secondary education. The proportion of rural children who had started lower secondary school was far lower than for urban children regardless of the mother's view of the value of secondary education, and a pronounced positive association persisted between children who had entered lower secondary school and the household wealth level. The only exception was the somewhat lower proportion entering secondary school among children in the highest wealth category compared with the second highest wealth category among children whose mothers considered a lower secondary education to be sufficient.

Availability of schools. Besides demographic and socioeconomic characteristics affecting a child's chances of attending secondary school, the location of schools in

relation to households is likely to play an important role. Information about the distance to the nearest primary and lower secondary school is available for most villages in the rural sample of the TDHS, based on a community-level questionnaire administered to community leaders. (For several villages, information on the distance to the nearest lower secondary school was missing in the original community questionnaire and had to be estimated indirectly on the basis of such information as travel time, taking into account the means of transportation used.) Although no equivalent community-level information was collected for the urban sample, it can be assumed that access to primary and secondary schools is uniformly high in all urban areas.

An important limitation of the information on availability of schools in the present study is that it refers only to the situation at the time of the survey and does not reflect changes that may have occurred after the children had completed their schooling. According to statistics published by the National Statistical Office, the number of public secondary schools more than tripled, increasing from 515 to 1,630, between 1970 and 1984 (Thailand, National Statistical Office, *Final Report on Educational Statistics*, various years, passim).

Because the number of schools, especially at the lower secondary level, has been expanding rapidly, the current distance to the nearest school is an increasingly poor measure of school availability at the time children were of school age, especially for those in the older age group at the time of the TDHS. It is

Table 5. Percentages of children starting secondary school, by rural-urban residence, household wealth level, and the mother's opinion about the sufficiency of lower secondary education: ages 15-24 in 1987

Residence or wealth level	Mother's opinion about the sufficiency of lower secondary education		
	Sufficient	It depends	Insufficient
Residence			
Rural	18	29	36
Urban	51	69	79
Household wealth level			
Lowest	9	14	16
Low	15	18	30
Middle	27	37	46
High	60	64	68
Highest	50	86	75
Total	21	36	42

therefore important to consider the age of the respondent's child when examining the association between the availability measures and educational attainment.

The association between school availability and the percentage of children who were 15-19 and 20-24 years old by 1987 and who had completed grades 4 and 6 and started lower secondary education is presented in Table 6. The widespread availability of primary schools in Thailand is reflected by the finding that all the children in the sample were either from a village that had its own school or lived near such a village. Only a small proportion of rural children live more than 2 kilometers from a primary school.

Completion of grade 4 was nearly universal among the sample, showing no consistent association with the distance to the nearest primary school. This was the case for both age groups under study. In contrast, distance to the primary school was inversely related to the percentage of children who had completed grade 6.

The relationship between education and school accessibility was different for two age groups, as Table 6 indicates. Among the 20-24 year olds, most of whom would not have been affected by the 1978 change in the compulsory level, a substantial rural-urban difference is apparent. Education was inversely associated with distance to the school for rural children, the percentage completing grade 6 being particularly low for those living furthest from a school.

For the 15-19 year olds, who attended primary school after the 1978 restructuring, the inverse

Table 6. Percentages of children completing grades 4 and 6 and starting secondary school, by distance to school and age in 1987

Measures of education and location of school	Age in 1987		
	15-19	20-24	Total
Percentage completing grade 4			
Location of primary school			
In urban area	98	97	98
In village or less than 1 km	95	95	95
1-2 km	96	91	94
3-5 km	97	100	98
Percentage completing grade 6			
Location of primary school			
In urban area	93	80	87
In village or less than 1 km	83	53	71
1-2 km	83	48	71
3-5 km	36	33	35
Percentage entering secondary school			
Location of secondary school			
In urban area	78	68	74
In village or less than 3 km	47	35	42
3-5 km	38	39	39
6-10 km	31	25	29
11-15 km	22	23	22
16 or more km	12	8	11

correlations between education and school proximity were substantially lower, except for the continuing low percentage completing grade 6 among rural children who lived furthest from a primary school. This group was made up largely of children from families in the most remote areas, including some hill tribe villages.

It is likely that few of the schools these children attended had extended the compulsory level to grade 7 before the 1978 restructuring, and thus they probably contributed to the low percentages completing grade 6 among the 20-24 year olds. Even since the restructuring, the implementation of grade 6 as the compulsory level has probably been

the most difficult to enforce in the remote areas, which would account for the low percentages in this group completing grade 6 among the 15-19 year olds.

As for the percentages starting lower secondary school, a sharp rural-urban difference is evident for both age groups, with urban children more likely to have started secondary education than rural children regardless of how close the school was to the rural village. Among rural children, a consistent inverse relationship with distance to the school is evident for those who were 15-19 in 1978. For older rural children, the association with current school availability was somewhat less consistent, possibly

reflecting problems with the measure of school accessibility related to changes in availability over the recent past as a result of the establishment of new schools.

Communities with unequal access to educational facilities are also likely to differ in the socioeconomic backgrounds of the resident families. More remote villages are more likely to have greater poverty and less educated parents in general than are less remote villages. Differentials in children's educational attainment according to family wealth levels or parental education may be partly a reflection of the relative availability of schools.

Conversely, the influence of school availability on children's education may vary according to the family's socioeconomic background. Wealthier families may be better able to take advantage of increased school availability than families who are worse off because the costs of sending children to school even when the school is nearby may be prohibitive for the latter group.

Public primary education is free in Thailand in the sense that there are no official tuition fees. Nevertheless, parents still incur real costs because schools do not provide school uniforms (which are mandatory) or shoes, and only in some cases do they supply textbooks and stationery to students (TDRI 1986). School attendance may also entail transportation costs, although these would be negligible in the case of most primary schools, given their present widespread availability.

In the case of secondary education, tuition is charged and other associated expenses are typically higher. According to the results of

the 1983 Children and Youth Survey, the average cost to a village household of sending a child to lower secondary school was almost four times that of the cost of sending the child to primary school (Thailand, National Statistical Office 1985). Opportunity costs to parents also increase with the age of the child.

Given that primary education is nearly universal in Thailand, the negative association between primary school completion and distance to school is likely to become negligible in the near future. In contrast, secondary school enrollment rates are still quite low and may rise substantially as the number of schools increases. A closer examination of the effect of availability on secondary education is therefore of interest.

To explore the possibility that the effect of school availability on children's continuing to secondary school in rural areas depends on the parents' economic means, we conducted separate analyses for

several wealth groups. For this purpose we grouped rural families into three broad categories according to their household wealth levels and for each level examined the association between children's entering secondary school and distance to the nearest school. The division we selected for wealth categories was designed to achieve a fairly even distribution of rural families among the categories and thus differs from the division used for the previous analysis.

We used multiple classification analysis to adjust statistically the results within each of the three wealth categories for several other potentially important confounding influences (parents' education, father's work, and mother's opinion about the necessity of lower secondary education). Both adjusted and unadjusted results are shown in Table 7, and the adjusted results are also illustrated in Figure 2.

The results show that wealth level is an important determinant of children's education among rural Thai

Table 7. Percentages of rural children starting secondary school, by household wealth level and distance to nearest lower secondary school, unadjusted and adjusted for selected characteristics of parents: ages 15-19 in 1987

Distance to nearest lower secondary school (in km)	Relative wealth level ^a					
	Lower		Middle		Higher	
	Unadj.	Adj.	Unadj.	Adj.	Unadj.	Adj.
0-2	18	18	55	50	72	67
3-5	21	18	39	40	76	69
6-10	18	18	34	35	58	61
11-15	9	10	25	27	65	71
16+	8	11	17	21	14	25

Note: Statistical adjustment, based on multiple classification analysis, incorporates the parents' education, father's work, and mother's opinion about the sufficiency of lower secondary education.

a. Wealth level categories are somewhat different from those in previous tables. Here the categories have produced a more balanced distribution of rural households.

families, independently of the availability of schools. Regardless of distance to the nearest school, children from the wealthiest families were

the most likely to have entered lower secondary school, and children from the poorest families were the least likely to have done so.

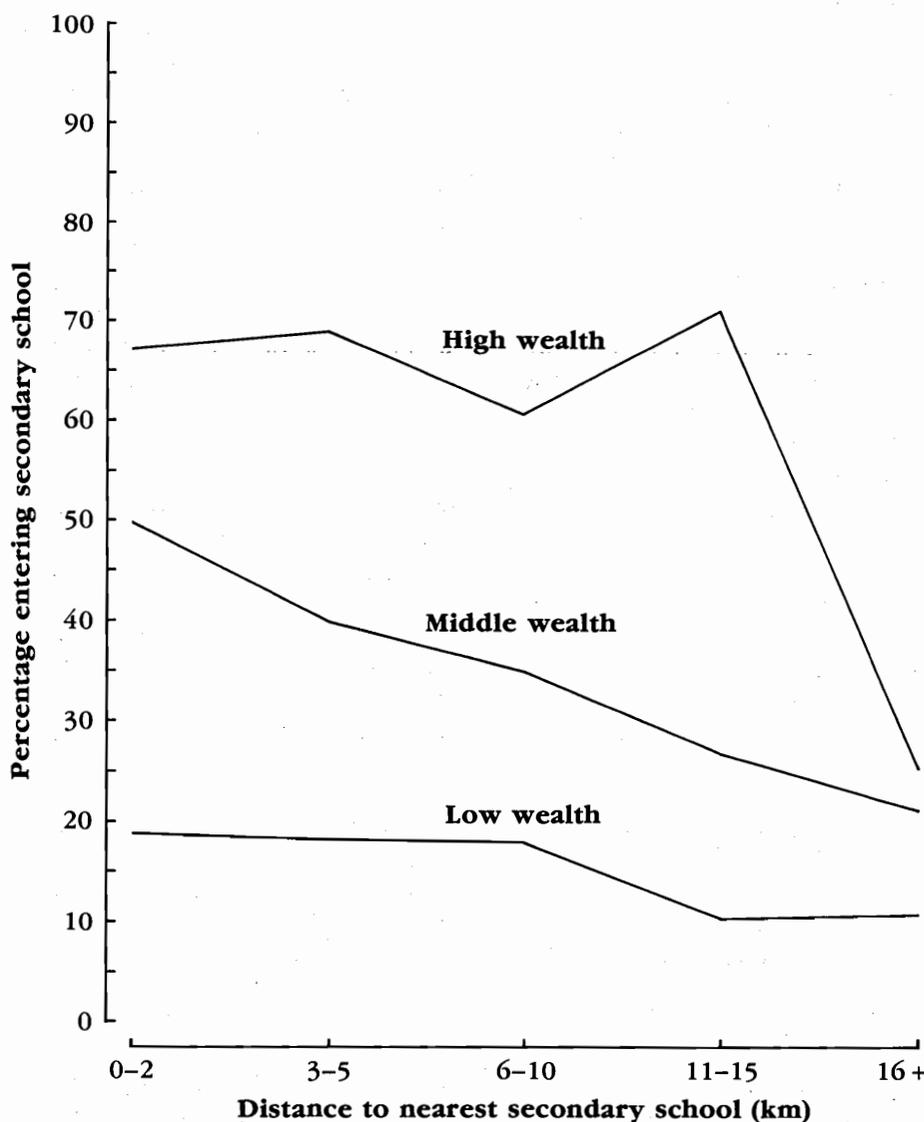


Figure 2. Adjusted percentage of rural children, ages 15-19, entering secondary school, by distance to school and family wealth level: Thailand

Note: Percentages are statistically adjusted for parents' education, father's work, and mother's opinion of the need for secondary education.

Particularly interesting are the distinctive patterns of association between distance to school and lower secondary education found within each of the three broad wealth categories. For the poorest group, the adjusted results show little relationship between distance to school and the percentage starting a secondary education. Regardless of how close to a school they lived, only a modest percentage of children from the poorest households had gone beyond the compulsory primary level.

Among the wealthiest group, however, the adjusted results indicate that distance was a serious barrier to high percentages' obtaining a lower secondary education only if the school was quite far away. For the middle group, the adjusted results show a consistent and sharp reduction in the percentages who had entered lower secondary school with each increase in distance to the school.

The TDHS did not solicit additional details about the constraints that rural families felt in connection with sending their children to school beyond the compulsory primary level, and therefore interpretation of these findings is necessarily speculative. It is possible that for poor families the costs (including opportunity costs) involved in sending their children to lower secondary school, other than those simply incurred through commuting, are sufficient to deter attendance.

For families who are better off but whose means are still modest, daily commuting costs associated with distance to the nearest school, including the opportunity costs implied by longer commuting times,

may play an important role in determining whether children continue to secondary school. For wealthier families, distance to the nearest school may become a deterrent to attendance only if the school is too far away to permit daily commuting, whereas differences in distances within the commuting range and the associated differences in transportation costs may be relatively unimportant.

Rural families with moderate financial resources appear the most likely to benefit from the introduction of secondary schools in their communities. Poorer families may need direct financial aid if they are to take advantage of such schools.

If this interpretation is correct, it appears that rural families with moderate financial resources are the most sensitive to school accessibility and stand to gain the most when lower secondary schools are located in or near their communities. In contrast, poor rural families appear to lack the resources to send their children past the compulsory level even when lower secondary schools are located nearby. If that is so, substantially improving the proportion of poor rural children who pursue a secondary education will require more than making schools physically more accessible. This group may also need programs of direct financial aid.

■ Conclusions

Given the importance of education in the process of socioeconomic de-

velopment, the need for accurate data and precise measures to monitor educational trends and differentials is self-evident. Correct interpretation of the results presented in this study requires a detailed understanding of the changes that have occurred in the Thai educational system, first as a result of progressive implementation of a plan to extend the compulsory level from 4 to 7 years of primary school and then as a result of a restructuring of primary and secondary education.

Use of the TDHS data illustrates that valuable data on children's education can be collected through supplementary questions added to demographic or related surveys that solicit information on the educational attainment of all the respondents' children at or beyond school age. This approach has considerable advantages over collecting educational information only for children present in the household.

Given that attendance of even secondary levels of schooling often requires children, especially those in developing countries, to reside away from their parental households, limiting educational information to only those children who currently reside in a household can yield a misleading impression of the extent to which children are educated and of the associations between children's education and family characteristics.

As in other studies of education in Thailand, analysis of the TDHS data reveals clear associations between a child's chances of receiving a lower secondary education and the child's family background (Tan and Naiyavitit 1984; TDRI 1989). The educational attainment of par-

ents and the household's economic level exert strong influences.

Children from families in which at least one parent has attended secondary or higher levels of school and children from the wealthiest stratum have far higher probabilities of going to secondary school than do children with the least educated parents or from the poorest families. Likewise, children from nonagricultural families, and especially from ones in which the father receives a regular wage or salary, are considerably more likely to obtain a secondary education than are children from agricultural families.

In addition to family background, the availability of schools exerts considerable influence on children's educational chances. Children living in urban areas or in rural areas where lower secondary schools are located nearby are more likely to enter secondary education than are those who must travel further distances. The rapid expansion of the number of lower secondary schools in Thailand should continue to contribute to the rising proportions of children who study beyond the compulsory primary level. Given the strong association between parents' and children's education, the trend being fostered by increased school availability should reinforce itself in succeeding generations.

The TDHS results also suggest, however, that the poorest families in rural areas are least responsive to improved school availability, presumably because their financial constraints prevent them from sending their children to school even when a school is nearby. In these cases, measures beyond the expansion of schools are called for to overcome the overwhelming disad-

vantages of severe poverty if more equitable access to secondary education is to be achieved.

APPENDIX: Calculation of the Education Attainment Measures

The 1980 census

Data on education from the 1980 census are published in two tables (Thailand, National Statistical Office, 1983). In the volume for the whole Kingdom, Table 20 provides information on school grade attended as of 1 January 1980 for those who were in school at that time and Table 21 provides information on the highest grade completed as of the same date for everyone including those not attending school.

Calculation of educational attainment measures for recent cohorts from the census tabulations involves two complications that need to be taken into account. One stems from the reference date used; the other stems from the way in which grades were coded in the census.

The census took place on 1 April 1980. Because the Thai school year runs from late May through March, the highest grade completed as of 1 January actually refers to the grade attained at the end of the prior school year (i.e., 1978-79); for students who were enrolled in school in January, the census does not take into account the grade completed in March just prior to the census date. Presumably the reason for asking the census questions in this way was to avoid ambiguities that could have arisen because results of the latest final examinations were not yet known at the time of the census and therefore it would not be

known if students had successfully completed the grades they had attended during the 1979-80 school year.

Although 1 January was used as the reference date for questions about completed education and current grade attended, in both cases the information was tabulated by current age at the time of the census. Because the question about completed education refers to the situation approximately one year earlier (at the end of the 1978-79 school year), it actually refers to the level of educational attainment at the time the person was one year younger. For persons who had completed their schooling by the end of the previous school year (by March 1979), this would be identical to their current educational attainment at the time of the census. For those who had attended school during the 1979-1980 school year and had passed the grade they had just attended, their current educational attainment would be one grade higher than that indicated in the tabulation of completed education.

The distribution of the population by educational attainment can be brought up to the date of the census by adding the number of students in each age cohort who were currently studying in a given grade in January to the number given as having completed the grade as of the same date (i.e., the number who had completed the grade by the end of the 1978-79 school year) and subtracting them from the number given as having completed the previous grade. This adjustment errs only to the extent that some students enrolled in a grade in January did not successfully complete it.

A second complication arises because data on education in the 1980 census are tabulated according to the educational system that existed from 1960 until the time of the 1978 restructuring of the system. Primary grades are stated in terms of Pratom 1-7 and secondary grades in terms of Maw Saw 1-5. When responses were given in terms of either the pre-1960 system or the newly restructured system, they were coded into the grade in the 1960-78 system that corresponded to the same number of years of schooling. As for the 1978 restructured system, which is of concern in the present study, Pratom 1-6 (which are the same in both systems) remain the same, but Maw 1 is coded as Pratom 7 and Maw 2 is coded as Maw Saw 1. Other grades are unaffected.

In addition, the new system was in only its second year of existence as of January 1980. Because the former secondary grades under the Maw Saw classification were being phased out one year at a time, no student had reached Maw 2 by the end of the 1978-79 school year, the effective reference time for Table 21 of the census, and no student had reached Maw 3 by January 1980, the reference time for Table 20.

The results in Table 20 showing the grade attended as of January 1980 refer exclusively to a time when the restructured system prevailed, and therefore they can be unambiguously converted into the grades of the new system. Results in Table 21 for the highest grade completed, however, refer to a mixture of systems. Since Pratom 4 and Pratom 6 were the same before and after the restructuring, the coding system has no effect on the percent-

ages calculated as having completed those two grades. But Maw 1 in the restructured system constitutes the start of secondary school, whereas Pratom 7 in the former system is still within the primary school range. That the census coded Maw 1 as Pratom 7 poses a problem for determining the third measure used

in the present study, namely the percentage starting lower secondary school.

Nevertheless, by combining information in Tables 20 and 21, it is possible to derive a reasonable solution to this problem. The number of students shown in Table 20 as being enrolled in Maw 2 in January

1980 (coded as Maw Saw 1) is approximately equal to the number who completed Maw 1 the year before. This number can be subtracted from the number in each age cohort given in Table 21 as having completed Pratom 7 (which includes both those who completed Pratom 7 under the former system and those who completed Maw 1 under the restructured system) to distinguish between those whose highest grade as of the end of the 1978-79 school year was Pratom 7 and those whose highest grade was Maw 1.

The Exhibit provides a detailed example of how we calculated the three measures of educational attainment from information contained in census Tables 20 and 21 for the cohort that was 16 years old at the time of the census. The number attending specific grades as of January is given in Table 20 by single years of age only through age 19 and is available only for the five-year age group 20-24 as a whole. To obtain data for items (f) through (k) for single-year cohorts within this age range, we divided the totals for the five-year group by 5. Given that very few members of those cohorts were still attending grades at or below Maw 2, a more refined partitioning of the five-year age group would have only a trivial effect.

The 1987 TDHS

In contrast to the census, questions on education in the TDHS referred to the situation as of the time of the survey. Field work for the survey took place from the second half of March through early June 1987, which was largely during the period of school vacation. Respondents

Exhibit. Example of calculation of educational attainment measures for 16 year olds enumerated in the 1980 census

1980 census (*Whole Kingdom* volume)

From Table 21 (Years of school completed)

(a) Total number of 16 year olds excluding those with unknown education, "other" education, and primary education of unknown grade	1,103,598
(b-d) Total who completed given or higher grade as of 1 January 1980 (i.e., by end of 1978-79 academic year)	
(b) Pratom 4	1,031,888
(c) Pratom 6	457,172
(d) Maw Saw 1	298,983
(e) Total with primary education of unknown grade	88

From Table 20 (Grade of school attended)

(f-g) Number attending given grade as of 1 January 1980	
(f) Pratom 1-3	4,993
(g) Pratom 4	6,875
(h) Pratom 5	6,189
(i) Pratom 6	6,602
(j) Maw 1 (coded as Pratom 7)	12,088
(k) Maw 2 (coded as Maw Saw 1)	22,990

Calculations

Percentage of cohort who completed grade 4: (b+g)/(a-f) =	94.6
Percentage of cohort who completed grade 6: (c+i)/[a-(f+g+h)]	42.7
Percentage of cohort who started secondary school (ever attended either Maw Saw 1 or Maw 1): (d+j+k)/[(a+e)-(f+g+h+i)]	31.0

Note: The data in Table 20 on grade attended are based on a 20 percent sample weighted to equal the national total, whereas the data in Table 21 on grade completed are based on a 100 percent enumeration. Because of the nature of the weighting, the total number of persons at a given age differs slightly between the two tables.

therefore would have included the grade just completed in their answers for children who had just completed the school year. If the interview took place after the vacation period and before the reopening of school, respondents would have interpreted the phrase "still in school" as referring to the start of the coming school year and "current grade attended" as referring to the grade to be started.

For the purpose of calculating the percentages completing grades 4 and 6, we treated children reported as currently in those grades as having completed them. Similarly, students reported as currently in Maw 1, were considered as having started secondary school regardless of whether the interview occurred before or after the opening of school

for the new school year. As in the case of the calculations from the 1980 census data, we excluded from the calculations children reported as currently attending school at grades below the grade to which the measure refers. As the vast majority of students who complete a primary education or start secondary school do so by age 16, these conventions should have only a minor effect on the calculations.

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U.S. Bureau of the Census . . .

(continued from page 16)

will aid in the recruitment of a large number of available qualified workers.

For the field managers, the temporary professionals who coordinate and oversee the process, the skills required are also increasingly complex. In addition to having to understand the changing technologies and give directions about their use, the field manager today supervises a diverse, sometimes demanding, work force involved in an extremely complicated task.

Currently the Census Bureau is having fewer problems finding entry-level professionals than finding lower-level workers, although turnover rates for managers may prove to be high. These profession-

als tend to be the tail end of the baby boomers, young people who have only lately entered the work force. The 1990 census may be the last, however, for which this large group of educated professionals will be widely available on a temporary basis. By the year 2000, the majority of baby boomers will no longer be looking for temporary work.

Many of the problems affecting the Census Bureau's temporary work force also affect its permanent work force. As in much of the federal government, large numbers of permanent employees of the bureau are classified at the lower end of the wage structure. About 33 percent of the bureau's current permanent work force is earning between

\$10,000 and \$15,000 per year. Half (51 percent) of the permanent work force is in the \$15,000-\$33,000 bracket, and only 16 percent is earning \$33,000 or more.

As competition for workers increases, the cumbersome federal personnel system will become increasingly handicapped in recruiting and retaining workers at all levels.

The problem of matching required education and skill levels with the education and skills of available lower-level workers is the

same in the permanent work force as in the temporary. It is mitigated somewhat by the Census Bureau's ability to compensate lower-level workers with wages comparable to those in the private sector. In its permanent job opportunities the federal government is actually quite competitive with other employers.

But again, as competition for workers increases, the slow, cumbersome federal personnel system will become increasingly handicapped in recruiting and retaining workers at all levels. The General Accounting Office (GAO) has found that despite comparability in wages for clerks and secretaries in the public and private sectors, federal clerical staff have the highest quit rate of any group in the federal government (U.S., GAO, 1987: 3). The GAO's report does not offer an explanation for this phenomenon, but recruiting this group of workers is already a difficult problem at the Census Bureau and is becoming increasingly so. Attracting and retaining clerical workers should become even harder for the bureau as wages in the private sector rise.

The statisticians, demographers, computer specialists, and geographers who make up the core of the Census Bureau's professional cadre are trained in fields paying exceedingly well in the private sector. Competition for qualified professionals will increase as skill levels of labor force entrants decline.

At the other end of the wage spectrum, the Census Bureau relies

heavily on specialists to plan and implement its work and analyze its data. Its ability to continue recruiting such specialists while not offering competitive wages is questionable. The statisticians, demographers, computer specialists, and geographers who make up the core of the bureau's professional cadre are all trained in fields that pay exceedingly well in the private sector. As the skill levels of those entering the work force decline, qualified professionals in these categories will become even scarcer and will therefore cost more.

■ Conclusion

The demographic and social issues discussed in this article reveal a work-force situation in which the employer is becoming increasingly vulnerable. Given the projected tightening of the labor market, decline in the skills of available workers, and growing complexity of skills required by the jobs of the future, any agency that has a critical reliance on a large number of support workers and on technical specialists is at risk. For employers unable to meet the rising costs of labor, the labor squeeze may spell decreasing work quality.

Much of the U.S. federal government is in this situation. For large agencies like the Census Bureau, the scarcity of skilled workers at both ends of the wage spectrum is projected to become even more critical. The reduced pool of qualified labor and the government's budgetary restrictions add up to a difficult labor market situation for the bureau in the future.

The first step in preparing for change is to examine the factors

likely to affect the future. On the basis of the examination recently conducted by the 21st Century Staff of the Census Bureau, planning for the next census and the ones beyond has begun. A key element of that planning will be consideration of using a smaller labor force.

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Old-Age Mortality in
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Reviews

Defects in Data on Old-Age Mortality in the United States: New Procedures for Calculating Mortality Schedules and Life Tables at the Highest Ages

Directly calculated mortality rates at very high ages are known to be untrustworthy, even for many populations with generally accurate demographic data. Even when the age at death and the number of very old decedents are recorded precisely, the number of persons at ages above 85, 90, and especially 100 are often misrecorded in population censuses. Mortality rates above age 85 or 90 are frequently calculated by fitting a mathematical function to death rates at ages less than these boundaries and extending the function to provide estimates to replace the defective rates for the very old.

Directly calculated death rates at advanced ages for the population of the United States have especially large errors. From age 65 to age 75, recorded mortality in the United States is higher than in many low-mortality populations in Europe, Oceania, and East Asia; yet above age 85 recorded mortality rates in the United States are lower by a considerable margin than in any of those populations. The oldest recorded age at death exceeds 120 years but is rarely as high as 110 in low-mortality populations with precise records of the age of decedents.

Overstatement of age in the census, in the register of death, and in Medicare statistics accounts for most of the distortion at very

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old ages in the mortality schedules and life tables of the U.S. population. This article describes new methods devised and applied by the authors to calculate more nearly correct schedules of mortality at ages above 70 for the white and nonwhite male and female populations in the United States in 1980.

*by Ansley J. Coale
and Ellen E. Kisker*

IN AN EARLIER paper (Coale and Kisker 1986), we challenged the validity of a widely noted reversal in relative mortality rates at higher as compared with lower ages. This phenomenon, known as the "crossover" of death rates, has been observed in various populations and often attributed to the elimination, by high mortality risks at younger ages, of the more frail members of a relatively disadvantaged population, with the result that the more robust survivors have lower mortality risks at older ages than the members of a relatively advantaged population, in which the less robust have not been eliminated to the same degree. We presented evidence that death rates at high ages are systematically understated in populations with imprecise records of age, and that understatement of old-age mortality probably accounts for most instances of mortality crossovers.

Mortality specialists from the National Center for Health Statistics,

aware of the possible weakness of U.S. data on mortality at advanced ages, invited us to undertake a study of old-age mortality data, with the aim of revealing any systematic defects in such data for the U.S. population, and with the further aim of correcting such defects and calculating an acceptable schedule of age-specific mortality rates and life table values for the very aged.

We have undertaken such a study, analyzing the data from which death rates for the population of the United States at ages 65 and over can be calculated. The primary data used for this purpose are registered deaths, classified by single years of age for the male and female, white and nonwhite, populations in 1980, and the number of persons in the same categories enumerated in the decennial census of 1 April 1980. For comparison, we have analyzed the number of deaths recorded in the Medicare system¹ for 1980 (and for the adjacent years, 1979 and 1981) and the number of persons enrolled in the

1. Medicare is a federal health insurance program for persons of ages 65 and over. Also eligible for coverage are disabled persons under age 65 who have been entitled to social security disability benefits at least 24 months, or have worked long enough in federal employment to be insured for Medicare, and insured workers and their dependents at any age who need dialysis treatment or a kidney transplant because of permanent kidney failure (Houghton Mifflin 1986: 333).

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system as of 1 January 1980 and 1981 (and the adjacent years, 1979 and 1982).

We have found evidence, which we judge to be conclusive, that death rates as calculated from vital statistics and the census seriously understate the true rates at ages over 95. We also find evidence (less obvious, but still persuasive) that directly calculated death rates may be too low at ages from 70 to 95. Mortality rates calculated from Medicare data are subject to broadly similar biases. Greater flaws for the nonwhite than for the white population exist in the data on deaths and on the population at risk of death.

The principal source of understatement of death rates at older ages is exaggeration of age, both the age recorded in the census and the registered age at death. Even if the ages registered for persons dying in 1980 were consistent with the ages reported in the 1980 census, overstatement of both ages would mean that death rates would be understated, since the death rate at age x would be attributed to a greater age, $x+d$, and death rates increase by as much as 10 percent per additional year of age.

It is evident, moreover, that age overstatement at very advanced ages is more prevalent for the population recorded in the census than for registered deaths. Because the number of persons in the very old population decreases rapidly with age, overstatement of age of persons greatly inflates the denominator of calculated death rates. As a result, calculated mortality rates decline with age beginning at age 96 or a little higher, a trend that we do not find credible. The ratio of registered

deaths to the enumerated population above age 110 for both white and nonwhite males is actually less than the calculated death rate at age 65.

To correct the very evident understatement of death rates at the most advanced ages, we have constructed modified mortality rates beginning at age 85. For the white population the modified rates agree within a narrow margin with directly calculated rates from age 85 to age 95, but above 95 they exceed the directly calculated rates by an increasing margin. The adjusted mortality rates incorporate directly calculated rates up to age 85 (slightly smoothed) and make use of the directly calculated rate at which the risk of mortality is increasing at age 85.

In accord with a general pattern found at older ages in low-mortality populations with precise data, the rate of increase with age in the risk of dying is assumed to change smoothly above age 85. Death rates are assumed to continue to rise with age, but the rate of increase in the risk of death is assumed to change linearly above age 85. The rate at which the increase in mortality risks changes is chosen so that a death rate of 1.0 per year (or about 0.083 per month) for males and one of 0.8 for females are assigned between exact age 110 and exact age 111.

This rule of thumb is arbitrary; a somewhat higher or lower death rate between ages 110 and 111 could be stipulated. But a very high rate at age 110 is consistent with a maximum age at death that is below, or very little above, 110 years, an age limit rarely exceeded in the experience of low-mortality countries



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Mortality rates above age 90 or 100 are greatly understated because the ages of very old persons, such as this woman, are often exaggerated.

with precise data on age at death. Mortality rates calculated by this method agree closely with directly calculated risks up to age 95 for the white population and age 92 for nonwhites.

When applied to data from Sweden, this procedure produces mortality schedules in good agreement with directly calculated rates at very high ages. The adjusted rates above age 90 for Sweden are closer to the simple ratio of deaths to the number of persons exposed than the mortality rates above age 90 given in the official Swedish life tables.

As we show in this article, death rates derived from Medicare data for the U.S. white population in 1980 differ little up to age 95 from rates derived from vital statistics combined with census data. Despite this agreement and despite the absence

of major differences before age 95 between the adjusted estimates just described and directly calculated rates, there are reasons for distrusting the directly calculated death rates for ages 70–95, as well as those for higher ages.

The rate at which mortality risks increase with age in the United States follows a pattern unaccountably different from that found elsewhere in populations with mortality rates known to be accurate. Moreover, the age distribution of both the nonwhite and the white U.S. population above age 70 has puzzling differences from the distribution in other low-mortality populations. These peculiarities are possibly caused by progressive overstatement of age as age increases above age 70. We present evidence here that ages over 65 are imprecisely reported in the census, in the death register, and in Medicare.

Death rates and numbers of persons derived directly from death registration, census, and Medicare data indicate a pattern of old-age mortality and an age distribution in the U.S. population at odds with those of other populations known to have accurate mortality rates. The evidence suggests progressive exaggeration of ages over 65 in all three U.S. data sources.

When age is imprecisely reported, international experience and past experience in the United States indicate a tendency toward progressive-

ly greater exaggeration of age as age increases. To bring mortality rates at older ages for white persons in the United States more in line with those in Sweden, the Netherlands, or Switzerland requires allowance for only mild overstatement of age over age 70, so that, for example, white females at age 75 are reported as one-half year older on average than their true ages and at age 80 are reported as one year older on average. In other words, if, above age 70, age is overstated on average by an additional one-tenth of a year with each increase of one year of true age, the peculiar features of age distribution and mortality pattern in the United States at ages above 70 are accounted for.

For our analysis we present three sets of mortality schedules for the population above age 65 derived from registered deaths and the 1980 census.

One set of mortality schedules is calculated directly from the number of deaths in each one-year age interval as registered, divided by the number of persons recorded in the age interval in the census. This mortality schedule has clearly unrealistic features, such as declining mortality rates beginning at about age 96 and an implied remaining expectation of life that increases with age after the mid-90s.

The mortality schedules in the second set are a slightly smoothed version of the first until age 85 and then incorporate mortality rates above age 85 that increase at a steadily changing rate to reach a high level at age 110. With this recalculation, the mortality rates in the second set of schedules are nearly the same as in the first from age 65 to age 95 for whites and

from 65 to 91 for nonwhites; but above 95, they continue to increase, although at a steadily declining rate, yielding a more believable sequence of remaining expectation of life above age 85.

The second set of mortality schedules still displays an anomalous pattern of mortality when compared with death rates at older ages in low-mortality countries with precise data on ages. Specifically, death rates above age 65 in the United States increase more slowly with age than in the other countries. For example, in comparison with eight countries—Japan, Denmark, France, West Germany, the Netherlands, Norway, Sweden, and Switzerland—in the United States the proportion of white females surviving from 65 to 75 (0.808) is lower than the median proportion in the other countries (0.829). Even after death rates above age 85 are adjusted, the expectation of life at age 80 (e_{80}) for U.S. females in 1980 is 8.51 years, 11.2 percent above the median and 5 percent above the highest e_{80} in the other eight populations.

We believe that overstatement of age also occurs between ages 70 and 95, although to a lesser degree. Allowance for such a bias yields our third set of mortality schedules. The death rates in these tables incorporate an assumption that, as age increases, it is overstated to a progressively greater extent, beginning with a modest exaggeration at age 70. In our opinion, the death rates in the third set of mortality schedules are closer to reality than those in the second set, which provide an obviously needed correction at ages above 95 but may still be distorted by age overstatement

among persons 70 to 95.

The additional corrections for age overstatement in the third set are somewhat arbitrary estimates.

Different corrections of about the same magnitude would be equally well justified. Our tables for the third set therefore show the distorting effect of age overstatement on U.S. mortality patterns at high ages, but the exact extent of distortion can only be guessed. Nevertheless, they are a sensible approximation of true mortality rates.

■ Evidence of faulty data on mortality rates of the very old

To test our hypothesis, we have considered several kinds of evidence that data used in the United States to calculate death rates at the highest ages are inaccurate. These include the high numbers of persons and deaths reported at very high ages, comparison of the enumerated very old population with the very old population implied by registered deaths at the highest ages, and consistency of registered deaths above age 65 with the over-65 population in the census.

Excess reported numbers of persons and deaths at very high ages. Examining first the excessive number of registered deaths at very advanced ages in the United States, we find that the highest age at death recorded in the United States exceeds that recorded in France, Italy, the Netherlands, Sweden, Switzerland, or Japan to an implausible degree (Table 1). We have used those countries for our comparison because age at death is carefully

Table 1. **Highest ages at death: selected countries with accurate recording of age at death, various years**

Country and year	Males			Females		
	Highest	Second highest	Third highest	Highest	Second highest	Third highest
France						
1920-29	104	104	104	104	104	104
1929-38	104	103	103	104	104	104
1948-69	107	106	106	109	108	108
Italy						
1953	105	104	103	106	104	104
1958	108	106	105	108	107	106
1963	111	105	105	109	107	106
1968	110	107	106	109	108	108
1973	108	107	106	110	107	106
1978	107	105	105	109	108	108
Netherlands						
1910-25	104	104	103	104	104	104
1925-45	103	103	103	106	105	103
1945-70	109	107	106	110	109	108
Sweden						
1901-14	105	104	103	106	106	105
1914-30	105	105	104	106	105	105
1930-45	106	106	105	106	105	105
1945-67	106	105	105	109	107	107
1983	106	105		107	105	
Switzerland						
1876-1914	103	103	103	106	104	102
1914-48	105	105	103	105	104	104
1948-70	105	105	105	108	106	105
Japan						
1953	105	104	104	112	108	107
1958	105	104	102	109	108	107
1963	104	102	102	109	108	107
1968	103	102	102	105	105	104
1973	107	105	105	107	107	105
1978	108	107	106	107	107	106
1983	107	106	105	109	107	106
United States						
1980 (vital statistics)	122	117	114	122	121	120
1979-81 (Medicare)	124	122	118	124	124	123

Sources: Official vital statistics or demographic yearbooks of the individual countries.

scrutinized and accurately recorded in each of them.

The highest age at death recorded among the six countries over fairly

long periods of observation exceeds 110 years in only one or two instances; the second highest age at death in those populations has

never been higher than 109. In the U.S. registry of deaths, in contrast, the second highest age at death among white females was 117 in 1980; for nonwhite females it was 120. For 1979-81 the first, second, and third highest ages at death recorded by Medicare were slightly higher than those recorded in 1980 in vital statistics.

Overstatement of age is much more prevalent in the 1980 census than in registered deaths. The international data contrasted with the U.S. data in Table 1 indicate that few persons die above age 110. Therefore, at any moment there are few living persons above this age. Yet the 1980 U.S. census lists more than 2,000 white persons and nearly 900 nonwhite persons above 110 years of age, compared with 24 white deaths and 65 nonwhite

deaths at ages above 110 in that year.

Age overstatement inflates the recorded number of persons and deaths over age 95 and does so markedly over age 100, not just over age 110. When overstatement transfers reported ages from below to above x , it falsely increases the number reported above x . The proportion of white females over age 65 in the United States reported in the 1980 census as above 95 is about twice as great as in Sweden or the Netherlands; the reported proportion over age 100 of those over 65 among U.S. white females is at least four times as great as in Sweden or the Netherlands (Table 2). Corresponding proportions for nonwhite females in the United States are even higher. There is also an apparent excess of deaths report-

ed at these high ages in the United States, but the excess is generally less extreme.

Comparison of the enumerated old-age population with the population implied by registered deaths: "extinct generations." The cumulative number of deaths above any given age (for example, age 100) in a birth cohort (for example, persons born in 1870) equals the number of persons who attain the exact age in question. Members of a cohort born in 1870 who survived through 1970 all attained 100 in that year. The deaths they experienced at age 100 occurred in 1970 or 1971. If the death register provides information on date of birth, on age of the decedent, and on the date of the death, the number of deaths at age 100 experienced by persons reaching 100 in 1970 can be extracted from the records of 1970 and 1971.

Further deaths at higher ages in later years can also be identified until the last survivor dies (say, at age 109). The number who die at 109 equals the number reaching 109. This number, plus those dying at 108, is the number reaching 108, and so on. The successive addition of deaths in this "extinct generation" yields the number of persons who reached 100 in 1970. An analogous calculation can determine how many in the next older cohort reached 101 in 1970. By interpolation between the number reaching 100 and those reaching 101 in 1970, one can determine the number of persons in the middle of the year who should have been reported as between 100 and 101.

Thus, the registered deaths in the years after 1970 can be used to con-

Table 2. Proportion of persons and proportion of deaths over ages 95 and 100 among those over age 65: selected populations, various years

Population	Of persons over 65		Of deaths over 65	
	Proportion 95+ (per 1,000)	Proportion 100+ (per 1,000)	Proportion at 95+ (per 1,000)	Proportion at 100+ (per 1,000)
Females				
Netherlands, 1976-80	3.39	0.26	24.69	2.67
Sweden, 1978-82	3.85	0.31	29.18	3.15
United States, 1980				
Whites	7.42	1.24	42.88	6.33
Nonwhites	10.89	3.34	39.92	11.80
Males				
Netherlands, 1976-80	2.78	0.16	14.46	1.32
Sweden, 1978-82	1.95	0.14	12.87	1.28
United States, 1980				
Whites	4.04	0.81	17.04	2.08
Nonwhites	7.70	2.75	20.05	4.95

Sources: U.S. census and official demographic yearbooks for the Netherlands and Sweden.

struct an estimated population by single years of age above 100 as of mid-1970. Because in many countries the registration of deaths is virtually complete and age at death is recorded accurately, this procedure, known as the method of extinct generations, provides a useful check on how well a census reports the very old population (Vincent 1951).

The Registrar General of the United Kingdom used this method to determine the accuracy with which the number of centenarians had been recorded in the 1971 census (Thatcher 1981). He found an overcount of about 100 percent; that is, the number of centenarians listed in the census was 2,320, whereas the number reconstructed from subsequent registered deaths was only 1,185.

In the United Kingdom, special checks show that age at death is recorded with good precision. For many years the Office of Population Censuses has made checks on the recorded age at death of centenarians to see whether their listed ages are consistent with their birth records. Of the 983 deaths at ages above 100 registered in 1979, 50 were to persons born abroad or whose birth place was not stated and another 83 were to persons who could not be traced in the birth records.

Among the remaining 850 persons whose deaths were registered as above age 100, eight were found to be false centenarians and 13 were found to be over 100, but with an age different, at death, from that given on the death record. This test suggests that mortality registration in England is virtually free of age misreporting.

The method of extinct generations cannot be used to check the validity of numbers of persons listed at higher ages in the U.S. census of 1980 because the method requires waiting until each generation is indeed extinct.

An extension of the method of extinct generations. If the rate of increase of the population in each age interval during a given year is known, the method of extinct generations can be modified to make use of the number of deaths recorded in the year in question to estimate the single-year age distribution of the population. If the population were stationary—that is, if the rate of increase of the population at every age were zero—then the total number of deaths above each age during the year in question would equal the number of persons attaining that age.

In any population with little in- or out-migration, the number of persons attaining a given exact age equals the sum of the deaths above that age, after the number of deaths has been “normalized” by adjustment for a nonzero rate of increase age by age (Bennett and Horiuchi 1981). Specifically, in a stationary population,

$$N(a) = \int_a^w D(x) dx,$$

where w is the highest age attained.

In a closed population with a different rate of increase at every age,

$$N(a) = \int_a^w D(x) [\exp \int_a^x r(y) dy] dx,$$

where $N(a)$ is the number attaining age a in a given year, and $D(x)$ is the number of deaths at age x , and $r(y)$ is the annual rate of increase at age y .

To use this formula for estimating the population from the distribution of deaths and the rate of increase for the population at every age, one can employ an iterative procedure as follows:

$$N(a) = N(a+1) \exp r(a) + D(a) \exp [r(a)/2].$$

We have applied this procedure to the distribution of female deaths and person-years lived above age 65 in Sweden during 1978–82. The life table presented in the Swedish demographic yearbook (Sweden, Statistiska Centralbyran, 1984) conveniently lists the number of person-years and the number of deaths in those five years by single years of age. The rate of increase at each age is readily determined as the numerical increase from 1 January 1978 to 31 December 1982, divided by the number of person-years. The number of persons at each age above 100 in Sweden is not listed; the number of deaths is.

We have calculated the number of females reaching each age from 65 to 109 by combining the recorded deaths with the rates of increase, and estimated the number in each one-year age interval x to $x+1$ as the average of those attaining x and $x+1$. For ages above 100, we have assumed that the rate of increase at every age was the same as the average rate of increase for the entire population above age 100.

The calculated number of females above 100 is 1,190; the recorded number is 1,183. At every single year of age from 65 to 100, except age 98, the calculated number differs from the recorded number by less than 1 percent. At age 98 the number of person-years lived is listed as 1,477, whereas the calculat-

ed number is 1,440. However, the number of females listed at age 98 on 31 December 1980 is 351; it should be 311, as can be verified by comparing cohort change with the number of registered deaths in 1980 and 1981.

Hence, the correct number of person-years at age 98 is about 1,437, in excellent agreement with our estimate. This application of the modified method of extinct generations serves to confirm both the method and the high consistency of Swedish data on deaths and on the populations still alive at very high ages.

We applied the same method to deaths in 1971 in the United Kingdom, making use of the average rate of increase of the population over age 100 from 1961 to 1971. The total number of persons over 100 estimated by this procedure is 1,160, compared with 1,185, as calculated by the method of extinct generations proper.

A test of the consistency of registered deaths above age 65 in 1980 with the population enumerated in the census. The number of persons in the United States at each age above 65 (white and nonwhite males and females) can be calculated from the number of registered deaths at older ages by the variation described above of the method of extinct generations. The requisite additional information, the annual rate of increase in 1980 at each age, is obtained from data on the Medicare population. The Medicare rolls list the numbers of males and females, white and nonwhite, by single years of age as of 1 January of each year. From these it is

Table 3. Enumerated population (1) compared with population implied by deaths and growth rates (2), by five-year age group: United States, 1980 (in thousands)

Age	White males		White females		Nonwhite males		Nonwhite females	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
65	3,517.5	3,375.8	4,375.8	4,217.6	385.10	357.61	503.71	449.78
70	2,578.3	2,482.1	3,575.5	3,498.4	275.25	253.03	369.06	328.71
75	1,668.5	1,615.3	2,683.1	2,661.9	179.17	157.95	263.00	225.80
80	932.0	929.8	1,773.8	1,828.6	87.23	83.36	141.99	135.97
85	439.0	452.6	970.3	1,043.2	38.18	37.25	72.74	72.68
90	144.1	141.7	366.8	382.5	14.98	13.51	30.70	30.48
95	30.1	26.8	85.6	82.8	4.89	4.59	10.53	11.69
100	5.3	2.9	13.6	9.9	1.66	1.17	3.05	3.30

easy to calculate rates of increase.

Tables 3 and 4 compare the population calculated from registered deaths and the Medicare rate of increase with the population enumerated in the 1980 census. The most informative comparison is the ratio of the enumerated population above each age x to the calculated population above x (Table 4). In Sweden this ratio is very close to 1.0 at all ages from 65 to 100.

The ratio for U.S. white males is slightly above 1.0 for persons 65 and over, and is quite close to 1.0 for the population over each age from 75 to 88. At higher ages it rises steeply to surpass 1.5 by age 98, 2.0 by age 100, and 10.0 by age 106.

Ratios for white females are consistently below those for white males, but they also rise steadily beginning at age 85. The lower ratios for older white females may be caused by a slight degree of underenumeration of females as compared with males. The rise in the ratio of enumerated to calculated

population for white males and females confirms overstatement in the census relative to a population consistent with the number of registered deaths, beginning somewhat before age 90.

The ratios in Table 4 for nonwhites indicate underregistration of deaths, since the total enumerated population above each age 65 to 77 exceeds the calculated population by 8 percent or more, for both sexes. From age 81 to age 98, the enumerated nonwhite female population above each age is about equal to or slightly less than the population calculated from deaths.

Older nonwhite females may have been underenumerated, to offset underregistration of deaths. The existence of underregistration of nonwhite deaths is also shown by a comparison of registered deaths with deaths recorded in the Medicare data. Over age 80, registered nonwhite male deaths in 1980 were 7 percent less than Medicare deaths, and registered nonwhite female deaths were 10 percent less.

Table 4. Ratio of census population above age x to population above age x calculated from deaths and growth rates: United States, 1980

Age	Whites		Nonwhites	
	Males	Females	Males	Females
65	1.032	1.009	1.087	1.109
66	1.031	1.007	1.088	1.109
67	1.031	1.005	1.096	1.113
68	1.030	1.003	1.098	1.112
69	1.028	1.000	1.103	1.116
70	1.026	0.996	1.093	1.103
71	1.024	0.993	1.092	1.099
72	1.022	0.990	1.093	1.099
73	1.020	0.987	1.093	1.095
74	1.019	0.985	1.102	1.097
75	1.016	0.981	1.097	1.089
76	1.015	0.978	1.097	1.083
77	1.012	0.975	1.099	1.080
78	1.010	0.973	1.096	1.073
79	1.012	0.975	1.109	1.079
80	0.999	0.960	1.055	1.022
81	0.996	0.955	1.042	1.001
82	0.993	0.950	1.048	1.001
83	0.996	0.952	1.053	1.006
84	0.994	0.950	1.060	1.006
85	0.994	0.948	1.069	0.996
86	0.998	0.950	1.078	0.996
87	1.007	0.956	1.096	1.001
88	1.015	0.959	1.104	0.992
89	1.047	0.983	1.144	1.006
90	1.059	0.987	1.152	0.989
91	1.068	0.990	1.153	0.973
92	1.088	0.998	1.165	0.955
93	1.135	1.030	1.200	0.962
94	1.187	1.063	1.218	0.955
95	1.256	1.100	1.247	0.954
96	1.345	1.144	1.281	0.951
97	1.485	1.212	1.362	0.966
98	1.663	1.311	1.472	0.991
99	1.974	1.457	1.629	1.038
100	2.395	1.612	1.802	1.099
101	2.837	1.775	1.938	1.143
102	3.638	2.136	2.165	1.241
103	4.809	2.640	2.395	1.363
104	6.707	3.429	2.684	1.494
105	9.499	4.794	3.172	1.703
106	13.153	6.926	4.124	2.039
107	20.214	9.870	5.327	2.554
108	35.122	15.089	7.018	3.316
109	65.903	25.572	10.542	4.638
110	111.875	48.596	16.714	7.187

A population calculated from deaths and rates of increase agrees with the enumerated population (as in Sweden) when age at death is accurately recorded, when the growth rate at each age is correct, and when registration and enumeration are equally complete. The rising ratios of enumerated to calculated population above age 90 in the United States confirm the increasing understatement of death rates that are computed as the ratio of the overstated number of deaths to an enumerated population that is even more overstated.

One can compute alternative death rates using as a denominator the population calculated from deaths and rates of increase. The death rates so calculated exceed or fall short of those calculated with the enumerated population as a base, precisely to the extent indicated by the differences between the enumerated and the calculated populations shown in Table 3.

The alternative schedules include death rates above age 90 that are higher than when denominators are taken from the census, but the older death rates are still too low. If there are too many deaths above age a , then the calculated population at a is too large. In fact, even if the number of deaths above a is correctly recorded, but the age at which the deaths occur is exaggerated, the calculated population at a is slightly too large if the rate of increase at older ages is positive.

Consider an approximation obtained by assigning all deaths above a to the mean age, \bar{x} , of deaths above a . Then

$$N(a) = D(\bar{x}) \exp \bar{r}(\bar{x} - a),$$

where \bar{r} is the average rate of in-

crease in the population between a and \bar{x} . If \bar{x} is overstated, the exponential factor $\exp \bar{r}(\bar{x}-a)$ is too great, and the calculated $N(a)$ is too large.

The exaggeration of age at death among nonwhite females is especially pronounced. The number of nonwhite females enumerated in the 1980 census as over age 110 is about one-half the number of white females over 110, but the number of registered deaths to nonwhite females above 110 is more than twice the number of registered deaths to white females. This extreme overstatement of age of nonwhite female deaths accounts for the failure of the ratio of enumerated to calculated nonwhite females to increase with age above age 90, as does the ratio for other populations.

Because the ratio of the enumerated to the calculated white population is so near 1.0 below age 90, the mortality schedule derived from registered deaths and the calculated population is only trivially different from the schedule calculated from registered deaths and the population enumerated in the census. Where there is a difference (above age 90), the schedule based on the calculated population is a better approximation of the true schedule.

In noncensus years it is possible to estimate the population base for older-age mortality rates from registered deaths and age-specific growth rates, rather than from the population projected from the preceding census. Rates of increase can be estimated from the rate of growth of each cohort in the most recently available Medicare tabulation. Comparison of the rate of increase of each cohort in 1979-80 with the rate of increase of the

same cohort two years older in 1981-82 shows little change; the average increase in rate of growth is only 1.3 per thousand for white male cohorts 65-95 in 1979.

Comparison of the Medicare population in 1980 with deaths recorded in Medicare. Surprisingly enough, death rates calculated from Medicare data also understate mortality at very high ages (those above 95 or 100). This bias is surprising for two reasons: persons enrolling in Medicare are required to provide a proof of age, and the Medicare records are essentially a register of the insured population. The population is listed by age in completed years as of the moment that separates two calendar years.

This system is equivalent to listing the population by year of birth. For example, persons at age 80 in completed years on 31 December 1980 were born in 1900. Deaths are listed by the age, at year's end, of the cohort of which each decedent was a part.

The date of birth of each decedent, which determines the listed age at death, is the date of birth carried in the Medicare roll. In other words, the required proof of age should minimize individual age misstatement, and the continuous registration of insured persons should provide consistency between age at death and age of the population.

We have been supplied data from the Health Insurance Program of the Social Security Administration, data that were transmitted to the National Center for Health Statistics and forwarded to us for our use. The data include the age distribution of persons classified as white

and nonwhite, male and female, on the health insurance tape as of 1 January 1979, 1980, 1981, and 1982; and also the number of deaths of enrolled persons classified by race, sex, and single years of age, in 1979, 1980, and 1981. Careful examination of these data shows misstatement of age, especially at advanced ages, and imperfect consistency between the listed population and listed deaths.

Persons who were obviously well above age 65 when the Medicare program began in 1966 were excused from providing a proof of age. Apparently many older early enrollees were entered with exaggerated ages. Advancing each year one year in age on the Medicare tape, by 1980 they were carried at implausibly high ages.

We have already noted the very high listed ages at death, including several above age 120 (Table 1). There were, moreover, 450 white persons and 287 nonwhite persons over 110 years of age recorded on 1 January 1980, and 100 white and 50 nonwhite persons listed as over 115 years old.

Consistency of the listed Medicare population and deaths can be checked without resort to age-specific rates of increase, because of the register-like nature of the data, and the system used to list deaths by age. If the Medicare population were a closed population, gaining only by registration at age 65 and losing only by mortality of its members, the number of persons at age 70-71 on 1 January 1981 would equal the number listed at age 69-70 one year earlier, less the deaths listed at age 70 in 1980 (in the Medicare system of listing age at death.)

We have compared the cohort change at each age in 1980 with the number of deaths recorded for each cohort (Tables 5 and 6). The comparison in Table 6 is cumulated above each age: the decrease in the number of persons above age x in 1980 to above age $x+1$ in 1981 is compared with the deaths to persons who were above age x in 1980. The agreement is quite obvious, but not perfect, despite the built-in consistency.

The decline in the number who were over age x at the beginning of 1980 is less than the number of deaths above age x up to about age 70 in the white population, and up to higher ages for nonwhites. The inequality between deaths and cohort change near age 65 is explained by belated registration of persons whose entry above age 65 into the system offsets some of the deaths that younger cohorts experienced.

At higher ages the decline in the number of persons who were above age x at the beginning of the year exceeds by a widening margin the number of deaths to these persons. This feature of the Medicare data can be explained by the removal of persons from the rolls for reasons other than recorded death.

At very high ages there are persons maintained on the rolls who are no longer legitimate entries. Some may have erroneously been enrolled twice, and others may have died or emigrated without notification of the Social Security system. Removal of such inappropriate entries when they are discovered diminishes the number of persons recorded in a cohort, without increasing the number of deaths being entered in the records to accom-

Table 5. Change in Medicare cohort (ΔC) compared with deaths among Medicare cohort: United States, 1980 (in thousands)

Age	White males		White females		Nonwhite males		Nonwhite females	
	ΔC	Deaths	ΔC	Deaths	ΔC	Deaths	ΔC	Deaths
65	18.000	21.000	9.000	12.400	1.500	2.810	0.000	1.810
66	19.000	21.600	10.000	13.200	2.000	2.910	0.600	1.860
67	21.000	22.700	12.000	13.700	2.300	2.990	1.100	2.040
68	23.000	22.900	13.000	14.400	2.400	2.840	1.400	2.030
69	22.000	23.700	15.000	15.500	2.800	3.110	1.600	2.140
70	23.000	23.900	15.000	15.900	2.800	3.050	1.900	2.200
71	25.000	24.800	18.000	17.100	2.700	2.870	1.800	2.120
72	26.000	25.400	17.000	18.000	2.900	3.080	2.200	2.340
73	25.000	25.100	19.000	18.700	2.600	2.760	2.300	2.370
74	25.000	25.100	20.000	19.800	3.000	3.080	2.300	2.480
75	25.000	24.900	20.000	20.400	2.800	2.840	2.300	2.400
76	25.000	24.600	21.000	21.300	2.600	2.660	2.400	2.390
77	24.000	24.200	22.000	22.200	2.700	2.720	2.400	2.510
78	23.000	22.600	22.000	21.800	2.200	2.260	2.200	2.260
79	24.000	23.100	25.000	24.200	2.800	2.830	2.700	2.700
80	21.000	21.000	23.000	23.100	2.100	2.100	2.300	2.300
81	22.000	21.300	26.000	25.800	2.100	2.040	2.200	2.230
82	20.000	19.900	25.000	25.000	1.800	1.800	2.300	2.270
83	20.000	19.700	26.000	26.100	1.900	1.980	2.200	2.150
84	19.000	18.500	26.000	26.100	1.800	1.730	2.200	2.260
85	17.000	17.400	26.000	25.700	1.480	1.500	2.100	2.110
86	15.500	15.700	25.000	24.600	1.280	1.290	1.700	1.780
87	14.600	14.600	24.000	23.500	1.190	1.270	1.800	1.780
88	12.000	11.900	21.000	21.000	0.930	0.932	1.400	1.370
89	10.100	10.100	19.000	19.200	0.870	0.867	1.400	1.430
90	8.900	8.900	17.000	17.100	0.680	0.752	1.190	1.180
91	7.300	7.380	15.100	15.100	0.680	0.678	1.070	1.160
92	5.600	5.590	11.900	11.900	0.480	0.475	0.880	0.871
93	4.700	4.690	9.900	9.870	0.400	0.401	0.720	0.712
94	3.500	3.450	7.800	7.800	0.350	0.345	0.580	0.578
95	2.710	2.700	6.200	6.160	0.290	0.282	0.510	0.503
96	1.800	1.800	4.500	4.470	0.204	0.202	0.390	0.377
97	1.280	1.260	3.200	3.200	0.157	0.154	0.330	0.313
98	0.830	0.822	2.200	2.210	0.106	0.103	0.200	0.202
99	0.590	0.585	1.620	1.610	0.101	0.101	0.216	0.208
100	0.345	0.349	1.010	1.000	0.050	0.050	0.118	0.114
101	0.218	0.217	0.620	0.610	0.038	0.035	0.080	0.076
102	0.108	0.106	0.370	0.360	0.028	0.028	0.059	0.059
103	0.071	0.067	0.240	0.230	0.026	0.023	0.034	0.030
104	0.044	0.043	0.170	0.160	0.013	0.011	0.032	0.029
105	0.015	0.015	0.080	0.071	0.013	0.011	0.024	0.023
106	0.017	0.014	0.040	0.033	0.008	0.008	0.015	0.012
107	0.013	0.012	0.040	0.026	0.004	0.004	0.007	0.006
108	0.004	0.003	0.020	0.011	0.006	0.006	0.010	0.007
109	0.015	0.007	0.050	0.021	0.004	0.004	0.012	0.018

Table 6. Change in Medicare cohort above age x (ΔC) compared with deaths among Medicare cohort: United States, 1980

Age	White males		White females		Nonwhite males		Nonwhite females	
	ΔC	Deaths	ΔC	Deaths	ΔC	Deaths	ΔC	Deaths
65	557.260	563.710	581.060	590.642	57.188	61.992	53.277	59.808
66	539.260	542.710	572.060	578.242	55.688	59.182	53.277	57.998
67	520.260	521.110	562.060	565.042	53.688	56.272	52.677	56.138
68	499.260	498.410	550.060	551.342	51.388	53.282	51.577	54.098
69	476.260	475.510	537.060	536.942	48.988	50.442	50.177	52.068
70	454.260	451.810	522.060	521.442	46.188	47.332	48.577	49.928
71	431.260	427.910	507.060	505.542	43.388	44.282	46.677	47.728
72	406.260	403.110	489.060	488.442	40.688	41.412	44.877	45.608
73	380.260	377.710	472.060	470.442	37.788	38.332	42.677	43.268
74	355.260	352.610	453.060	451.742	35.188	35.572	40.377	40.898
75	330.260	327.510	433.060	431.942	32.188	32.492	38.077	38.418
76	305.280	302.610	413.060	411.542	29.388	29.652	35.777	36.018
77	280.260	278.010	392.060	390.242	26.788	26.992	33.377	33.628
78	256.260	253.810	370.060	368.042	24.088	24.272	30.977	31.118
79	233.260	231.210	348.060	346.242	21.888	22.012	28.777	28.858
80	209.260	208.110	323.060	322.042	19.088	19.182	26.077	26.158
81	188.260	187.110	300.060	298.942	16.988	17.082	23.777	23.858
82	166.260	165.810	274.060	273.142	14.888	15.042	21.577	21.628
83	146.260	145.910	249.060	248.142	13.088	13.242	19.277	19.358
84	126.260	126.210	223.060	222.042	11.188	11.262	17.077	17.208
85	107.260	107.710	197.060	195.942	9.388	9.532	14.877	14.948
86	90.260	90.310	171.060	170.242	7.908	8.032	12.777	12.838
87	74.760	74.610	146.060	145.642	6.628	6.742	11.077	11.058
88	60.160	60.010	122.060	122.142	5.438	5.472	9.277	9.278
89	48.160	48.110	101.060	101.142	4.508	4.540	7.877	7.908
90	38.060	38.010	82.060	81.942	3.638	3.673	6.477	6.478
91	29.160	29.110	65.060	64.842	2.958	2.921	5.287	5.298
92	21.860	21.730	49.960	49.742	2.278	2.243	4.217	4.138
93	16.260	16.140	38.060	37.842	1.798	1.768	3.337	3.267
94	11.560	11.450	28.160	27.972	1.398	1.367	2.617	2.555
95	8.060	8.000	20.360	20.172	1.048	1.022	2.037	1.977
96	5.350	5.300	14.160	14.012	0.758	0.740	1.527	1.474
97	3.550	3.500	9.660	9.542	0.554	0.538	1.137	1.097
98	2.270	2.240	6.460	6.342	0.397	0.384	0.807	0.784
99	1.440	1.418	4.260	4.132	0.291	0.281	0.607	0.582
100	0.850	0.833	2.640	2.522	0.190	0.180	0.391	0.374
101	0.505	0.484	1.630	1.522	0.140	0.130	0.273	0.260
102	0.287	0.267	1.010	0.912	0.102	0.095	0.193	0.184
103	0.179	0.161	0.640	0.552	0.074	0.067	0.134	0.125
104	0.108	0.094	0.400	0.322	0.048	0.044	0.100	0.095
105	0.064	0.051	0.230	0.162	0.035	0.033	0.068	0.066
106	0.049	0.036	0.150	0.091	0.022	0.022	0.044	0.043
107	0.032	0.022	0.110	0.058	0.014	0.014	0.029	0.031
108	0.019	0.010	0.070	0.032	0.010	0.010	0.022	0.025
109	0.015	0.007	0.050	0.021	0.004	0.004	0.012	0.018

pany the removal of these persons from the register.

Unbelievably slow attrition within the very old cohorts listed in the Medicare rolls is evidence that some of the listed persons are erroneous entries. For example, in January 1979 the rolls included 39 non-white females at ages 114 through 121, and three years later 33 were listed between the ages of 117 and 124. The deaths of only six persons out of 39 in three years is not credible when the persons in question are allegedly over 114 years of age. Undetected fictitious entries are apparently immortal; if there is no person corresponding to an entry in the register, there can be no death to remove the person from the roll.

In Medicare data as in vital statistics and the census, therefore, ages of the very old are overstated. And

as in the other data systems, the denominator of death rates above 95 or 100 is inflated more than the numerator, so that calculated mortality rates are too low.

The traditional need to close out schedules of mortality rates at higher ages is still present, whether rates are calculated from registered deaths and enumerated populations, or from Medicare data.

Death rates calculated directly from registered deaths and the census compared with death rates calculated directly from Medicare records. Single-year-of-age mortality schedules can be calculated for white and nonwhite males and females from Medicare populations listed at the beginning and the end of 1980 and the deaths in 1980 listed in Medicare. The

mean population between ages x and $x+1$ can be taken as the arithmetic average of the populations on 1 January 1980 and 1 January 1981. Deaths in 1980 are listed by the age at the end of the year of the cohort within which the deaths occurred. Deaths during the year to persons x to $x+1$ at the time of death were assumed to include one-half of the deaths within the cohort x to $x+1$ at the end of the year, and one-half of the deaths within the cohort $x+1$ to $x+2$ at the end of the year. Only half of the deaths to the cohort 65-66 at the end of 1980 occurred after the members of the cohort had attained exact age 65 and become eligible for enrollment.

Thus, twice the number of deaths listed at age 65 was taken as the numerator of the death rate from 65

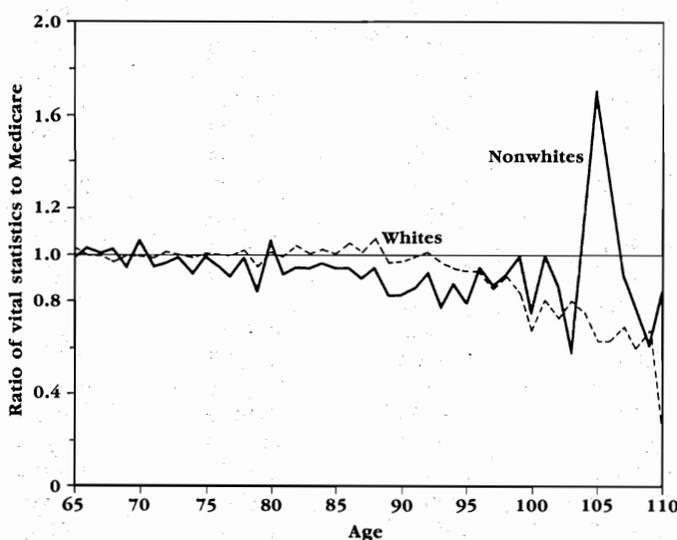


Figure 1. Death rates of males, ages 65 and over, calculated from vital registration statistics and census data divided by Medicare death rates: United States, 1980

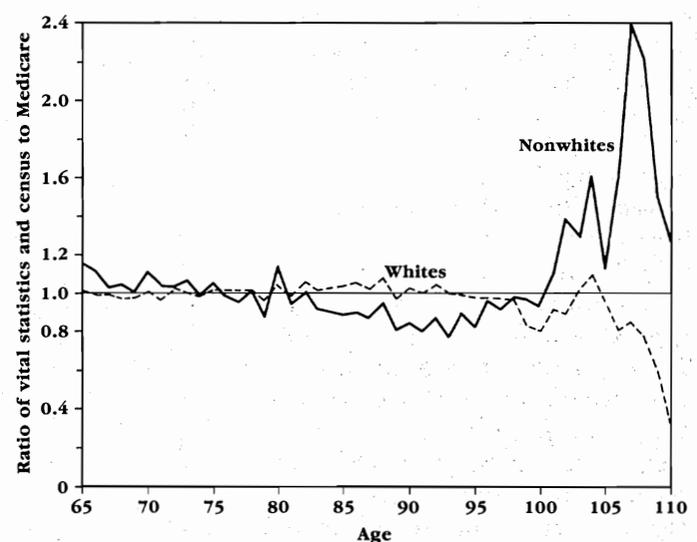


Figure 2. Death rates for females, ages 65 and over, calculated from vital registration statistics and census data divided by Medicare death rates: United States, 1980

to 66. The denominator was the arithmetic average of the population 65-66 at the beginning and end of the year.

Medicare-based mortality rates for 1980 are compared with rates based on registered deaths and the census in Figures 1 and 2. The ratios of mortality rates from the two sources are listed in Table 7. White death rates are almost the same from the two sources until ages well above 90 years.

From ages 65 to 93, the ratio of white male single-year age-specific rates calculated from the two data sets falls within the range of 0.95 to 1.05 at every age but one. In the white female population there are only two ages before 98 at which the ratios of rates differ from 1.0 by more than 5 percent.

The fall in death rates beginning at around age 100 is shared by mortality schedules based on both data sets, although generally the decline with age in Medicare-based death rates is less. The ratio of the registration-census rates to the Medicare rates declines at the highest ages.

Nonwhite death rates calculated from registered deaths in the census are substantially lower than Medicare death rates from age 82 until age 95 for both males and females. The calculated proportion surviving from age 65 to age 95 according to death rates for nonwhite males is only 73 percent as great when calculated from Medicare as from registered deaths in the census; the corresponding ratio for white males is 98 percent.

The number of persons enrolled in Medicare on 1 January 1980 is less than the population enumerated by the census in April of that year

Table 7. Ratio of death rate at age x calculated from registered deaths and the census to death rate calculated from Medicare: United States, 1980

Age	Whites		Nonwhites	
	Males	Females	Males	Females
65	1.0231	1.0145	0.9855	1.1540
66	0.9941	0.9950	1.0264	1.1113
67	0.9854	0.9937	1.0062	1.0321
68	0.9687	0.9813	1.0212	1.0408
69	0.9887	0.9761	0.9358	1.0004
70	0.9898	1.0049	1.0626	1.1114
71	0.9799	0.9783	0.9487	1.0361
72	1.0037	1.0248	0.9580	1.0183
73	1.0000	1.0110	0.9795	1.0653
74	0.9803	0.9872	0.9132	0.9806
75	0.9940	1.0127	0.9883	1.0432
76	0.9972	1.0096	0.9421	0.9899
77	0.9928	1.0088	0.9115	0.9544
78	1.0083	1.0164	0.9862	1.0116
79	0.9497	0.9674	0.8350	0.8691
80	1.0016	1.0413	1.0521	1.1375
81	0.9869	0.9931	0.9086	0.9435
82	1.0278	1.0472	0.9404	0.9989
83	1.0032	1.0245	0.9380	0.9217
84	1.0201	1.0288	0.9578	0.9117
85	1.0099	1.0366	0.9406	0.8907
86	1.0392	1.0541	0.9375	0.8987
87	1.0144	1.0263	0.8960	0.8715
88	1.0696	1.0745	0.9352	0.9510
89	0.9657	0.9803	0.8253	0.8142
90	0.9654	1.0203	0.8197	0.8480
91	0.9844	1.0020	0.8483	0.8059
92	1.0099	1.0403	0.9227	0.8699
93	0.9706	1.0068	0.7648	0.7673
94	0.9352	0.9934	0.8743	0.9000
95	0.9217	0.9802	0.7838	0.8337
96	0.9247	0.9694	0.9462	0.9792
97	0.8527	0.9728	0.8570	0.9146
98	0.8901	0.9663	0.9103	0.9883
99	0.8304	0.8474	0.9973	0.9809
100	0.6718	0.8163	0.7309	0.9323
101	0.8023	0.9111	0.9955	1.0975
102	0.7346	0.8866	0.8557	1.3861
103	0.8017	1.0089	0.5703	1.2894
104	0.7460	1.0940	1.1132	1.6095
105	0.6359	0.9523	1.7013	1.1176
106	0.6268	0.8172	1.2806	1.6017
107	0.6862	0.8475	0.9185	2.3948
108	0.5958	0.7901	0.7475	2.2165
109	0.6722	0.6051	0.6017	1.5026
110	0.1401	0.2792	0.8575	1.2547

Table 8. Ratio of census population to Medicare population and of registered deaths to Medicare deaths: United States, 1980

Age	Population				Deaths			
	White males	White females	Non-white males	Non-white females	White males	White females	Non-white males	Non-white females
65	1.080	1.088	1.110	1.191	1.109	1.111	1.126	1.390
66	1.085	1.091	1.076	1.144	1.060	1.069	1.085	1.249
67	1.080	1.084	1.108	1.167	1.059	1.074	1.114	1.202
68	1.096	1.097	1.121	1.170	1.043	1.060	1.097	1.154
69	1.088	1.094	1.161	1.248	1.065	1.062	1.119	1.264
70	1.076	1.078	1.117	1.155	1.057	1.072	1.166	1.260
71	1.062	1.062	1.096	1.144	1.040	1.041	1.006	1.131
72	1.072	1.070	1.044	1.082	1.065	1.084	1.025	1.130
73	1.060	1.057	1.042	1.083	1.042	1.053	0.984	1.120
74	1.064	1.063	1.066	1.108	1.035	1.043	1.000	1.100
75	1.056	1.059	1.106	1.135	1.034	1.056	1.048	1.132
76	1.058	1.043	1.062	1.060	1.048	1.046	0.978	1.042
77	1.043	1.032	1.047	1.066	1.027	1.033	0.969	1.017
78	1.048	1.022	1.065	1.033	1.019	1.003	0.961	0.981
79	1.081	1.096	1.185	1.283	1.047	1.079	1.102	1.181
80	1.075	1.071	1.188	1.156	1.034	1.066	1.103	1.202
81	1.001	0.998	0.923	0.903	1.007	1.012	0.843	0.857
82	1.005	0.984	0.972	0.881	1.022	1.012	0.890	0.876
83	1.005	0.991	0.911	0.933	1.020	1.020	0.890	0.842
84	1.012	1.000	0.970	0.973	1.029	1.021	0.913	0.883
85	1.000	0.989	1.013	0.938	1.010	1.008	0.910	0.820
86	0.993	0.981	0.981	0.946	1.018	1.016	0.888	0.812
87	0.998	1.001	0.971	0.980	1.009	1.012	0.905	0.854
88	0.967	0.958	1.006	0.966	0.998	0.993	0.846	0.842
89	1.056	1.061	1.039	1.024	1.002	1.013	0.887	0.854
90	1.065	1.068	1.159	1.096	1.022	1.065	0.926	0.884
91	1.043	1.055	1.046	1.034	1.028	1.035	0.917	0.841
92	1.073	1.058	1.120	1.024	1.011	1.029	0.951	0.827
93	1.039	1.057	1.117	1.064	1.008	1.038	0.865	0.806
94	1.099	1.119	1.128	1.070	1.006	1.069	0.992	0.947
95	1.133	1.144	1.125	1.080	1.028	1.085	0.925	0.905
96	1.178	1.178	1.178	1.123	1.043	1.083	1.029	1.027
97	1.211	1.188	1.018	1.026	1.014	1.108	0.949	0.971
98	1.219	1.239	1.310	1.173	1.035	1.118	1.035	1.052
99	1.303	1.314	1.132	1.058	1.072	1.093	1.255	1.073
100	1.777	1.570	1.987	1.552	1.094	1.175	1.166	1.224
101	1.343	1.290	1.284	1.200	1.071	1.116	1.271	1.242
102	1.536	1.401	1.549	1.256	1.071	1.165	1.270	1.585
103	1.513	1.346	1.628	1.217	1.145	1.305	0.863	1.618
104	1.831	1.239	1.327	1.241	1.127	1.308	1.647	1.898
105	1.708	1.437	1.383	1.204	1.138	1.203	2.273	1.308
106	2.039	1.575	2.066	1.457	1.103	1.173	2.105	2.000
107	1.906	1.543	1.651	1.383	1.308	1.220	1.667	3.333
108	3.429	1.858	2.511	1.830	1.467	1.297	1.400	3.231
109	2.510	2.329	2.489	1.647	2.000	1.273	1.600	2.714
110	6.630	3.697	4.081	2.839	0.714	0.905	2.800	2.889

until age 80, in both the white and nonwhite populations. The total above age 80 is virtually the same in the two data sets. The lesser numbers at ages 65–79 in Medicare are caused in part by the belated enrollment in the Medicare system after age 65. Above age 90 or 95, the ratio of census to Medicare population rises markedly because of greater age misstatement in the census (Table 8).

Overstatement of age is greater in the census and death registration than in Medicare.

White registered deaths exceed Medicare deaths in a pattern similar to the excess of census population over the Medicare population, except that the excess at higher ages is less, undoubtedly because overstatement of registered age at death surpasses Medicare overstatement less than overstatement in the census surpasses Medicare overstatement (Table 8).

Registered white deaths over age x surpass Medicare deaths over age x by a small and consistent margin (between 1.6 and 3.1 percent among white males, and between 3.1 and 5.4 percent among white females) up to age 90 (Table 9). In the nonwhite population, from age 65 to age 70 registered deaths are more than 10 percent more numerous than Medicare deaths, as is the enumerated population compared with the Medicare population, in both instances because of belated Medicare enrollment.

The number of registered deaths over age 80 is 7 and 10 percent less

Table 9. Ratio of census population above age x to Medicare population and of registered deaths above age x to Medicare deaths: United States, 1980

Age	Population				Deaths			
	White males	White females	Non-white males	Non-white females	White males	White females	Non-white males	Non-white females
65	1.064	1.059	1.085	1.112	1.037	1.041	1.013	1.037
66	1.063	1.057	1.083	1.106	1.035	1.040	1.008	1.027
67	1.061	1.054	1.083	1.103	1.034	1.039	1.004	1.020
68	1.059	1.052	1.081	1.097	1.032	1.038	0.998	1.014
69	1.056	1.049	1.077	1.091	1.032	1.038	0.992	1.008
70	1.052	1.045	1.067	1.076	1.030	1.037	0.985	0.998
71	1.050	1.042	1.061	1.068	1.029	1.036	0.973	0.986
72	1.048	1.040	1.057	1.061	1.028	1.036	0.970	0.980
73	1.045	1.037	1.059	1.058	1.026	1.034	0.966	0.972
74	1.043	1.035	1.061	1.056	1.025	1.033	0.965	0.964
75	1.041	1.032	1.061	1.049	1.024	1.033	0.962	0.955
76	1.038	1.029	1.054	1.039	1.023	1.032	0.953	0.944
77	1.035	1.027	1.053	1.036	1.021	1.031	0.951	0.937
78	1.034	1.027	1.053	1.032	1.020	1.031	0.949	0.931
79	1.032	1.027	1.052	1.032	1.020	1.033	0.948	0.927
80	1.024	1.017	1.024	0.991	1.018	1.030	0.929	0.904
81	1.015	1.010	0.996	0.966	1.016	1.027	0.905	0.874
82	1.018	1.012	1.010	0.977	1.017	1.028	0.913	0.876
83	1.020	1.017	1.017	0.994	1.016	1.030	0.916	0.876
84	1.024	1.021	1.040	1.005	1.016	1.031	0.920	0.880
85	1.027	1.026	1.057	1.011	1.014	1.032	0.922	0.880
86	1.034	1.034	1.067	1.027	1.014	1.035	0.924	0.889
87	1.045	1.048	1.087	1.045	1.013	1.039	0.930	0.902
88	1.059	1.061	1.119	1.060	1.014	1.043	0.936	0.910
89	1.088	1.090	1.145	1.081	1.018	1.053	0.955	0.922
90	1.098	1.099	1.172	1.096	1.023	1.062	0.970	0.936
91	1.111	1.109	1.176	1.096	1.023	1.062	0.981	0.947
92	1.138	1.129	1.215	1.113	1.021	1.069	0.999	0.974
93	1.164	1.156	1.239	1.135	1.025	1.081	1.013	1.014
94	1.219	1.196	1.271	1.155	1.031	1.096	1.054	1.070
95	1.274	1.230	1.311	1.178	1.041	1.105	1.073	1.105
96	1.342	1.270	1.369	1.208	1.047	1.114	1.126	1.168
97	1.420	1.314	1.421	1.232	1.049	1.128	1.162	1.216
98	1.523	1.376	1.555	1.300	1.068	1.137	1.244	1.305
99	1.666	1.442	1.620	1.338	1.087	1.148	1.323	1.400
100	1.845	1.509	1.799	1.443	1.097	1.179	1.353	1.539
101	1.873	1.480	1.752	1.412	1.098	1.182	1.443	1.697
102	2.094	1.566	1.875	1.470	1.119	1.225	1.506	1.889
103	2.312	1.636	1.958	1.523	1.155	1.265	1.595	2.019
104	2.627	1.760	2.036	1.610	1.163	1.238	1.915	2.176
105	2.865	1.997	2.263	1.722	1.189	1.184	2.024	2.274
106	3.291	2.218	2.596	1.900	1.222	1.167	1.934	2.707
107	3.733	2.467	2.749	2.033	1.279	1.163	1.857	3.012
108	4.571	2.865	3.256	2.283	1.257	1.129	1.933	2.921
109	4.918	3.280	3.519	2.427	1.100	1.031	2.200	2.840
110	6.630	3.697	4.081	2.839	0.714	0.905	2.800	2.889

than that of Medicare deaths, for nonwhite males and nonwhite females, respectively. Apparently, recording of deaths above 80 in Medicare is more complete than the registration of deaths, although it is difficult to imagine notifying the Social Security Administration of a death without its being registered. Perhaps a small fraction of older nonwhite deaths are registered as white deaths.

Because ratios of registered white deaths to Medicare deaths, and of the enumerated white population to the Medicare population, have very similar patterns by age, the white mortality schedules from the two data sets correspond closely until age 95. At the highest ages the two sets of schedules have a similar defective feature, in that mortality rates decline as age increases.

In contrast, ratios of registered nonwhite deaths to Medicare deaths are much lower at ages 81-97 than ratios of the nonwhite census population to the population listed in Medicare. Therefore, the nonwhite mortality schedule based on Medicare shows higher death rates over this range. The proportion of nonwhite females surviving from 80 to 95 according to mortality rates derived from registered deaths is 20.1 percent; according to Medicare-based mortality rates, the proportion is 16.2 percent.

■ A new procedure for calculating an adjusted mortality schedule at ages above 85

Directly calculated mortality rates at the very highest ages are mistrusted in all populations because of the random element inherent in ratios

of small numbers of deaths to small numbers of persons at risk, and because of possible imprecision in the recording of age. Adjusted rates based on mathematical formulas are usually substituted for rates based on raw data at ages over 85 or 90. Alternatively, a consolidated rate, such as the death rate over age 80 or 85, is used to terminate the published life table.

Various mathematical functions are fitted to death rates calculated up to age 80, 85, or 90, and the function is extrapolated to close out the mortality schedule. The classical function used for this purpose is the Gompertz "law" of exponentially increasing mortality with rising age. Other commonly used variants closely approximate the Gompertzian fixed annual rate of increase in death rates above age 65 or 70 as age increases.

According to the Gompertz formula, above age 65,

$$m_x = m_{65} \exp [k(x-65)],$$

where k is the annual rate of increase of m_x as x increases. It has long been suggested that the rate of increase of m_x is not constant, but rather declines at higher ages. Close examination of old-age mortality rates in populations with exceptionally good data has shown interesting similarities in the way in which the rate of increase of m_x changes with age (Horiuchi and Coale 1990).

Suppose the rate of change, k , in the Gompertz function expression for m_x is itself considered a function of age. The simple exponential expression for m_x above age 65 is replaced by

$$m_x = m_{65} \exp \sum_{66}^x k_y. \quad (1)$$

In Figure 3, approximate values of k_x are plotted (from age 70 to age 95) for the female populations of seven countries with good data on mortality. We calculated the value of k_x for every five years, using the approximation that at five-year intervals $k_x = [\log({}_5m_x/{}_5m_{x-5})]/5$. In all of these countries k_x declines after age 80 or 85. Mortality rates continue to increase at a declining rate.

If in any population the function k_x were known at every age above a stated threshold age, this knowledge, combined with the known mortality rate at any one age above the threshold, would suffice to specify the m_x function above the stated threshold, by suitable use of Equation (1).

If directly calculated mortality rates up to about age 85 are accepted, the value of k_x can be deter-

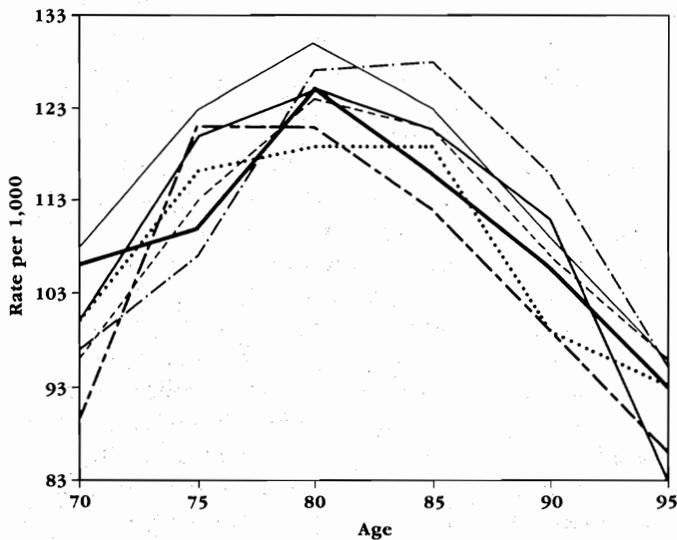


Figure 3. Rate of increase in mortality, $k(x)$: selected countries, recent years

Note: Countries included are Austria, France, Japan, the Netherlands, Norway, Sweden, and West Germany.

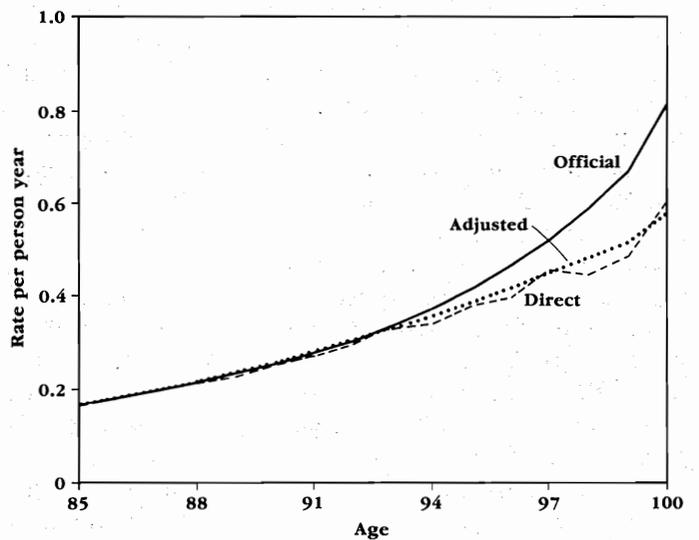


Figure 4. Direct, adjusted, and official death rates for males: Sweden, 1978-82

mined at each age from 65 to this age. We propose the assumption that k changes linearly above an age near 85, or that

$$k_x = k_{85} + s(x - 85).$$

In the populations shown in Figure 3, a linear decline in k_x from 85 to 95 and above appears to be a sensible assumption.

The slope, s , of the assumed linear course of k_x above age 85 is determined by postulating a high mortality rate from age 110 to 111, for example, an m_{110} of 1.0, or a q_{110} of 0.632. This postulate is based on the rarity of survival above age 110, as illustrated in Table 1.

An annual mortality rate of 1.0 may be reached at age 108 or 112 instead of 110; the absence of deaths above 110 implies that the assumed m_{110} of 1.0 is reasonable. To avoid imposing a crossover of male and female mortality at 110, an m_{110} of 0.8 can be assumed for females.

The choice of 1.0 or 0.8 for m_{110} has only a minor effect on the constructed life table for white males. The death rate for white males at age 90 is 0.223 when 1.0 is chosen as m_{110} , and 0.221 when 0.8 is chosen; at age 95 the two rates are 0.332 and 0.320; and expectation of life at age 90 is 3.61 and 3.69 years, respectively.

The slope of the linear course of k after age 85 is readily calculated from the assigned value of m . According to Equation (1),

$$m_{110} = m_{84} \exp(\sum_0^{25} k_{85+i}).$$

But k is assumed to change linearly above age 85, so that $k_{85+i} = (k_{85} + is)$. Since a value is assigned to m_{110} , this equation can be solved

for s , yielding

$$s = -[\log(m_{84}/m_{110}) + 26k_{85}]/325.$$

This method of calculating the force of mortality above age 85 assures the presence of two features in the resultant schedule of death rates. First, the adjusted mortality rates differ little from the original rates in a short span of ages above 85, since the adjusted rates incorporate both the original mortality rate at age 84 and its rate of change. Moreover, assigned values of k_x change gradually and continuously, and so do the values in populations with accurate data. The second assured feature of the resultant schedule is that mortality rates become quite high as age 110 is approached, so that a population subject to the adjusted schedule has few survivors beyond that age.

To summarize, the method we propose for closing out a mortality schedule is to calculate the rate of increase, k_x , in mortality rates at each age up to age 85; to assume that k_x changes linearly from age 85 to age 110, with a slope that yields an assigned value of m_{110} ; and to calculate m_x above 85 as $m_{84} \exp(\sum_{85}^x k_y)$.

In the next section we illustrate the efficacy of this procedure by applying it to Swedish data and comparing the resultant estimated mortality rates with the accurate, directly calculated Swedish mortality schedules. We then use the method to close out mortality schedules for the male and female, white and nonwhite populations of the United States in 1980.

Estimation of mortality rates above age 85 in Sweden, 1978-82, by the new procedure,

and comparison with directly calculated rates. To test the method of closing out a mortality schedule above age 85 described in the preceding section, we have applied the method to data on deaths and population listed by single years of age for males and females in Sweden during the five years 1978-82. First, we calculated a set of death rates by dividing the listed number of deaths at each age by the listed population at risk (number of person-years lived). Then, for ages 85 and above, we calculated death rates as

$$m_x = m_{84} \exp \sum_{85}^x k_y.$$

The value of k_y , in turn, was calculated as $k_{85} + s(y-85)$: the rate of change in mortality was assumed itself to change linearly. Finally, we chose s so as to create an estimated m_{110} of 1.0 for males and m_{110} of 0.8 for females; i.e.,

$$s = (\log m_{84} + 26 k_{85})/325$$

for males, and

$$s = -[\log(m_{84}/0.8) + 26 k_{85}]/325$$

for females.

All values of m_x at age 85 and above are determined by m_{84} and k_{85} . These two quantities are defined as the death rate between exact ages 84 and 85, and the rate of increase of mortality at age 85 or $\log(m_{85}/m_{84})$. Because of slight stochastic variation, especially in the ratio of two adjacent single-year mortality rates, the value of m_{84} used in this procedure is the arithmetic average of mortality rates from ages 82 to 86, and k_{85} is taken as $[\log(m_{88}/m_{81})]/7$.

Directly calculated and adjusted mortality rates above age 85 for Swedish males and females are

Figure 5. Direct, adjusted, and official death rates for females: Sweden, 1978-82.

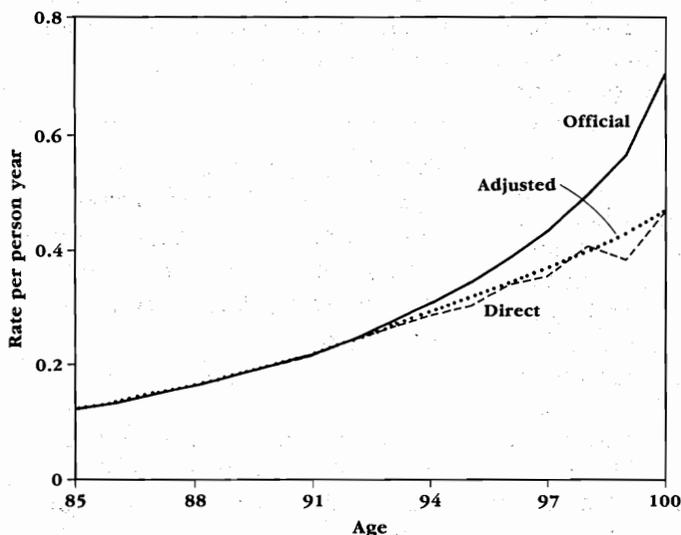
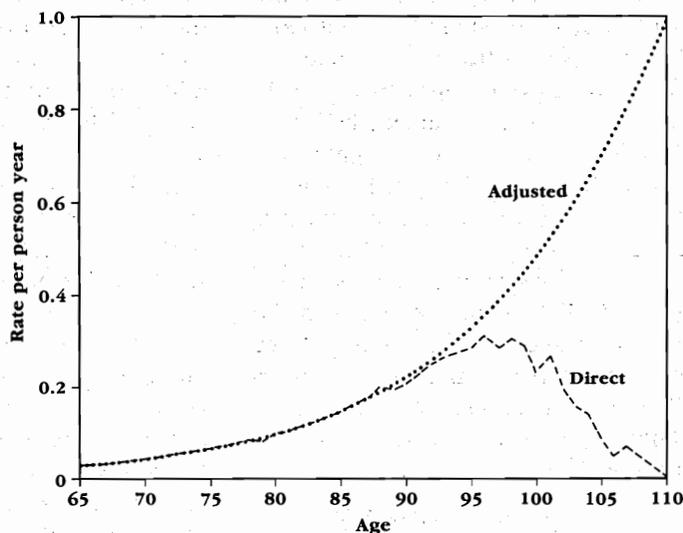


Figure 6. Direct and adjusted death rates for white males: United States, 1980.



shown in Figures 4 and 5. Because population data by single years of age are not listed above 100, the death rate plotted at age 100 in these figures is the death rate over 100.

The fit of the adjusted rates to the directly calculated rates is very good, especially for males. The official Swedish life table for the same period employs the so-called Wittstein formula to close out the schedule, beginning at age 90. The official rates are shown for comparison; the fit of the official rates above 90, based on a mathematical formula, is much poorer.

Estimation of mortality rates above age 85 in the United States, 1980, and comparison with directly calculated rates.

The use of an assumption of linear change in k_x above age 85, at a pace to produce a stipulated m_{110} , to construct estimated mortality

rates above age 85 in Sweden is intended as a test of whether this assumption produces a good approximation to well-recorded low-mortality old-age death rates. We interpret the results of the test as indicating that the procedure does indeed produce a close approximation.

The purpose of the method is to yield sensible estimates of mortality rates above age 85 in the United States, where, as we have seen, directly calculated rates are increasingly unacceptable as age increases.

In adapting the procedure to mortality schedules in the United States, we believe that additional smoothing of the directly calculated m_x 's, and especially of the k_x function, is desirable. Death rates calculated from registered deaths and the census population form a slightly erratic sequence even below age 85, because overreporting of numbers at certain preferred ages is more

pronounced in the census than in death registration.

Most persons born in 1900 were 79 years old at the time of the 1980 census, and age was determined from the reported date of birth. The number of white women listed at age 79 is nearly 8 percent greater than the average number at ages 77 through 81. As a result, the death rate calculated for age 79 is only 6 percent above the rate for 78, whereas the rate for age 80 is 20 percent above the rate for 79.

A smoothed schedule of k_x is prepared in two stages. The first stage is the calculation of the average rate of increase in m_x over a five-year span centered on x . Thus,

$$\hat{k}_x = [\log(m_{x+2}/m_{x-3})]/5.$$

The second stage sets the final smoothed k_x equal to the mean of five values of \hat{k}_x centered on x . These two stages produce smoothed k_x 's beginning with k_{70} .

From age 65 to age 69, the directly calculated m_x 's are made part of the adjusted schedule. From 70 to 85, m_x is slightly smoothed by being set in this range equal to $\hat{m}_{69} \exp(\sum_{70}^x k_x)$. Fluctuations in the original m_x 's are reduced, because k_x has been made more regular. Because the adjusted m_x sequence is linked to m_{69} , and because m_{69} may be distorted by "age heaping" (most persons giving 1910 as their year of birth would be listed in the census at age 69), \hat{m}_{69} in the above expression is the mean of m_x in the five years from age 67 to age 71. Above age 85, k_x is assumed to change linearly,

$$[k_x = k_{85} + s(x-85)],$$

with its annual change calculated to yield m_{110} of 1.0 for males, and 0.8 for females.

We have written a program, in APL, that computes an adjusted m_x schedule from a list of deaths and population by single years of age above age 65; it calculates k_x and smoothed values of k_x in two steps, and calculates the slope, s , of changing k_x above age 85. It then determines the schedule of m_x implied by m_{69} and k_x from 70 to 110, and joins it to the directly calculated m_x from 65 to 69. Finally, the program computes q_x , l_x , L_x , T_x , and e_x , with a radix of 1.0 at age 65.

Two mortality schedules for each population (white and nonwhite males and females) are shown in Figures 6 to 9. One schedule is simply the ratio of registered deaths in 1980 to the number of persons recorded in the 1980 census. The other is the schedule adjusted as just described. The higher estimated than recorded rates above age 85

are evident. Recorded mortality rates level off and then decline; estimated mortality rates continue to increase. The proportion surviving from age 65 is little different in the adjusted as compared with the unadjusted life tables until age 95 or 100.

In the unadjusted life tables the remaining expectation of life rises with age beginning at age 86 for white males, 91 for white females, 88 for nonwhite males, and 94 for nonwhite females; in the adjusted tables expectation of life at higher ages continues to decline, and e_x above age 85 is greatly reduced by the adjustment. At age 65, the reduction in e_x is only 0.4 of a year for white males and 0.3 of a year for white females.

Puzzling features of mortality rates and age distribution in the United States at ages 70-95.

As we have noted, the proportion surviving from age 65 to age 75 among white females in the United States in 1980 was below the average of survival over this range in eight countries with low mortality and reliable data. The expectation of life at age 80 for U.S. white females, even after the adjustment described above of mortality rates above age 85, was greater than in any of the other eight countries. The recorded increase in mortality with age above age 65 is much more gradual in the United States than in the other low-mortality populations.

Specifically, in the Netherlands, Sweden, and Hungary, the ratio of the death rate at age 90 to the death rate at age 65 ranges from 8.3 to 10.9 for males and from 16.0 to 17.5 for females. In the U.S. white

population the corresponding ratio is 7.4 for males and 11.9 for females, and for the nonwhite population the ratios are 4.8 for males and 7.7 for females.

The U.S. population between ages 70 and 100 has higher proportions at the upper end of the age range than do other low-mortality populations with reliable data.

The proportional distribution of the population between ages 70 and 100 in the United States has higher proportions at the upper end of this range than is found in other low-mortality populations. In Figure 10 the proportion in each age interval in four female populations is divided by the proportion recorded in Sweden in 1981.

The distribution between ages 70 and 100 in Norway is virtually the same as in Sweden. In France in 1980, the proportionate distribution by age above 70 fell much more gradually than in Sweden, so that the proportion between ages 90 and 95 was 1.2 times as great as in Sweden and the proportion between ages 95 and 100 was over 1.5 times as high as in Sweden. An opposite pattern is found in Japan, with only about two-thirds as high a proportion at ages 90-95 as in Sweden and only about one-half as high at ages 95-100.

The increasing ratios of the proportion in successively older age groups in France relative to Sweden can be understood as a consequence of the lower rate of increase of the population in France over

Figure 7. Direct and adjusted death rates for white females: United States, 1980

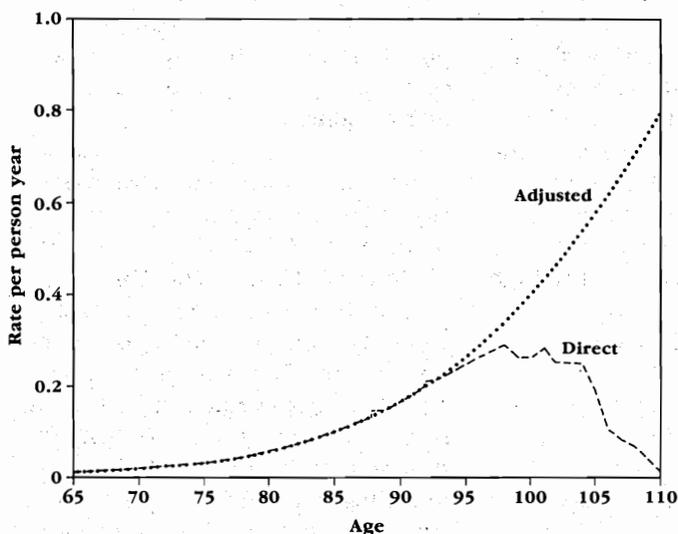


Figure 8. Direct and adjusted death rates for non-white males, United States, 1980

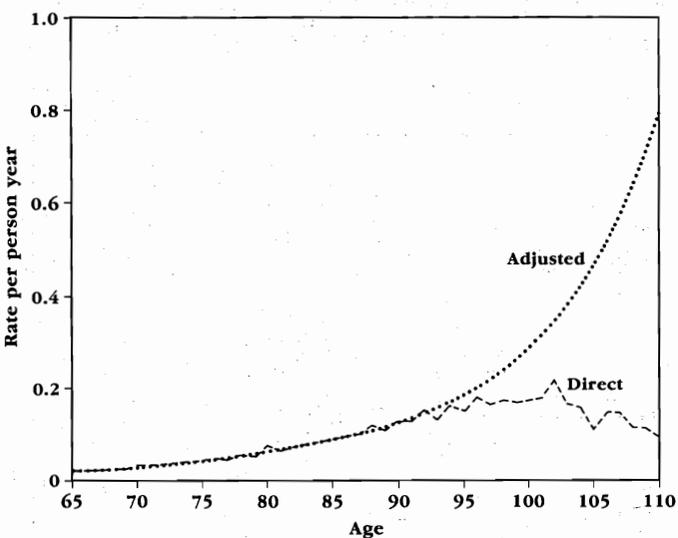
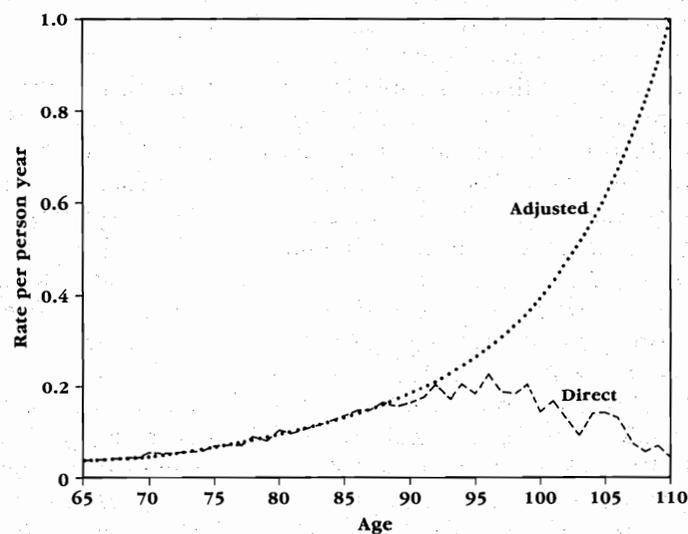


Figure 9. Direct and adjusted death rates for non-white females: United States, 1980

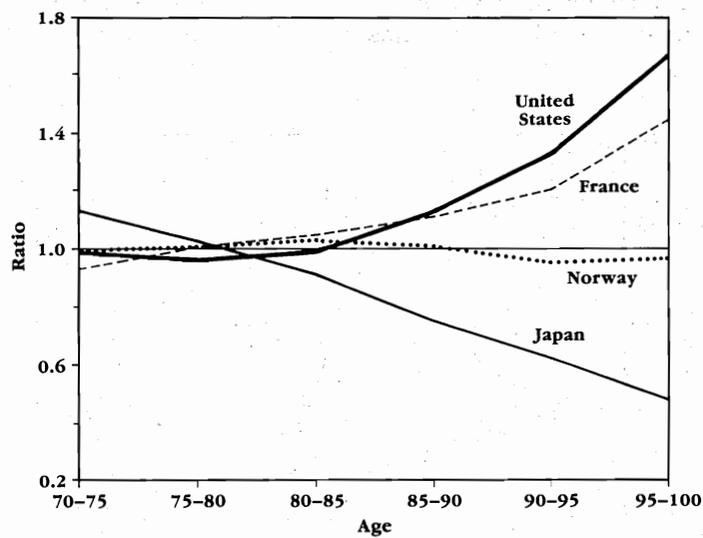


Figure 10. Ratio of female age distributions of selected populations to the female age distribution of Sweden, 1981 (ages 70-75 to 95-100)

Sources: Official demographic statistics of France, Japan, Norway, and the United States.

age 70 in the preceding decade: only 1.3 percent compared with 2.5 percent in Sweden. A population with a given rate of increase and the same mortality schedule tapers more slowly than a population with a higher rate of increase. The rate of increase in Norway was virtually the same as in Sweden; the rate of increase in Japan in the decade prior to the census was much higher, over 4.4 percent.

If we look at the ratio of the proportions in each age interval above age 70 in the U.S. population relative to the proportion in Sweden, we see that the proportions at higher ages in the United States increase relative to the proportion in Sweden even more than that in France. However, the rate of increase of the U.S. female population over age 70 was not less than that of Sweden, as was true of France; on the contrary, the rate of increase of the white female popu-

lation over age 70 in the United States was nearly 2.7 percent, somewhat above the Swedish rate of increase.

Evidence examined earlier shows that the population above ages 110, 100, and even 95 in the United States is overstated in the 1980 census because of age exaggeration. The anomalously slow rate of increase of mortality rates as age increases, and the unaccountably high proportions of the population reported in the census at ages 90-95, as well as at higher ages, suggest that age overstatement also occurs at ages below 90.

As we have shown elsewhere (Coale and Kisker 1986), when ages are misreported at moderately old ages (such as age 70), overstatement of age at older ages also occurs. The evidence we found of age misstatement at moderately old ages was the degree of heaping on age 70, as indicated by a much larger

number reported at age 70 than at the average of 69 and 71. This index of age heaping was highly correlated with the proportion of the population over 70 that was reported to be over 95 in censuses from many countries.

Evidence of imprecise recording of age at older ages less than 90 or 95 in data sets for the population of the United States. In the U.S. censuses prior to 1960, age heaping was a conspicuous feature. Too many persons were reported at convenient ages such as those divisible by 5 or 10. The extent of such heaping had been declining with each census but was still prominent in 1950. In the 1940 and 1950 censuses, the ratio of the number of persons reported at age 70 to the average of the number reported at 69 and 71 (the measure of age heaping that we used) was 1.286 and 1.221, respectively.

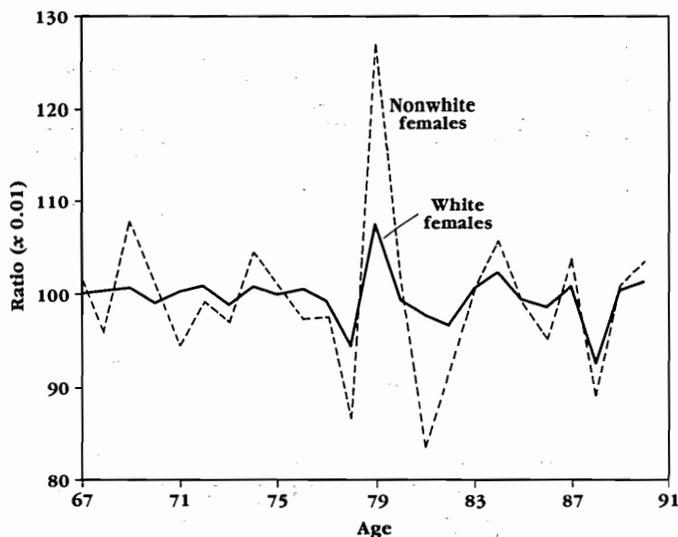


Figure 11. Ratio of females, ages 67-91, to moving average: U.S. census count, 1980

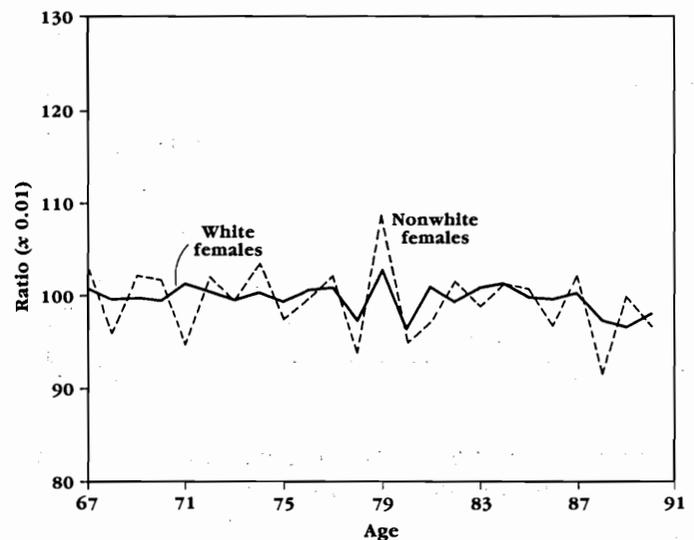
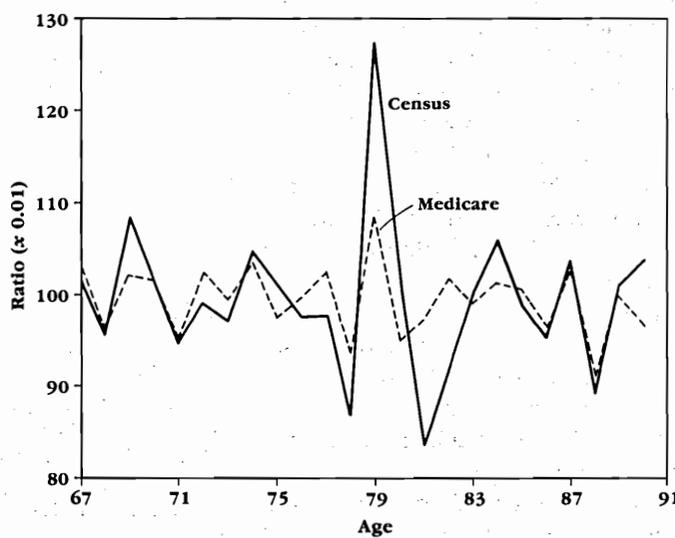
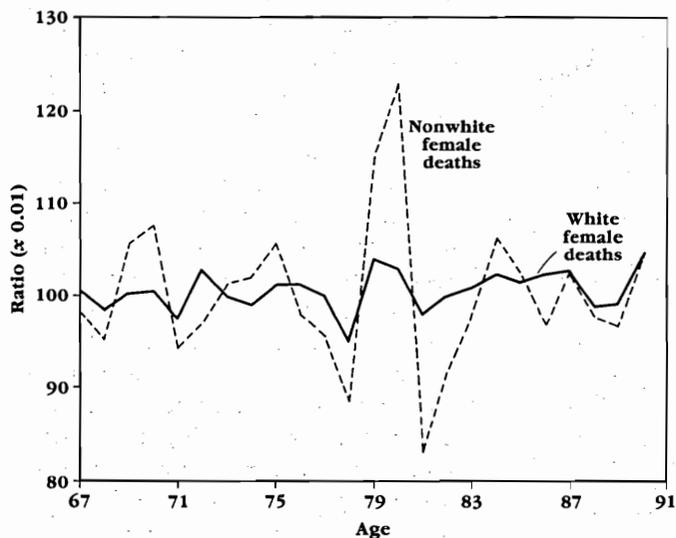


Figure 12. Ratio of females, ages 67-91, to moving average: Medicare population, 1980

Figure 13. Ratio of female deaths at ages 67-91 to moving average: U.S. registered deaths, 1980

Figure 14. Ratio of nonwhite female deaths at ages 67-91 to moving average: U.S. census count and Medicare population, 1980



In 1960 such age heaping essentially vanished, and it has not re-emerged in subsequent censuses because in 1960 the former method of ascertaining age by asking a question about age in completed years or age on last birthday was replaced by a question about date of birth. The age entered for each person was now determined by subtracting the date of birth from the date of the census. As a result, the ratio of reported 70-year-olds to the average of those reported at 69 and 71 was 0.996, 1.036, and 0.991, respectively, in 1960, 1970, and 1980, in contrast to a ratio above 1.2 in earlier censuses.

Replacing a question about age at last birthday by a question about date of birth reduces the tendency to use a convenient number divisible by 10 as the age reported to the census. The use of a convenient number in reporting age is replaced,

however, by the use of a convenient number in reporting the year of birth.

In the 1960 census the number of persons listed at age 59 is 1.22 times the mean of the numbers at 58 and 60. This heaping on age 59 is the result of too many persons reporting 1900 as their year of birth. The heaping on 59 is slightly diminished by the fact that only three-fourths of the persons born in 1900 (those born after April 1) would be listed at age 59 in the 1960 census. If the census had been taken on January 1, the heaping on age 59 would undoubtedly have been greater.

We have compared the number of persons and the number of deaths reported at each age in three data sets with the average number of persons and deaths, respectively, reported in a five-year age interval centered on the age in question.

The ratio of each number to a five-term moving average measures departure of the number reported at each age from a straight line distribution over a five-year interval. True departures from linearity appear when the number of persons at a given age is unusually large or small because of an excess or deficit in the number of births that originated the cohort in question.

We calculated ratios to a five-term moving average for the female population over 65 in the 1980 census, the population listed in Medicare on 1 January 1980, and also the number of deaths over age 65 registered in 1980. Separate sets of ratios were computed for white and nonwhite females (Figures 11 to 14). The synchronism of peaks and hollows in these figures is very evident.

This general congruence could be interpreted as the trace of large and

small cohorts in both data sets, but close inspection rules out this possibility. Systematically larger deviations in cohort size, either positive or negative, for nonwhites cannot be genuine. The age ratios above and below 1 occur in the number of registered deaths for whites and nonwhites in the Medicare population, as well as in the census. The deviations indicate some heaping on certain years of birth, which translates in turn into heaping on certain reported ages.

The high ratios at ages 69, 74, 79, and 84 in the 1980 census are readily identified with inflated reports of birth years 1910, 1905, 1900, and 1895. High ratios at ages 90 and 100 indicate the persistence of the choice of a favorite age even when the date of birth is requested. Evidently, in supplying a year of birth in the census, the respondent sometimes chooses a reported age of 100 and then supplies a date of birth that lies between 1 April 1879 and 1 April 1880.

It is our contention that the false reporting of year of birth implies that, in general, knowledge of year of birth among the elderly is inexact. The tendency for older persons to overstate age when knowledge of age or date of birth is imprecise occurs to some extent before age 95 or 100. Above 95, age overstatement is obvious.

The effect on death rates of a moderate degree of overstatement of age at ages above 70.

Suppose that at ages above 70 age is more often exaggerated than understated. As a result, persons reported to have attained during a year a given exact age such as 75 would, in fact, have attained a somewhat



Although the man pictured above is very old, it is possible that his age was overstated in his census return.

lesser age, for example $74\frac{1}{2}$, on average. We make an explicit numerical assumption to explore the effect of gradually increasing average overstatement of age above age 70. We assume no systematic overstatement of age until after age 69, and then assume that starting at age 70 age is overstated on average by a steadily rising increment.

It is assumed that in the white population age is overstated by 1/10 of a year at age 70, 2/10 of a year at age 71, 1/2 of a year at age 74, a full year at age 79, etc. Overstatement of age in the nonwhite population is assumed to be 2/10 of a year at age 70, 4/10 at 71, etc. For simplicity, ages reported in the death register are assumed to be consistent with ages reported in the census, until age 85, at least. This assumption is invalid at very high ages, where the exaggeration of age

in the census is clearly greater than in the recorded age at death.

The assumption of progressively greater overstatement of age is simply incorporated into our method of calculating an adjusted life table for the white population. The postulated pattern of overstatement implies that the true age of the population increases only 91 percent as fast as the reported age increases. Consequently, the increase in mortality calculated to occur in a 10-year span of age really occurs in a nine-year span. In other words, the true rate of increase of mortality with increasing age is 10 percent greater than the calculated rate of increase. In constructing a mortality schedule incorporating an assumption of progressively greater overstatement of age, we accept the m_x values from 65 to 69 as directly calculated, calculate a smoothed schedule of rates of increase in mortality with age (k_x) from age 70 to age 85, and multiply these rates of increase by a factor of 1.1.

Starting with a smoothed estimate of m_{69} (the average of the mortality rates between 67 and 71), we compute mortality rates at 70 to 85 as

$$m_x = m_{69} \exp(\sum_{70}^x k_x).$$

Above age 85 the modified estimate of k_{85} is assumed to change linearly, so as to produce an m_{110} of 1.0 for males and 0.8 for females. In other words, mortality rates above age 70 are assumed to increase more steeply than the directly calculated mortality rates.

Two adjusted schedules for white and nonwhite males and females are compared in Table 10. The second set of adjusted schedules, unlike the first, differs appreciably from unadjusted mortality rates well before

age 95. The assumption of modest, but progressive, overstatement of age in the U.S. white population produces a mortality schedule that is close indeed to the mortality schedule of the Swedish female population of 1978-82. The same is true for the corresponding modified male mortality schedule (Figure 15).

Adjusted mortality schedules in 1980 derived from Medicare data compared with adjusted schedules derived from registered deaths in the census.

In our earlier comparison of mortality schedules calculated directly from vital statistics and the census with schedules calculated directly from 1980 Medicare data, we found that mortality rates from the two sources were trivially different in the white population at least until age 95; but for nonwhites, Medicare death rates were higher at ages above 80 than rates derived from registered deaths and the census.

We also computed mortality rates above age 65 from Medicare data, using the method proposed here for closing out mortality schedules. Additional sets of rates are based on Medicare data incorporating the effects of progressively greater age overstatement beginning at age 70. The adjusted Medicare white mortality rates scarcely differ from the corresponding schedules derived from vital statistics, but adjusted Medicare mortality schedules for nonwhites incorporate substantially higher death rates above age 80. Because the difference is apparently caused by underregistration of nonwhite deaths, the adjusted mortality rates derived from Medicare are preferable (Table 11).

Table 10. Abridged life tables for ages 65 and over, adjusted (1) so that $M_{110}=1.0$ (males) or 0.8 (females), and (2) multiplication of $x(x)$ by 1.1 (whites) or by 1.2 (nonwhites), death rates from vital registration statistics and census: United States, 1980

White males, adjustment 1				White males, adjustment 2			
Age	l_x	${}_5M_x$	e_x	Age	l_x	${}_5M_x$	e_x
65	1	0.03319	14.14	65	1	0.03319	13.75
70	0.8463	0.05051	11.24	70	0.8463	0.05182	10.78
75	0.656	0.0753	8.754	75	0.6515	0.08033	8.229
80	0.4481	0.1128	6.653	80	0.4334	0.1251	6.106
85	0.2519	0.1704	4.931	85	0.2282	0.1958	4.41
90	0.1046	0.2518	3.612	90	0.0825	0.2931	3.178
95	0.02799	0.3642	2.626	95	0.01755	0.4197	2.314
100	0.003991	0.5236	1.91	100	0.001828	0.5808	1.722

White females, adjustment 1				White females, adjustment 2			
Age	l_x	${}_5M_x$	e_x	Age	l_x	${}_5M_x$	e_x
65	1	0.01652	18.37	65	1	0.01652	17.7
70	0.9205	0.02603	14.72	70	0.9205	0.02681	14
75	0.8077	0.04244	11.41	75	0.8044	0.04587	10.63
80	0.652	0.07232	8.513	80	0.638	0.08231	7.722
85	0.4514	0.1223	6.151	85	0.4191	0.1456	5.409
90	0.2409	0.1964	4.38	90	0.1973	0.2377	3.767
95	0.08666	0.2996	3.113	95	0.05655	0.3581	2.671
100	0.0177	0.4466	2.239	100	0.008336	0.5071	1.972

Nonwhite males, adjustment 1				Nonwhite males, adjustment 2			
Age	l_x	${}_5M_x$	e_x	Age	l_x	${}_5M_x$	e_x
65	1	0.04198	13.56	65	1	0.04198	12.97
70	0.8096	0.05664	11.14	70	0.8096	0.05863	10.42
75	0.6088	0.07724	8.995	75	0.6024	0.08501	8.142
80	0.412	0.1085	7.107	80	0.3914	0.1275	6.19
85	0.2374	0.1494	5.554	85	0.2039	0.1855	4.668
90	0.1107	0.2071	4.249	90	0.07842	0.2618	3.511
95	0.03795	0.2962	3.137	95	0.01997	0.3677	2.607
100	0.007939	0.448	2.232	100	0.002812	0.5207	1.921

Nonwhite females, adjustment 1				Nonwhite females, adjustment 2			
Age	l_x	${}_5M_x$	e_x	Age	l_x	${}_5M_x$	e_x
65	1	0.02391	17.41	65	1	0.02391	16.39
70	0.8869	0.03524	14.3	70	0.8869	0.03696	13.15
75	0.743	0.05085	11.57	75	0.7363	0.05735	10.31
80	0.575	0.07384	9.203	80	0.551	0.08957	7.912
85	0.3959	0.1026	7.24	85	0.3496	0.1316	6.038
90	0.2352	0.1459	5.528	90	0.1785	0.1904	4.54
95	0.1114	0.2158	4.052	95	0.06676	0.2753	3.35
100	0.03618	0.3521	2.84	100	0.01572	0.4112	2.432

Additional comments on schedules for the nonwhite population. The defects in the data upon which death rates are based are in every respect more severe for the nonwhite population than for the white. Nonwhite overstatement of ages of persons in the census, of ages at death in vital statistics, and of ages in the Medicare system are all more extreme, as is heaping on preferred years of birth and preferred ages. In addition, we have found disturbing indications of substantial underregistration of deaths above age 80 for the black population in the comparison of the population calculated from a combination of registered deaths above each age

and the rate of increase at each age from Medicare data.

Among nonwhites, overstatement of ages in the census and the Medicare system, and of ages at death in vital statistics, is more extreme than among whites. The practice of rounding, or "heaping," on preferred ages and years of birth by persons who do not know their precise birth dates is more prevalent among nonwhites. Nonwhite deaths are also substantially underregistered.

The entire population over 65 calculated from registered deaths and Medicare death rates is about 1 percent less than the enumerated white female population, nearly 3 percent short of the enumerated white male population, but 10 percent short for nonwhite females and 9 percent for nonwhite males. The inference of an underregistration of deaths in the nonwhite population is supported by a 7-10 percent shortfall of registered deaths above age 80 as compared with those recorded in the Medicare system. The extent of heaping on preferred years of birth is also substantially greater for the nonwhite population than for the white in each of the data sets (registered deaths, census enumerated population, the Medicare population, and the Medicare deaths).

The most conspicuous feature differentiating nonwhite data from white and from data from other countries with accurate records of old-age mortality is the gradual increase in mortality with age in schedules calculated either from vital statistics plus census data or from Medicare data. Figure 16 shows the smoothed annual rate of increase (k_x) in mortality (as calculated from registered deaths) for white and nonwhite females.

The rate of increase in nonwhite mortality with age is uniformly lower than in white mortality until age 100, although k_x for the white population is already anomalously lower than for other low-mortality populations. When calculated from vital statistics and the census, the nonwhite female death rate at age 65 is 1.51 times the white female death rate; by age 83 it has become lower than the white and by age 90

Table 11. Abridged life tables for ages 65 and over, adjusted (1) so that $M_{110}=1.0$ (males) or 0.8 (females), and (2) for multiplication of $x(x)$ by 1.2 (nonwhites), death rates from Medicare: United States, 1980

Nonwhite males, adjustment 1				Nonwhite males, adjustment 2			
Age	l_x	${}_5M_x$	e_x	Age	l_x	${}_5M_x$	e_x
65	1	0.0417	13.28	65	1	0.0417	12.68
70	0.8108	0.05826	10.78	70	0.8108	0.06058	10.05
75	0.6045	0.08175	8.597	75	0.5971	0.09087	7.736
80	0.3997	0.1148	6.734	80	0.3763	0.1363	5.819
85	0.2229	0.1625	5.166	85	0.1872	0.2046	4.283
90	0.09682	0.2315	3.879	90	0.06472	0.2984	3.136
95	0.02904	0.3316	2.851	95	0.01342	0.4201	2.313
100	0.004985	0.4864	2.056	100	0.001402	0.577	1.733

Nonwhite females, adjustment 1				Nonwhite females, adjustment 2			
Age	l_x	${}_5M_x$	e_x	Age	l_x	${}_5M_x$	e_x
65	1	0.0223	17.19	65	1	0.0223	16.14
70	0.8941	0.03431	13.91	70	0.8941	0.03612	12.74
75	0.7524	0.05162	11.05	75	0.7453	0.05892	9.759
80	0.5799	0.07767	8.57	80	0.5532	0.09596	7.254
85	0.3912	0.117	6.493	85	0.339	0.1549	5.253
90	0.2153	0.1752	4.812	90	0.1524	0.2383	3.781
95	0.08715	0.2607	3.495	95	0.04381	0.347	2.75
100	0.02215	0.4006	2.496	100	0.006924	0.4879	2.049

Figure 15. Mortality rates for Sweden (closed out), 1978-82, and for U.S. whites (adjustment 2), 1980

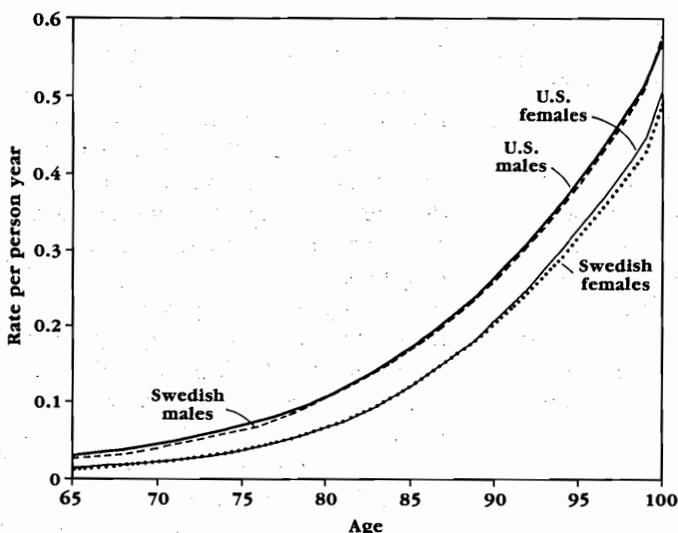
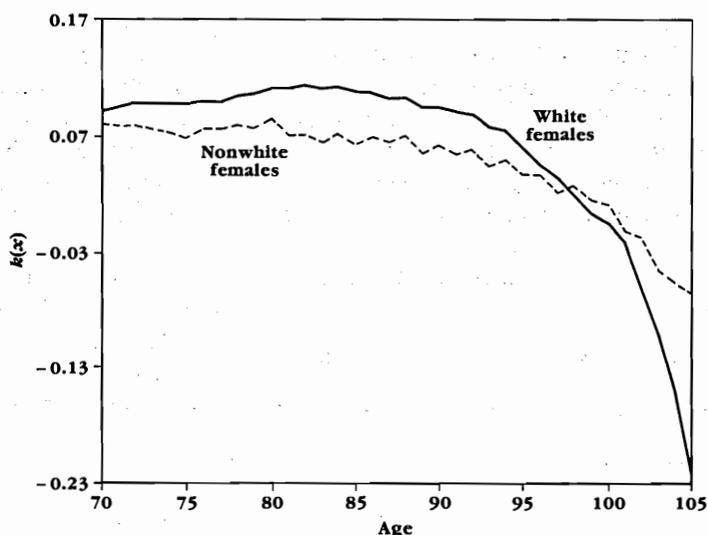


Figure 16. Rate of increase, $k(x)$, of mortality with age among females, ages 70-105: United States, 1980



is only 75 percent as great; yet the white mortality schedule itself rises more slowly than in any of the eight other low-mortality populations with which it has been compared.

For these reasons, less confidence can be placed in the adjusted as well as in the unadjusted mortality schedules for the nonwhite population. The schedules that may be nearest the true nonwhite death rates are the fully adjusted sets of mortality rates derived from Medicare data (adjusted, that is, by k_x multiplied by 1.2 above age 70, and changing linearly from 85 to 110 to yield an m_{100} of 1.0 for males and 0.8 for females). According to these mortality rates, the remaining nonwhite expectation of life is less than implied by similarly adjusted white mortality rates.

In contrast, when adjusted mortality rates are based on registered

nonwhite deaths, which are under-registered, the implied remaining nonwhite expectation of life is higher than the corresponding white expectation, beginning at age 78 for males and 81 for females.

The reality of such a crossover in the mortality of whites and nonwhites has been much discussed (Coale and Kisker 1986). Because of underregistration of deaths and more severe overstatement of age, nonwhite death rates require more adjustment. The multiplication of k_x by 1.2, the change in k_x above 85 so that m_{100} is 1.0 (or 0.8), and the use of data derived from Medicare provide adjusted rates that do not cross over adjusted white rates before very high ages (Table 10).

In our "preferred" adjusted tables, estimated nonwhite mortality rates are higher than white until age 90, among both males and females. The estimated rates above 90 are

slightly lower for nonwhites (at 90-94, 2 percent lower among males and less than 1 percent lower for females). In the official life tables for 1979-81, the crossover occurs at age 77 for males and 84 for females, and at 90-94 the rates are more than 16 percent lower for nonwhites, male and female. Our estimated rates at higher ages incorporate arbitrary assumptions about age overstatement, and we doubt that even slightly higher white than nonwhite mortality really occurs at very advanced ages. More robust data are needed to decide.

The age distribution of the population over age 65 implied by death rates and rates of increase. Earlier we employed a fundamental relation that holds in any closed population to calculate the population implied by the number of registered deaths at each age

above 65 and the rate of increase of the population at each age according to Medicare data. Now that adjusted mortality schedules have been constructed, the same relation makes it possible to calculate the proportionate distribution by age of the population over 65 from an adjusted mortality schedule and the Medicare-based growth rates.

The number attaining each age x relative to the number attaining age 65 can be calculated from Equation (2),

$$N(x+1) = N(x)(l_{x+1}/l_x) \exp(-r_x), \quad (2)$$

where l_{x+1}/l_x is the proportion sur-

living from x to $x+1$ according to the single-year death rate m_x (Preston and Coale 1982). The values of $N(x)$ relative to $N(65)$ from age 66 to 110 permit the determination of the proportionate age distribution above 65 inherent in the adjusted mortality schedule and the Medicare rates of increase.

We have calculated the proportionate age distribution of the Swedish female population over 65 from (a) the life table for 1978-82, based on recorded death rates to age 85, and closed out by a linear change in k_x such that $m_{110} = 0.8$; and (b) the average rate of increase

at each age in 1978-82. This age distribution is compared, in Table 12, with the recorded age distribution.

In the last three columns of Table 12 the estimate and recorded proportions over age x of the population over 65 are compared. The last column lists the difference between these proportions. This difference can arise either because the calculated population is inappropriate, or because the age distribution is inaccurately recorded as a result, for example, of age misstatement. For the Swedish population, the slight disagreement is doubtless the result of very slight differences between the adjusted mortality schedule and the true death rates.

When the calculated population can be accepted as approximately correct, the last column in Table 12 tells us what proportion of the population over 65 has been transferred upward (when the entry is positive) or downward (when the entry is negative) in the recorded population. Thus, the positive entry of 1.46 per thousand at age 70 implies, under the assumption that the calculated population is correct, that this fraction of the population over 65 consisted of persons who were falsely reported as over age 70. The population at ages 65-69 (.3068 of the total) would have lost to the population 70-74 (on the assumption) 1.46/306.8, or 4.8 per thousand, through overstatement of age.

At all ages, the implied transfer is less than 1.0 percent, an indication in this instance of how well the adjusted mortality schedule fits, rather than an indication of a slight degree of age misstatement. (This argument ignores the inflation or deflation of

Table 12. Percentage distribution of females, ages 65 and over, as estimated from growth rates and adjusted life table and as recorded: Sweden, 1978-82

Age	Estimated population	Recorded population	Recorded population/estimated population
65	0.3068	0.3054	0.9952
70	0.272	0.2713	0.9977
75	0.2067	0.207	1.002
80	0.1296	0.1304	1.006
85	0.06175	0.06232	1.009
90	0.01941	0.01971	1.016
95	0.00343	0.00354	1.032
100	0.00032	0.00030	0.9286
105	0.00001	0.00001	0.9604

Age	Estimated population $x+$	Recorded population $x+$	Recorded-estimated $x+$
65	1	1	0
70	0.6932	0.6946	0.00146
75	0.4212	0.4233	0.00289
80	0.2145	0.2163	0.00172
85	0.08492	0.08588	0.00096
90	0.02317	0.02356	0.00039
95	0.00376	0.00385	0.00009
100	0.00033	0.00031	-0.00002
105	0.00001	0.00001	-0.00005

the number at 65–69 by transfers across age 65, a factor that may distort the comparisons for the U.S. female population shown in Table 13.

Similar calculations for the white female population of the United States, based on an adjusted mortality schedule and Medicare rates of increase, yield a much poorer fit to the recorded age distribution (Table 13). When calculated from the mortality schedule that is merely closed out above age 85, from 3 to 6 percent of each calculated five-year age group must be transferred to the next *younger* age interval to match the reported age distribution, from ages 70–74 to ages 85–89. In other words, when this calculated age distribution is used as a standard, it appears that age understatement had transferred persons from above to below ages 70, 75, 80, and 85.

When the more fully adjusted white female mortality schedule is the basis of a calculated age distribution, the reported age distribution is matched by upward transfer to the next higher age interval of 1.7, 4.4, 9.3, 14.7, 19.4, and 31.3 percent, respectively, of persons at ages 70–74, 75–79, 80–84, 85–89, 90–94, and 95–99 (Table 14).

The mortality schedule that adjusts mortality rates from age 70 to 85, as well as above age 85 (when combined with Medicare rates of increase), produces an age distribution above 65 that implies a more plausible pattern of misreported ages than the schedule that merely closes out death rates above age 85.

■ Conclusions

In this examination of old-age mortality in the United States, we have found conclusive evidence of overstatement of age above age 90 or 95

Table 13. Percentage distribution of white females, ages 65 and over, as estimated from growth rates and adjusted life table (adjustment 1) and as recorded: United States, 1978–82

Age	Estimated population	Recorded population	Recorded population/estimated population
65	0.3081	0.316	1.026
70	0.2563	0.2582	1.007
75	0.1952	0.1937	0.9925
80	0.1338	0.1281	0.9576
85	0.07457	0.07007	0.9396
90	0.02624	0.02649	1.009
95	0.005311	0.006179	1.163
100	0.000529	0.000984	1.86
105	0.000022	0.000026	11.85

Age	Estimated population $x+$	Recorded population $x+$	Recorded – estimated $x+$
65	1	1	0
70	0.6919	0.684	-0.007923
75	0.4357	0.4258	-0.009835
80	0.2404	0.2321	-0.00837
85	0.1067	0.104	-0.002693
90	0.0321	0.03391	0.001809
95	0.005862	0.007423	0.00156
100	0.000551	0.00124	0.000693
105	0.000022	0.000026	0.000376

in the 1980 census, in deaths registered in 1980, and in the population and deaths recorded in Medicare data for 1980. Exaggeration of age was more pronounced among non-whites than among whites.

This article presents a new method of closing out mortality schedules, based on acceptance (with some mild smoothing) of death rates and rate of change with age of death rates to age 85. Above age 85 the new procedure postulates a linear change in the rate of increase of the force of mortality, rather than its approximate constan-

cy. A declining rate of increase in mortality rates above age 85 is consistent with observations of accurately recorded old-age mortality in a number of populations. The method combines a steadily changing rate of increase in mortality with an estimated high level of mortality at age 110. This combination closes out the schedule with a maximum age at death not far above age 110.

When applied to Swedish data, the method yields an estimated mortality schedule above age 85 in good agreement with the unusually

accurate recorded rates above 90; in fact, the estimated schedule is in better agreement with the recorded rates than the official schedule, which incorporates assumed rapidly increasing death rates above 90. The new method provides a sensible way of replacing the clearly defective mortality rates above age 90 or 95 in the United States.

Less direct evidence is found of overstatement of age, in each of the data sets, at ages from 70 to 85 or 90. The possibility of overstatement in this age range is suggested by an anomalously slow rate of increase

in death rates above age 65 in the United States, compared with other low-mortality populations with precise data, and a less steeply declining older age distribution than in other populations that should be comparable.

The possibility of overstatement is further suggested by the tendency of people to round their ages or birth dates, which results in "heaping" on ages corresponding to preferred years of birth: 1910, 1905, 1900, etc. Such heaping characterizes the census, registered deaths, and the Medicare listing of popula-

tion and deaths. Heaping on ages divisible by 5 or 10 is a generic characteristic of censuses in which age (at last birthday) is recorded and when knowledge of age is imprecise. When knowledge of age is inexact, age of older persons is usually exaggerated.

A simple hypothesis of greater average overstatement of age (by 0.1 of a year more with each advance of age above 70 for the U.S. white population, and 0.2 of a year for nonwhites) was the basis for calculating an alternative set of adjusted mortality schedules. This system of additional adjustment produces mortality schedules for the white population very similar to Swedish mortality schedules.

White mortality schedules derived from registered deaths in the census scarcely differ (before age 95) from schedules derived from Medicare; but Medicare-based schedules for nonwhites have higher death rates from age 80 to 95 because nonwhite deaths over age 80 appear to be underregistered by 8 to 10 percent. The best approximation to the true mortality rates of older nonwhites may be the Medicare-based schedules adjusted for age overstatement and closed out above age 85.

Medicare data provide a useful resource for the analysis of old-age mortality, in the form of age-specific rates of increase. These rates can convert the number of registered deaths at each age above 65 into a estimated number of persons. Such estimates provide an independent indication of underregistration of nonwhite deaths. The number of white persons at each age estimated from registered deaths is in close agreement with the enumerated population up to about

Table 14. Percentage distribution of white females, ages 65 and over, as estimated from growth rates and adjusted life table (adjustment 2) and as recorded: United States, 1978-82

Age	Estimated population	Recorded population	Recorded population/estimated population
65	0.316	0.316	1
70	0.2625	0.2582	0.9834
75	0.1981	0.1937	0.9779
80	0.1316	0.1281	0.9733
85	0.06785	0.07007	1.033
90	0.02043	0.02649	1.297
95	0.003222	0.006179	1.918
100	0.000233	0.000984	4.231
105	0.000007	0.000260	36.95

Age	Estimated population $x+$	Recorded population $x+$	Recorded-estimated $x+$
65	1	1	0
70	0.684	0.684	0.000007
75	0.4215	0.4258	0.004362
80	0.2233	0.2321	0.008731
85	0.09174	0.104	0.01224
90	0.02389	0.03391	0.01002
95	0.003462	0.007423	0.003961
100	0.000240	0.001243	0.001004
105	0.000007	0.000260	0.000253

age 90, and is, in fact, closer to the true number at higher ages, because the number listed in the census at very high ages is inflated.

Apparently, the rates of increase at single years of age derived from Medicare are fairly robust. If numbers of persons near 65 are too low because of delayed registration into the Medicare system, the rates of increase are still valid if the extent of late registration does not vary greatly from one year to the next. The combination of Medicare-based rates of increase and registered deaths provides an alternative way to determine the base population for mortality schedules in years separated from the census. Our preferred life tables for white and nonwhite males and females are shown in Tables 10 and 11. The tables for the white population are based on the

doubly adjusted death rates calculated from registered deaths and the census. The nonwhite tables are based on doubly adjusted Medicare death rates.

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Reviews

Seeds: Supporting Women's Work in the Third World edited by Ann Leonard. New York: The Feminist Press at the City University of New York, 1989. xiii, 256 pp. ISBN 0-935312-92-7 (cloth), US \$29.95; 0-935312-93-5 (paper), US \$12.95. Available from Talman Company, 150 Fifth Avenue, New York, NY 10011, U.S.A.

This collection of case studies examines eight development projects for women conducted in the 1970s in Asia, Africa, Latin America, and the Caribbean. The book grew out of a Seeds pamphlet series on women's income-generating activities.

In the introduction, Adrienne Germain, vice president and program director of International Women's Health Coalition, traces the

background of increased emphasis on women's status from the 1974 World Population Conference until the present. Although women have always worked, she observes, most women in developing countries have worked at home or outside the modern wage structure, so that their contributions to development have been overlooked. The United Nations Decade for Women (1975-85) created a need for information about income-generating programs for women. It was hoped that such programs would provide women with cash incomes and involve them in decision making, and that the programs would be based on sound economic criteria.

The Seeds pamphlet series, which

appeared during that period, described those efforts. Ann Leonard, a specialist in communications, worked on the series and later edited the book. Some of the authors of the pamphlets were women who were personally involved in the activities they described, and the narratives were geared toward the interests of development practitioners and policymakers.

Several new audiences for the series quickly emerged: resource centers on women's roles, development organizations committed to educating their supporters in developed countries about economic and social change; and university needs-based training programs for development practitioners. It was

these new audiences that led the *Seeds* Steering Committee to consider publication of the book.

The case studies, updated and adapted for the book, contain descriptions of income-generating projects for women. The authors describe how the projects have been based on the women's own initiatives, encourage broad changes in the workers' socioeconomic status, and are economically viable. They also describe the obstacles that the women have had to overcome to achieve their goals.

For example, several of the projects include strategies to move women into traditionally "male" occupations. Among these are a public transport service for Kenya and a women's construction project in Jamaica. Other projects involve credit corporations in India and Nicaragua, waste recycling in Mexico, and forest conservation in Nepal.

A ninth chapter on handicrafts, written from an international perspective, points out the weaknesses of projects that are based on stereotyped roles for women. Women's advocates in Asia, Africa, and Latin America comment on the projects in three closing sections, and the final chapter presents suggestions for using *Seeds* in the classroom.

Besides Leonard and Germain, contributors to the volume were Jill Kneerim (on Kenya), Susan Caughman and Mariam N'diaye Thiam (on Mali), Marty Chen (on India and Bangladesh), Augusta Molnar (on Nepal), Judith Bruce (on Nicaragua), Marianne Schmink (on Mexico), Ruth Mcleod (on Jamaica), Jasleen Dhamija (on handicrafts), Vina Mazumdar (on a new model of development), Aminata Traore (on an

African perspective), Marguerite Berger (on Latin America and the Caribbean), and Kathleen Staudt (on planting the *Seeds* concept in the classroom).

Leonard and the *Seeds* Publication Committee are to be congratulated for this informative and practical volume. By publishing the pamphlets in a more durable format, they have made a worthy contribution to the literature on women in development.

—Alice D. Harris

Demographic Yearbook 1987 by United Nations Statistical Office. New York: United Nations, 1989. x, 1399 pp. ISBN 92-1-051070-4 (cloth), US \$110.00; ISBN 92-1-051071 (paper), US \$85.00. Available from Sales Section, United Nations, New York, NY 10017.

In 1948 the United Nations Statistical Office began to publish an annual compendium of international population statistics based on national figures supplied by cooperating countries. This, the thirty-ninth edition, reflects the growing interest in statistics at the household level.

In addition to basic demographic data, the 1987 *Demographic Yearbook* contains for the first time tables, for each census during the years 1975-86, on population in households, numbers of households, and the number of family nuclei by size of household and urban/rural residence; headship rates by age and sex of householder and urban/rural residence; households by age, sex, and marital status of householder and urban/rural residence; and population in households by age and sex of householders, size and relationship to householder, and

urban/rural residence.

Although previous editions of the *Demographic Yearbook* have included data on households by size and family nuclei, "this is the first time that this topic receives extensive treatment including a review article on definitions, use of headship rates, and nine tables on the number, size and composition of households and population living in households and institutions" (p. 3).

More than 139 countries contributed data for this compilation. Among the interesting statistics reported in the current edition are the following:

- Average number of persons per household ranges from a high of 7.2 persons in Algeria to 2.2 in Sweden.

- 86 percent of Philippine households are composed of a one-family nucleus—that is, a husband or wife with or without children.

- Women in Japan, Switzerland, Sweden, and Iceland enjoy a life expectancy of more than 80 years, and in 35 other countries women's life expectancy is at least 75 years.

- Japanese men now have a life expectancy of 75.2 years. This is the first time that the *Demographic Yearbook* has recorded male life expectancy above 75 years.

- The 10 most populous countries in 1987, in decreasing order, were China, India, the Soviet Union, the United States, Indonesia, Brazil, Japan, Bangladesh, Pakistan, and Mexico.

These statistics illustrate why the *Demographic Yearbook* remains the leading reference source in the field of population studies. No demographic library should be without the latest volume.

—Alice D. Harris

ASIAN AND PACIFIC POPULATION FORUM

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Counting Pakistanis in the Middle East: Problems and Policy Implications

The international movement of workers has become a common feature of the economic landscape of many Asian countries over the last two decades. The countries involved have attempted to formulate policies aimed at ensuring that the export of their manpower provides developmental benefits as well as protecting the welfare of the individuals involved. The formulation of appropriate policy is hampered, however, by incomplete information about the numbers of workers involved.

Using Pakistan as a case study, this article focuses on the difficulties of measuring both the outflow of workers over time and the stock abroad at any particular time. The various estimates of the number of Pakistanis in the Middle East are evaluated and an alternative estimate is provided based on hitherto unused data from two major surveys of returning workers. The alternative estimate differs substantially from the others, the difference being attributed principally to clandestine worker immigration. The concluding section discusses the policy implications of inaccurate information about the numbers of workers abroad and the likely effects of the current Persian Gulf crisis on Pakistan's economy.

ASIAN AND PACIFIC POPULATION FORUM

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The EAST-WEST POPULATION INSTITUTE, a unit of the East-West Center, conducts research, training, and related activities in the population field, with emphasis on economic, social, psychological, and environmental aspects of population problems in the Asia-Pacific region.

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by Charles W. Stahl
 and Farooq-i-Azam

MANY COUNTRIES in South, Southeast, and East Asia have been sending workers to the oil-exporting countries of the Persian Gulf and North Africa for nearly two decades. The demand for Asian labor in the Middle East experienced its fastest growth over the period 1975-83, reaching its highest level in the latter year, when the number of workers who went abroad reached just under 1 million. Demand then fell precipitously during 1984-86 by some 300,000 per year. In 1987 the number of annual placements began to recover, approaching 800,000 by the end of 1988.

The labor-exporting countries of Asia keep accurate information on the number and characteristics of workers departing through official channels for employment in the Middle East. However, all of the countries experience unofficial worker migration to a greater or lesser extent. Unofficial worker migrants are those going abroad to work without appropriate visas. Instead they may carry tourist visas, visas for the religious pilgrimages of *Haj* or *Umra*, or falsified documents. None of the governments has reliable information on the stock of its citizens working abroad, not only because of unofficial

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emigration but also because information on return migration is unavailable.

Without better knowledge of the number of workers abroad, Asian governments are unable to evaluate the efficacy of their labor migration policies or to assess their policy needs. Without knowing the number of workers abroad, for example, it is difficult for them to judge the extent to which the remittances of overseas workers are being channeled through the formal banking sector or through informal financial channels. Lack of knowledge about

None of the governments of labor-exporting Asian countries has reliable information on the stock of its citizens working abroad or the foreign-exchange remittances they generate. Lack of such information increases the difficulty of formulating policies to alleviate the disruptions caused by labor migration.

the stock of workers abroad, their occupational distribution, and their origins in the home country increases the difficulty of formulating policies to alleviate labor market disruptions caused by labor emigration and to facilitate the reintegration of returning workers.

Using Pakistan as a case study, this article examines the difficulties of measuring both the outflow of workers and the stock of workers abroad, focusing on Pakistani emigrant workers and on the Middle East as their principal destination.

■ Pakistanis in the Middle East, 1972-89

In part because of its proximity to the Middle East, Pakistan was the first Asian country to become involved in the export of labor services to the oil-exporting countries of that region. As early as the 1960s, Pakistanis were finding employment in the Middle East. Sarmad (1985:6) has estimated that by 1972 some 200,000 Pakistanis were residing there, and 20 percent of them, or 40,000, were in the work force. By 1977, Pakistanis in the Middle East numbered 727,000, of whom 89.5 percent were in the labor force (Sarmad 1985:10).

Information on the annual outflow of Pakistani workers abroad is presented in Table 1. Figures for the total annual placements during the years prior to 1977 are adjusted to account for those workers who obtained their visas directly from their country of employment, usually through the help of friends or relatives, rather than through the government or a licensed recruiting agency of that country.¹ Since 1977, such workers have been included in official labor emigration statistics.

Over the period 1975-89, annual placements abroad averaged 104,815 and annual placements in the Middle East averaged 99,431. As the percentages in column 4 of Table 1 indicate, the Middle East has attract-

ed by far the greatest proportion of Pakistani emigrant workers. On average, 95.3 percent of emigrant workers were destined for the Middle East over the period of 1971-89.

Table 2, which compares the labor export performance of Pakistan with that of other Asian labor-exporting countries, shows that in 1975 only Pakistan and, to a lesser extent, South Korea, had substantial numbers of contract workers in the Middle East. Other Asian countries were slower to respond to

the rapidly expanding demand for nonnational labor in the region. Neither Bangladesh, India, Sri Lanka, nor Indonesia officially registered any worker migration to the Middle East in that year, and the Philippines and Thailand registered only a token number of workers.

By the late 1970s, other Asian countries had begun to compete with Pakistan in the Middle Eastern labor market. Whereas Pakistan's annual export of workers fluctuated, peaking in 1977 at 140,000 and again in 1981 at 153,081, then declining again in subsequent years, other major labor exporters experienced more consistent growth in the placement of their workers through the early 1980s. Demand for labor from Bangladesh, Thailand, and South Korea peaked in 1982, whereas the demand for Filipino labor did not peak until 1983.

Thus, despite a decline in the recruitment of Pakistani labor of some 33,000 workers between 1981 and 1983, the recruitment of Asian workers continued to grow through 1983, when it peaked at just over 948,000. After 1983, the collapse of world oil prices reduced the demand for Asian workers as the oil-exporting countries were forced to cut back on development expenditures. Demand was also reduced because of the completion of major infrastructural projects in the Middle East.

Table 2 indicates that demand for Pakistanis in the region declined more than did the demand for other nationalities. Pakistan's share of the annual inflow of Asian workers fell from 17.7 percent in 1981 to 9.4 percent in 1987. Several factors account for this trend.

Table 1. Manpower exports from Pakistan, 1971-89

Year	Total annual placements	Middle Eastern placements	
		Number	%
1971	5,885	5,677	96.47
1972	7,544	7,278	96.47
1973	20,484	19,760	96.47
1974	27,191	26,273	96.62
1975	38,431	37,323	97.12
1976	69,428	66,420	95.67
1977	140,522	140,445	99.95
1978	130,525	129,533	99.24
1979	125,507	118,259	94.23
1980	129,847	118,397	91.18
1981	168,403	153,081	90.90
1982	142,945	137,535	96.22
1983	128,206	120,031	93.62
1984	100,407	93,540	93.16
1985	88,461	82,393	93.14
1986	62,641	58,032	92.64
1987	69,619	66,186	95.07
1988	84,840	81,545	96.12
1989	92,440	88,742	96.00

Sources: Unpublished information from the Overseas Pakistanis Foundation, Islamabad; the International Labor Organization, Regional Office for Asia and the Pacific; Pakistan, Ministry of Labour, Manpower and Overseas Pakistanis.

1. We derived our estimate of these "direct" visa holders by taking the proportion of migrants who obtained visas on their own during the years 1977 and 1978, averaging the two proportions, and using the result to estimate the number of migrants going abroad on their own for each of the years 1971-76. We then added this latter figure to the official migration figure for each year. The official figures are from the Ministry of Labour, Manpower and Overseas Pakistanis.

Table 2. Annual placements of contract workers in the Middle East, by country of origin, 1975-88

Country of origin	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
South Asia	37.3	88.7	196.4	246.3	341.3	440.2	504.5	441.6	411.5	359.9	335.0	250.1	276.8	u
Bangladesh	0.0	5.6	15.4	22.7	24.2	29.8	53.7	62.2	58.2	55.9	76.9	67.8	73.3	67.4
India	0.0	4.2	22.9	69.0	171.0	236.2	276.0	224.3	218.0	198.5	160.4	109.2	121.8	u
Pakistan	37.3	66.4	140.4	129.5	118.3	118.4	153.1	137.5	120.0	93.5	82.4	58.0	66.2	81.5
Sri Lanka	0.0	12.5	17.7	25.1	27.8	55.8	21.8	17.6	15.3	12.0	15.3	15.1	15.5	17.8
Southeast and East Asia	18.3	46.8	84.7	138.8	188.4	284.8	358.1	477.7	536.8	448.0	436.8	397.3	426.7	433.6
Indonesia	0.0	1.9	2.9	8.2	7.6	11.5	11.5	9.6	17.9	28.7	48.3	42.1	48.8	53.2
South Korea	15.7	35.8	52.2	82.0	99.1	120.5	138.3	151.6	130.8	100.8	72.9	44.8	31.1	21.5
Philippines ^a	1.6	7.8	25.7	34.4	73.2	132.0	183.6	211.0	323.4	311.5	266.6	262.8	306.8	u
									(250.2)	(253.9)	(236.4)	(272.0)	(267.0)	
Thailand	1.0	1.3	3.9	14.2	8.5	20.8	24.7	105.5	64.7	68.3	61.7	74.0	74.8	91.9
Grand total	55.6	135.5	281.1	385.1	529.7	725.0	862.6	919.3	948.3	807.9	771.8	647.4	703.5	u

Source: Compiled from unpublished data from the International Labor Organization, Regional Office for Asia and the Pacific.

u—Data unavailable.

a. Figures in parentheses represent "deployed" workers, whereas the corresponding numbers above are for "processed" workers.

First, the Gulf countries in particular chose to diversify their sources of labor, relying increasingly on workers from East and Southeast Asia. Nagi (1986:51) has suggested that they did so because of the readiness of East and Southeast Asians to participate in "enclave" development; the greater degree of "formalization" of labor supplies from those regions, which appeals to the labor-importing countries because of its consistency with their nonsettlement policies; and the perception by Gulf state employers that East and Southeast Asian labor is more cost-effective than South Asian labor. In general, East and Southeast Asian labor exporters have shown greater organizational skills in supplying the labor needs of the Gulf countries.

Second, this geographic expansion of the labor recruitment network resulted in substantial increases in available labor supplies

in combination with declining demand. The result was falling wage rates, which must have discouraged Pakistanis from taking jobs in the Middle East.

In recent years East and Southeast Asian labor-exporting countries have shown greater organizational skills in supplying the labor needs of the Gulf countries than have South Asian countries.

Beginning in 1987 and until the recent Gulf crisis, there was a slight recovery in demand for labor from most of the Asian labor exporters. Assuming that India sent 120,000 workers to the Middle East in 1988, we estimate the official annual placements of all Asians at 720,000 in that year. If the 1989 Middle East

emigration figures for Pakistan are indicative of a continued rise in the demand for Asian labor in general, then 1989 may have witnessed in excess of 750,000 Asian workers emigrating to the Middle East. Despite this recovery in the demand for Asian labor in the region, it is unlikely that demand would ever again reach the proportions that it did in the early 1980s, even if the Gulf crisis had not occurred.

Before 1983 most Asians employed in the Middle East were production workers, engaged mainly in construction projects. Since 1983 labor demand has shifted from production and construction workers to professional and technical, clerical, and service workers.

In 1973 some 27 percent of Pakistani workers in the Middle East were classified as production workers or laborers, approximately 15 percent were professional/technical or administrative workers, and

Since 1983 labor demand in the Middle East has shifted from production and construction workers to professional and technical, clerical, and service workers.

fewer than 1 percent were service workers (Table 3). With the commencement of infrastructural development in the Middle East in the mid-1970s, however, the composition of demand for Pakistani workers changed markedly. By 1981, the year of peak demand for Pakistani workers in the region, more than 77 percent of them were engaged in production (mainly construction), professional/technical and administrative workers accounted for only 4 percent of the annual outflow of workers, and service workers accounted for 11 percent.

Between 1981 and 1987, however, despite a large reduction in the placement of Pakistanis in the Middle East from 153,081 to 66,186, and despite a major shift in the composition of demand for Asian labor generally, the occupational distribution of Pakistanis shifted only marginally. The importance of service workers increased slightly in relation to production workers, with the former increasing from 11.4 percent to 20.1 percent of the total and the latter decreasing from 77.2 percent to 62.8 percent. The shift was thus due to a decline in the placement of production workers rather than to an increase in service workers; in fact, placement of service workers also declined.

As one of Pakistan's main Asian competitors in the Middle Eastern

labor market, the Philippines offers an interesting contrast with Pakistan. In comparison with Pakistanis, the number of Filipinos placed in the Middle East in 1987 was significantly greater than in 1981 (Table 4). It rose by 67 percent, whereas Pakistani placements fell by 57 percent over the same period.

Part of the explanation lies in the displacement of Pakistani production workers by Filipinos. Over the period of 1981-87 the placement of Filipino professionals, clerical workers, and service workers increased respectively by 560 percent, 606 percent, and 150 percent. For Pakistan, placements in each of those categories declined. These statistics are indicative of the advantages of Filipino over Pakistani labor as perceived by both the governments of the oil-rich Middle Eastern countries and the companies operating in those countries.

■ Pakistani stocks abroad

There have been various attempts to estimate the stock of Pakistani migrants abroad. The methods used can be divided into two basic approaches. The first is a stock/flow method, by which annual net flows are added to a base-year estimate of the stock abroad. The second method employs household surveys in Pakistan to arrive at an estimate of numbers abroad, the assumption being that the regions, villages, and households surveyed are representative of those throughout the country with respect to their involvement in international migration. The various estimates are summarized in Table 5.

An estimate often cited (the first in Table 5) is that based on data collected during 1971-79 by Paki-

stan's Bureau of Emigration and Overseas Employment, a division of the Ministry of Labour and Manpower (now called Ministry of Labour, Manpower and Overseas Pakistanis). Their method was to add annual outflows over the period 1971-79 to arrive at a stock estimate for 1979 of 489,696. Prior to 1977, however, bureau data excluded all migrants who had obtained visas through channels other than the government or a licensed recruiting agency, i.e., migrants who had obtained their visas directly from the receiving country through friends or other channels. The bureau's own data indicate that the number of unregistered migrants averaged 80,000 per year over the period 1977-79. The essential drawbacks of this method of estimation are the exclusion of illegal migrants and the failure to account for returnees.

The estimate by Abbasi and Javed (1980) is based on a sample of departing passengers drawn to determine the proportion of whom were emigrants. Abbasi and Javed then applied the proportion to the total volume of departing airline passengers to arrive at an estimate of numbers abroad. Their method has several shortcomings that cast doubt on the reliability of their estimate. First, emigrants who used transport modes other than air travel to depart from Pakistan were excluded. Second, during the short period in which the survey took place, departing Pakistanis may or may not have been representative of the usual types of emigrants. Third, the estimate did not take account of return migration. Finally, it is probable that many of the emigrant workers included in the survey who

Table 3. Occupational distribution of Pakistanis in the Middle East, 1973-88

Occupation	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Engineers	155	205	302	419	871	875	683	790	1,069	1,029	737	500	370	240	201	264
Doctors	222	286	118	120	231	64	103	100	93	60	44	60	51	62	74	63
Nurses	46	58	62	298	572	173	201	209	121	112	28	213	78	46	49	34
Teachers	415	349	446	111	374	274	52	199	201	65	89	100	65	70	175	91
Accountants	98	97	73	72	875	653	489	521	747	630	892	518	230	216	198	212
Technicians	311	524	319	360	1,371	1,456	1,222	786	1,393	2,120	2,569	2,109	2,014	1,939	2,288	3,019
Total professional/technical	1,247	1,519	1,320	1,380	4,294	3,495	2,750	2,597	3,624	4,016	4,359	3,500	2,808	2,573	2,985	3,683
% of total	10.14	9.30	5.72	3.31	3.06	2.70	2.33	2.19	2.37	2.92	3.63	3.74	3.41	4.43	4.51	4.52
Managers	26	17	46	113	219	289	200	127	357	406	361	249	252	129	148	113
Foremen/superintendants	597	—	188	871	2,085	1,784	1,521	1,179	2,210	1,732	1,870	740	861	758	440	731
Total administrative	623	17	234	984	2,304	2,073	1,721	1,306	2,567	2,138	2,231	989	1,113	887	588	844
% of total	5.07	0.10	1.01	2.36	1.64	1.60	1.46	1.10	1.68	1.55	1.86	1.06	1.35	1.53	0.89	1.04
Stenographers	45	94	80	141	287	267	62	39	48	75	90	92	24	41	25	14
Storekeepers	133	83	124	328	721	430	379	234	177	276	423	126	118	105	51	63
Clerk/typists	52	327	571	1,192	3,201	2,919	2,344	2,153	2,849	2,688	2,444	1,859	1,570	1,286	1,942	2,364
Surveyors	—	—	—	—	102	81	297	231	657	670	505	265	241	179	168	123
Total clerical	230	504	775	1,661	4,311	3,697	3,082	2,657	3,731	3,709	3,462	2,342	1,953	1,611	2,186	2,564
% of total	1.87	3.09	3.36	3.98	3.07	2.85	2.61	2.24	2.44	2.70	2.88	2.50	2.37	2.78	3.30	3.14
Cooks	—	159	314	452	4,222	3,368	2,507	2,019	1,971	2,250	1,970	3,162	1,789	1,244	1,325	1,882
Waiters/bearers	26	116	146	340	444	462	596	172	736	815	1,678	885	941	588	660	660
Drivers	—	—	—	—	4,164	6,643	5,295	5,072	8,445	10,370	9,211	6,967	7,981	6,198	6,478	8,349
Tailors	—	—	—	—	3,586	2,837	4,629	5,423	6,345	5,529	5,819	5,586	5,682	3,813	4,858	7,108
Total service	26	275	460	792	12,416	13,310	13,027	12,686	17,497	18,964	18,678	16,600	16,393	11,843	13,321	17,999
% of total	0.21	1.68	1.99	1.90	8.84	10.28	11.02	10.71	11.43	13.79	15.56	17.75	19.90	20.41	20.13	22.07
Agriculturists	912	16	1	6	2,851	2,315	1,770	2,878	4,455	5,371	5,462	5,147	3,120	3,832	5,568	6,524
% of total	7.41	0.10	0.00	0.01	2.03	1.79	1.50	2.43	2.91	3.91	4.55	5.50	3.79	6.60	8.41	8.00
Welders	44	442	663	691	1,471	1,585	1,204	1,062	1,825	1,671	2,145	1,163	704	586	495	575
Masons	338	1,166	1,789	3,535	10,987	11,311	11,183	10,286	12,354	11,345	11,016	7,389	6,607	3,544	3,697	4,898
Carpenters	90	924	2,642	4,364	9,792	9,570	7,837	6,981	8,728	9,336	7,783	4,621	3,708	2,375	2,801	2,915
Electricians	53	252	723	836	3,638	4,332	3,955	4,074	4,674	4,397	4,428	1,810	2,636	1,577	1,770	2,508
Plumbers	—	162	426	413	1,034	1,428	1,408	1,554	2,380	2,595	2,102	1,478	1,206	598	548	935
Cable jointers	—	—	24	431	289	136	163	63	50	200	212	194	272	175	6	31
Steel fixers	616	—	452	1,617	5,154	4,667	3,668	3,718	5,035	4,425	4,576	3,379	2,026	1,499	1,253	1,746
Painters	2,037	87	133	334	2,570	2,368	2,109	2,238	2,221	2,247	2,862	1,837	1,244	967	934	1,436
Laborers	129	3,126	5,934	12,779	55,833	52,071	51,039	52,138	72,973	57,596	44,283	37,739	34,015	22,639	26,984	30,721
Mechanics	—	455	1,221	1,205	4,283	4,784	3,700	3,184	3,837	3,640	3,319	2,467	2,838	1,680	1,779	2,464
Operators	—	—	—	—	283	2,409	2,004	1,636	2,603	2,815	1,501	1,200	1,059	865	613	832
Fitters	—	—	—	—	319	252	1,049	847	787	1,037	794	992	241	372	252	341
Denters	—	—	—	—	349	276	771	641	748	917	818	693	450	409	406	529
Total production/laborers	3,307	6,614	14,007	26,205	96,002	95,189	90,090	88,422	118,215	102,221	85,839	64,962	57,006	37,286	41,538	49,931
% of total	26.89	40.51	60.70	62.86	68.36	73.49	76.18	74.68	77.22	74.32	71.51	69.45	69.19	64.25	62.76	61.23
Others	5,955	7,383	6,280	10,662	18,267	9,454	5,819	7,851	2,992	1,116	—	—	—	—	—	—
% of total	48.41	45.22	27.21	25.57	13.01	7.30	4.92	6.65	1.95	0.81	0.00	0.00	0.00	0.00	0.00	0.00
Grand total	12,300	16,328	23,077	41,690	140,445	129,533	118,259	118,397	153,081	137,535	120,031	93,540	82,393	58,032	66,186	81,545

Source: Compiled from unpublished data from the Overseas Pakistanis Foundation.

Note: Data source had no entries for occupations and years represented by blank cells.

Table 4. Occupational distribution of Pakistanis and Filipinos in the Middle East, 1981 and 1987

Occupation	1981				1987			
	Pakistan		Philippines		Pakistan		Philippines	
	Number	%	Number	%	Number	%	Number	%
Professional	3,624	2.4	10,740	5.9	2,985	4.5	70,554	23.0
Administrative	2,567	1.7	1,560	0.9	588	0.9	1,227	0.4
Clerical	3,731	2.4	2,258	1.2	2,186	3.3	15,951	5.2
Sales	—	—	404	0.2	—	—	3,681	1.2
Services	17,497	11.4	28,822	15.7	13,321	20.1	72,088	23.5
Agriculture	4,455	2.9	1,157	0.6	5,568	8.4	2,147	0.7
Production and laborers	118,215	77.2	126,176	68.7	41,538	62.8	138,961	45.3
Entertainers	—	—	12,465	6.8	—	—	2,147	0.7
Others	2,992	2.0	—	—	—	—	—	—
Total	153,081	100.0	183,582	100.0	66,186	0.0	306,757	100.0

Source: Compiled from unpublished data from the International Labor Organization, Regional Office for Asia and the Pacific.

Note: Data source had no entries for occupations represented by blank cells.

were leaving the country without appropriate documentation declared that they were going abroad for purposes other than work.

Zar (1978) derived his estimate by adding annual flow data to a 1972 (stock) base of 689,000. The base figure came from information provided by Pakistani embassies and consulates abroad. The official annual outflow data used by Zar appears in the Pakistan Economic Survey. Except for the omission of unofficial (illegal) emigration, these outflow data are accurate; but the estimate does not account for return migration.

Moreover, Zar's estimate of the 1972 stock must be viewed with caution. The methodology underlying the estimates made by the Pakistani missions abroad appears to be unknown to Zar and others. If the Pakistani missions were privy to information on immigrants collected by labor-importing countries with efficient immigration and

emigration data collection and processing facilities, then estimates from those countries should be accurate. But several Middle Eastern governments are sensitive about revealing information on the number of nonnationals residing in their countries. This reticence has proved to be a problem for many researchers doing migration research on the Middle East.

Another reason for scepticism about the figures provided by the Pakistani missions is that some estimates may have been based on work permits issued and expired for a particular country. Such estimates would not include illegal workers, who, according to some analysts (e.g., Birks et al. 1988:270), represent a substantial proportion of the work force in some Middle Eastern countries. And in countries with inefficient procedures for collecting, processing, and reporting data on immigration and emigration—probably the majority—

estimates of the numbers of Pakistani workers could be little more than educated guesses.

The 1979 estimate of 1,120,000 from Gilani et al. (1981) is essentially an informed judgment based upon information provided by labor attachés in Middle Eastern countries. It is subject to the same criticisms as the estimate by Zar and would not include workers who were illegally residing in the Middle East.

The alternative stock estimate for 1979 of 1,790,000 by Gilani et al. (1981) was the first attempt to use household survey data to arrive at an estimate of the number of Pakistanis abroad. The estimate was part of a much larger study funded by the World Bank and has been advanced by the research team as being the first scientifically based estimate of Pakistanis abroad. The survey was done by the Pakistan Institute of Public Opinion (PIPO) in 175 locations throughout the coun-

Table 5. Estimates of stocks of Pakistani migrants abroad, various dates

Source of estimate	Estimated stock (millions)	Middle East ^a (millions)	Reference year	Evaluation
1. Pakistan, Ministry of Labour and Manpower, Bureau of Emigration and Overseas Employment (1980)	0.490	—	1971-79	Excludes pre-1977 migrants departing on visas obtained directly from country of immigration. Excludes undocumented workers. Does not account for returnees.
2. Abbasi and Javed (1980)	1.042	—	1977-78	Sample excluded emigrants using land and sea routes. Numbers and types of migrants enumerated during the survey period may not have been representative of emigrants during other periods of the year or past years. Did not distinguish between passengers departing for the first time and those departing after a temporary visit.
3. Zar (1978)	1.500	—	1978	Method adds estimated outflows for 1973-78 to a 1972 stock figure. Annual outflow figures do not account for clandestine or return migration. The 1972 stock figure is based on reports from Pakistani consulates and embassies abroad. The reliability of the 1972 stock estimate is unknown.
4. Gilani et al. (1981)	1.120	—	1979	Based on information provided by Pakistani consulates and embassies in countries of Pakistani immigration. Methods used and sources of information of the embassies and consulates is unknown.
5. Gilani et al. (1981)	1.790	1.246	1979	Uses household survey with sample frame adopted by Statistics Division for their labor force survey. Implicitly accounts for returnees and unofficial migrants. Estimate is sensitive to assumptions about average size of households.
6. 1981 population census (Pakistan, Census Organisation, 1981)	1.709*	1.113 ^b	1981	Based on a 10% sample. Omits persons residing outside the country for more than 10 years. (Figure for the Middle East is our own estimate and includes the pre-1972 stock of Pakistanis in the region.) Census estimate may overstate emigration to the extent that rural-to-urban migrants who become emigrants may be claimed as members of both their former rural households and their urban households.
7. ILO/ARTEP (1984)	2.462*	1.788	1982	Total stock figure based on 1981 census adjusted for pre-1972 stock plus official out-migration for 1982. Does not account for return migration in 1982. Because it is based on the census estimate, it suffers from the same weaknesses.
8. Pakistan, Manpower and Overseas Pakistanis Division (1983)	1.891	1.355 ^c	1982	Estimate provided by Pakistani embassies and consulates abroad. Information sources and methods unknown.
9. Pakistan, Manpower and Overseas Pakistanis Division (cited in ILO/ARTEP 1987, Vol. 6, pp. 4-6)	1.844	1.024 ^d	1985	Estimate provided by Pakistani embassies and consulates abroad. Information sources and methods unknown.
10. Ian J. Seccombe, Institute of Manpower Studies, University of Sussex (unpublished data); Birks et al. (1988)	—	0.771	1985	Based on official Middle Eastern sources. Would exclude undocumented immigrants, overstayers, and those using forged documents.

* Estimate includes both workers and their dependents.

a. Estimates for the Middle East are for workers only; i.e., they exclude dependents, who represent approximately 10.5 percent of the Pakistani population in the Middle East.

b. Adjusted for pre-1972 stock of workers in the Middle East, less estimated returnees from that stock.

c. Estimate based on the assumptions (made in various sources) that the proportion of the total stock of overseas Pakistanis in the Middle East is 80 percent and that the labor force participation rate of Pakistanis in the Middle East is 89.5 percent.

d. The Manpower Division's estimate for all Pakistanis in the Middle East in 1985 was 1,143,951. We multiplied this figure by 0.895, the assumed labor force participation rate of Pakistanis in the Middle East.

try and used a sample design based on that adopted by the Statistics Division of Pakistan's Federal Bureau of Statistics for its labor force surveys.

The 175 sample locations were divided into rural and urban categories according to definitions adopted by the Statistics Division. On the basis of two surveys, the first in October 1978 and the second in January 1979, PIPO estimates that 9.3 percent of rural households and 15.9 percent of urban households had at least one member working abroad. The next step entailed calculating the number of rural and urban households nationwide by using census estimates of the population in combination with estimates derived from survey data. Finally, the stock estimate was derived by multiplying the percentage of urban and rural sample households with migrants abroad by the average number of migrants per household and, in turn, multiplying this product by the estimated number of urban and rural households, respectively, and summing the two figures.

One merit of the survey technique for estimating stocks of Pakistanis abroad is that the problem of illegal emigration is overcome and returnees are accounted for implicitly. However, the estimate is sensitive to assumptions about household size. The larger the assumed household size, the fewer would be the estimated number of households and the lower would be the estimate of the stock of workers abroad.

Three estimates of household size are available. The Statistics Division's Household Economic and Demographic Survey estimated aver-

age household size in Pakistan to be 5.2 persons; the PIPO survey estimated it to be 7.8; and the International Migration Project, 8.5. Gilani et al. (1981) opted for the intermediate figure of 7.8. Unfortunately, available documentation does not indicate whether the PIPO estimate is based on interviews with migrant households, nonmigrant households, or some weighted average of both.

If it is based on interviews with migrant households, then the estimate of stocks abroad may be underestimated because, as evidence from several studies in Pakistan indicates, migration often results in the amalgamation of two households. It is common for the wife and children of the migrant to move in with the parents of the migrant during his sojourn abroad. Hence migrant households would, on average, be larger than nonmigrant households. The high figure of 8.5 for average household size reported by the International Migration Project is for migrant households and lends support to the hypothesis that international migration can result in household amalgamation. If one were to use the Statistics Division's low estimate of household size, then the stock estimate of Gilani et al. would be 55 percent greater, or 2,774,500.

Another estimate of stocks abroad is that of Pakistan's 1981 census. Besides enumerating the population, the census asked detailed questions of every tenth household. The questionnaire for this 10 percent sample included a question about the number of persons in the household who had migrated abroad during the last 10 years and were still living abroad at the time of the

census. Based on the reported information, a nationwide estimate of the stock of Pakistanis abroad was derived (Pakistan, Census Organisation, 1981:Table 22). Of the total (1,708,608), an estimated 1.2 million would have been in the Middle East; and of that 1.2 million, an estimated 1.075 million would have been in the work force.

A principal shortcoming of the census estimate is that it omits persons who had resided outside the country for more than 10 years at the time of the 1981 census. To compensate for this shortcoming, it is necessary to add the estimated stock of Pakistani workers who had moved to the Middle East before 1972 and were still residing there at the time of the census. Drawing upon information reported in Irfan et al. (1983:57), we estimate the pre-1972 stock to be around 38,000. Adding this to our previously adjusted 1981 census estimate, we arrive at a 1981 estimate of 1.113 million Pakistani workers in the Middle East.

On first inspection, it would appear that the census would provide the most accurate estimate of the number of Pakistanis abroad during 1981. We believe, however, that the census estimate is biased upward. Our reasoning is as follows.

A substantial redistribution of the Pakistani population from rural to urban areas occurred over the intercensal decade of 1972-81. During that period the urban population as a percentage of the total population increased from 25.4 percent to 28.3 percent, reflecting an increase of 7.25 million urbanites, of whom 5.19 million were migrants from rural areas (Pakistan, Census Organisation, 1981:78-79). Many rural

households thus experienced a loss of members to urban areas, where either new households were formed or the migrants joined established households of relatives or friends.

A portion of the internal migrants would have become international migrants. Those urban households with members abroad would have duly reported this fact at the time of the census. However, many rural households with absent members would have continued to consider the internal or international migrants to be part of their households, especially if they were receiving remittances from the overseas workers. We can infer from these assumptions that both double counting of migrants and overestimating the proportion of international migrants originating from rural areas occurred in the census.

The International Labor Organization's Asian Employment Programme (ARTEP, formerly Asian Regional Team for Employment Promotion) prepared a range estimate for 1982 of 1.680 to 2.462 million Pakistanis worldwide. It derived the high figure by adding official outflow data for 1982, amounting to 145,000 Pakistanis, to the census estimate adjusted for the pre-1972 stock abroad. The lower figure is the estimate provided by the Bureau of Emigration in 1979, adjusted for out-migration and return migration between that date and 1982. Because the higher figure is essentially based on the 1981 census estimate, it suffers from the same problems as the census estimate.

Estimates 8 and 9 of Table 5 were made by the Manpower and Overseas Pakistanis Division of the Ministry of Labour (unpublished data). The estimates are based on

information provided by Pakistani missions abroad, adjusted by annual outflows and estimates of returnees. As with Zar's estimate, they are only as reliable as the missions' information, which in turn depends on the reliability of information supplied to the missions by the governments of countries receiving Pakistani immigrants.

The last estimate in Table 5, that of Seccombe (who derived his estimate from the data underpinning the study by Birks et al. 1988), was based on information obtained from Middle Eastern government sources. For Bahrain, Kuwait, Libya, Qatar, and the United Arab Emirates, the sources were mid-1980s census information and detailed work permit data. Omani estimates were based on official work permit statistics, and Saudi estimates were based on multifarious sources. The total number of Pakistanis estimated for the seven countries was 720,000.

We have added to this figure our own estimate of the number of Pakistanis in Iraq, Jordan, Yemen, and other Middle Eastern countries to yield an adjusted total of 771,000, which is substantially less than the 1985 figure of 1.024 million estimated by the Manpower and Overseas Pakistanis Division.

Another exercise lends support to Seccombe's estimate of the stock of Pakistanis in the Gulf states. Using Middle Eastern sources, he estimated the stock of South Asians in the Gulf region at 2,214,600 in 1985 (see Birks et al. 1988:274). We have calculated Pakistan's share of that total at 708,672 on the basis of its share (32 percent) of annual South Asian emigration to the Gulf region through official channels during 1977-87. Seccombe's own estimate

of the number of Pakistanis in the Gulf states in 1985 is 709,950 (personal correspondence).

Seccombe's estimate may be too low because it does not include immigrants on visitors' visas who were working illegally, those overstaying their work visas, and those working with forged documents. Birks et al. (1988:270) reported that Saudi Arabia had deported nearly 300,000 nonnationals in 1986 for overstaying their visas or violating Saudi visa regulations. They projected the number of illegal entry cases investigated in Kuwait to reach 100,000 by 1987. In the United Arab Emirates 6,200 nonnationals were deported in 1986 for visa violations. Birks et al. estimated that by 1986-87 the number of illegal immigrants in the nonnational work forces of Gulf states was at least 7.5 percent of the total.

There is reason to believe that the extent of illegal worker emigration from Pakistan to the Middle East is much greater than either the Pakistani or the Middle Eastern governments realize.

Whatever their sources of information about their immigrant citizens, it is doubtful that Pakistani embassies and consulates would know the extent of illegal immigration by Pakistani citizens into the countries of the missions' accreditation. In short, illegal immigration to the Gulf states is undoubtedly widespread, but it cannot explain the large discrepancy between Sec-

(continued on page 24)

Economic Activity and Occupation in the Pacific Islands: Issues of Census Classification and Analysis

Classification of "work" and "economic activity" has been inadequate in many censuses and surveys, particularly those in developing countries. In the Pacific Islands, subsistence and certain kinds of cash activities are often overlooked, and this omission tends to make vulnerable groups, especially women, less visible to planners and politicians. Some progress has been made in incorporating nonwage and noncash activities into recent classification systems used in censuses. One of the purposes of the new International Classification of Occupations (ISCO-88) is to provide an improved system of classification for such activities. Still, the convention that a single "job" must be identified for each individual obscures much important information about some societies and their economies. Also needed in the Pacific are systems for providing more meaningful data collection and analysis on the relationship between individual and household activities.

by Wardlow Friesen

During the 1980s, precise definitions of "economic activity" and related concepts were adopted internationally for use in censuses and surveys, and a new International Standard Classification of Occupations (ISCO-88) was proposed. The new definitions and classification systems are designed to allow greater international data comparability,

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while recognizing the great variety of conditions existing among countries. The new ISCO standard has been adopted by some countries in the Pacific region (e.g., Australia and New Zealand), but it has not yet been fully adapted for use in the Pacific Islands.¹

1. In 1988 and 1989 expert groups on census design met to consider the adaptation of ISCO-88 for use in Pacific Island countries and to discuss the application of computer-assisted coding (CAC), especially in relation to the coding of occupation. These meetings, sponsored by the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) and the South Pacific Commission (SPC), made only preliminary recommendations (SPC 1990).

The new systems of classifications are not only of methodological interest to statisticians and census takers. Individual status is often linked to the description of occupation, and social and economic analyses are affected by the underlying assumptions and value judgments inherent in the classification systems used.

Assessment of these systems thus leads to wider considerations of such terms as "work," "economic activity," "labor force," and "occupation." How these terms are defined depends not only on cultural, economic, and political conditions within a society but also on the reasons for collecting information on these subjects. The challenge is to take such internal considerations into account, while achieving international comparability.

■ Who is "economically active"?

In many past censuses in the Pacific, only persons engaged in cash-related activities were enumerated as being "economically active." In labor force surveys, generally only those working for wages or salaries, employers, and self-employed individuals in the formal sector are

enumerated. Even when the labor force so defined is not called the "economically active" population, much macroeconomic analysis deals exclusively with this group, implying that it is the economically significant segment of the population. In many Pacific Island countries, however, this group makes up a minority of the adult population.

Traditionally censuses and surveys have considered only persons engaged in cash-related activities to be economically active. They have overlooked significant segments of the working adult population—especially in the Pacific, where such persons constitute a minority in some countries.

Debates on the meaning of "economic" have taken place in many academic disciplines, but perhaps the most relevant debate here is that between the formalists and the substantivists in economic anthropology. Formalists (e.g., Schneider 1974) hold to mainstream Western (non-Marxian) concepts of economics as the study of scarce resources, quantifiable choices, and monetary exchange. In contrast, substantivists (e.g., Dalton 1968) argue for a broader definition that relates the term "economic" to the provision of goods for biological and social needs, without implying any underlying assumptions about scarcity, choice, and exchange.

Another debate on the meaning on "economic" has arisen in relation to the position of women. Participants at numerous international

meetings have expressed concern about the lack of accurate information on the effects of development and socioeconomic change on Pacific women (Fleming 1987:1-3). One of the major issues has been the way in which work is defined:

The concepts of the labour force, of those who "work" or are "economically active", were developed for industrial economies and there are problems in applying these concepts to the subsistence sector. Under-reporting is especially true of employed rural women and urban women seeking work. (Fleming 1987:8)

The low rates of participation by Pacific women in the "labor force" as defined by generally accepted classification systems may discourage the analysis of available statistics of importance to women (Chilcott and Lucas 1985), and this makes women less visible to planners and politicians.

The international agencies that are concerned with international conventions and standards have been working on the issue of economic activity for several decades. The most influential of these is the International Conference of Labour Statisticians (ICLS), which meets every five years, with the support of the International Labour Office (ILO), to reconsider international statistical conventions. At the Thirteenth ICLS in 1982, the economically active population was defined as:

all persons of either sex who furnish the supply of labour for the production of economic goods and services as defined by the United Nations systems of national accounts and balances, during a

specified time period. According to these systems, the production of economic goods and services includes all production and processing of primary products, whether for the market, for barter or for own consumption, the production of all other goods and services for the market and, in the case of households which produce such goods and services for the market, the corresponding production for own consumption. (ICLS 1983:xi)

In addition, "fixed capital formation for own use" was included within the concept of economic activity. This includes construction of housing and other assets with an expected useful life of at least one year (Husmanns 1989:ix-x). The 1982 convention, which most statistical agencies now accept, is more inclusive than previous conventions on economic activity, but it still excludes certain activities. Among excluded activities are "non-primary production and service activities such as storage, transportation and sale of crops, cooking food, making, mending and washing clothes, [and] teaching own children . . . unless performed in conjunction with similar activities for the market" (Rao and Mehran 1984:ix). These exclusions are made to maintain consistency with the United Nations System of National Accounts (SNA).

Another issue in determining economic activity relates to the specified time period. Although some censuses have attempted to determine "usual occupation," the widely accepted standard is occupation "during the week prior to the census." Related to this definition is the minimum duration of participation

in an activity necessary for it to be enumerated. One hour has usually been the standard in this case.

From a feminist perspective the criteria of economic activity adopted by the SNA result in the exclusion of much of the work traditionally done by women, thus undervaluing that work (Waring 1988). More generally, the inclusion in the SNA of subsistence production of primary products may increase the visibility and status of nonmarket activities, but the predominance of the market criterion is still obvious. Nonprimary activities for one's own consumption are considered to be economic only when they are performed by individuals who also do these activities for the market. This is a difficult criterion to justify in the context of the Pacific Islands.

Recently broadened definitions of economic activity continue to exclude much work done by women and others who do not produce products for the market.

For example, a woman who sells cooked food in a local market is performing an economic task in cooking for her own household, whereas her neighbors, who do similar work, are not. Similar anomalies abound.

A strong case can be made for the adoption of the SNA criteria of economic activity to ensure international statistical compatibility and comparable analysis of employment and production statistics at various levels (Dupre et al. 1987). At the same time, the complex and inter-

related nature of market and non-market activities in Pacific and other Third World countries requires an on-going attempt to refine existing definitions so that more meaningful information can be gathered.

■ Pacific censuses and economic activity

The issues of definition and classification of "work" are relevant at several stages during the census process. First, the phrasing of the activity question in the questionnaire will set the boundaries of subsequent data manipulation. The quality and consistency of data collected depend on the precision of instructions given to enumerators and the degree to which they understand the concepts involved. At

the data entry stage, coding systems aggregate and impose consistency on the questionnaire categories; but if too much aggregation takes place at this stage, certain kinds of analysis may be preempted. Finally, at the stages of tabulation and analysis, a great deal of detail must be ignored in the interests of readability and generalization. Much of the time and expense devoted to classification at earlier stages is often made superfluous at this stage by oversimplified tables and analysis.

The collection and analysis of data on so-called economic and noneconomic activity has varied considerably between Pacific censuses over the last 15 years. Between 1976 and 1980, a full round of censuses was undertaken in the South Pacific, and they illustrate the variety of approaches taken



Small village market, Solomon Islands. Marketing is just one of the many activities of Pacific Islands women.

(Groenewegen 1979a, 1979b; Cho and Hearn 1984).²

In some cases (e.g., Solomon Islands, 1976) only persons who "worked to earn money" were enumerated. In the French territories (New Caledonia, 1976; Wallis and Futuna, 1976; French Polynesia, 1977) the census questionnaires tried to elicit information on non-cash activities by asking whether an individual was working by helping a family member or other person in his or her job (with or without pay) and to identify the institutional nature of this activity, but they did not allow a clear distinction to be made as to whether independent farmers were working for subsistence, cash, or both. In the 1976 Fiji questionnaire, individuals were asked simply whether they had been "working last week," and the enumerators' manual elaborated upon that question by stating "by 'worked' we mean any activity concerned with providing the necessities of life for the person or his family or his household."

Other censuses also incorporated subsistence activities by mentioning them in their instructions to enumerators rather than explicitly including them in the questionnaires. For example, the 1976 Tongan census used this approach, although it was unusual in asking for both "principal" and "subsidiary" occupations, which increased

the likelihood of subsistence activities being enumerated.

Some censuses of the late 1970s round explicitly elicited information on subsistence. Western Samoa's 1976 census questionnaire included "working to grow, gather, or catch food to eat (not for sale)" as one of 10 (supposedly) mutually exclusive categories of activity. The 1979 Vanuatu census questionnaire asked about participation in the specific village activities of copra and cocoa production, livestock rearing, and gardening. It also enumerated "principal occupation," with this to be coded according to the ISCO.³

The 1980 Papua New Guinea census listed 10 discrete activity categories in its questionnaire, including "farming or fishing, subsistence only" and "farming or fishing for food or money." The potential difficulty of precoding categories in this way was illustrated by the 1979 Tuvalu census. It contained 12 precoded choices, including "village life" and "home duties," but these were not mutually exclusive and the meaning of some categories was not clear to the enumerators (Bertram 1980:85).

Despite the increased international attention to the issue of work classification in the 1980s, little change is apparent in approaches taken to work activity in Pacific Island censuses throughout the decade. Essentially the same questions and categories used in earlier cen-

suses were used in Fiji (1986), Papua New Guinea (1990), and the French territories. In other countries, minor changes included the adoption of the "discrete categories" approach taken by Tonga in 1986 and a move in the opposite direction by Western Samoa (1981) and Kiribati (1985) in favor of more open, enumerator-sensitive questions.

A few Pacific census organizations changed their approach during the 1980s and tried to create more meaningful classifications of economic activity and occupation. The 1986 census of the Solomon Islands broadened the scope of work-related questions from the census held 10 years earlier. The first question asked if a person did any work for money and, if so, for how many days during the preceding week. Another question asked if the person had done any "village work," and enumerators were instructed to include in this category such activities as gardening, food collecting, fishing, preparations for village ceremonies, maintenance of village tracks, construction of a church building or water supply, and mission work.

In combination with a further question on employment status (whether the person was an employer, self-employed, wage earner, or other) the following categories of workers were used in the census analysis: (1) village workers only, (2) self-employed and village workers, (3) self-employed only, (4) wage and village workers, and (5) wage workers only (Friesen 1989b). These groups had distinctive demographic and socioeconomic characteristics, and analyses not previously possible at the national level were carried out.

2. The many published census volumes of the Pacific countries mentioned in the text were consulted during preparation of this article but are not referenced here. Country names and dates in the text refer to the censuses of those countries in particular years, not to publication dates. Unpublished materials were also used, in particular enumerator manuals and the questionnaires of recent censuses.

3. Much of the usefulness of Vanuatu's approach was lost in the basic tabulations, which showed that 86.9 percent of males and 79.9 percent of females were "economically active" and then presented a breakdown for each sex by major ISCO groups, without distinguishing between subsistence, cash, and wage activities.

Nevertheless, some issues of classification remained unresolved in the 1986 Solomon Islands census. Many women were considered to be economically active because of their substantial involvement in gardening, but many others who had done "home duties" in the week preceding the census were excluded from this category because they had not taken part in activities classified as "village work." Users of the data also had difficulty in interpreting the meaning of "self-employed" because this description could apply to a financial consultant to a large corporation, to a villager producing small amounts of copra, and to many types of self-employed persons in between.

One of the more elaborate questionnaires on economic activity was used for the 1989 Vanuatu census. It contained a series of questions layered as follows to elicit information on work: (1) usual work (*wok yu stap mekem oltaem*) in broad categories such as pay or salary, subsistence, and housework; (2) whether or not one had worked in the last seven days and, if not, the reason; (3) main work in the last seven days; (4) number of days worked; (5) employment status; (6) work in gardening, fishing, or similar activity; (7) whether products had been sold; (8) if in paid employment, name of company or government department; (9) nature of business; and (10) place of work. These questions allowed information to be gathered on both cash and subsistence activities for each individual, but the first question on usual work required a single answer and therefore may have encouraged the idea that this category was more important than the others.

The discussion thus far has dealt with collection of data at the enumeration stage, and with the implications of data collection for classification and analysis at later stages in the census process. The potential for analysis depends not only on initial questions and classifications, but also on how well enumerators are trained and the quality of enumeration instructions. As already mentioned, some questionnaires with open-ended questions on activity rely on precise classification systems contained in enumeration manuals. In other cases, greater reliance is placed on self-explanatory questionnaires or the interpretive skills of enumerators.

At the coding, editing, tabulation, and analysis stages of a census, the use of a clear and consistent classification system is essential. The 1988 International Standard Classification of Occupations proposes such a standard.

At the coding, editing, tabulation, and analysis stages of the census, the use of a clear and consistent classification system is essential, and that is the purpose of the proposed ISCO standard. The standard is important from the coding stage onward, but it may also contribute to greater consistency at earlier stages of data collection.

■ What is ISCO-88?

Several years' work on classifying occupations by the International Conference on Labour Statisticians

(ICLS) resulted in the adoption of the first International Standard Classification of Occupations in 1958. Ten years later ISCO-68 was adopted with an expanded number of occupational descriptions, and this was the standard used by statistical and census agencies for 20 years, until ISCO-88 was proposed. Although continuity with ISCO-68 was an important criterion in the design of ISCO-88, there are significant differences (ILO 1987).

The basis of the ISCO-88 classification is skill level and skill specialization. The skill level of an occupation is determined by the complexity and range of tasks involved. Use of the International Standard Classification of Education (ISCED) is recommended specifically for the establishment of four levels of skill. To overcome the diversity of institutional arrangements for education among countries, ISCED is based on the period of formal education undertaken by an individual. The ICLS also recognized that skills are acquired through informal training and experience; but as these are difficult to compare internationally, informal education is one area where modifications and elaborations need to be done at the national level.

Skill specialization of an occupation relates to the field of knowledge required, the tools and equipment used, the materials worked with, and the goods or services produced. If skill specialization is used as a secondary criterion, there is some overlap with the International Standard Industrial Classification (ISIC), used to define economic (industrial) sectors. According to the ILO (1987:10), however, "This is not because ISCO



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is using industry as a classification criterion, but because skills are linked to products, materials, etc., which are also important determinants of industry."

ISCO-88 has five levels of aggregation: major, submajor, minor, unit, and occupation groups. It was decided that for purposes of basic analysis, statisticians would need to maintain about 10 categories at the highest level of aggregation, as was the case in ISCO-68. At the major level, therefore, changes from the previous standard do not appear to be great (Table 1), although several should be mentioned.

One is the separation of military occupations from others. This change was controversial because it does not follow the principles of classification related to skill levels, but was accepted because some governments are reluctant to make public detailed information about their military personnel (ILO 1987:14). The other major group that is not based primarily on the criterion of skill level is group 1, consisting of legislators, administrators, and managers. The reason is that for this group, other qualities, such as inherited status, *mana*, charisma, luck, or entrepreneurship, are considered to be more important than skill.

Another important change is the distinction made between group 7 (craft and related workers) and group 8 (plant and machine operators and assemblers). Although workers in each group may produce similar products, the former require "an understanding of and experience with the natural resources and raw materials worked with," whereas the latter require "sufficient knowledge of the machines to

(Above) Traditional house construction, Choiseul, Solomon Islands. (Below) Welding for ship construction, Tulagi, Solomon Islands. Is one of these jobs more "skilled" than the other?

ensure that they work properly" (ILO 1987:10). This classification thus allows a distinction to be made, for example, between skilled traditional craftspeople, and workers who produce crafts but whose skills are mainly machine-oriented. Craftspeople may also work with machines, but the range of their skills is broader.

The submajor level is new to ISCO-88 and allows a division of the labor force into 25 groups. This level is expected to be used widely for national tabulations and analysis, since analysis with this number of groups is manageable but allows much more detail than is possible with the 10 major groups. Below the submajor level are 94 minor groups and 329 unit groups (the latter representing an expansion from 286 unit groups in ISCO-86). An example of this grouping hierarchy is shown in Table 2.

Another important change in ISCO-88 is that it does not suggest a classification of occupations, unlike ISCO-68. Instead, it provides guidelines to aid individual countries in classifying the occupations that are most appropriate. Of course, even within ISCO-68 many countries had devised their own classifications at this level, using the recommended categories as guides. One of the primary purposes of ISCO is international comparison, and past experience has shown that comparisons are rarely done at the most detailed levels of classification.

■ Applying ISCO-88 in the Pacific

One of the purposes of the ISCO revision is to permit the classification of workers who are not work-

Table 1. Major occupational groups in ISCO-68 and ISCO-88

ISCO-68		ISCO-88	
Group no.	Title	Group no.	Title
0-1	Professionals and technical workers	1	Legislators, senior officials, and managers
2	Administrators and managers	2	Professionals
3	Clerical workers	3	Technicians and associate professionals
4	Sales workers	4	Clerks
5	Service workers	5	Service workers and shop and market sales workers
6	Agricultural, forestry, and fishery workers	6	Skilled agricultural and fishery workers
7-9	Production and related workers	7	Craft and related workers
		8	Plant and machine operators and assemblers
		9	Elementary occupations
		0	Military operations personnel

Note: The description of these groups may vary slightly in the standards adopted in individual countries.

Table 2. Example of occupational group levels in ISCO-88

Group level	No.	Title
Major	6	Skilled agricultural and fishery workers
Submajor	61	Market-oriented skilled agricultural and fishery workers
Minor	611	Market gardeners and crop growers
Unit	6111	Field crop and vegetable growers
	6112	Tree and shrub crop growers
	6113	Gardeners, horticultural and nursery growers
	6114	Mixed crop growers
Minor	612	Market-oriented animal producers
	.	
	.	
Submajor	62	Subsistence agricultural and fishery workers

Note: This example is only one version of the suggested classifications for ISCO-88.

ing for wages and in some cases are not working for any cash income. Especially relevant for this purpose is major group 6, consisting of "skilled agricultural and fishery workers," including both those working in the cash (or market) economy and those practising subsistence. The lower levels of classification in this group are of special interest in the Pacific Islands because of the high proportions of people in most Pacific Island countries who work outside the cash economy, and particularly outside the wage sector.

The initial breakdown of group 6 suggested by the ILO had all subsistence workers in a single submajor group, but without any further breakdown (as in Table 2). An alternative possibility is to base the submajor grouping on broad agricultural system types, namely gatherers, hunters and fisherpersons, animal producers, crop growers, and forestry workers.

Below this level, classifications might be related to the subsistence/cash/wage distinction (although this distinction may be determined partly by a question on employment status) and to the most important products produced in the Pacific. For example, within the submajor group of crop growers, distinctions among subsistence, cash, and wage incomes could be specified at the minor group level, and work with particular crop types (coconut, coffee, cocoa, etc.) could be classified at the unit level.

Even if the classification system is sensitive to the conditions prevailing in a region or nation, problems remain in applying ISCO-88 as recommended to Third World situations. One problem is the concept

Table 3. The simplified "work" activities of two married Solomon Islanders

Activity	Hours spent in activity during a six-day week (Monday through Saturday)	
	Woman	Man
Food gardening	16	8
Home duties	14	3
Copra production	1	16
Fishing	3	10
Community work	4	7
Weaving mats	8	0

Source: Friesen (1986).

of "job," which is the basis of determining "occupation." For ISCO-88 a job is defined as "a set of tasks performed or designed to be performed by one individual" and an occupation is "a set of jobs which involve the performance of a common set of tasks" (ILO 1987:7). But how much variation can this set of tasks have? And what about tasks that are performed by groups of people, rather than individuals?

ISCO-88's definition of a job as a set of tasks performed by an individual may not be appropriate to settings, such as the Pacific, where many tasks are performed by groups of people.

Priority rules have been proposed to determine the classification of jobs. When a number of tasks are performed, classification of the primary occupation is determined by (1) the task that requires the highest level of skill and (2) the task

that is most directly related to the production process rather than to sales, transport, etc. (ILO 1987:11).

According to the first criterion, one hour of work in a week as a teacher, builder, or first-aid assistant would take priority over 40 hours of work as a cocoa producer. The second criterion is less problematic because its application is similar in subsistence, cash, and wage situations. For example, the cocoa producer may also keep his or her own accounts and transport the finished product to market, but will still be classified as a cocoa producer.

To see how classifications might be applied in practice, let us consider the "work" activities over a week of two typical Solomon Islanders, shown in Table 3.

The woman works in the garden more than she engages in any single other activity, so that perhaps she is a "subsistence farmer." However, a census enumerator is just as likely to consider her as a "homeworker" or equivalent because her food

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News and Announcements

India Prepares for 1991 Census

With 1 March as the reference date of the 1991 census, Indian census officials are gearing up for the biggest census operation in India's history. The sheer size of the nation's population, estimated to be in excess of 853 million, poses a formidable challenge to the Office of the Registrar General and Census Commissioner of India (RGI), which is charged with planning and conducting the census.

During meetings with staff members of the East-West Population Institute, Mr. A. R. Nanda, India's registrar general and census commissioner, reported recently that the size of the Indian population is



SANDRA WARD

A. R. Nanda became registrar general and census commissioner of India in September 1989, after holding various posts in the State Government of Orissa, including the position of permanent secretary of Housing, Urban Development, Mining and Planning.

only one reason why conducting the census is such a mammoth undertaking. Despite rapid urbanization, India still has some 600,000 villages, in which approximately 74 percent of the country's population lives. Before the population count can be taken, a listing of all housing units must be compiled and detailed maps drawn showing their location, the census questionnaire must be pretested, and 1.6 million enumerators must be hired and trained. To handle this formidable enterprise, the Indian government relies upon a census organization that functions at national, state, and district levels.

Mr. Nanda reported that Indian census officials began preparations for the 1991 census in 1987 by updating lists of villages and preparing maps of districts and towns. In 1988 and 1989 questionnaires were drafted and pretested in selected enumeration blocks, first by census personnel and then by village officials and school teachers acting as supervisors and enumerators. In designing the questionnaires, the government consulted a wide range of potential data users, both national and international.

The 1991 census will use three main questionnaires—the houselist already mentioned, a household schedule, and an individual schedule. In addition, an enterprise list was completed as part of an economic census, to be processed by the Central Statistical Organisation. A special survey of postgraduate degree holders and technical personnel is planned during the main enumeration in 1991 on behalf of

the Council of Scientific and Industrial Research.

The houselisting operation. Information collected during the houselisting operation, begun in April 1990 and due to be completed in September 1990, will be used to delineate enumerator blocks for the population census. The operation is also collecting information about individual dwellings, such as their uses, ownership, the identity of household heads, and physical characteristics of the homes.

Information on household amenities (e.g., sources of drinking water, availability of electricity and plumbing) was gathered during the population census in 1981 but was transferred to the houselisting operation for the 1991 census to enable the RGI to issue tabulations on housing conditions earlier than in the past.

The population and household enumerations. The population enumeration will take place between 9 February and 5 March 1991. The houseless population will be enumerated on the night of 28 February.

The schedule for individuals contains 22 basic questions. Topics include relationship to household head, age, sex, literacy and educational attainment, whether attending school or college, religion, mother tongue and two other languages known, whether the individual is a member of a scheduled caste or scheduled tribe, employment status and economic activity, migration history, marital status, and, for women, age at marriage, the number of children ever born,

number born during the previous 12 months, and number surviving. The questionnaire does not ask about income.

Persons seeking work will be asked if they have ever worked before. Answers to this new question are expected to reveal the number of persons who are labor market entrants. Instructions to enumerators will include examples of economic activities commonly associated with women, whose economic contribution to Indian families is known to be underreported. To remind enumerators to record unpaid economic activities of family workers, particularly of female workers, the question on economic activity specifically mentions "unpaid work on farm or in family enterprise" for the first time.

A household schedule will also be completed for every household. The purpose of this questionnaire is twofold: to enable the RGI to issue the provisional results of the census quickly, and to permit the manual generation of a primary census abstract covering the entire population that presents, for each village and urban ward, data on population size, number of literates, scheduled castes and tribes, workers (classified by nine industrial categories), marginal workers, and nonworkers.

The census will be a combination of *de jure* and *de facto* enumeration. Household members will be defined as those who normally live together and take their meals from a common kitchen. Those who are away from their usual residence during 9–28 February will be counted at their *de facto* residence.

Each enumerator will canvas 120–150 families. Most of the enumerators will be school teachers.

The enumeration will be done during 9–28 February and followed by a revisional round during 1–5 March.

During the enumeration, enumerators will copy some of the information obtained from completed household schedules onto the individual questionnaires and some of the answers to the individual questions onto the household schedules.

The RGI aims to release provisional results of the census in late March 1991. Those results will consist of population figures for the country, states, and union territories, classified by sex and literacy. They will be followed by provisional reports at the all-India level on the rural–urban population distribution and on main workers, marginal workers, and nonworkers in the population.

Indonesian Fertility Is Down, Contraceptive Use Up

According to a recent large-scale, detailed study of fertility and contraceptive use in Indonesia, the total fertility rate among Indonesian women fell from 5.1 children during 1971–75 to 3.4 during 1982–87. In Java and Bali fertility dropped by almost 30 percent, from a rate of 4.2 in 1976 to 3.0 during 1984–87. Increased use of contraception is a major factor in the fertility decline. The survey found 48 percent of currently married women are using a contraceptive method, and among that group 92 percent are using modern methods—mostly the pill, the IUD, and injection.

These are some of the results of the National Indonesia Contraceptive Prevalence Survey (NICPS), a

collaborative effort of the National Family Planning Coordinating Board, the Central Bureau of Statistics, and the U.S.-based Institute for Resource Development, with financial support from the U.S. Agency for International Development and the United Nations Population Fund. Conducted in late 1987, the survey included 11,884 ever-married women of ages 15–49 in 20 of Indonesia's 27 provinces, representing 93 percent of the nation's population.

The CICPS found that contraceptive use is more prevalent among urban and better-educated women than others and is especially high in Java, particularly Bali, where 70 percent are practicing contraception. During the 11 years between the 1976 Indonesia Fertility Survey and the NICPS, contraceptive use doubled, from 26 to 51 percent of currently married women.

Nevertheless, the newer survey found that 41 percent of married women are still in need of family planning. These are women who are not using contraception and either do not want another birth or want to delay their next birth for at least two years. Only about one-fifth of women 30 or older are using a long-term method.

The Indonesian survey is one of 59 population and health surveys being conducted in developing countries over a nine-year period with technical support from the Demographic and Health Surveys (DHS) Program of the Institute for Resource Development/Macro Systems, Inc., in Columbia, Maryland, and financial support from the Agency for International Development. Many of the surveys use standard DHS questionnaires and

procedures to collect comparable data on fertility, family planning, and health. The remaining in-depth surveys will focus on particular topics and employ specially designed survey instruments and procedures.

To date 37 of the surveys have been completed. Besides Indonesia, the Asian countries have included Sri Lanka and Thailand, both surveyed in 1987.

Reports and Data Files Are Available on Demographic and Health Surveys

Various publications describing the Demographic and Health Surveys (see news item above) are available from the Institute for Resource Development, regional depositories, and selected libraries.

The Institute for Resource Development (IRD) issues the **DHS Newsletter** twice a year, which provides information on the current status of DHS surveys. **Summary Reports** are prepared for most surveys with the assistance of the Population Reference Bureau in Washington, D.C. Published in the language of the country surveyed, they are designed for use by policymakers and planners. To date, Summary Reports have been issued on the DHS surveys in Botswana, Brazil, Ecuador, Ghana, Guatemala, Indonesia, Kenya, Liberia, Mali, Mexico, Morocco, Nepal, Peru, Senegal, Sri Lanka, Togo, Trinidad and Tobago, Tunisia, Uganda, and Zimbabwe.

Final Reports on the surveys are published about one year after completion of the field work and provide detailed summaries of the results. Final Reports have been is-

sued for the three completed surveys in Asia.

Basic Documentation of the DHS survey methodology is described in the **DHS Basic Documentation Series**. Key findings from the Final Reports are summarized in **tables and graphs** published in the journal *Studies in Family Planning*, published by the Population Council in New York City. IRD and the Population Council are also publishing **Further Analysis Reports** on the surveys.

To request a list of DHS publications or be placed on the mailing list of the DHS Newsletter, write to Sidney Moore, Editor, IRD/Macro, 8850 Stanford Boulevard, Suite 4000, Columbia, MD 21045, U.S.A.

Data files for DHS surveys are also available to researchers upon publication of the surveys' final reports. The files can be obtained in three formats: flat files, rectangular files, and hierarchical files. Owing to the large size of the survey data sets (an average of 10 megabytes), Bernoulli cartridges are the primary medium supported for microcomputer users, but files are also available on diskette or tape. All DHS data files are distributed with questionnaires, machine-readable data file descriptions, and associated documentation.

Cost of each data set is US \$200. For institutions in developing countries and researchers from those countries, the cost is \$50. A DHS Data Request Form must be completed and returned with a description of the proposed analysis. For more information, write to DHS Data Archive, IRD/Macro, 8850 Stanford Boulevard, Suite 4000, Columbia, MD 21045, U.S.A. (Telephone 301 390-2977).

Training Opportunities

The following programs in demography and population-related subjects are being offered in 1991. Persons interested in applying should write to the sponsoring institutions for more information.

Committee on Demographic Training, University of Chicago, postdoctoral fellowships, 1991-92.

Two fellowships are available to U.S. citizens and resident aliens, and one is available to candidates from developing countries who plan to pursue professional careers in their home countries after completing their training. Deadline for applications: 15 February 1991. Applications should include a curriculum vitae, three-page description of research to be undertaken, one-page statement of how postdoctoral training would complement prior training and skills in demography, one research paper, and names and addresses of two references from whom the applicant has requested letters of recommendation. Address applications to: Chair, Committee on Demographic Training, Population Research Center, University of Chicago, 1155 E. 60th Street, Chicago, IL 60637, U.S.A.

Graduate Group in Demography, University of California, Berkeley.

This program offers M.A. and Ph.D. degrees in demography. All applicants are eligible for financial aid; special resources are available for the support of students from developing countries or committed to studying developing-world demography. New entrants are

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Reviews and Publication Notes

Demographic and Programmatic Consequences of Contraceptive Innovations edited by Sheldon J. Segal, Amy O. Tsui, and Susan M. Rogers. New York: Plenum Press. xx, 318 pp. ISBN 0-306-43384-2, US \$69.50. Available from Plenum Press, 233 Spring Street, New York, NY 10013, U.S.A.

What are some of the contraceptive methods currently being developed? What would be the effect of using these new methods in developed countries, many of which have already achieved replacement fertility, and in developing countries, where fertility is much higher? What are the health implications of the new methods and, finally, what resources will be needed to deliver them to developing countries in future decades?

These are some of the questions addressed by *Demographic and Programmatic Consequences of Contraceptive Innovations*, which contains papers originally presented at a Conference on Demographic and Programmatic Consequences of Contraceptive Innovations, in Washington, D.C., October 1988. Sponsored by the Committee on Population of the National Academy of Sciences, the conference brought together 24 experts from the fields of reproductive technology and family planning program administration to present the papers and 15 other experts from the population community to comment on them. The conference focused first on the new contraceptives themselves and then on their introduction and dissemination, placing chief emphasis on the rising costs and manpower needs of family planning services.

The volume has five sections. Part I contains a chapter on the new contraceptive technology by Sheldon J. Segal and a historical perspective on the introduction of contraceptives by W. Parker Mauldin and John A. Ross. In Part II Charles F. Westoff, Lorenzo Moreno, and Noreen Goldman each discuss the demographic effects of changes in contraceptive practice in developing countries and William R. Grady and John O. G. Billy, John Townsend, and Susan Philliber review the demographic, programmatic, and psychosocial factors affecting contraceptive usefulness.

In part III Mahmoud F. Fatalla describes the potential effects of the new contraceptives on reproductive health, and Jacqueline Darroch Forrest and Stanley K. Henshaw examine how the new methods will affect abortion. Part IV, on the introduction of new contraceptives, contains articles by Joanne Spicandler on Norplant and James F. Phillips et al. on the use of depot-medroxy progesterone acetate services in rural Bangladesh.

Part V, the concluding section, is concerned with the resources needed to introduce the new contraceptive technologies to developing countries. Jacqueline Sherris and Gordon W. Perkin discuss the administrative and manpower needs of family planning programs. Duff G. Gillespie and associates from the U.S. Agency for International Development describe the challenge of financing the delivery programs. They estimate that the total cost of providing these services to developing countries by the year 2010 will

amount to \$9 billion annually, or three times the amount currently invested. If this goal is to be met, resources must increase by \$250 million each year. Unless cheaper contraceptives are found, the program effort will be staggering.

Where will the money come from to pay for these services? Gillespie et al. suggest that donors cannot subsidize the increasing costs, and therefore local governments and the private sector will need to pay more. Stimulating new sources of investment, concentrating on activities that multiply investments, improving the efficacy of family planning programs, and improving contraceptive technology and delivery systems will help to contain costs.

An appendix describes the methods of fertility regulation likely to be available within the next 10 to 15 years. Each chapter contains a list of references.

This volume should be of special interest to family planning specialists, program administrators and personnel, and development planners. It is highly recommended for collections in the population field.

—Alice D. Harris

International Handbook on Internal Migration edited by Charles Nam, William J. Serow, and David F. Sly. New York: Greenwood Press, 1990. xv, 438 pp. ISBN 0-313-25858-9 (cloth), US \$75. Available from Greenwood Press, 88 Post Road West, Westport, CT 06881, U.S.A.

The governments attending the 1974 World Population Conference

in Bucharest evinced as much concern about the problems and issues of population movement within their countries as they did about population growth per se. In the ensuing years there has been a steady accumulation of migration literature on such topics as circulation, transmigration, urban agglomeration, rural-to-urban migration, and rural development in both developed and developing countries. Geographers, economists, psychologists, and urban planners have joined demographers and sociologists in producing studies on migration.

Useful as this body of literature has become, however, the editors of the *International Handbook on Internal Migration* believe it has lacked "a broad review of the state of migration, knowledge and research in particular countries," one that would describe the types of data available for migration analysis on a country-by-country basis, show migration trends and patterns in a large number of countries classified by region, and examine the specific causes and consequences of mobility within individual countries (p. 2).

The present volume attempts to remedy this situation. It contains 21 case studies of internal migration from countries in both developed and developing regions. To facilitate comparison among the countries selected for study, a common outline is used, covering six topics: the collection of migration data, principal population movements within the country, who are the movers, the consequences of migration at the aggregate level, why people move, and the consequences of migration at the individual level.

An introductory chapter by the editors discusses the six topics in greater detail. Each chapter includes a selected bibliography, and the volume concludes with a general migration bibliography and an index. All the studies are concise and well written, and each contains useful information not found elsewhere.

Although this is an excellent book, two minor problems with its organization may confuse the reader. First is the title itself. "International" implies more than 21 countries, and "Handbook" implies a more formalized, tabular presentation of data for ready reference. It is disappointing not to find the wealth of information contained in the individual case studies developed into country-by-country tables for comparison, although the editors state that they have chosen instead to emphasize "the range of observations that can be made from country case studies" (p. 5).

Of course, it is possible for the reader to draw such comparisons from the chapters. For example, Alice and Sidney Goldstein rely on household registration as the primary data source for their study of China, whereas Mahendra K. Premi cites the value of India's decennial censuses for migration analysis. Readers will find numerous ways to make the data presented relevant to their own research.

Because this volume covers internal migration only, the publication of a second volume on international migration will be welcome. Despite the high price of the *International Handbook on Internal Migration*, it is recommended for population collections and large academic libraries.

—Alice D. Harris

ALSO NOTED

World Population Monitoring, 1989. New York: Population Division, United Nations Department of International Economic and Social Affairs, 1989. Sales No. E.89.XIII.12, US \$28.50. Available from Sales Section, United Nations, New York, NY 10017, U.S.A.

According to this report, the number of governments of least developed countries (LDCs) now acknowledging that their population growth rates are too high more than doubled between 1974 and 1988, from 25 to 54 percent, and the percentage of such governments considering their population growth rates to be satisfactory fell from 68 to 39 percent. The report points out that the 41 LDCs were characterized in 1989 by high levels of mortality and fertility and very low levels of industrialization, literacy, and contraceptive use.

The report documents a widening gap in fertility levels between the LDCs and other developing countries. In the latter group of countries, aggregate fertility declined steadily from 5.9 children per woman during 1965–70 to 4.0 over the 1980–85 period. But in the 41 LDCs, average total fertility has remained at 6.5 children for the past two decades. One encouraging sign: nearly all LDC governments now support family planning activities either directly or indirectly.

Monthly Product Announcement. Monthly newsletter published by the U.S. Bureau of the Census. Free. Available from Customer Services, Data Users Service Division, U.S. Bureau of the Census, Washington, D.C. 20233, U.S.A. (Telephone 301 763-4100).

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Counting Pakistanis . . .

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combe's estimate and the estimates coming out of Pakistan.

As we show in the next section, there is reason to believe that the extent of illegal worker emigration from Pakistan to the Middle East is much greater than either the Pakistani or the Middle Eastern governments realize.

■ An alternative measure of stocks abroad

Each of the stock estimates considered thus far has serious shortcomings. Even the 1981 census estimate, which should be the most reliable, has problems. An alternative method of calculating stocks abroad exists, however, that relies on official information on the annual emigration of workers, their occupational distribution, and their length of stay abroad.

During the month of November in both 1986 and 1987 the Overseas Pakistanis Foundation, a quasi-governmental organization, conducted interviews with all Pakistani workers returning from abroad. The interviews took place at all international airports in Pakistan; seaports were not covered, but the number of persons returning by sea was considered to be negligible.

Persons who had been working abroad were asked whether their return was for a visit or as a result of the expiration of their contract. They were also asked where they were returning from, what their occupation had been while working abroad, and how long they had been working abroad. The number of workers returning in November

of both years because their contracts had expired was 12,302. Those persons were called "permanent returnees," although some of them may have later emigrated again with new contracts.

Table 6, which cross-tabulates broad occupational groupings by length of stay abroad, indicates that the average period abroad for all occupations was 5.61 years, that ad-

ministrative workers stayed abroad longest on average (8.91 years), and that agricultural workers were abroad the shortest average period of all occupational groups except "others" (4.35 years). Professionals spent an average of 7.11 years abroad.

Drawing upon the information in Table 3 on the annual outflow of Pakistanis and upon the information

Table 6. Permanent returnees, by major occupational group and length of stay abroad

Number of years abroad ^a	Profes- sional	Admin- istra- tive	Cler- ical	Service	Agri- cul- tural	Produc- tion and labor	Others
<1	29	9	8	185	60	633	69
1-2	44	9	24	280	95	1,087	90
2-3	52	16	27	360	109	1,367	69
3-4	35	11	26	244	72	873	79
4-5	34	4	16	174	48	863	51
5-6	47	14	28	144	29	620	50
6-7	33	17	25	189	56	550	60
7-8	25	15	30	142	20	350	12
8-9	25	28	13	144	16	404	14
9-10	10	13	19	104	10	318	11
10-11	13	7	14	58	13	169	10
11-12	8	8	11	25	2	78	6
12-13	9	5	12	30	5	64	6
13-14	1	14	4	10	0	21	5
14-15	1	0	1	7	1	15	3
15+	61	29	27	203	16	551	8
Not specified	1	0	1	0	1	8	1
Total ^b	428	199	286	2,319	555	7,971	544
Average stay (years) ^c	7.11	8.91	7.47	6.02	4.35	5.44	4.31

Source: Compiled and calculated from unpublished data from the Overseas Pakistanis Foundation.

a. For intervals denoting length of stay abroad, "1-2 years" means at least one year but less than two years, and so forth.

b. Grand total = 12,302.

c. Average stay for all occupations combined = 5.61 years.

in Table 6 on the number of returnees by length of stay abroad, we have estimated the stock of Pakistanis in the Middle East for the years 1985-88 (Table 7).² According to our calculations, out of 1.449 million Pakistanis who went to the region between 1973 and 1988, 540,966, or 37.3 percent, remained at the end of the period.

The annual stock totals in column 2 of Table 8 reflect an adjustment of the data for pre-1973 emigration. The totals in column 3 of Table 8 also include an adjustment for clandestine emigration. Our 1985 adjusted estimate of 1.195 million (column 3) is higher than the estimates for the same year reported by the Manpower and Overseas Pakistanis Division and by Seccombe in Table 5. Several factors merit consideration before we compare the various estimates.

First, our estimate is based on placement figures going back to 1973. Although it ignores workers who went abroad before that time, the numbers going to the Middle East prior to 1973 was quite small. (As we have already noted, Sarmad 1985:6 reported the number of Pakistani workers in the Middle East in 1982 to be 40,000.) Of course, a substantial number of the pre-1972 migrants would have returned to Pakistan by 1985. Irfan et al. (1983:58) assumed that 4.5 percent of the 1972 stock had returned by 1981 but gave no reason for assuming such a low rate of return. If we assume that for each year after 1972, 5 percent of the remaining 1972 stock of workers returned,

2. A discussion of the methodology underlying these estimates is available from the authors upon request.

Table 7. **Stock of Pakistanis in the Middle East, by broad occupational category, 1985-88**

Occupation	1985	1986	1987	1988
Professional	19,862	19,970	20,350	21,176
Administrative	10,629	10,449	9,705	9,496
Clerical	21,444	21,380	21,851	22,429
Service	88,643	90,393	92,974	96,923
Agriculture	7,782	6,492	6,568	7,069
Production	396,799	382,206	376,354	380,447
Others	18,299	12,874	8,260	3,426
All occupations	563,458	543,764	536,062	540,966

Source: Compiled and calculated from unpublished data from the Overseas Pakistanis Foundation.

Table 8. **Stocks of Pakistanis in the Middle East, 1985-88**

Year	Stock based on official emigration data	Stock adjusted for pre-1973 emigration	Stock adjusted for pre-1973 emigration and clandestine emigration ^a
1985	563,458	584,458	1,194,870
1986	543,765	563,715	1,152,794
1987	536,062	555,015	1,135,749
1988	541,964	559,947	1,147,075

Sources: Unpublished data, Overseas Pakistanis Foundation; Sarmad (1985:6).

a. To adjust for clandestine migration, we have divided the official emigration data by 0.48 and added to this figure the pre-1973 stock. E.g., for 1985, $584,458 - 563,458 = 21,000$ (the pre-1973 stock). $(563,458/0.48) + 21,000 = 1,194,870$.

then nearly 21,000 workers who went to the Middle East before 1973 would have still been there by 1985. If we add this number to our 1985 estimate of 563,458, we arrive at a figure of 584,458 workers (column 2 of Table 8).

Second, it is possible that workers going abroad in earlier years stayed longer, on average, than workers going abroad in later years. Our estimate is based on surveys of workers returning in 1986 and 1987, who had stayed in the Middle

East an average of 5.6 years. Most of them, therefore, would have migrated after 1980. If workers migrating in the 1970s stayed longer, on average, than workers migrating in the 1980s, then this would imply that our estimate understated the actual numbers abroad. A survey of returned workers conducted in 1981-82 by the Pakistan Institute of Public Opinion (PIPO: 1983:11) found, however, that the average length of stay abroad was 5.5 years, which is very

close to our estimate of 5.6 years.³ Most of the workers interviewed in the PIPO survey would have left Pakistan during the 1970s.

Third, our estimate for 1985 does not include clandestine emigrant workers (those without contracts). Such workers would not have been registered by the Pakistani agency Protectors of Emigrants and hence not enumerated as emigrant workers. Arriving in the Middle East with tourist, *Haj*, or *Umra* visas or with forged documents, they may or may not have obtained work visas from the host governments. If they did not, they would have become part of the gray, or underground, labor market. Whether or not they obtained work visas, what is important to our stock estimate is that they were not enumerated in Pakistan.

The limited amount of information available indicates that unofficial worker emigration amounts to a substantial proportion of total worker emigration from Pakistan. In a survey of 800 returned Pakistani migrant workers in four rural sub-districts selected from three of the four provinces of Pakistan and Azad Kashmir, Azam (n.d.:15-16) found that only 48 percent of the migrants had signed a work contract at the time of their departure for the Middle East. That is, 52 percent of those surveyed had left Pakistan without work visas. Among the returned workers surveyed by the PIPO (1983:86), only 43 percent claimed to have signed a contract

prior to their departure; 57 percent had gone abroad without work visas.

Using Azam's more conservative 52 percent estimate for clandestine workers and assuming that the average length of stay for illegal migrants was the same as that for legal migrants, we have adjusted our 1985 estimate of 563,458 migrants upward to 1,173,871. To this figure we have added the 21,000 Pakistanis remaining in the Middle East from pre-1973 emigration, thus arriving at our total estimate of 1.195 million workers in the Middle East in 1985 (third column, Table 8).

Now let us first adjust Seccombe's estimate of 771,000 to account for clandestine worker immigration to the Middle East. It is necessary to distinguish between workers who illegally left Pakistan (that is, were not registered with the Protectorate of Emigrants) and workers who were illegally working in the Middle East. These two groups are not the same because a portion of the unregistered workers leaving Pakistan obtained work visas upon arrival in the Middle East whereas the remainder became part of the underground labor market.

Somewhat arbitrarily, we assume that of the estimated 610,413 unregistered workers leaving Pakistan, one-half, or 305,206, eventually acquired work visas in the Middle East. Given the broad extent of illegal immigration into the Middle East, however, this assumption is reasonable. Adding 305,206 to Seccombe's estimate yields a figure of 1.076 million, 10 percent less than our estimate of 1.195 million.

Next, we adjust the 1985 estimate of the Manpower Division, which is based on an estimate provided by

Pakistani missions of the number of Pakistanis living abroad on 31 December 1984. On the basis of this estimate, we calculate there to have been 1.024 million Pakistanis working in the Middle East at that time. This figure would include illegal emigrants who registered for work upon arrival. Assuming an illegal migration rate of 52 percent and also assuming that half of the illegal migrants joined the underground labor market, we calculate that 664,000 of those workers would have registered at the time of their return departure to Pakistan. This figure represents 48 percent of the actual stock of 1.383 million in the Middle East and is approximately 16 percent greater than our estimate of 1.195 million.

Finally, we adjust our (adjusted) 1981 census estimate of the stock of Pakistani workers, which was 1.113 million, to reflect net official out-migration plus unofficial (illegal) emigration from Pakistan during the period from March 1981 through 1984. Official out-migration to the Middle East over that period was 473,571. Applying our percentages from Table 7, we calculate that approximately 361,000 of those workers still would have been abroad on 1 January 1985. Besides those legal emigrants, there would have been approximately 391,000 unregistered emigrants. Adding the two figures to our 1981 census estimate of 1.113 million yields 1.865 million. From this figure we must subtract the number of workers returning who went abroad prior to March 1981, or 391,000 (from Table 7). Thus we obtain a final adjusted census-based figure for 1985 of 1.474 million.

To review, compared with our estimate of 1.195 million Pakistani

3. The average stay abroad of 5.5 years includes migrants to countries other than those in the Middle East. The figure for the Middle East would be slightly less since, for example, the average length of stay in the United Kingdom was 19 years.

workers in the Middle East in 1985, Seccombe's estimate is about 10 percent less, the Manpower Division's adjusted estimate is almost 16 percent greater, and the adjusted census estimate is approximately 23 percent greater. The substantial differences between these estimates are cause for concern. We have already expressed doubt about the reliability of the information on stocks abroad reported by the Pakistani missions, which served as the basis for the Manpower Division's 1985 estimate. Our findings also support our assertion that the 1981 census estimate overstated the number of Pakistanis abroad.

Over- or underestimation of unofficial emigration is not the source of the divergence between Seccombe's and our estimate and the two others. If it were assumed that unofficial emigration did not exist, there would still be a substantial difference between our estimate and that of the Manpower Division, and between ours and the adjusted census estimate.

■ Conclusions and implications for policy

Our analysis of flow and stock data on Pakistani migration to the Middle East indicates major differences in the estimated numbers of Pakistani workers in the region. We conclude that annual placement figures published by the Pakistani Ministry of Labour and Manpower probably understate the level of annual emigration to the Middle East by at least 50 percent. That at least half of emigrant workers are leaving Pakistan without formal work agreements should be of grave concern to both Pakistan and the Middle

Eastern states. Workers without foreign service agreements are vulnerable to exploitation in the form of lower than average wages and poor working conditions. Such workers are also easily cheated by employers who know that the workers are illegal residents.

That at least half of emigrant workers are leaving Pakistan without formal work agreements should be of grave concern to both Pakistan and the Middle Eastern states.

Without accurate knowledge of the numbers of workers emigrating, their occupations, and their places of origin, it is difficult for the Pakistani government to provide appropriate worker-development programs that may be needed to fill gaps in the labor force created by emigration. Although we have good survey information about the amount of remittances sent back and savings brought back by individual workers, without knowing the total number of workers in the Middle East it is impossible to estimate the total amount of remittances generated by them. This lack of knowledge makes it difficult to determine the extent to which Pakistani resources need to be devoted to ensuring that most remittances flow through formal banking channels, which is a requisite for effective monetary management.

The substantial difference between our estimate of stocks abroad based on official out-migration statistics, and the estimates made by

Pakistani missions abroad and the estimate derived from the 1981 census, indicates that unregistered worker emigration is much more extensive in Pakistan than has been realized heretofore. Much remains to be learned—about the channels through which those workers leave Pakistan, the extent to which they depend upon informal networks composed of friends and family members abroad, whether they rely instead upon illegal recruiters who make a business of circumventing official channels, whether the clandestine emigration results from emigrants' not knowing how to use legal channels or instead from there being less red tape and lower costs associated with illegal recruitment, and whether illegal recruiters cheat and exploit prospective recruits to any greater extent than do official recruiters.

Answers to these questions will determine governmental policy actions. If prospective migrants use illegal recruiters through ignorance and are often victimized by them, then the Pakistani government may need to devote more resources to informing the public about the dangers of dealing with the illegal recruiters, how to recognize them, and what individuals can do to protect themselves from them. If, on the other hand, prospective migrants use illegal recruiters because those recruiters are more efficient and less costly than the official alternatives, the government must consider ways to improve its own efficiency and lower the costs of legal recruitment procedures, for example by allowing more recruiter licenses to be issued.

Increasing the number of legal recruiters could have negative consequences, however. It would

produce more competition among them to secure the limited number of visas sold by brokers operating out of the Middle East. The increased cost of visas to the recruiters would be passed along to the prospective migrants. As the supply of Pakistanis willing to go to the Middle East to work, at least until the invasion of Kuwait by Iraq, has exceeded the available job opportunities, strict policing of recruiters is needed to prevent them from charging what the market will bear.

The return of more than 100,000 Pakistanis from Kuwait as a result of the Gulf crisis is likely to place strains on Pakistan's economy, causing loss of foreign exchange and problems of economic reintegration of the workers.

The drastically changed situation in the Middle East caused by the Iraqi invasion deserves special comment. Pakistan has always been a major source of labor for Kuwait. A great number of professional and merchant-class Pakistani families have resided there for a long period, and a significant number of temporary workers were employed in Kuwait's construction and service sectors. Altogether, more than 100,000 Pakistanis would have been residing in Kuwait on the eve of the Gulf crisis. Their return to Pakistan is likely to place strains on Pakistan's economy for several reasons.

First, Pakistan relies heavily on its overseas workers as a source of for-

eign exchange. The loss of remittances from Kuwait, and probably from neighboring states as well if tensions remain high in the region, will have a serious impact upon the balance of payments, which will be transmitted throughout the economy in the form of reduced demand for products and a reduced availability of funds for investment purposes. Second, the sudden return of over 100,000 workers from Kuwait and other Gulf states will pose problems of economic reintegration.

The government of Pakistan undoubtedly finds itself in a policy dilemma, having to decide whether to curtail its placement of workers in the Gulf states during the current crisis and suffer the economic consequences or to continue with its labor export policy despite the risk of physical harm to its citizens in the event of war. Under the circumstances, it is understandable that Pakistan, as much as any other country, wants and desperately needs a timely solution to the Gulf conflict.

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We are grateful to the Australian Research Council and the University of Newcastle for financial support of the research upon which this article is based.

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Economic Activity and Occupation . . .

(continued from page 18)

gardening is done mainly for her own family and she also performs many "home duties." By the proposed priority rules, the most skillful activity undertaken by this woman may be seen to be weaving mats, so that this woman may even be classified as a "craftsperson."

The man will most likely be classified as a "copra worker (own account)," unless we find that he has a particularly clever way of catching his fish. Whichever of the classifications is applied, it is obvious that a great deal of significant information will be lost if only a single job description is applied to each person.

For practical reasons, many statistical organizations in the Pacific are likely to maintain the concept of a single job and a system of priorities as the basis of occupational classification, even for nonwage village workers. This practice may necessitate the continuing use of general categories such as "subsistence farmer" and "cash cropper." The ILO has suggested, however, that occupational data be collected by asking not only for an occupational title, but also for a description of specific tasks undertaken (SPC 1990:3). These tasks could be coded and then computer-assisted coding used to apply priority rules to derive a primary occupation, but with the possibility of further analysis of tasks.

An alternative (not suggested by the ILO) is to use ISCO categories but attribute more than one occupation to an individual. Such a system of multiple coding would override the job criterion, but it could still be adapted to a system of priority

rules to derive a single classification when necessary.

The measurement of time allocation is one means of determining the most important activities undertaken by an individual, especially

Because many Pacific workers perform a variety of tasks, a great deal of significant information is lost if only a single job description is applied to each person. Multiple coding of occupation could be used and, when necessary, adapted to a system of priority rules to derive a single classification.

activities during the week preceding a survey or census. Time-allocation surveys are time-consuming and have other limitations as well, but simplified approaches are possible (see, e.g., Hoffman 1981). The argument that individuals have difficulty in determining which of their activities occupied the most time over the previous day or week can be countered by suggesting that the resulting information is still likely to be more meaningful than a classification based on requiring an individual or enumerator arbitrarily to select a category from one of several important activities.

Time-allocation surveys have been used most commonly in small-scale surveys (Kirkpatrick 1978), but they may also be practicable in census samples. This and related approaches may serve as supplements

to censuses and surveys based on simpler classification systems.

■ Economic activities of households

The discussion so far has concerned data collected from individuals, and the ISCO and the concepts of "job" and "occupation" are designed for data collection and analysis at this level. However, the economic reality in the Pacific Islands is that the boundaries between individual and household activities are not always clearly defined. Of all the data collected in censuses, it is probably those related to households that are most underutilized.

All recent Pacific Islands censuses have used household questionnaires, but few have published more than basic tables on household composi-

The boundaries between individual and household activities are not always distinct in Pacific populations, and therefore new approaches are needed to produce information on the relationship between the two types of activity.

tion and economic activities. Yet with the availability of large computing systems, and with the advent of computer-assisted coding, new approaches need to be explored to produce more relevant information on the relationship between the ac-

tivities of individuals and households.

One possibility is the incorporation of household data into individual records at the time of enumeration or during analysis. To classify the activities of individuals who belong in a mixed subsistence-cash category of the ISCO, it is possible to use data collected on household activities to identify labor practices and product types with which those individuals are involved. Doing this would require a system of multiple-activity coding similar to that already mentioned, although a simpler system might derive generalized household characteristics and associate them with each individual (e.g., identify the individual as a "member of subsistence household").

More readily applicable, mainly at the analysis stage, is the use of individual data on economic activity to produce more extensive information on the characteristics of Pacific households. An example of this approach is found in the analysis of the 1986 census of the Solomon Islands (Friesen 1989a). In attempting to construct a measure of the economic well-being of households, I summarized and added to household records some variables from individual census records.

For example, I determined from individual records the number of individuals in each household who had been working for wages or salaries in the week before the census. By relating household activities such as subsistence gardening and particular types of cash cropping to the cumulated individual work activities, if was possible to determine a variety of household types, ranging from those relying purely on

subsistence production to those engaged in a great variety of activities.

I constructed a "diversity index" for income sources of Solomon Islands households. The index was based on the presence or absence of the following categories of cash income: (1) cash crops (e.g., coconuts, cocoa) and other primary cash activities (e.g., livestock raising, fishing, shell collecting), (2) business activities (e.g., running a store, boat, truck), (3), handicrafts, (4) receipts from outside the household (e.g., remittances, royalties, pensions), and (5) wages. In a broader schema, household food gardens and products of certain other subsistence activities could also be included as "income." Considering only cash income sources, however, I found that about 13 percent of Solomon Islands households had no apparent source of cash income, 33 percent had only one type of income, 30 percent had two, and 23 percent had three or more income types (Friesen 1989a:240).

An obvious weakness of this analysis is that the household data were based on activities conducted over a year whereas the individual data considered only activity in the week prior to the census. In a future census design, this discrepancy could be overcome by incorporating some wage labor activities into the household questionnaire.

Even the household level is inadequate to analyze certain activities common to the Pacific. For example, the clearing of a new garden plot and the construction of a village church are usually done by extended families or whole villages. I am not suggesting that these activities should become the subject of census enumeration, especially be-

fore adequate approaches to household analysis have been developed, rather that conventional systems of classification may miss significant categories of work.

■ Conclusions

By virtue of the complexity and diversity of economic activity, systems for its classification and analysis may never be as rigorous and widely accepted as some conventional demographic techniques, such as those used to measure fertility and mortality. This may be one reason why it has been a neglected area of census analysis, even when relevant data have been collected. However, progress is being made in developing more workable conventions for classifying economic activity.

Many subsistence activities have now been incorporated into the UN System of National Accounts (SNA), and a further review of this system is under way. Future changes in the system will have far-reaching effects, since most other statistical conventions relating to economic activity are based on the SNA. The current debate is centered mostly on the boundary between "economic" subsistence activities, such as food gardening, and other activities within the household so far considered to be noneconomic.

The proposed ISCO-88 is an opportunity to devise an appropriate and consistent standard for the classification of occupation in the Pacific Islands. Although there are advantages in accepting most of the classifications suggested by the ILO, in the major group comprising "skilled agricultural and fishery workers" considerable scope exists for further development.

Perhaps the most problematic issue relating to the classification of occupation in the Pacific Islands is whether the convention of regarding each individual as holding a single "job" should be maintained in all cases. I have argued here that enumerating and coding several activities for each individual (when doing so is appropriate) has some advantages. Priority rules can be used to derive a single occupation when necessary, but collecting information about multiple activities leaves open the option of more detailed analyses.

A further area of opportunity is in the development of more useful approaches to the analysis of the relationship between individual and household activities. Data from one level can be used at the other level to allow analyses that are more meaningful in situations where many economic decisions are made at the household level. Although this approach may sometimes involve more extensive data collection during census enumeration, important insights may be gained simply from better use of the data normally collected.

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News and Announcements

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usually accepted only in the autumn. Application deadline for students seeking financial aid: 5 January for the following autumn; for applicants not seeking financial aid, deadline is 12 February, although application by 5 January is advised. For details and application form, contact Graduate Secretary, Demography, 2232 Piedmont Avenue, University of California, Berkeley, CA 94720, U.S.A. (Telephone 415 642-9800; Fax 415 643-8245).

RAND Visiting Scholars Program. The Population Research Center at the RAND Corporation and the RAND Center for Aging Studies have established a modest program for bringing one or two visiting scholars to RAND per year for at least several months to pursue their own research and participation in ongoing RAND research. For more information, contact Linda Waite (Telephone 213 393-0411, extension 6277).

Thirteenth Population Census Conference Is Planned

The East-West Population Institute will host the Thirteenth Population Census Conference, a meeting of heads of census and statistical offices in the Asia-Pacific region, during 10-14 December 1990 in Honolulu, Hawaii. Participants will compare their 1990-round censuses and discuss uses of the census data.

Reviews and Publication Notes

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This monthly publication is designed to inform users about new products available from the Census Bureau. It lists publications and data files released by the bureau during the previous month, announces upcoming products, and contains useful ordering information and telephone numbers.

Family Planning Enterprise: Profiles of Private Sector Initiatives for Family Planning. Quarterly newsletter published by the Enterprise Program of John Snow, Inc. Available from the Editor, Family Planning Enterprise, John Snow, Inc., 1100 Wilson Blvd., Ninth Floor, Arlington, VA 22209, U.S.A.

The newsletter reports to family planning, business, and development communities lessons learned from its private-sector family planning activities in a diverse range of

environmental and institutional settings around the world.

Lights! Camera! Action! Promoting Family Planning with TV, Video, and Film by Cathleen A. Church with the assistance of Judith Geller. Population Reports, Series J, No. 38, December 1989, 32 pp. Baltimore: Johns Hopkins University, Population Information Program. Available from Population Information Program, The Johns Hopkins University, 527 St. Paul Place, Baltimore, MD 21202, U.S.A.

This issue of the Population Reports series on family planning describes the trend toward using creative and entertaining television programs, films, video, and other mass media to promote family planning and responsible sexual behavior. The productions blend humor, drama, and emotion, "keeping entertainment in the foreground and infor-

mation in the background," according to the report. The Center for Communication Programs, which administers the Population Information Program at Johns Hopkins, has helped to produce hit songs containing family planning messages in Latin America, the Philippines, and Nigeria.

In contrast with the United States, where mention of family planning on television often arouses controversy, popular acceptance of family planning information delivered through broadcast media has been high in many developing countries, where surveys show that couples want such information. The report cautions that mass-media health campaigns can be controversial, expensive, and time-consuming, but also can reach millions of people and therefore be cost-effective.

ASIAN AND PACIFIC POPULATION FORUM

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Women's Preferences for Children in Shifang County, Sichuan, China

Fertility preference is related to government policy in China and therefore has been a sensitive topic in Chinese fertility surveys. Direct measures of fertility preference among Chinese women, from responses to direct questions about the number of children they desire, are generally biased downward. The study described here uses a binomial probit model to estimate the probability that family-size preferences reported by women in Shifang County, Sichuan, China, are understated. It estimates both the overall percentage of understatement and the number of children "truly" desired by women of different ages and social characteristics. The number actually desired is estimated to be on average half a child greater than the number reported. Using binomial and ordered probit models, the study also estimates Shifang women's preferences for sons versus daughters. The results indicate that son preference among Shifang women is weaker than expected, although it is still strong among mothers considering only one child, particularly in rural areas. Possible reasons for the inferred decline in son preference are suggested.

ASIAN AND PACIFIC POPULATION FORUM

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Principal funding for the Center comes from the United States Congress. Support also comes from more than 20 Asian and Pacific governments, as well as private agencies and corporations. The Center has an international board of governors.

by Jichuan Wang

As developing societies have experienced economic growth and social change, increased public awareness of effective techniques of birth control, and greater availability of family planning services, fertility behavior has increasingly become a matter of conscious choice. Couples' family-size preferences have accordingly become an important determinant of fertility.

For several decades most fertility surveys have included questions about respondents' desired number of children. Desired number of children is usually measured by answers to a hypothetical question: "If you could choose exactly the number of children to have in your lifetime, how many children would that be?" (International Statistical Institute 1975: Appendix I). Although empirical studies based on responses to that question have provided evidence of a strong relationship between desired number of children and actual fertility behavior (Knodel and Prachuabmoh 1973; Freedman et al. 1975; Hermalin et al. 1979), the measurement is widely recognized to be subject to deficiencies of validity, reliability, and intensity of the attitudes reported (Hauser 1967). The measurement problem is even more complicated in a country like China, where a large fraction of respondents are poorly educated or illiterate and fertility attitudes are influenced by government policy and therefore politically sensitive.

Jichuan Wang is Research Fellow at the Population Studies Center, The University of Michigan, Ann Arbor.

Many surveys show a desire for only one child among large numbers of young Chinese, both married and unmarried (Hong et al. 1984; Chen and Luo 1985). Comparing the results of various Chinese surveys, Whyte and Gu (1987: 489) report that for 14 out of 20 population groups they studied—including rural, urban, metropolitan, and several special groups—the mean number of children preferred was less than two.

Measuring desired family size is especially complicated in China because family size is influenced by policy and therefore a politically sensitive issue.

Hermalin and Liu (1990), however, believe this average understates true family-size preferences in China. They indirectly estimated the number of children desired by women in Shanghai, China's largest city, by using a standardization approach and data from two surveys conducted in the same region with different interviewing procedures.

In the study presented here I used an alternative method to estimate not only the desired number of children but also preference for the sex of children among women in Shifang County, Sichuan Province. Respondents were asked directly about the number and sex of children they preferred. They were also asked to compare hypothetical families of various compositions and indicate their preferences among them.

The purpose was twofold. First, I wanted to ascertain whether the

number of children that respondents "truly" desired was greater than the number they reported when asked directly about their fertility preference, and to estimate the probability that women having specific characteristics would underreport the number of children they really desired. Second, I hoped to learn whether son preference exists among Shifang women, if there has been any change in the values attached to sons and daughters, and, if so, what factors would explain the change.

■ The study area

Shifang County is located on the northern edge of the fertile Chengdu plain, about 60 kilometers northwest of Chengdu, the capital city of Sichuan Province (Figure 1).

In 1986 it had a population of 393,732, 85.3 percent rural and 14.7 urban. (Urban residents are defined by the government as those who are entitled to grain rations.)

A nationally renowned model for birth planning performance in China, Shifang County has been frequently commended by the provincial and national governments for its outstanding achievement in planning and limiting births over the past two decades. Its crude birth rate declined from 34.2 to 13.7 births per thousand population between 1971 and 1976 and in 1978 reached the extremely low level of 8.7 births per thousand. The rate remained at a low level until 1986 (Wang 1989:5).

The experience of the family planning program in Shifang County

is being replicated in other areas of China. Given that China's fertility transition is a program-induced process, understanding the reproductive attitudes of the Shifang population may provide insights about the demographic behavior of Chinese in other areas of the country.

■ The sample and study design

In July 1987 I conducted a fertility survey of women between ages 15 and 65 in Shifang County. The survey was based on a stratified multistage cluster sample of the county's population. The county's population was divided into three strata (urban, rural mountainous, and rural plain areas) with villages as clusters, and a cluster sample of 31 villages was drawn randomly with probability proportional to size. Then 501 households were randomly selected from the sampled villages and an effort was made to interview all women between ages 15 and 65 in the selected households.

The interviews, which were conducted in the first half of July 1987, generally took place in the respondents' homes, or if a respondent's residence was too far away, at a more central place, such as a village school classroom or village meeting room. The day before each interview was to take place, a village cadre visited the household and requested the household head and women between ages 15 and 65 residing in the household to stay at home or go to the designated interview site at a scheduled time.

Although an average interview took less than two hours, interviewers were able to canvass only about

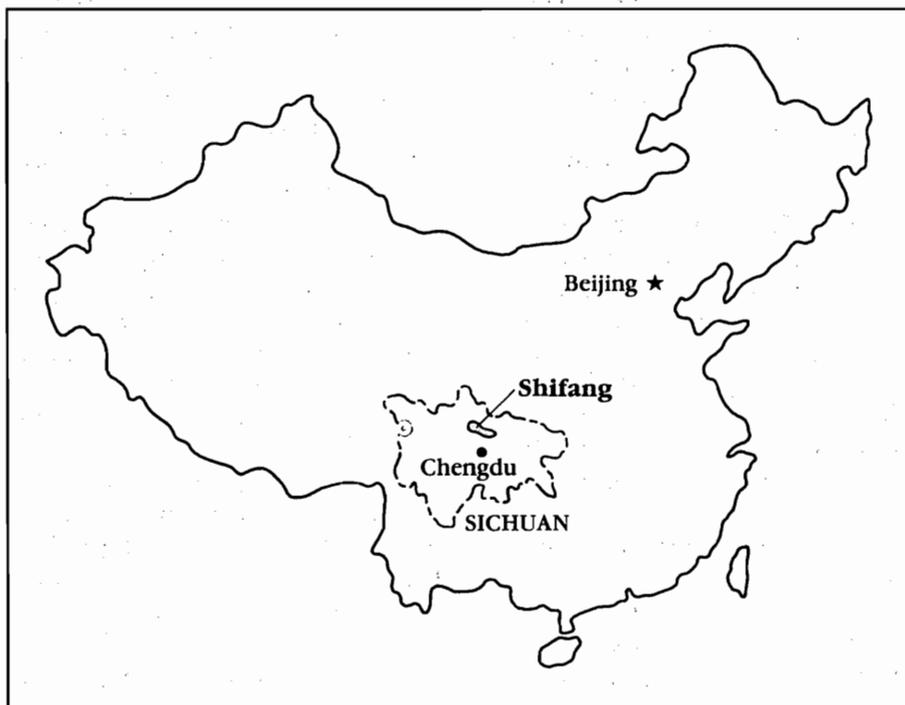


Figure 1. Location of Shifang County, Sichuan, China

two and a half households per day because they had other administrative responsibilities. A few respondents were not at home at the time of their scheduled interviews and were interviewed at their work places. Only those who could not be reached, fewer than 5 percent of the drawn sample, were excluded from the survey. The final sample consisted of 664 women.

In conducting the survey I was assisted by 14 teachers from the Sichuan Family Planning Cadre College and eight students of the college who were former local family planning committee personnel or leaders in other counties of Sichuan Province. Two family planning personnel of the Shifang County Family Planning Committee also provided assistance and took part in the sampling work.

Our work was made more efficient through the efforts of the local cadres, who led us to the respondents' homes and interview sites at the scheduled times. The involvement of the local authorities, however, introduced a note of formality to the survey. To minimize the potentially inhibiting effect of their participation, we requested that village cadres be absent during the actual interviews.

One of the major objectives of the survey was to measure women's preferred family composition. Respondents were asked directly about how many children of each sex they desired in the following questions: "How many children would you prefer to have altogether if there were no family planning program?" and "How many sons would you prefer to have among them?"

In addition, the respondents were

shown pictures illustrating pairs of hypothetical families and asked to indicate which family type they

To test for possible understatement of women's desired family size and for their actual sex preferences, I compared their responses to direct and hypothetical questions about preferred family size and composition.

preferred in each picture. The illustrations represented three types of paired comparisons: (1) comparisons between one-, two-, and three-child families with various gender combinations; (2) comparisons between a son and a daughter in single-child families; and (3) comparisons of various gender combinations within two-child families.

For example, the left side of a picture might show a couple with a boy, and the right side a couple with two girls. The cards were presented in a consistent order and shown one by one so that respondents were forced to consider only two choices at a time. (If a respondent had no preference for either type of family portrayed on a particular card, her response was treated as a missing value. Approximately 2 percent of responses were thus coded.)

During this portion of the interview the respondents appeared to be relaxed and behaved as though the questions were part of a game. My intention was that, through the psychological process of projection, they would reveal their real fertility

preferences in the course of playing the game.

The first set of family-size comparisons, together with the number of children and sons that respondents reported preferring, was used to test for possible understatement of family-size preferences. The other two sets of comparisons were used to test respondents' sex preferences in the context of a single-child family and a two-child family.

■ Study model for family-size preference

The reported number of children preferred, expressed mathematically, was $C_i = j$, ($j = 1, 2, \text{ or } 3$). If a respondent reported a preference for a j -child family with a specified gender combination, her selection from the paired comparisons of this specific family and families with $j + 1$ children of all possible gender combinations was used to determine whether she had underreported her desired family size.

For example, if in response to a direct question a respondent reported a preference for one child and also for at least one son, I used her selections from the paired comparisons of a one-son family and a two-child family of all possible gender combinations to determine whether she had underreported her desired number of children. If she had indicated a preference for any of the two-child families rather than a one-son family, I interpreted this to mean that she actually preferred, at least to some extent, to have more than one child.

For those who reported that they had no preference regarding the sex of their children (about one-third of the respondents stated no prefer-

ence), I examined their choices among the pairs of hypothetical family compositions with j and $j + 1$ children of all possible gender combinations. If a respondent preferred any hypothetical family with $j + 1$ children to a family with j children, I suspected that she had, at least to some extent, understated her preferred family size.

Because the number of children in the illustrated hypothetical families did not exceed three, it was not possible to determine whether respondents who expressed a preference for three or more children (almost no respondents reported a preference for more than three children in my survey) underreported their true preference. Respondents expressing a preference for three children were treated as the baseline group and assumed not to have understated their preferred family size.

A binomial probit model was used to analyze the preference for number of children (see Hanushek and Jackson 1977:198; Kmenta 1986:553-554). I defined the dependent variable as $Y_i = 1$ if a respondent understated her desired family size, $Y_i = 0$ if not. The independent variables were three factors known to be associated with fertility preference: women's urban-rural residence, their educational attainment, and their age.

On the assumption that in any population, regardless of the normative family-size preference, at least some women will prefer a small family (of one or two children), my research hypothesis was that such women were more likely to be "modern"—that is, younger, more urban, and better educated—than women who preferred to have



Although the Chinese government strongly encourages couples to limit their family size to one child, evidence from the Shifang County survey indicates that most women, especially rural women, would prefer two children if the one-child policy were not a consideration.

larger families. Therefore I expected to find smaller proportions of younger, more urban, and better-educated women understating their

actual desired family size than of women who were older, rural, and less educated, when they reported desiring a small family size.

I expected to find that younger, more urban, and better educated women who expressed a desire for only one or two children were less likely than other women to understate their actual desired family size.

Whereas residence was treated as a dichotomous variable (rural versus urban), I divided women's educational attainment into three levels (no school, primary school, and middle school or higher) and age also into three cohorts (15-24, 25-34, and 35 and above). The reported number of children preferred, C_b , was included in the model as a covariate.

■ Study model for gender preference

To analyze respondents' preferences for children of a particular sex, I employed both a binomial probit model and an ordered probit model (see McKelvey and Zavoina 1975; Maddala 1983:46-49). The binomial model was used to determine whether a woman would prefer a son or a daughter if she wanted to have only one child, and the ordered probit model was used to examine sex preference among respondents preferring a two-child family.

For respondents preferring a single-child family, the dependent variable was defined as $Y_i = 1$ if a son was preferred, $Y_i = 0$ if preference was for a daughter. In the case of a two-child family, I measured the dependent variable, son preference, by means of ordinal categories ranging from the weakest to the

strongest preference for a son. Thus the values 0, 1, 2, and 3 for Y_{ji} represented strong daughter preference, weak daughter preference, weak son preference, and strong son preference, respectively. The ordinal category of strong daughter preference was normalized to zero.

These ordinal measures of Y_{ji} were based on respondents' choices among the pairs of hypothetical families with two children. Three combinations of gender were possible: (A) two sons and no daughter, (B) one son and one daughter, and (C) two daughters and no son.

I coded a respondent's gender preference as 3 (strong son preference) if she preferred two sons and no daughter to one son and one daughter. The preference can be expressed mathematically as $A > B$. Similarly, I coded her preference as 2 (weak son preference) if she preferred one son and one daughter to two sons and no daughter but also preferred two sons and no daughter to two daughters and no sons ($A < B$, but $A > C$); as 1 (weak daughter preference) if she preferred one son and one daughter to no son and two daughters but also preferred two daughters and no son to two sons and no daughter ($C < B$, but $C > A$); and as 0 (strong daughter preference) if she preferred two daughters and no son to one son and one daughter ($C > B$).

I theorized the existence of an unmeasured "true" son preference, Y_i^* , for each individual. On the scale of true son preference I demarcated three thresholds: $\mu(0)$, $\mu(1)$, and $\mu(2)$, the first threshold being normalized to zero. Thus each respondent could be located in one of four ordinal categories on the scale. If $Y_i^* < \mu(0)$, then $Y_{ji} = 0$; if

$\mu(0) < Y_i^* < \mu(1)$, then $Y_{ji} = 1$; if $\mu(1) < Y_i^* < \mu(2)$, then $Y_{ji} = 2$; if $\mu(2) < Y_i^*$, then $Y_{ji} = 3$. As I was interested in the effect of respondents' age and social characteristics on their "true" son preference, my analysis focused on the probabilities of their being located in the ordinal categories of son preference. The estimated \hat{Y}_i^* values and the three thresholds are not displayed here.

Given the traditional value attached to sons in Chinese society, I expected son preference to vary only modestly among respondents regardless of age and social background.

All independent variables considered in the model for studying respondents' family-size preference, except C_b , were included in this model as well. Given the pervasive and traditional value attached to sons in Chinese society, I hypothesized that son preference would vary only modestly with respondents' scores on the modernization indices (see Coombs and Sun 1978).

■ Results

Desired number of children.

Table 1 shows the probabilities of respondents' underreporting their actual preferred family size, by age group and social characteristics. Rural women were more likely than urban women to underreport their desired number of children when the stated preference was for one or two, which is what one would expect if the proportion of women really preferring one or two children is larger in urban areas than in

rural areas. But given that urban women tend to be generally more sophisticated than rural women, it is possible that urban respondents were more careful to match their choices of paired comparisons during the second part of the interview with the number of children they had reported when asked directly about their preferred family size. As a result, the estimated probability of underreporting by urban women shown in Table 1 might be biased downward. Unfortunately it is not possible to estimate this possible bias with the data from the study.

Among rural respondents who

stated that they preferred to have one child, the probability that this preferred number was understated was 84 percent. A somewhat smaller majority (60 percent) of urban women expressing a preference for one child also probably understated their family-size preference. The probability of underreporting was significantly different for rural and urban women at the 1 percent level.

Among respondents stating two children as their desired number, only 24 percent of rural women and 6 percent of urban women probably understated their actual

preference. The probability of underreporting was also significantly different for rural and urban women at the 1 percent level.

As hypothesized, women with little or no formal education were more likely to understate their family-size preference than were women with more education if they expressed a preference for one or two children. It is also possible that the better-educated respondents understated their preference more than the estimated probability for them indicates because they may have been more careful than less educated women to match their paired-family selections with their reported desired number of children.

Among the three age groups, women of ages 25–34 had estimated probabilities of underreporting their true family-size preferences only marginally different from those of the other age groups, net of residence and educational attainment. For women of that age group expressing a desire for one child, the probability was slightly lower than in the other two age groups (.79 versus .80), whereas for those

Table 1. Estimated probability of preferring more than the reported desired number of children, by background characteristics of women: Shifang, Sichuan Province, China, 1987

Reported no. of children desired and background characteristic	Probability	Stand. error	No. of women
One child ($C_i = 1$)	.80	.0982	213
Rural	.84**	.0379	178
[Urban]	.60	.0572	35
No school	.86**	.0539	61
Primary school	.80*	.0781	105
[Middle school +]	.70	.1109	47
Ages 15–24	.80	.0747	78
Ages 25–34	.79*	.1238	46
[Ages 35 +]	.80	.1021	89
Two children ($C_i = 2$)	.23	.0635	409
Rural	.24**	.0533	391
[Urban]	.06	.0207	18
No school	.28**	.0502	158
Primary school	.22*	.0429	182
[Middle school +]	.16	.0444	69
Ages 15–24	.19	.0421	88
Ages 25–34	.27*	.0604	143
[Ages 35 +]	.22	.0579	178

Note: Characteristics in brackets are omitted categories in the model.

** Difference from omitted category is statistically significant at the 1 percent level.

* Difference from omitted category is statistically significant at the 5 percent level.

Four-fifths of the respondents who expressed a desire for one child understated their family-size preference, but only about one-fourth of those reporting a desire for two children did so.

reporting a desire for two children it was slightly higher (.27 versus .19 and .22). These findings indicate that in all three age groups, underreporting family-size preference was common—in fact, it was the rule rather than the exception among

women expressing a preference for one child.

The data presented in Table 1 thus indicate that four-fifths of the

respondents who expressed a desire for one child understated their family-size preference, but only about one-fourth of those reporting

a desire for two children did so. On the assumption that underreported family-size preferences were deflated by at most one child, the number of children "actually" desired, C_k^* , by women with characteristic k can be estimated from N_{ck} and P_{ck} :

$$C_k^* = \sum_{C_k=1}^3 (N_{ck} * C_k + N_{ck} * P_{ck}) / N_k$$

where C_k , the reported number of children desired, equals 1, 2, or 3;

N_{ck} is the number of respondents with characteristic K who preferred C_k ;

P_{ck} is the estimated probability, based on paired comparison data, that the same respondents preferred more than C_k ;

and P_{3k} is assumed to be zero, meaning that no underreporting occurred if a respondent chose three children as her desired family size.

The estimated values of the "truly" desired number of children, C_k^* , and the corresponding weighted average values of the reported desired number of children, C_k , are shown in Table 2. For the total sample and for each subgroup, the estimated number of children "truly" desired exceeds the reported number desired. For the sample as a whole the mean number "truly" desired is 2.13, or about half a child more than the mean reported number (1.73). Not surprisingly, rural women, those with no formal education, and older women desired and reported desiring more children than the comparison groups.



A Chinese adage states "The more sons, the more happiness." But among Shifang women only slightly more than half (55 percent) stated a preference for a son rather than a daughter; and younger, more urban, and more educated women preferred to have a daughter if having only one child.

The proportions stating a preference for one child were greater among urban, more educated, and younger women. As a majority of respondents underreported their actual family-size preference when they stated that they desired only one child, the large proportion stating a preference for one child contributes a disproportionate weight to overall underreporting. As a result, the relative difference between C_k^* and C_k , or the percentage of underreporting, was greater among those same women than among the comparison groups, regardless of preferred family size (last column of Table 2). Thus more modern (i.e., urban, younger, and more educated) women appear to be more sensitive to the government's one-child policy and more likely to hide their real attitudes toward family size in the face-to-face interviews.

Urban, younger, and more educated women appear to be more likely to hide their real attitudes toward family size than other women when asked directly about their family-size preference.

According to the results presented in Table 2, the mean number of children "truly" desired by Shifang women was slightly more than two. Although that is a very low number for a rural Chinese community, obviously a real gap exists between the government's one-child goal and the individual preferences of the women sampled.

It is reasonable to infer that the fertility level induced by the family planning program in Shifang County was even lower than couples' pre-

ferred fertility. In 1981 the total fertility rate in Shifang was only 1.16. It was probably even lower in 1984, when the crude birth rate reached a historically low level of 8.2 births per thousand population (Shifang County Family Planning Commission 1980-86). The difference between couples' fertility preferences and their actual fertility can be considered a sacrifice they make to society on behalf of the one-child program. How great that difference is depends upon not only the fertility level preferred by couples but also the ability of the government to compel conformity to its goal.

Sex preference. Among the Shifang women sampled, 55 percent stated a preference for a son rather than a daughter in a one-child family (Table 3). This finding implies that, for most women considering a one-child family, a son had more utility than a daughter.

Table 2. Estimated average number of children desired, by background characteristics of women: Shifang, Sichuan Province, China, 1987

Background characteristic	Number and percentage of women desiring specified number of children								C_k^* (Estimated av. no. of children truly desired)	C_k (Weighted av. reported no. of children desired)	$\frac{C_k^* - C_k}{C_k^*}$ (% of under-reporting)
	1 child		2 children		3 children		1-3 children				
	No.	%	No.	%	No.	%	No.	%			
All women	213	33	408	62	33	5	654	100	2.13	1.73	19
Rural	178	30	391	65	32	5	601	100	2.16	1.76	19
[Urban]	35	65	18	33	1	2	54	100	1.78	1.37	23
No school	61	26	158	66	20	8	239	100	2.24	1.83	18
Primary school	105	35	182	61	11	4	298	100	2.10	1.69	20
[Middle school +]	47	40	69	59	1	1	117	100	1.98	1.61	19
Ages 15-24	78	46	88	52	4	2	170	100	2.03	1.56	24
Ages 25-34	46	24	143	73	6	3	195	100	2.17	1.79	17
[Ages 35 +]	89	31	178	61	23	8	290	100	2.15	1.77	18

d.f. = 5

Note: Characteristics in brackets are omitted categories in the model.

Fifty-seven percent of rural women preferred to have a son if having only one child, in contrast with only 31 percent of urban women, and this difference was statistically significant. Inversely, 69 percent of urban women and only 43 percent of rural women preferred a daughter.

In China boys are generally considered to cause parents more worry than daughters because of their greater propensity to engage in aggressive, risk-taking behavior. Under the restriction of the one-child policy, this liability of boys may dampen son preference, but evidently it does not outweigh the positive value of sons in a rural setting.

As expected, a majority (62 percent) of women with no formal education preferred to have a son rather than a daughter if having only one child. Women with a primary education also expressed a slight preference for a son, whereas

a majority of women with more education preferred to have a daughter. Differences in the probability of preferring a son versus preferring a daughter among women with different educational levels are statistically significant.

The youngest age group (15–24) was the only group in which a majority of women preferred a daughter if having only one child. Majorities of the other two age groups expressed a preference for a son.

Results of the ordered probit model are shown in Table 4. The model has only one coefficient for each dummy variable, which represents a deviation from the mean of "true" son preference among women with a certain characteristic different from that of the corresponding baseline group. A significant positive (or negative) coefficient means greater (or less) son preference.

The coefficient column of Table 4 shows that only rural–urban residence and age had statistically significant effects on son and daughter preference. As expected, rural women had a stronger preference for sons than did urban women. Women in the prime childbearing age group expressed a stronger preference for sons than did women in the other two age groups.

The estimated probabilities of respondents' ordinal categories being 0, 1, 2, and 3, by age and social characteristic, are also shown in Table 4. If sex preference were evenly distributed between daughter preference categories and son preference categories, it would imply that preferences for sons and daughters were balanced overall among the sample.

It is possible to estimate the value of the unobserved "actual" son preference as $\hat{Y}_i^* = \hat{B}X_i$, where B represents the corresponding coefficients estimated from the ordered probit model. On the assumption that individual preferences are normally distributed around the mean preference, the distributions of the estimated sex-preference values can be illustrated on a scale that is divided into four categories by the three estimated thresholds of $\mu(0)$, $\mu(1)$, and $\mu(2)$. A mean preference around $\mu(1)$ on the preference scale would indicate a balanced preference for sons and daughters among respondents (Wang 1990).

The sample as a whole exhibited an almost sex-balanced preference for children when respondents considered a two-child family. Respondents were almost evenly divided between categories 1 and 2, representing moderate daughter and son preference (44 and 41 percent,

Table 3. Estimated probabilities of preferring one son versus one daughter, by background characteristics of women: Shifang, Sichuan Province, China, 1987

Background characteristic	Probability of preferring 1 son	Probability of preferring 1 daughter	Stand. error	No. of women
All women	.55	.45	.1066	649
Rural	.57**	.43**	.0812	597
[Urban]	.31	.69	.0552	52
No school	.62**	.38**	.0641	236
Primary school	.53*	.47*	.0891	296
[Middle school +]	.43	.57	.1083	116
Ages 15–24	.43**	.57**	.0570	169
Ages 25–34	.61	.39	.0938	195
[Ages 35 +]	.56	.44	.0854	284

Note: Characteristics in brackets are omitted categories in the model.

** Difference from omitted category is statistically significant at the 1 percent level.

* Difference from omitted category is statistically significant at the 5 percent level.

Table 4. Estimated probabilities of daughter and son preference in a two-child family, by strength of preference and background characteristics of women, based on ordered probit model: Shifang, Sichuan Province, China, 1987

Background characteristic	Coefficient	Strong daughter preference (ordinal cat. 0)		Weak daughter preference (ordinal cat. 1)		Weak son preference (ordinal cat. 2)		Strong son preference (ordinal cat. 3)		No. of women
		Prob.	S.E.	Prob.	S.E.	Prob.	S.E.	Prob.	S.E.	
All women		.11	.0184	.44	.0461	.41	.0690	.04	.0184	648
Rural	.39**	.10	.0335	.43	.0446	.42	.0602	.05	.0177	596
[Urban]	—	.19	.0469	.49	.0140	.30	.0541	.02	.0064	52
No school	.23	.08	.0259	.41	.0419	.46	.0491	.05	.0182	236
Primary school	.03	.12	.0390	.45	.0414	.40	.0639	.03	.0156	295
[Middle school +]	—	.14	.0483	.47	.0365	.36	.0687	.03	.0139	116
Ages 15-24	-.06	.15	.0248	.48	.0184	.35	.0289	.02	.0037	170
Ages 25-34	.35**	.07	.0257	.39	.0392	.48	.0482	.06	.0167	194
[Ages 35 +]	—	.11	.0360	.45	.0259	.40	.0516	.04	.0096	284
- 2 log (LR)	27									

Notes: Urban, middle school +, and ages 35 + are reference categories and therefore have no coefficients. Each dummy variable has only one parameter, estimated from the ordered probit model. An estimated parameter presents the deviation of mean son preference among women with a specified background characteristic from that of the corresponding reference category.

S.E.—standard error.

** Significant at the 1 percent level.

respectively), whereas only 11 percent of respondents expressed strong daughter preference

Surprisingly, the majority of urban, younger, and more educated women reported preferring a daughter if having only one child, although a son was still preferred by rural, older, and less educated respondents. When considering having two children, most respondents expressed a preference for children of both sexes.

(category 0) and 4 percent expressed strong son preference (category 3).

Categories 0 and 1 accounted for a majority of urban respondents, indicating a tendency to prefer daughters among them. Rural women, on the other hand, exhibited a more sex-balanced preference, the distribution of son and daughter preference for this group being almost even, and the mean of preference distribution was close to the value of $\mu(1)$ (Wang 1990: Figure 2a).

Women with no schooling tended to exhibit a nearly equal preference for sons and daughters, whereas educated women were more likely to prefer daughters, the strength of their preference increasing with the level of education.

As in their responses to direct questions about their gender preferences for children, women of the prime childbearing ages (25-34) ex-

hibited a preference for sons, which was not evident among either younger or older women when considering hypothetical two-child families, although even among this group only small minorities expressed a strong preference for either sons or daughters. Daughter preference was greatest among the youngest age group, 63 percent of whom expressed either strong or moderate preference for girls.

The binomial and ordered probit models used to test son preference suggest that Shifang women generally favor having a single son rather than a single daughter; but when considering a two-child family, they prefer to have a child of each sex and even have a slight preference for daughters. These findings are at odds with the traditional Chinese

preference for sons and findings of persistent son preference in China reported in many recent studies (e.g., Coombs and Sun 1978; Feeney et al. 1985; Palmore et al. 1985; Arnold and Liu 1986).

Several possible explanations for the evident decline in son preference among Shifang women suggest themselves.

One is that the financial exchange that takes place between the families of betrothed couples no longer seems to favor the groom's family. Many people in Shifang County told me of the increasing cost of providing for a son's marriage. The groom's family is supposed to hold three feasts for the betrotheds' relatives during the year between the couple's engagement and their marriage—during the Spring Festival, in mid-May, and in mid-August of the Chinese calendar. Moreover, the wedding, the expenses of which are the groom's family's responsibility, lasts three days, and each day they must hold an expensive feast.

The increased financial cost of rearing and marrying sons in rural areas, the improvement of women's status in Chinese society, and the success of family planning educational efforts are possible explanations for the apparent decline in son preference among Shifang women.

The cost of these festivities often exceeds 3,000 yuan (about U.S. \$810 in 1986), an amount approximately six times the annual per ca-

pita income in rural China in 1986. In contrast, the traditional dowry, paid by the bride's family to the groom's, has become less important. Consequently, the direction of wealth flow no longer favors the groom's family.

Another possible explanation is that changes in rural family residential arrangements have made sons more costly to their parents. Whereas in the past married sons continued to live with their parents after marriage, today it is becoming more common for them to establish their own households in the same compound as the parents'. The groom's parents are obliged to build a house for the newly married couple if the bride is considered to marry into the groom's family. For families with two sons, two houses have to be built.

The greater difficulty of raising sons, already mentioned, may be another reason for the apparent increase in daughter preference, especially in urban areas, given the government's one-child policy.

A final possible explanation is that the perceived value of daughters to their parents has increased with the improvement of women's status in Chinese society. My survey revealed a nearly universal involvement of women in nondomestic work in Shifang County. Fewer than 3 percent of respondents reported that they were "not working." Although a majority of women were still engaged in agricultural occupations, substantial fractions of younger women—one-fourth of those between ages 15 and 19 and one-fifth between ages 20 and 24—had full- or part-time employment in nonagricultural sectors of the economy, mostly in occupations

related to township industry.

With job opportunities for women expanding and their marriages being delayed, daughters, like sons, can earn income and contribute to the economic well-being of their parents until reaching their early or mid-20s. The improvement of women's status within the family means that married daughters are better able than in the past to help their parents, both physically and economically. Some Shifang respondents even told me that daughters are more dependable than sons, not simply because they are more filial and accustomed to providing domestic service and physical care to their parents, but also because after marriage they are more likely than sons to give money to their parents. In short, the perceived values of sons and daughters are changing, although some degree of son preference persists among Shifang women.

■ Conclusion

Like Hermalin and Liu (1990), my study found clear evidence of underreporting of desired family size by Chinese women when they were asked a direct question in face-to-face interviews. In answer to the question "How many children would you prefer to have altogether if there were no family planning program?" respondents were likely to give the interviewer a socially acceptable answer and to hide their true preferences. For each reported number of children desired, rural, uneducated, and older women were more likely to understate their desired family size than were urban, more educated, and younger women. But overall, larger percentages

(continued on page 27)

Untilting Age Distributions: A Transformation for Graphical Analysis

This article presents a new approach to the plotting of age distribution data. "Untilting" is a way of transforming data that vary systematically from very high to very low values so as to show local variation more clearly. The article derives an untilting transformation from the formal structure of age distributions. The transformation turns out to be closely related to two familiar demographic techniques, reverse-survival estimation of births and birth rates, and comparison of observed with stable age distributions. The ideas are illustrated by application to age distributions from the 1979 and 1989 censuses of Vietnam.

by Griffith Feeney

The past several decades have seen the development of increasingly sophisticated techniques for estimating levels and trends of fertility and mortality. Valuable as these developments are in particular applications, they do not eliminate the need for understanding the quality and characteristics of the data to which they are applied. This understanding must usually be acquired through a careful scrutiny of the data, using relatively elementary tools. There is a danger that naive enthusiasm for elaborate formalism will result in the neglect of simpler and more traditional, but essential, preliminaries.

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Age distributions are perhaps the most fundamental of all demographic data. Accurate age distributions contain a great deal of population history, and an appreciation of the errors present in age data is fundamental to the study of many populations, both historical and contemporary.

The first step in analyzing an age distribution is to plot it and scrutinize the result against whatever background is provided by context. When numbers of persons decline very rapidly with increasing age, however, changes from one age group to the next tend to be obscured by the overall downward sweep of the plotted points. We can hope to improve a plot that is sharply tilted in this way by "untilting," that is, by transforming the plotted values so as to make the smaller ones roughly equal in magnitude to the larger ones. The vertical axis may then be rescaled to display fluctuations more clearly.

These ideas are not new in the demographic literature, going back at least to Carrier and Farrag (1959), but they seem to have been largely lost in recent years. The authoritative United Nations *Manual X* (UN, DIESA, 1983) does not discuss them, for example, nor does its predecessor, *Manual IV* (UN, DESA, 1967). The weighty Shryock and Seigel (1973) cites the Carrier-Farrag paper in the chapter on age composition, but the text is silent. Interestingly enough, the graphical procedure of plotting against oblique axes used by Carrier and Farrag is identical to the general approach to untilting described by Tukey (1977:154-156).

This article presents a new approach to the plotting of age distribution data based on an untilting transformation derived from the formal structure of age distributions. Plotting is regarded here not merely as a means for displaying known results, but also as an important tool for data analysis. This view has been developed over the past several decades by a number of writers, including Tukey (1977), Tufte (1983), Wainer (1984), and Cleveland (1985). The untilting procedure turns out to be closely related to two familiar demographic techniques, reverse-survival estimation of fertility and comparison of observed with stable age distributions.

■ The problem illustrated

Figure 1 plots the age distribution of the total population of Vietnam at the census taken on 1 October 1979. The shape is characteristic of rapidly growing populations, with large numbers of persons in the younger age groups and small numbers in the older age groups. The downward sweep of the plotted points with increasing age is so strong that departures of particular age groups from the general trend are difficult to make out.

Because this pattern is typical of developing countries, conventional plots of their age distributions tend to look very much the same. Discrimination being a prime purpose of plotting, the plots are unsuccessful. The naive conclusion is that we may as well not have bothered. The correct conclusion is that we need more effective plotting techniques.

Several comments on Figure 1 are in order. First, we are concerned here with plots as tools for data

analysis. Although the population pyramid so popular in demographic methods texts and elsewhere may have its uses, data analysis is not one of them. We want to make plots quickly and with a minimum of effort, and the histogram format of the population pyramid is hopelessly inefficient in this respect.

Equally important, comparisons of plots are best made by overlaying plots drawn on separate pieces of tracing paper. If we want to compare the male and female age distributions, in particular, we want them on separate pages, not side by side. Such is the rationale for the general format of Figure 1.

Two other details are worth noting. We follow the usual convention of plotting the number in a given age interval above the mid-point of the interval. Following Cleveland (1985:31), we put axes and scales on all four sides of the plot and use two scales for each axis when it is useful to do so. Thus the lower

horizontal scale in Figure 1 shows age, whereas the upper scale shows year of birth. The vertical scale on the left is number of persons, while the scale on the right is proportion of total population.

■ The untilting transformation defined

Age distributions may exhibit proportionately small numbers of persons at older ages for two reasons. First, older persons have had longer exposure to mortality; hence fewer of them will have survived. Second, older persons were born longer ago, and in a growing population there will be fewer persons born in the past than more recently. These two factors completely determine the shape of the age distribution in a population closed to migration, and they are usually the primary influences in the overall shape of the age distribution even in the presence of substantial migration.

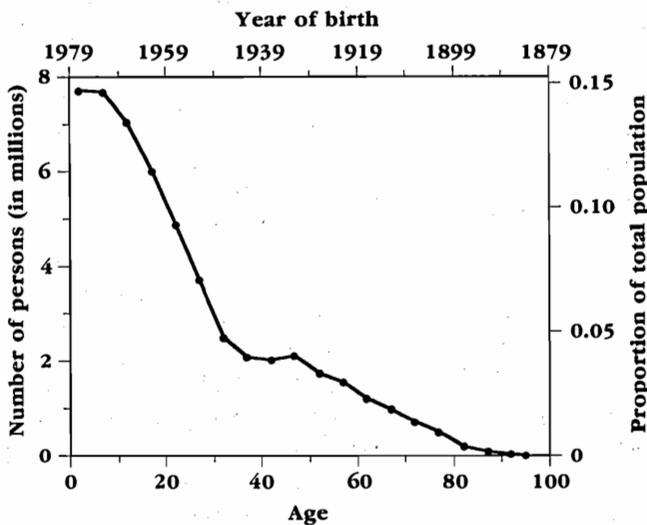


Figure 1. The age distribution of Vietnam, total population, 1979

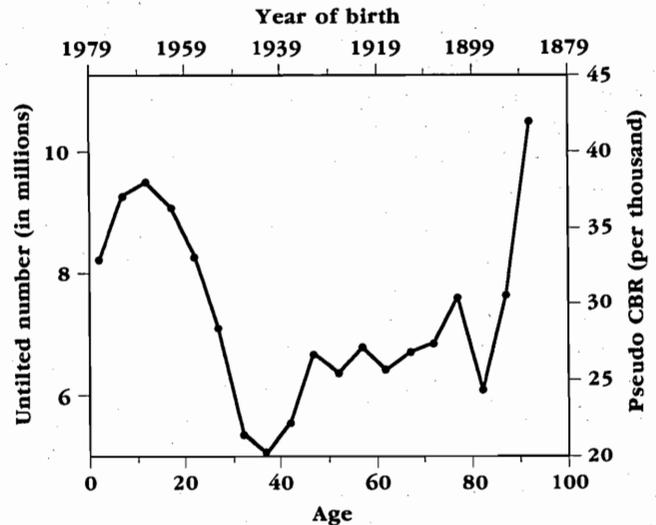


Figure 2. The untilted age distribution of Vietnam, total population, 1979

The tilting effect of mortality on an age distribution may be removed by dividing the number of persons in each five-year age group by the corresponding cohort survivorship proportion, taken as usual to be ${}_5L_x/5l_0$, from a suitably chosen life table. Taking the life table radix l_0 to be one, we simplify this to ${}_5L_x/5$. The tilting effect of population increase may be removed by multiplying the number of persons in the age group $(x, x+5)$ by e^{rx} , where r is an approximate average annual growth rate for the 80 years prior to the date of the age distribution.

Our first untilting transformation is defined by applying both of these operations. Thus from given numbers ${}_5N_x$ for five-year age groups we compute

$$\frac{{}_5N_x e^{rx}}{{}_5L_x/5} \quad (1)$$

where r denotes the growth rate and ${}_5L_x$ the number of person-years lived in the interval $(x, x+5)$.

Although we should utilize whatever knowledge we have of the population to choose sensible values for r and the ${}_5L_x$, it is neither necessary nor appropriate to conduct elaborate investigations.

Our purpose here is simply to untilt the plot, and a good initial guess will often accomplish this. If it does not, we simply adjust the values and try again. It should of course be remembered that the growth rate and mortality levels are likely to have been changing, so that there may be no strictly correct choice.

To untilt the Vietnamese age distribution in Figure 1, we take r to be the growth rate between the censuses of 1979 and 1989, 0.0210, and apply the ${}_5L_x$ values from the

Coale-Demeny West Level 19 model life table (Coale and Demeny 1983), with female and male tables averaged, using a sex ratio at birth of 106. The resulting untilted values, calculated from formula (1), are shown in Figure 2, with the vertical scale to the left.

The untilted values for the oldest ages now have roughly the same magnitude as the values for the youngest ages. This makes variation in numbers for the older age groups, invisible in Figure 1 because of their relatively small numbers, as visible as the variation in numbers for the younger age groups. It also makes it possible to "blow up" the vertical scale, rendering all variations more readily apparent.

Figure 2 shows a smooth progression from one age group to the next through age 35, with an initial rise followed by a steep drop; a clearly defined hollow centered on the age group 35-39, corresponding to the birth cohort of 1940-44; minor irregularities between the ages of 40 and 80 and a sharp dip at the age group 80-84; and sharply increasing values for the oldest age groups.

■ Untilting and reverse-survival estimation

The untilted age distribution values from formula (1) are absolute numbers, whence comparisons of two or more untilted distributions confound fluctuations with population size. Dividing (1) by $5Pe^{-2.5r}$ and rearranging terms gives

$$\frac{{}_5N_x / ({}_5L_x/5)}{5Pe^{-r(x+2.5)}} \quad (2)$$

where P denotes the total number of persons in all age groups.

Formula (2) gives relative numbers, removing the effect of total population size. More importantly, it shows that the untilted values, suitably scaled, approximate crude birth rates. The numerators are reverse-survived numbers of births in five-year time periods, and the denominators approximate the corresponding number of person-years lived.

The numerators will be exact if the population is closed to migration and experiences constant mortality corresponding to the given ${}_5L_x$ values. The denominator is necessarily approximate, except in the degenerate case of a stable population, since actual annual growth rates will vary from year to year.

Because the untilted values (2) differ from the untilted values (1) only by the constant factor $5Pe^{-2.5r}$, the plots of the two series are identical except for the scale. Figure 2 shows both scales, with the scale for the formula (2) values on the right.

Table 1 presents the data, intermediate calculations, and results. The first two columns give the ${}_5N_x$ and ${}_5L_x$ values. Column C1 shows ${}_5N_x / ({}_5L_x/5)$, i.e., reverse-survived numbers of births for five-year periods prior to the census. Column C2, calculated as the values in column C1 multiplied by e^{rx} , gives the result of the first untilting transformation (1). The effect, assuming the usual case of $r > 0$, is to inflate the reverse-survived numbers of births in earlier periods. The operation is analogous to the discounting of income and expenditure flows in economics, but applied in reverse. Column C3, calculated as the values in column C2 divided by $5Pe^{-2.5r}$, shows the values of the second un-

tilting transformation (2). The final column indicates birth cohorts corresponding to the age groups at left.

The identification of the untilted age distribution values (2) with crude birth rates is valuable, but it is essential to remember that the approximations may be very inaccurate. I shall refer to them as "pseudo CBRs" or as "CBR indices," simultaneously calling attention to the identification and warning against its uncritical acceptance.

■ Interpreting the untilted age distribution

Taken at face value, the pseudo CBRs in Figure 2 suggest that the crude birth rate in Vietnam rose sharply, from 20 per thousand in the early 1940s to 38 per thousand in the late 1960s, and fell with equal rapidity to 33 per thousand in the late 1970s. The first question to be addressed is the extent to which this pattern is robust against changes in the untilting parameters.

The effect of choosing a larger

value of r will be to increase the value of e^{rx} in (1) more at older ages and earlier years than at younger ages and later years. Hence, if a value of r that yields an approximately level plot is increased, the effect of choosing a higher value of r will be to tilt the plot upward, holding the leftmost point fixed. Similarly, choosing a lower value of r will tilt the plot downward. The overall tilt of the plot reflects the choice of r and must not therefore be interpreted as a characteristic of the given age distribution.

Figure 3 shows the effect of choosing growth rates of 0.016 and 0.026 as compared with the reference value of 0.021 per thousand. This is a wide range, and there is substantial variation in the levels indicated, but the pattern of rise and fall is untouched.

The effect of choosing different mortality levels is slightly different. Given an initial choice that yields an approximately level plot of the untilted values, choosing ${}_5L_x$ values corresponding to higher mortality means lower values and hence larger untilted values computed from (1). While the values at older ages will tend to increase more, the values for all the age groups increase, so that the effect is both to lift the untilted values up overall and to tilt them upward. Lower mortality levels reverse this effect, lowering the overall level and tilting the plot downward.

Figure 4 shows the effect of choosing various Coale-Demeny "West" mortality schedules. Because the reference choice was a female life expectancy (e_0) of 65 years, a higher than expected value, we consider only lower alternatives, e_0 values of 60, 55, and 50 years.

Table 1. Untilting the 1979 age distribution of Vietnam: both sexes

Age (x)	${}_5N_x$	${}_5L_x$	C1	C2	C3	Years
0	7,712	4,678	8,243	8,243	32.9	1975-79
5	7,691	4,600	8,360	9,285	37.1	1970-74
10	7,040	4,571	7,701	9,500	38.0	1965-69
15	6,015	4,537	6,629	9,083	36.3	1960-64
20	4,882	4,487	5,440	8,280	33.1	1955-59
25	3,718	4,427	4,199	7,099	28.4	1950-54
30	2,492	4,360	2,858	5,366	21.4	1945-49
35	2,071	4,281	2,419	5,044	20.2	1940-44
40	2,004	4,184	2,395	5,547	22.2	1935-39
45	2,109	4,057	2,599	6,687	26.7	1930-34
50	1,728	3,883	2,225	6,359	25.4	1925-29
55	1,554	3,643	2,133	6,770	27.1	1920-24
60	1,204	3,310	1,819	6,412	25.6	1915-19
65	979	2,859	1,712	6,704	26.8	1910-14
70	718	2,275	1,578	6,863	27.4	1905-09
75	496	1,574	1,576	7,611	30.4	1900-04
80	200	881	1,135	6,090	24.3	1895-99
85	91	354	1,285	7,660	30.6	1890-94
90	27	85	1,588	10,513	42.0	1885-89
95	9	9	5,000	36,761	146.9	1880-84
100	3	0	—	—	—	—

${}_5N_x$ —number of persons in age interval $(x, x+5)$, in thousands.

${}_5L_x$ —life table person years lived in age interval $(x, x+5)$.

C1— ${}_5N_x / ({}_5L_x / 5)$.

C2— $C1e^{rx}$, $r = 0.0210$.

C3— $C2/5Pe^{-2.5r}$, where P denotes total population, 52,742 thousand.

Year—year in which persons aged $(x, x+5)$ were born.

Sources: ${}_5N_x$ values from Vietnam, GSO (1983:34, Table 5), ${}_5L_x$ values from Coale and Demeny (1983).

This again is a broad range, and the resulting shift in magnitudes is again substantial; but the pattern stubbornly persists. It is, in short, extremely robust against changes in the untilting parameters.

Might the rise-and-fall pattern be due to errors in the age distribution? The smoothness of the changes makes this hypothesis implausible. UN *Manual IV* (UN, DESA, 1967:17-22) shows that, although we may encounter age distribution errors of this magnitude, the pattern is entirely different. Other relevant evidence includes the Vietnamese practice of observing an animal-year cycle and the finding that the single-year age distribution from the 1989 census shows little evidence of heaping (Vietnam, GSO, 1990). Unfortunately, the single-year age distribution for the 1979 census is unavailable. Age-distribution errors are undoubtedly present and perhaps even influential in some respects (we shall

see evidence of this below), but they cannot plausibly explain the suggestion of rising and then falling crude birth rates.

We must conclude, therefore, that crude birth rates in Vietnam really did rise and fall according to the general pattern indicated. More work would be required to get a better fix on the magnitudes involved, but the simple operation of untilting the age distribution has provided a significant conclusion and a useful guide to further analysis.

Analysis of the untilted age distributions at the older ages is in general more problematic, and I shall not pursue its deeper aspects, some of which are discussed in Feeney and Hamano (1990). The essential difficulty is that the values are far more influenced by the choice of untilting parameters, as is evident in the righthand portions of Figures 3 and 4.

Two exceptions are worth noting,

however. Short-term fluctuations, such as the regular up-down-up pattern seen at ages over 40 in Figures 3 and 4, are invariant under all changes in the untilting parameters and must therefore reflect either errors in the reported age distribution or changes in fertility or mortality.

The second exception occurs at the extreme old ages. The sharp rise in the pseudo CBR values for the oldest age groups has already been noted, and in fact the plot omits the pseudo CBR for the 95-99 age group, an obviously absurd 143 per thousand. To understand these observations, note first that the reverse-survived numbers of births from the oldest age groups are obtained by dividing the very small numbers in these age groups by even smaller survivorship proportions, rendering the calculation nonrobust against small errors. It might be suggested that the pseudo CBRs for the older age groups be ignored entirely for this reason.

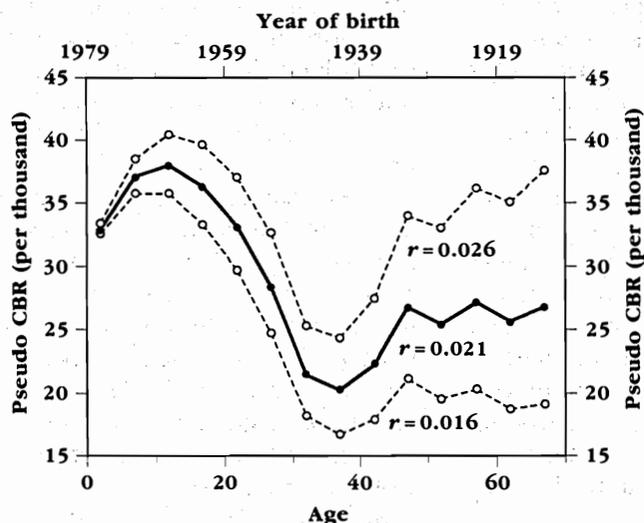


Figure 3. The age distribution untilted, with various growth rates, 1979

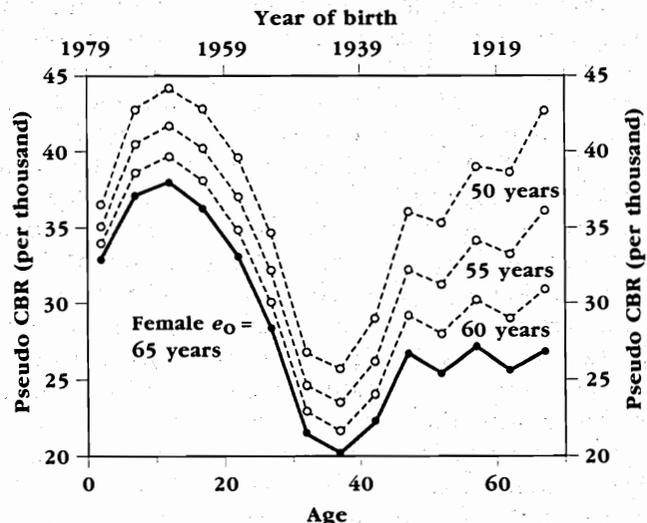


Figure 4. The age distribution untilted, with various mortality levels, 1979

Figure 5. Age-specific sex ratios for Vietnam, 1979

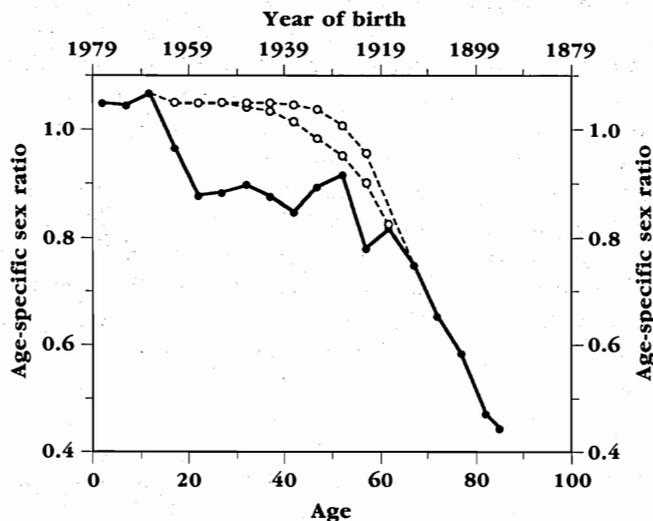
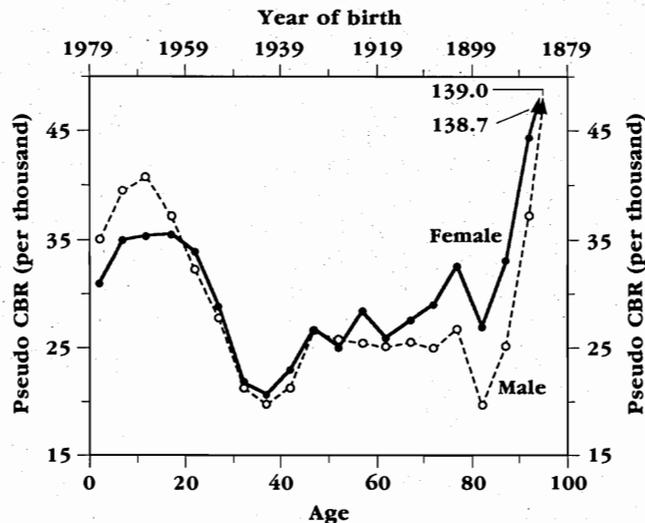


Figure 6. The untilted male and female age distributions of Vietnam, 1979



It turns out, however, that useful conclusions can be drawn from them. Though the values are unstable, they show a persistent empirical tendency to rise with increasing age.

I shall not go into the arguments in detail here, but this almost certainly reflects age exaggeration, which results in greatly excessive numbers in the oldest age groups. A detailed analysis of U.S. data is given in Coale (1990); see also Coale and Kisker (1986).

Having recognized this, we find that sharply increasing pseudo CBRs for the oldest age groups are a useful indicator of probable age exaggeration. The case for age exaggeration in this case is strengthened by the observation that the older cohorts experienced higher mortality than is assumed in the untilting transformation. A life table reflecting this higher mortality would result in even higher pseudo CBRs.

■ Sex ratios in Vietnam

Age-specific sex ratios from the 1979 census of Vietnam are plotted in Figure 5 with solid dots from data in Table 2. Notable anomalies are the sharp decline between the 10–14 and the 20–24 age groups, the relatively low values between ages 20 and 60, the pronounced dip in the 55–59 age group, and the leveling off at the oldest ages.

The sex ratios over age 60 are much lower than those in the Coale–Demeny model tables at any relevant mortality level and may represent the “Far Eastern” pattern of mortality identified by Goldman (1980). To provide a plausible reference schedule, we examine life table sex ratios, calculated as the ratio of the male and female ${}_5L_x$ values multiplied by the sex ratio at birth, taken here as 106 male births per 100 female births.

Life tables for Taiwan over the period 1959–61 and Singapore in 1957, given in Keyfitz and Flieger

(1968:204 and 234, respectively; data in table 2) and intercensal life tables for China, 1953–64 and 1964–82, given in Coale (1984:202), provide useful references. Having plotted all these sex ratios on separate pieces of tracing paper, I placed the Vietnamese plot over the plots for Taiwan and Singapore, then added the upper and lower reference schedules shown in Figure 5 with small circles and dotted lines.

The difference between the reference schedules and the observed schedules represents “missing males” broadly understood. They may be missing because males have been underenumerated relative to females, because males have emigrated in greater numbers than females, or because males have suffered greater mortality than females. The differential mortality explanation stands out as the obvious candidate, given Vietnam’s history of war first with France and then

with the United States; but this explanation is somewhat confounded by the pattern of sex ratios in the 1989 census (data in Table 2). If war deaths were the explanation of the deficit, the deficit would move to the right 10 years between the two censuses. This is not what we observe. The sex ratios in 1989 fall sharply from the 10–14 to the 20–24 age group, just as in Figure 5, and there is no trace in 1989 of the sharp dip at ages 55–59 in Figure 5.

A full analysis of the Vietnamese sex ratios is beyond the scope of this article, but let us consider the question of the "disappearing dip" at ages 55–59 in 1979. Because this dip does not appear at ages 65–69 in 1989, we may be reasonably sure

that it does not reflect a real sex imbalance in the birth cohort. A real sex imbalance occasioned by death or migration in earlier years would persist, and an imbalance at these ages coming into existence during the intercensal period is most improbable.

A possible explanation is that the dip in 1979 is simply due to a typographical error in the census report, but this is quickly dismissed. Not only do the male and female numbers add properly to the total for the age group, but also some three quarters of the provincial age distributions (Vietnam, GSO, 1983:35–74) show the same dip. It is notable that most of the exceptions are southern provinces,

though it is not clear how this observation may be put to use.

A speculation advanced by several members of the General Statistical Office staff was that males of ages 55–59 were overreporting their ages to avoid government-imposed work requirements on working-age men. If this were the case, we should see a dip in the numbers of males, but not of females, in this age group, and a corresponding excess of males in the 60–64 age group.

The observed pattern is readily displayed by untilting the male and female age distributions separately. Figure 6 shows these results. Contrary to expectation, the male age distribution between ages 45 and 80 is relatively smooth. The sex ratio dip appears to be due to a surfeit of females in the age group rather than to a deficit of males. The up-down-up-down pattern for females between ages 40 and 65 is curious, for it appears to represent age-distribution errors shared neither with males nor with older age groups. Note, however, that it is only the numbers of females in the 55–59 age group that is sharply out of line with the numbers of males.

■ Untilting and the stable age distribution

If the given age distribution is stable,

$${}_5N_x = Be^{-rx}({}_5L_x/5) \quad (3)$$

where B denotes the number of births in the five-year period preceding the census. We see at once from (1) that the corresponding untilted values will be identical to B . This suggests that the transformed values may be thought of as representing deviations from a con-

Table 2. Age-specific sex ratios for Vietnam, Taiwan, and Singapore

Age group	Vietnam		Taiwan, 1959–61	Singapore, 1957
	1989	1979		
0–4	1.065	1.048	1.058	1.051
5–9	1.054	1.044	1.059	1.051
10–14	1.062	1.066	1.058	1.050
15–19	0.981	0.965	1.057	1.048
20–24	0.923	0.877	1.052	1.046
25–29	0.907	0.882	1.047	1.046
30–34	0.917	0.896	1.045	1.046
35–39	0.874	0.875	1.041	1.044
40–44	0.869	0.847	1.034	1.042
45–49	0.814	0.893	1.023	1.031
50–54	0.804	0.915	1.004	1.002
55–59	0.882	0.780	0.970	0.956
60–64	0.830	0.815	0.920	0.867
65–69	0.766	0.749	0.848	0.734
70–74	0.678	0.654	0.755	0.598
75–79	0.597	0.585	0.648	0.469
80–84	0.487	0.472	0.524	0.353
85+	0.434	0.443	0.343	0.217

Sources: Vietnam, 1979, calculated from Vietnam, GSO (1983:34, Table 5). Vietnam, 1989, calculated from Vietnam, GSO (1990, Appendix Table 1.2). Taiwan, 1959–61, and Singapore, 1957, calculated from the male and female ${}_5L_x$ values in the life tables given in Keyfitz and Flieger (1968:204, 234, respectively), assuming a sex ratio at birth of 1.06 in both cases.

dition of stability.

To obtain a formal result, let us consider the deviation of the observed age distribution from a fitted stable,

$$D_1(x) = {}_5N_x - Be^{-rx}({}_5L_x/5) \quad (4)$$

on the one hand, and the deviations of the untilted age distribution values (1) from B ,

$$D_2(x) = {}_5N_x e^{rx}({}_5L_x/5) - B \quad (5)$$

on the other. Multiplying both sides of the latter identity by $e^{-rx}({}_5L_x/5)$ gives

$$D_2(x)e^{-rx}({}_5L_x/5) = D_1(x), \quad (6)$$

whence also

$$D_2(x) = D_1(x)e^{rx}({}_5L_x/5). \quad (7)$$

Thus we see that the deviations $D_2(x)$ of the untilted age distribution from the number of births B equal the deviations $D_1(x)$ from the fitted stable age distribution transformed by the untilting procedure (1).

If we believe that the true age distribution of the population is stable and have reasonably accurate values for the growth rate r and the life table survivorships ${}_5L_x/5$, the deviations from the fitted stable age distribution may be interpreted as representing errors in the reported age distribution. This is the method of UN *Manual IV* (UN, DESA, 1967:17-22).

■ Discussion and conclusion

The variation displayed in the untilted age distribution reflects four factors: the true age distribution of the population; the errors suffered by the reported distribution; the history of fertility, mortality, and

population growth; and the growth rate and survivorship parameters chosen for the untilting transformation. Assigning each factor its proper role is a difficult and sometimes impossible task. This is our natural objective, however, and we aim to carry the analysis of each case as far as circumstances permit. The saving grace is that we are not aiming for definitive conclusions, but rather for various indications to inform subsequent analysis. One or two modest conclusions and a list of sensible questions for further analysis will constitute fair payment for the hour or so of work invested in untilting and plotting an age distribution.

ACKNOWLEDGMENTS

The idea for this article germinated while I held a visiting teaching appointment at the Graduate Group in Demography, University of California at Berkeley, during the winter semester of 1987. The application to Vietnam was suggested by a United Nations Population Fund (UNFPA) consulting mission to the General Statistical Office of Vietnam in Hanoi during the summer of 1990. I am grateful to Kenneth Hill and Norman Y. Luther for comments on an earlier draft.

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News and Announcements

J. R. Rele, Southeast Asia Demographic Specialist, Dies

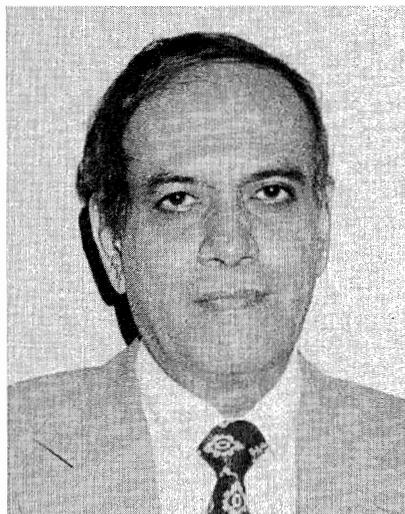
J. (Jawahar) R. Rele, 59, research associate and valued member of the East-West Population staff, was stricken with a fatal heart attack 13 November 1990 in Bombay, India, where he was visiting relatives after conducting a workshop in New Delhi.

Dr. Rele, who had been with the institute since 1985, will be remembered for his central role in the institute's cooperative work with the Indian Registrar General's Office, producing reports on such diverse topics as literacy, urbanization, and fertility. His research also focused on the indirect estimation of fertility and mortality rates. He had been working on refinements of the Rele method and on the development of new methods of estimation.

In addition to coordinating several workshops and coauthoring numerous research reports published by the Registrar General's Office, Dr. Rele had recently agreed to coauthor three more research papers on the topics of indirect evaluation of the Sample Registration System in India, on district fertility estimates for India, and on a new method of estimating life expectancy at birth.

Dr. Rele received his Ph.D. in Sociology from the University of California at Berkeley. In addition to his appointment at the East-West Population Institute, he held the position of adjunct professor of Public Health and affiliate graduate faculty in Population Studies at the University of Hawaii.

"He was our good friend and will be sorely missed by all of us here at the Population Institute," said Director Dr. Lee-Jay Cho. Dr. Rele is survived by his wife, Shaila, and a son, Amit, who is an engineering student at the University of Hawaii.



Status of Women in Laos Is Gradually Improving, According to Lao Social Scientist

Although men still dominate top positions in the Lao government and labor force, women have made significant gains since 1975, when the Lao People's Revolutionary Party, the Pathet Lao, took control of Laos and adopted a policy of equality between the sexes. Traditionally, women had been expected to be subservient to men in domestic as well as other spheres of activity. Today, numerous women hold government posts, and five of the 79 deputies to the National Assembly are women.

These are some of the observations of Mayoury Ngaosyvathn, a Lao jurist, herself former deputy director of the Ministry of Foreign Affairs and the Ministry of Justice, and today coordinator of the State Committee for Social Sciences, established in Vientiane in 1988. For the past few weeks she has been a fellow at the East-West Population Institute, working with Research Associates Peter Xenos and Ken Breazeale on a study of Laos's population.

Laos, with a population of only 3.58 million in 1985, is wedged between the far more populous and militarily powerful Vietnam on the east and Thailand on the west. It is not surprising, therefore, that the Lao government's policy is pronatalist and birth rates are high.

Nevertheless, there are signs that the government's population policy may be changing in response to

concern about maternal and child health. In 1984, at the first National Congress on Women, the prime minister made mention of a need to limit births. Last year an Institute on Mothers and Children was established, and it is seeking funds from international organizations for population education. The government is considering activities to encourage birth spacing.

The Indochinese War destroyed much of Laos's educational infrastructure. Today the country is rebuilding its social sciences and humanities institutions. The State Committee for Social Sciences, the Lao equivalent of the U.S. National Academy of Sciences, is one of the new organizations attempting to reestablish contacts with the world community of scholars. It comprises five institutes, of Art, Literature, and Linguistics; of History, Archeology, and Geography; of Economics; of Ethnology, and of Marxism-Leninism. Another new organization is the State Statistical Center, which was responsible for conducting Laos's first census (in 1985) and is in the process of developing a program of social and demographic data collection and analysis.

U.S. Census Bureau Announces Summer 1991 Workshops

Six workshops offered by the U.S. Bureau of the Census will provide opportunities to learn some of the latest techniques for conducting statistical activities. The workshops are open to personnel of any ministries and agencies involved in planning and conducting statistical programs. They are:

Integrated Microcomputer Processing System (IMPS), 8 July-16 August 1991 (in English).

Program fee: \$4,750 (includes a copy of REALIA COBOL for participant); without copy, \$3,950.

Integrated Microcomputer Processing System (IMPS), 15 July-23 August 1991 (in French).

Program fee: \$4,750 (includes a copy of REALIA COBOL for participant); without copy, \$3,950.

Automated Cartography for Censuses and Surveys, 15 July-2 August 1991.

Program fee: \$2,800.

Conducting an Economic Census: A Case Study, 5-23 August 1991.

Program fee: \$2,800.

Microcomputers for Demographic Analysis, 5-23 August 1991.

Program fee: \$2,800.

Evaluation of Population and Housing Censuses: Post Enumeration Survey (PES), 19-30 August 1991.

Program fee: \$1,950.

The program fee for each workshop does not include international travel or living expenses. Possible sources of fellowship funds are the U.S. Agency for International Development, the United Nations and its specialized agencies, the Organization of American States, and the World Bank. The Census Bureau has no fellowship funds available for the workshops.

Deadline for nominations is 15 May 1991; early application is advised. Applicants must identify a funding organization. Application forms and information about nomination procedures are available from:

Mr. Thomas C. Walsh
Chief, International Statistical Programs Center
Bureau of the Census

U.S. Department of Commerce
Washington, D.C. 20233
(Fax 301 763-7589; Telex
9102509167 ISPC Census Wsh)

Carolina Population Center Sponsors Symposium

Population: Growing as a Field, a symposium sponsored by the Carolina Population Center at the University of North Carolina, Chapel Hill, will take place 5-7 May 1991. The symposium is open to all who are interested, but alumni and others having a connection with the Carolina Population Center are especially encouraged to attend. For details, write to Karen Kurczewski or Don Thomas, Carolina Population Center, University of North Carolina, CB #8120, University Square, Chapel Hill, NC 27516-3997, U.S.A.

Management Sciences for Health Announces 1991 Course Schedule

Management Sciences for Health, a nonprofit public health agency that conducts health training projects worldwide, is offering eight courses in 1991 at its Boston, Massachusetts, headquarters. The courses are:

Managing Drug Supply for Primary Health Care (18 March-19 April). Tuition: \$5,300; field trip fee, \$450.

Managing Information in Primary Health Care Supply Systems (22 April-10 May). Tuition: \$3,800; computer fee, \$350.

District-Level Management of Health Programs (20 May-14 June). Tuition: \$4,500; field trip fee, \$450.

MIS [Management Information

Systems] Development and Design for Health and **Family Planning Organizations** (17 June–19 July). Tuition: \$5,300; computer fee, \$450.

Financial Management for Health Programs (22 July–16 August). Tuition: \$4,500; computer fee, \$400.

Environment and Health: Strengthening Policies and Programs (26 August–13 September). Tuition: \$3,800.

Gestion des Programmes de Formation en Santé et en Planning Familial (16 septembre–18 octobre). Tuition: \$5,300.

Conception et Développement de Systèmes d'Information pour les Organisations de Santé et de Planning Familial (21 octobre–22 novembre). Tuition: \$5,300; computer fee, \$450.

For additional information, contact:

Management Sciences for Health
Management Training
165 Allandale Road
Boston, MA 02130, U.S.A.
(Telephone 617 527-9202;
Fax: 617 965-2208;

Telex: 4990154 MSH UI;
Cable: MANSHEALTH)

Conference on the Peopling of the Americas Planned for 1992

In commemoration of the 500th anniversary of Christopher Columbus's arrival in the Americas, an international, interdisciplinary Conference on the Peopling of the Americas is planned for March–April 1992 in Veracruz, Mexico. The conference is being sponsored by the International Union for the Scientific Study of Population, the Associação Brasileira de Estudos Populacionais, the Federation of Canadian Demographers, the Population Association of America, the Programa Latinoamericano de Población, and the Sociedad Mexicana de Demografía under the auspices of the Consejo Nacional de Población, with the support of El Colegio de México, the Universidad Autónoma de México, and other Mexican institutions; it will be chaired by Mexico's Secretario del Gobernación.

The conference will present research on the processes of popu-

lation settlement and growth in the Americas from precolumbian times to the present, giving equal weight to historical and contemporary research. Sessions will cover mainstream demographic topics, such as the demographic transition, fertility and mortality decline, family structure, rural–urban migration, urbanization, and also topics peculiar to the peopling of the Americas, such as slavery, the consequences of conquest and contact, the survival of the Amerindians, and population and environmental issues in the Amazon.

Invited papers will be published in the conference proceedings before the conference takes place. Contributed papers are also encouraged.

For additional information about the conference, contact:

Mr. Bruno Remiche
Executive Secretary
IUSSP
34 rue des Augustin
B-4000 Liège, Belgium
(Fax: 32 41 223847; Telephone:
041 224080; Telex: 42648 popun;
Cable: Popunion-Liege)

Reviews and Publication Notes

Changing Cities of Pacific Asia: A Scholarly Interpretation by Yue-Man Yeung. Hong Kong: The Chinese University Press, 1990. xxii, 320 pp. No index. Available from The Chinese University Press, Sha Tin, New Territories, Hong Kong.

Pacific Asia, according to Professor Yeung, includes the continental na-

tions from Korea through China to Indochina and Burma; and the archipelagos of Japan, the Philippines, and Indonesia. Its great cities include Seoul, Shanghai, Taipei, Hong Kong, Hanoi, Saigon, Phnom Penh, Bangkok, Rangoon, Kuala Lumpur, Singapore, Jakarta, Manila, and Tokyo. Professor Yeung's book is

about these cities (or most of them) and their experiences and problems since 1960.

Implicit in the chosen scope of his subject is the assumption that these cities have something in common that explains their individual histories and shapes their futures. Though the author is never explicit

about this assumption, the cities he chooses—out of a larger set available in that part of the world—are nearly all saltwater or estuary ports developed by colonial powers in the sixteenth through the nineteenth centuries. (Exceptions are Kuala Lumpur and Taipei, now connected by rail to harbors 30 or 40 kilometers distant; and Phnom Penh, on a navigable river but about 200 kilometers from an oceanic harbor.) Of some 31 cities of mainland China that had more than a million inhabitants in 1985, only Shanghai is mentioned in the text; but the others are inland cities, without important functions in international trade.

Professor Yeung's main interest, however, is not in economic history but in municipal administration. He has a lively appreciation of the problems of urban life when cities are growing rapidly but most urban residents are poor—an appreciation cultivated by his decade of association with the International Development Research Centre. The essays in the volume explore policies and proposals for managing urban growth, rationalizing land use and transportation systems, providing decent housing for the urban poor, encouraging informal entrepreneurship, and improving the urban food supply. The perspective is consistently comparative, but the intercity comparisons seldom lead to compelling generalizations.

The colonial powers that developed these cities were naturally most interested in their economic functions, building modern port facilities, warehouses, office buildings, railways, electric power generators, and public water and sewer systems to serve the import-export

trade and its minions. They installed municipal administrations that reflected the varying bureaucratic styles of the mother countries. Some of these administrations were reasonably effective managers of urban resources, but none was much concerned about social (or even civil) justice for the indigenous labor force. The colonials mostly lived in gated enclaves of prosperous homes and gardens; the indigenes mostly lived in crowded shanties and flimsy multiple dwellings lacking basic sanitary conveniences.

Between 1945 and 1960, the colonial powers were either forcibly dispossessed or had the good sense to pack up and go home; the sole vestige today is Hong Kong, due to be incorporated into mainland China in 1997. But from Professor Yeung's description of Pacific Asia's cities during the 1970s and 1980s, not much has changed except the scale of cities and the ethnicities of the ruling oligarchies. The cities are still based economically in international trade, the facilities relevant to that function have been modernized and expanded, municipal bureaucracies still function much like their colonial predecessors, and the interests of the urban poor still get short shrift.

The manifest exceptions to these generalizations are Hong Kong and Singapore, both city-states with strong traditions of British governing style. Both have flourished in recent decades as manufacturing centers; their populations, though necessarily crowded, have shared in the national prosperity; and their governments have been effective instruments of social betterment, particularly with respect to housing

and transportation. A critical ingredient of their success has been fiscal systems that tax urban residents and urban property to provide urban infrastructure and services—an arrangement facilitated by their limited territorial responsibilities. Formosa is also a small and relatively prosperous nation, but it has been much less effective in managing urbanization: In 1975, says Yueng, the total housing stock of Taipei was owned by 5.6 percent of its inhabitants, and the exploding population of motor vehicles made the air unbreathable and the noise unbearable. Seoul, the primate city of a larger nation (60,000 km²) colonized not by Europeans but by Japanese, also has found prosperity in manufactures for international trade, but "unabated urban growth has led to intolerable population and traffic congestion, serious industrial pollution, environmental deterioration, housing shortages, and inadequate public service" (p.38).

The real basket cases are Jakarta, Bangkok, and Manila. In 1982 only 30 percent of Jakarta's households had access to piped water, and the city of 6.5 million inhabitants had no waterborne sewage system. Jakarta's municipal budget was less than 10 percent of Singapore's, for a population 2.7 times as large. Manila's sewerage system was built in 1909 to serve a population of 220,000 to 440,000 and has not since been substantially improved or extended even though the metropolitan population is now over 7 million. Traffic jams in Bangkok are probably the worst in Asia, with peak-hour speeds of 12 km per hour for autos and 9 per hour for buses. Over a fourth of Manila's

and Bangkok's populations live in squatter settlements. (pp. 43-44, 151)

The subtitle of this volume might lead a potential reader to expect a coherent theoretical statement about urban processes in Pacific Asia.

However, the book is actually a collection of 15 essays that Professor Yeung wrote (a few are coauthored) between 1975 and 1988 on various aspects of urbanization in Pacific Asia. They were prepared for a variety of audiences and occasions, so overlap considerably in content; and later essays borrow freely from earlier ones. (Compare Chapter 3, "Great Cities of Eastern Asia," first published in 1988, with Chapter 6, Southeast Asian Cities: Patterns of Growth and Transformation," first published in 1976.)

Formal theories of urban development are briefly reviewed in Chapter 5, "Changing Southeast Asian Cities." Professor Yeung concludes (correctly, I think) that no general theory of urbanization with wide applicability exists, and that the succession of fashionable hypotheses and paradigms (over-urbanization, pseudo-urbanization, economic dualism, dependent urbanization) has created a "conceptual smog . . . so dense that [much research will be needed] before the air is clear" (p. 85).

Because the volume has no large-scale structure and no index (or even a list of the tables and maps scattered through the text), it isn't useful as a reference work. Overlap and repetition among the individual essays discourages straight-through reading. However, for readers who need a competent survey of current problems and policies among the great cities of Pacific Asia, I can

recommend Chapter 3, "Great Cities of Eastern Asia"; and Chapter 10, "Cities that Work: Hong Kong and Singapore." Both are up to date (1988 and 1987 publication), reasonably systematic in exposition, interesting, and informative.

—Ira S. Lowry
Housing and Development
Consultant, Pacific Palisades,
California

Population Transition in India edited by S. N. Singh, M. K. Premi, P. S. Bhatia, and Ashish Bose. Delhi: B. R. Publishing Corporation for the Indian Association for the Study of Population, 1989. 2 vols. Vol. 1, xxiv, 506 pp.; Vol. 2, xix, 404 pp. ISBN 81-7018-579-3 (set, cloth), U.S. \$155. Available from D. K. Publishers Distributors (P) Ltd., 1 Ansari Road, Darya Ganj, New Delhi-110002, India.

This two-volume set contains papers prepared by South Asian scholars for the South Asian Regional Conference on Population, sponsored by the Indian Association for the Study of Population, and the 21st International Population Conference of the International Union for the Scientific Study of Population (IUSSP), both of which took place in New Delhi in September 1989. Many of the authors, representing a wide variety of population-related disciplines, are published here for the first time. Although the papers are uneven in quality, they show a marked improvement in the use of tables, charts, and bibliographical citations from earlier work submitted to IUSSP conferences. The editor notes that contributors "have a rich and varied background as teachers and researchers in univer-

sities and research institutions, government organisations like the Office of the Registrar General and the Department of Family Welfare, technical institutions like the Indian Institute of Technology and the Indian Council of Medical Research" (Preface).

Because the contributions cover such a wide range of population topics, the editors found it hard to assign them to specific sections. There is some overlap in topics between Volume 1 and Volume 2.

Volume 1 contains 5 sections. Section A, Wider Issues, contains papers on population and development, Indian population policies, and private and governmental programs. Section B, Stalling of the Birth Rate, includes papers analyzing the causes of the smaller than expected decline in Indian fertility despite the government's use of incentives to lower birth rates. "Fertility Behaviour in India, 1961-86: The Stalled Decline in the Crude Birth Rate" by Mahinder D. Chaudhry; "On the Myth of Lower Urban Fertility in India and the Controversy between Programme and SRS [Sample Registration System] Birth Rates" by S. Mukerji; and "Alternative Routes of Fertility and Mortality Decline—A Study of Kera and Punjab" by Moni Nag, are informative and provocative reading in this area.

Section C, Fertility and Family Planning, contains papers on contraceptive technology, communication and pill promotion, and other factors, such as socioeconomic development, affecting the use of family planning. Section D, Family, Child Survival and Aging, addresses topics that are of concern to policymakers in both the economi-

cally developing and developed countries. The use of mathematical models in the analysis of fertility, mortality, and mobility and in population projections can be found in the 16 papers in Section E.

Volume 2 includes papers on a diverse array of subjects: data bases and research; macrolevel studies; nuptiality; fertility and family planning; health, nutrition, and mortality; common influences on fertility and mortality; tribal fertility and mortality; migration and urbanization; historical demography; and religion and language in relation to population issues. A list of the papers presented by Indian authors at the 1989 IUSSP Conference, arranged by session, is also included.

Population libraries with substantial holdings on South Asia will want to purchase these volumes, as will academic libraries with South Asian collections. It is unfortunate that the purchase price outside India is so high that only libraries with generous budgets will be able to acquire this contribution to current Indian population research.

—Alice D. Harris
Palm City, Florida

ALSO NOTED

Cities: Life in the World's 100 Largest Metropolitan Areas published by the Population Crisis Committee. Washington, D.C., 1990. 16 pp. in wall-chart form. U.S. \$5. Available from Population Crisis Committee, 1120 19th Street N.W., #500, Washington, D.C. 20036-3605, U.S.A. (Telephone 202 659-1833).

This report, edited by the Population Crisis Committee's Senior Vice

President Sharon L. Camp and prepared with assistance from urban specialists throughout the world, ranks 100 metropolitan areas in 45 countries using 10 indicators: the murder rate, food expenditures, living space, access to utilities, communications, education, infant mortality, air quality, noise pollution, and traffic congestion.

Ranked as the five most livable metropolitan areas are Melbourne, Montreal, Seattle-Tacoma, and Essen-Dortmund-Duisburg. The five largest cities with the worst living conditions, according to the report, are Lagos, Kinshasa, Kanpur, Dhaka, and Recife.

The report states that rapid urbanization has become the dominant demographic trend of the late twentieth century, after population growth itself. Between 1900 and 1950 the proportion of the world's population living in cities rose from 10 to 30 percent. By the year 2010, nearly half of the world's population is projected to be urban. Rapid urbanization will remain the dominant demographic trend until well into the twenty-first century, when population growth is expected to moderate.

The report notes that rural-to-urban migration is responsible for less than half of the current increases in urban populations in most developing countries. High birth rates in the cities cause most of the growth.

The study's authors used consistent criteria to define the 100 largest metropolitan areas included in their ranking. The population estimates used were as of 1 January 1989 and prepared by urban demographer Richard L. Forstall. Each of the 10 indicators of urban

livability accounted for 10 points on the study's 100-point scale, 10 being the most favorable and 1 the least favorable. Total scores ranged from 86 to 19.

Twenty-eight cities ranked as poor with scores below 45. All were in developing countries and most had annual population growth rates of 2.5 percent or more. Besides Dhaka, Asian cities in this category included Pune, Lahore, Calcutta, Bombay, Surabaya, Karachi, Delhi-New Delhi, Bangalore, Tehran, Hyderabad, Jakarta, Ho Chi Minh City, Shenyang, Madras, Istanbul, Guangzhou, Bangkok, Manila, and Ahmedabad.

Among the 26 cities ranking as fair with scores of 45-59 were 10 in Asia: Seoul, Pusan, Shanghai, Beijing, Bandung, Harbin, Tianjin, Wuhan, Nanjing, and Chongqin.

Most cities ranking as good (scores of 74-60) and very good (100-75) were in developed or newly industrialized countries. Cities ranked as very good in Asia were Osaka-Kobe-Kyoto, Tokyo-Yokohama, Singapore, and Nagoya. Those ranked as good were Taipei, Hong Kong, Tashkent, and Ankara.

Detailed information on the 10 indicators used in the study is available in a *Statistical Appendix*, available from the Department of Publications, Population Crisis Committee. The entire data set is available to research institutions in Lotus 1-2-3 on 3.5 inch or 5 inch floppy disk upon written request to the Director of Research.

Population Growth and Policies in Mega-cities published by the United Nations. Series of reports, each \$7.50.

Available from United Nations Publications, Sales Section Room DC2-0853, New York, NY 10017.

A series of studies on cities in the developing world whose populations are expected to exceed eight million by the year 2000. Each report focuses on a particular city and aims to provide a better understanding of the city's formulation, implementation, and evaluation of population policies. Topics include demographic trends, economic background, early and recent decentralization strategies, key social and economic sectors and issues, distribution of public investment, and resource generation.

Currently available reports focus on the following Asian cities (date of publication and UN sales number

appear in parentheses after each title):

Bangkok (1987, E.90.XIII.8)
Bombay (1986, E.90.XIII.9)
Calcutta (1986, E.90.XIII.10)
Delhi (1986, E.90.XIII.11)
Dhaka (1987, E.90.XIII.12)
Jakarta (1989, E.90.XIII.13)
Karachi (1988, E.90.XIII.14)
Madras (1987, E.90.XIII.15)
Metro Manila (1987, E.90.XIII.16)
Seoul (1987, E.90.XIII.17)

Pharmacists and Family Planning by Robert E. Lande with the assistance of Richard Blackburn. Population Reports, Series J, No. 37, November 1989, 28 pp. Baltimore: Johns Hopkins University, Population Information Program. Available from Population Information Pro-

gram, The Johns Hopkins University, 527 St. Paul Place, Baltimore, MD 21202, U.S.A.

The report documents the degree of reliance on pharmacies for contraceptives in developed and developing areas, describes lessons learned about the dispensing of contraceptives through pharmacies, and recommends ways to make pharmacies more effective contraceptive dispensers and educators.

Currently about 55 million couples buy their contraceptives in pharmacies. According to the authors, almost 450 million couples need the contraceptive supplies that pharmacies sell. For millions of customers who do not visit clinics or doctors, pharmacy personnel are the only source of information about contraceptives.

WOMEN'S PREFERENCES FOR CHILDREN IN SHIFANG . . .

(continued from page 12)

of underreporting were found among urban, educated, and younger women because larger proportions of them reported one child as their desired number. In other words, these more "modern" women appeared to be the most sensitive to the government's one-child policy. In contrast, Hermalin and Liu found that rural and uneducated women were more likely to hide their true attitudes about family size in face-to-face interviews.

The results of the Shifang study indicate that most women, especially rural women, prefer to have more than one child. Children still have important economic value for them in agricultural production and

as a source of old-age support in rural areas. If couples did not prefer more than one child, there would be no need for the government's one-child policy or its vigorous birth control programs. Most Chinese couples who are limiting their family size to one child are doing so not out of choice, but as a sacrifice of their own interest for national prosperity and the welfare of future generations.

The critical task of the family planning program is to gain the understanding and support of the people for the national policy through family planning education. One way it can do so is to formulate realistic and meaningful policies of reward-

ing couples who have only one child, particularly by providing social insurance for them in old age.

Certainly, family-size preference has greatly decreased in China. The number of children estimated to be actually desired by Shifang women in my study was only 2.13, a very low average for a rural community. The decline is probably due to several factors, among them a changing social setting and the success of family planning educational efforts in recent decades.

Not only has there been a decline in the number of children desired, but also the relative values of sons and daughters has undergone a noticeable shift. A substantial num-

ber of the Shifang respondents did not subscribe to the adage "The more sons, the more happiness." Raising sons has become more expensive, even in rural areas. In contrast, with the improvement of women's status, the value of daughters has increased. As a result, women are now more likely than formerly to express a preference for daughters and for a sex-balanced family. Yet, when considering having only one child, Shifang women, especially those in rural areas, still seem to regard a son as having more utility than a daughter.

The gap revealed by this study between individual fertility preferences and the government's one-child policy suggests that any relaxation of the policy would lead to a rise in fertility toward the preferred level. In fact, it is the fundamental reason for the increased fertility in China in recent years and is likely to continue being a source of fertility instability in the future.

ACKNOWLEDGMENTS

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reviewer and from Sandra Ward's careful editing.

The *Forum* acknowledges with thanks the use of two photographs by Linus Chao of the University of Hawaii, Hilo Campus, taken as part of a research project on cultural change in China sponsored by the East-West Institute of Culture and Communication.

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ASIAN AND PACIFIC POPULATION FORUM

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The AIDS Prevention Dilemma in Thailand

Acquired immune deficiency syndrome (AIDS) and its causative human immunodeficiency virus (HIV) have become a rapidly spreading menace in Asia as elsewhere. This article summarizes the current status of the AIDS epidemic in Thailand, identifies the patterns of HIV transmission through Thai society, describes governmental and private responses to the epidemic, and suggests further countermeasures.

The number of HIV positive cases has risen dramatically since 1988. By September 1990 the Ministry of Public Health estimated 100,000 Thais to be HIV positive, a figure thought by other observers to be conservative. Until recently intravenous drug use and sexual contact among male homosexuals accounted for nearly all cases, but a new pattern of transmission—through heterosexual contact between female prostitutes and their male clients—is emerging, particularly in Northern Thailand. Through such casual, unprotected sex, the virus is now entering the general Thai population.

It is strongly recommended that every effort, public and private, be undertaken to educate the public about ways to avoid contracting and transmitting HIV, and to facilitate the widespread use of AIDS-preventive measures. A recently announced national policy to prevent AIDS represents a hopeful step in this direction.

ASIAN AND PACIFIC POPULATION FORUM

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The *Asian and Pacific Population Forum*, published quarterly by the East-West Population Institute, contains policy-relevant and technical articles on population issues affecting the Asia-Pacific region, reviews of demographic publications, and news about population activities in the region. Guidelines on manuscript submission are available from the editor. All manuscripts are peer-reviewed. Readers are invited to submit articles, news items, reviews, and letters to:

Editor, Asian and Pacific Population Forum
 East-West Population Institute
 1777 East-West Road
 Honolulu, Hawaii 96848, U.S.A.

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The EAST-WEST POPULATION INSTITUTE, a unit of the East-West Center, conducts research, training, and related activities in the population field, with emphasis on economic, social, psychological, and environmental aspects of population problems in the Asia-Pacific region.

The EAST-WEST CENTER is a public, nonprofit educational institution established in Hawaii in 1960 by the United States Congress with a mandate "to promote better relations and understanding among the nations of Asia, the Pacific, and the United States through cooperative study, training, and research." Some 2,000 research fellows, graduate students, and professionals in business and government each year work with the Center's international staff on major Asia-Pacific issues relating to population, economic and trade policies, resources and development, the environment, culture and communication, and international relations. Since 1960, more than 25,000 men and women from the region have participated in the Center's cooperative programs. Principal funding for the Center comes from the United States Congress. Support also comes from more than 20 Asian and Pacific governments, as well as private agencies and corporations. The center has an international board of governors.

by Marjorie A. Muecke

EXPERIENCE with the unrelenting spread of the human immunodeficiency virus (HIV) in Sub-Saharan Africa indicates that, in the absence of a cure or vaccine for acquired immune deficiency syndrome (AIDS), the disease will create a major social crisis wherever it takes hold. The countries of Asia are only beginning to recognize the AIDS pandemic as a threat to themselves (Karel and Robey 1988: 2-4, 18).

Thailand is more advanced than its neighbors in recognizing AIDS as a threat of major proportions. It has a sentinel surveillance program to track the diffusion of HIV in the Thai population, and the proportion of its citizens who have heard about the disease is greater than in other countries of Southeast Asia.

However, many Thais who have heard of AIDS know little about it. Eighty-eight percent of a stratified random sample of 1,500 people in Bangkok knew that AIDS is a dangerous and contagious disease; but fewer than half knew that use of condoms can reduce the spread of HIV, more than one-third thought they could not be infected by people who look healthy, and another third did not know that AIDS is a fatal disease (Somchai Durongdej 1990).

Until recently the AIDS risk in Thailand has been associated

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primarily with intravenous drug use. Most estimates of the number of intravenous drug users in the country range between 100,000 and 200,000, the majority of users living in Bangkok. Other risk factors are high levels of population mobility and return migration from abroad, sexual mores that endorse male sexual freedom and restrict it for women who are not prostitutes, the large scale of its tourist and night entertainment industry, nonuse of condoms, and an uncircumcised male population (Fink 1989; Waugh and Spicer 1990). (See box on page 3.)

All these sociocultural characteristics bring people intimately together, providing the necessary environment for extensive HIV transmission. For these reasons, Thailand is selected for a case study AIDS update in the *Asian and Pacific Population Forum*.

It is characteristic of epidemics to begin quietly and capriciously, as depicted by Albert Camus in his novel *The Plague* (1948). In its early phase of surreptitious spread, few realize their vulnerability to AIDS. In Asia the epidemic is still invisible. In Thailand, with fewer than 200 persons known to be symptomatic out of a population of 56 million, hardly anyone feels vulnerable. The Thais have an aphorism: "*Mai ben long sop mai lang naamtaa*" (If you don't see the corpse in the coffin, you don't shed a tear).

Some government officials, health care providers, and nongovernmental organizations (NGOS) are profoundly aware of the dangers that AIDS poses to the Thai population at large. But other officials, the mass media, and the majority of

their audiences still associate AIDS with foreign male tourists and social deviants—intravenous drug users, homosexuals, and female prostitutes—not with high-risk sexual behavior that may be widespread among the general population.

Most Thais misleadingly associate AIDS with male tourists from abroad, intravenous drug users, homosexuals, and female prostitutes rather than with high-risk sexual behavior that may be widespread among the general population.

Attempts to control AIDS by associating it only with foreigners and "undesirables" are common national responses, particularly in countries where HIV prevalence rates are still low. Nevertheless, where AIDS is concerned such defenses of denial and displacement can be suicidal because they reinforce the false notion of personal safety among the general populace.

This approach also encourages a disease-based xenophobia. The Thai government's prohibition (until 1991) of known HIV carriers from entering the country and its concentration of HIV screening efforts on intravenous drug users, prostitutes, and clients of sexually transmitted disease (STD) clinics misleadingly suggest that Thais who are not prostitutes and do not abuse drugs or have an active STD are safe from AIDS. Anonymous random testing of other population segments at risk, such as military personnel, male youths, and truck

drivers, would yield more valid information on the prevalence of the disease while still economizing resources.

Selective targeting of prostitutes and intravenous drug users for HIV testing reinforces negative attitudes toward these high-risk groups, as has happened in the United States, thus legitimating an inadequate

governmental and public response to the problem of AIDS.

What Bateson and Goldsby (1988:134) argue in the case of the United States holds equally for countries such as Thailand: "If the population at large does not alter its sexual behavior until it has experienced the depth of loss and direct contact with suffering that

Survey of Foreign Tourists in Thailand Reveals Majority Experience Night Life

In mid-1990 a self-administered questionnaire gathered information from 1,200 foreign tourists in Bangkok and Pattaya, Thailand's two major tourist cities, about their sexual experiences and use of condoms while in Thailand. The survey, conducted by the Program on AIDS of the Thai Red Cross Society, also asked respondents about their demographic characteristics, knowledge of and attitudes toward AIDS, awareness of the AIDS situation in Thailand, and opinions about the possible impact of AIDS information campaigns on tourism.

Preliminary results indicate that 63 percent of those surveyed had experienced Thai night life (e.g., had patronized bars, clubs, or massage parlors). Among the Bangkok tourists, 40 percent of men and 5 percent of women said they had already had or were planning to have sex with a Thai person. Only 40 percent of the tourists interviewed were married. Of those 40 percent, 25 percent were traveling alone.

The research team included Werasit Sittitjai, deputy director of the Thai Red Cross Society's Program on AIDS and assistant professor at the Institute of Population Studies, Chulalongkorn University; Praphan Phanuphak, director of the Program on AIDS; and Charlotte Shum and Dominique Michaud, undergraduate students from the University of Pennsylvania. A complete report on the survey will be available in June 1991 from the Thai Red Cross Society. Requests for copies should be directed to:

Director of Program on AIDS
Thai Red Cross Society
1871 Rama 4 Road
Bangkok 10330, Thailand
Fax: (662) 255 3727

—by Werasit Sittitjai

[accompanies death from AIDS], . . . it will be too late to change."

Like other government officials around the world, Thai officials face a difficult set of challenges: Even if they have the vision to foresee the epidemic in its maturity, how are they to contain the spread of AIDS, when change in individual behavior is what is essential to stem the tide? (Rosenberg 1989:10) How can they protect the health of the public without discriminating against certain individuals or groups? How can they orchestrate change in social norms to reduce high-risk behavior without appearing to condone such behavior and without upsetting the political and economic stability of their nations?

Even if government officials have the vision to foresee the AIDS epidemic in its maturity, they face the dilemma of having to orchestrate change in social norms to reduce high-risk behavior without appearing to condone such behavior and without upsetting the nation's political and economic stability.

This report reviews the epidemiologic development of the HIV epidemic in Thailand, describes the Royal Thai Government's dilemma and its response to the epidemic, and discusses the implications of the government's actions, offering suggestions for improving the efficacy of AIDS preventive work in Thailand. Unless otherwise stated,

Table 1. **Known numbers of new cases of HIV infection, ARC, and AIDS, by year: Thailand, 1984-90**

Type of case	1984	1985	1986	1987	1988	1989	1990	Total
HIV	0	5	10	171	5,045	10,648	11,151	27,030
ARC ^a	0	5	8	13	22	90	105	243
AIDS	1	1	0	7	5	29	48	91

Source: Thailand, Department of Epidemiology (1990b).

a. AIDS-related complex (ARC) is a combination of physical symptoms and signs, existing over time, that indicate infection of a person with HIV. In the United States it is now referred to as "constitutional disease."

all statistics cited herein, including those reported in the news media, are from the Department of Communicable Diseases Control (CDC), Ministry of Public Health, Bangkok.

■ The epidemiologic pattern of HIV infection in Thailand

The AIDS pandemic has crept into Thai society covertly, and official response has been equally quiet. The first case was diagnosed in 1984. By 1988 there were only 10 known cases; most were among gay (homosexual) men, who were said to have contracted the disease from foreigners.

Rapid rise in cases. Initially the small number of cases and their apparently foreign origin permitted complacency. But in 1988 Thailand experienced a sudden escalation of known HIV prevalence (Smith 1990). The rise evidently reflects actual seroconversion rather than more adequate screening because HIV screening began prior to the surge in prevalence. By the beginning of 1988, 186 asymptomatic

persons had been found to be HIV positive (Table 1). Jonathan Mann, director of WHO's Global Programme on AIDS, was quoted in the *New York Times* (Altman 1988:12), "This Thai experience shows very clearly that Asia is just as vulnerable to an explosion of HIV infection as any other part of the world."

A sudden escalation of known HIV cases in 1988 appears to reflect actual seroconversion rather than more adequate screening. By mid-January 1991 the number of known cases had reached 27,030.

Within two years, the cumulative number of HIV positive cases shot up to 15,879; and just 10 months later, in October 1990, the Department of CDC reported a total of 23,279 known HIV cases, 200 AIDS-related complex (ARC) cases, and 69 cases of active AIDS. By 15 January 1991 the number of known HIV cases had risen to 27,030.

These figures, alarming as they are, probably indicate only the tip of the iceberg. The Department of Epidemiology in the Ministry of Public Health reported in September 1990 that an estimated 100,000 cases were HIV positive, but estimates by nongovernmental observers are much higher. Jon Ungphakorn, director of the Thai Volunteer Service, has estimated at least 200,000 are HIV infected. Mechai Viravaidya, secretary general of the Population and Community Development Association, estimated that in October 1990 between 300,000 and 400,000 Thais were infected with HIV, and some insurance companies' estimates at that time were as high as 800,000.

The meaning of the dramatic increase in HIV cases has not been widely reported in the Thai media, however. The director-general of the Department of CDC recently told the *Bangkok Post* (Ampa and Veera 1990) that the government strategy is to release AIDS data gradually to prevent panic and protect the tourist industry.

This restriction of information on the AIDS pandemic's emergence in Thailand is the continuation of a policy expressed as early as 1987. It was reiterated by the director-general of the Corrections Department when he recently declined to disclose the number of HIV carriers in prisons on the grounds that the figure is "alarming and might cause panic" (*The Nation* 29 November 1990). Nevertheless, the policy has allowed for full reporting of AIDS cases to the World Health Organization (WHO) since 1987 (*Bangkok Post* 28 November, 1987; see also Truong 1990:158-191).

Patterns of transmission. The routes of transmission in Thailand initially appeared to conform to the pattern in developed countries, through male homosexual practices and intravenous drug use, with a consequent sex ratio strongly favoring males (May et al. 1989:166-167). In May 1990, 84 percent of the known living 17,328 cases were among males (*Bangkok Post* 17 June 1990).

At the beginning of 1988, fewer than 1 percent of intravenous drug users at Bangkok detoxification clinics were HIV positive; nine months later, over 40 percent were. As of 15 October 1990, 61.3 percent of known HIV-positive persons were male intravenous drug users and 2.5 percent were female intravenous drug users (Thailand, Department of Epidemiology, 1990a). Similar rapid rises and sex ratios of HIV prevalence among intravenous drug users have been reported for American and European cities such as New York and Edinburgh.

The government estimates there to be 80,000 to 100,000 intravenous drug users in Thailand, 75-80 percent of them in Bangkok (Thailand, Dept. of CDC, 1988:11). Until 1990, more than 75 percent of the known HIV positive cases were among intravenous drug users. The proportion is in a progressive decline owing to the increase in sexual transmission of HIV (Table 2).

Recent regional surveillance has identified another pattern, one more like that in Sub-Saharan Africa, where the sex ratio of AIDS cases is close to one female for every male (Quinn et al. 1989). Heterosexual behavior is now the paramount route of transmission in Northern Thailand, and it may soon become so for the nation. Nationally, the ratio of male to female HIV-infected persons was 8 to 1 in 1989, but by October 1990 it had dropped to 4 to 1 (*The Nation* 9 November 1990).

Because prostitutes have a high rate of change in sex partners and

Table 2. Sources of HIV transmission among known HIV positive persons: Thailand, various dates, December 1988 to October 1990 (percentage distribution)

Source	December 1988	June 1989	December 1989	October 1990
Intravenous drug use	91	84	78	64
Sexual contact	4	10	14	27
Blood transfusion	u	u	u	0.2
Maternal	u	u	u	0.0
Unknown	5	6	8	9.3
All sources	100	100	100	100

Sources: Vicharn (1990:24); Thailand, Department of Epidemiology (1990b:545).

Note: Percentages may not sum exactly to 100 because of rounding.

u—unknown.

are highly mobile, female prostitutes have been designated the major vector of HIV transmission into the general population (Sombat 1990: 535).¹ Estimates of the number of female prostitutes in Thailand range from more than one-half million to one million (Mattani 1984; Khin 1983). These numbers are equivalent to 2–4 percent of the total female population.² The National Commission of Women's Affairs estimated in 1990 that some 100,000 prostitutes were girls of ages 15 and under (Mayuree 1990).

Corresponding numbers of male prostitutes are not known, although the Department of CDC estimated the number at 5,000 in 1988 and the rate of HIV infection to be higher among them: 1.28 percent versus 0.09 percent for female prostitutes (Thailand, Dept. of CDC, 1988:9,18). HIV prevalence among three types of prostitute have been reported for Chiang Mai Province as of December 1990): undisguised female prostitutes, 23.2 percent; disguised or "hidden" female prostitutes (those working in nightclubs, bars, escort services, massage parlors, and the like), 8.4 percent; and male prostitutes, 14.0 percent

1. Female prostitutes are thus viewed as vectors of the HIV, but not as recipients of it. This view is contrary to medical evidence that HIV is more concentrated in semen than in vaginal fluids, and so more readily transmitted by men than by women; and it is contrary to evidence that prostitutes become HIV infected from male clients, particularly from men who are intravenous drug users.

2. Government figures for numbers of prostitutes are consistently many times lower than those of other observers. The government estimates the total number of women in the "entertainment" services to be approximately 100,000 (Thailand, CDC, 1988:18).



Nightclub floor shows such as the one shown here are one aspect of Thailand's large entertainment industry. Prostitution is an integral part of that industry, and sexual intercourse between prostitutes and male clients who do not use condoms is thought to be the main source of HIV transmission to the general population.

(Chiang Mai Provincial Health Office).

The Thai government and non-governmental organizations have mounted a variety of programs targeted to female prostitutes in cities that have large numbers of prostitutes in an effort to contain the spread of HIV infection. Worldwide, prostitutes are the focus of AIDS-prevention education programs for several reasons. They are more easily identified than the larger and more dispersed circle of their clients. They are also integrated with a broad spectrum of society. (WHO 1989:2)

Although prostitution is illegal in Thailand, Thai society is sexually permissive and the laws against it are seldom enforced. Werasit (1990) reports that over half of the mar-

ried men interviewed in a recent study had up to five sex partners other than their wives in a 12-month period. (See shaded box on page 7.)

Most patrons of prostitutes are not foreign visitors, but rather Thais. It is widely accepted as normal for teenage boys to have their first sexual experiences with prostitutes, and for any men (except monks and royalty) to visit prostitutes. The greater need for men than for women to demonstrate sexual prowess may be associated with the Thai tolerance of both prostitution and polygyny, even though both practices are illegal (Khin 1980).

High concentration of cases among prostitutes in North. The highest HIV prevalence rates reported in Thailand to date—over 70 percent and in some areas up to 100 percent—are among low-priced female prostitutes in some northern provinces (Vicharn 1990:30). (See Table 3.) This high range appears not to be an artifact of reporting.

STD clinics in Chiang Mai, the capital province of the Northern Region, began testing for HIV in

Table 3. Percentage of female prostitutes HIV positive, by price of service: Chiang Mai, June 1990

Price (U.S. \$)	Number tested	Percentage HIV+
>\$4	12	17
\$2–4	52	31
<\$2	36	72

Source: Vicharn (1990:30).

January 1988. No HIV tests were positive until the seventh month of testing, when 447 cases were recorded (mean of 371 prostitutes tested per month for the first six months). The proportion testing positive increased monthly thereafter, to 44 percent by June 1989 (Vicharn 1990:28). By the same date the HIV prevalence among prostitutes in two other northern provinces was 54 and 59 percent (Vicharn 1990:27); one year later, analogous rates had risen to 62 and 64 percent, respectively (Kampol 1990).

Chiang Mai Province has the highest reported HIV prevalence rates in the nation among female service workers (prostitutes), male STD clinic clients, and blood donors (Vicharn 1990:29). Data-based explanations for the concentration of heterosexual transmission in the Northern Region are yet to come. One likely explanation is that the North is the home base of the majority of prostitutes who work in cities where intravenous drug users also congregate. It is not yet known whether the women contract HIV from clients who use intravenous drugs, as occurs among street prostitutes in the United States (Cohen et al. 1988), or whether the chronic poverty of lower-priced prostitutes is a cofactor for AIDS, the associated poor nutrition and untreated STDs contributing to their excess vulnerability (Cates 1990; Latif et al. 1989).

Vulnerability of teenage girls in poverty. Low-priced prostitutes, many of them teenagers, have the greatest numbers of customers. A sizable proportion of their customers may be teenage boys. A re-

Survey of Partner Relations Finds Many at Risk of AIDS in Thailand

Preliminary analysis of data from a 1990 nationwide survey in Thailand, soon to be published, indicates that Thai men, both married and unmarried, are engaging in high levels of casual sexual behavior that carry the risk of HIV infection. Although the survey finds low levels of casual sexual behavior by Thai women, many women may be placed at risk of contracting the AIDS virus by their sexually more active husbands and boyfriends.

The study, called the Survey of Partner Relations and Risk of HIV Infection in Thailand, collected information from 2,801 Thai men and women through interviews, using an anonymous structured questionnaire. Respondents ranged in age from 15 to 49 and were drawn from both rural and urban areas of Thailand, including Bangkok. Questions asked about respondents' demographic characteristics, types and frequency of sexual behavior, choice of sexual partners, alcohol and drug use, knowledge of and attitudes toward AIDS, knowledge of and history of other sexually transmitted diseases, first sexual experience, and their definitions of "having sex" and virginity.

The study was conducted by the Thai Red Cross Society Program on AIDS and the Institute of Population Studies of Chulalongkorn University with financial support from the Global Programme on AIDS of the World Health Organization. The project coordinator was Werasit Sittitrai. Other researchers included Praphan Phanuphak, director of the Red Cross Society's Program on AIDS; Jean Barry of the Department of Psychology, Chulalongkorn University; and Tim Brown of the Department of Electrical Engineering, University of Hawaii.

The investigators have presented preliminary results to policymakers and planners, focusing on implications of the findings for policy. For example, information from the survey on the early sexual behavior of youths suggests there is a need for a sex education curriculum in primary schools. Other results are being used to develop projections of the AIDS epidemic's spread in Thailand.

The Thai Red Cross Society will publish the results of the survey in the form of two major reports, the first of which will be available in June 1991. A series of journal and newspaper articles presenting further analyses of the data will follow.

Copies of the initial report can be ordered from:

Director of Program on AIDS
Thai Red Cross Society
1871 Rama 4 Road
Bangkok 10330, Thailand
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—by Werasit Sittitrai and Tim Brown

cent study of 400 males, ages 15 to 24, found that 46 percent had had their first experience of sexual intercourse between ages 15 and 17, most of them with prostitutes (Wer-asit 1990).

The highest HIV prevalence rates reported in Thailand are among low-priced female prostitutes in Northern Thailand, many of whom are teenagers.

The prostitutes whom teenagers are most likely to patronize are those who charge the least for their services—girls from rural, poor Thai families, from indigenous Hill People villages, and from poverty-stricken areas of neighboring Laos and Burma. The girls and their families are lured by the financial rewards promised for working in Thailand (Somchai Hareuthaihansa 1986).

Because they are young, may not speak standard Thai, and are poorly educated, they are easily exploited and not reached by AIDS education campaigns. They are least likely to know how AIDS is transmitted, least likely to be successful in convincing clients to use condoms, and least likely to have access to or to use STD clinic services. Some, perhaps a majority, are elusive to even government program intervention because they are in debt bondage to their procurers or brothel owners. Owners rarely permit HIV testing of "their girls" until the girls have paid off their purchase price in service.

Table 4. Percentage of HIV positive persons among blood donors: Nakhorn Chiang Mai Hospital of Chiang Mai University, 1988 and 1989

Type of donor	1988		1989	
	Number tested	% HIV+	Number tested	% HIV+
Voluntary	14,755	0.6	5,978	2.1
Exchange ^a	3,576	0.6	5,339	2.2
Commercial	6,747	1.6	3,293	6.0

Source: Vicharn (1990:33-34).

a. An exchange donor is one who donates blood to replace that used by a specific patient in order to defray charges for the blood used.

For these reasons, low-priced prostitutes and intravenous drug users are currently the highest-risk sector of the population. This positive association between low socioeconomic status and HIV susceptibility is also found in the United States and other countries (Curran et al. 1988).

Not only does the prevalence of HIV infection among prostitutes vary inversely by cost of service in Northern Thailand (Table 3), but also studies of blood donors at the Nakhorn Chiang Mai Hospital Blood Bank reveal an inverse relation between socioeconomic status and HIV infection rates (Table 4). Prevalence rates among commercial donors were substantially higher among volunteer donors, and the difference between the two types of donor increased between 1988 and 1989.

The heterosexual pattern of HIV transmission preeminent in the Northern Region (Table 5) has affected young women there disproportionately. July 1990 figures from HIV surveillance in Chiangrai Province, bordering Laos, show that females are the primary carriers, ac-

Table 5. Sources of HIV transmission among known HIV positive persons: Three Northern provinces of Thailand, September 1989 (percentage distribution)

Source	Province		
	A	B	C
Intravenous drug use	17	11	7
Sexual contact	59	83	91
Unknown	23	6	1
All sources	100	100	100

Source: Vicharn (1990:25).

Note: Percentages may not sum exactly to 100 because of rounding.

counting for 64 percent of the total, compared with 15.9 nationally. The age distribution found in the Chiangrai study is particularly worrisome: over half (53 percent) of the HIV-infected females were teenagers, whereas most HIV-infected males were older, only 4

(continued on page 21)

Comments on Wardlow Friesen's "Economic Activity and Occupation in the Pacific Islands: Issues of Census Classification and Analysis"

by Eivind Hoffmann

IN HIS recent *Forum* article (Volume 4, No. 2, Summer 1990) Wardlow Friesen gives an overview of two statistical instruments developed by the International Labour Organisation (ILO) for the measurement of the economically active population, employment, unemployment and underemployment, and the occupations of the economically active population. The purpose of these comments is, on the basis of the more complete documentation now available in Hussmanns et al. (1990) and ILO (1990), to discuss further some of the issues raised in the article in order to avoid misunderstandings with respect to the appropriateness of applying these instruments in the Pacific region.

Who is "economically active"?

Friesen (1990:13) states that in the context of the Pacific Islands it is an anomaly to consider that "a woman who sells cooked food in the local market is performing an

economic task in cooking for her own household, whereas her neighbors, who do similar work, are not." Several comments are in order:

In the present framework of both the United Nations System of National Accounts (SNA) and the International Labour Organisation (ILO) only a part of the woman's cooking for her own and her household's consumption is considered economic activity to be included in an estimate of the number of hours worked and the value of goods and services produced (in addition to the cooking she does for the market and for any hired workers engaged in the production activities of, say, the farm). This part refers to the preparation of foodstuffs that are identical to the items produced for the market but are prepared or retained for consumption by the household. It should be noted that the consideration of this part of cooking as economic activity has no effect on *head counts* of economically active persons.

It is useful, as Friesen recognizes, to distinguish between the concept of "economic activity" and other, perhaps wider, concepts of "work" and "useful activity." The production boundary of the revised SNA is likely to be extended to include more nonmarket activities than at present. The ILO concept of "economic activity" will be adapted to these changes.

There is nothing in the interna-

tional guidelines or recommendations to prevent or discourage countries from applying several work-related concepts in their population censuses or household surveys, as long as such different concepts can be clearly distinguished from one another. Friesen's review of the census practices in the region demonstrates that this has in fact been recognized by some countries.

In a number of cases in the past the actual census measurement of "economic activity" has been more limited in scope than that of the SNA or ILO framework. The main reason is that the borderline cases for the concept of "economic activity" are difficult to handle in a population census when just one or two questions can be used and enumerators can be given little or no special training. As a consequence the questions (and the instructions to enumerators) have resulted in a substantial underestimation of the economically active population, in particular of economically active women. However, this problem must be blamed on census practices and limited resources, not on the underlying concepts.

What is ISCO-88?

ISCO-88 consists of a classification structure and a dictionary. A proper description of the classification structure will consist of three components: first, that the *primary*

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unit of observation to be classified is a "job" (defined as a set of tasks carried out by one person, but not necessarily the set of all tasks carried out by that person during the reference period); second, that the *aspect (variable) being measured* is "the type of work performed" in the job (and not "working conditions" or "pay," for example); and third, that "skill level" and "skill specialization" are the main *similarity criteria* used to define groups in ISCO-88.

In reference to the differences between ISCO-68 and ISCO-88 discussed by Friesen (1990:17, col. 1), three points should be added. It was never intended that ISCO-68 should be used by any government without modification to fit national circumstances. The ISCO-68 publication did include more detailed occupational (group) descriptions than the ISCO-88 publication does. And various countries have used the ISCO-68 virtually without modification because they lacked the necessary resources and expertise to make appropriate adjustments.

Applying ISCO-88 in the Pacific

There is no problem in principle in extending the coverage of ISCO-88 to "job" covered by a broader concept of "work" than the SNA and ILO concept of "economic activity" (cf. Friesen 1990:18, col. 1). However, some practical work may be needed to determine whether the additional activities can be classified under any of the existing ISCO-88 groups or whether some new groups will need to be created at the lowest level in the classification.

The work started by the South

Pacific Commission (SPC) to adapt ISCO-88 major group 6, "skilled agricultural and fishery workers," and in particular submajor group 62, "subsistence agricultural and fishery workers," to the circumstances of the Pacific (SPC 1990) is welcome. It would be best, however, if this could be done in a way that makes it possible to create, from the most detailed groups, alternative aggregate structures—either that of the ISCO-88 or one focusing on "broad agricultural system types" if that is seen as the major distinction to be made.

The problem raised by Friesen (1990:18, col. 2) with respect to "tasks that are performed by groups" refers to a "job" concept different from the one used by ISCO-88. To classify by occupation the members of the group, one must shift the focus from the group to the tasks of its members. If all members of a group (e.g., all crew members of a fishing boat) carry out the same tasks, then they all should be given the same code. If there is a division of labor between the group members, however, this may mean that their tasks are sufficiently different to warrant that they be given different codes. The correct code to be given to the group as a unit is that of *industry*, as the group must be considered to be a type of establishment.

With reference to the point made by Friesen (1990:18, col. 3) about persons undertaking different types of activities and the example in Table 3, it should be emphasized that the person who during the reference week works 40 hours as a cocoa producer and one hour as a builder should be considered as having *two* jobs, both of which can

be given an occupational code. The *main* job should be selected on the basis of numbers of hours worked or size of income generated. The priority rules specified for ISCO-88 coding do not apply to these situations; they apply only when the combination of tasks *in the same job* is such that they cut across the dividing lines of the classification. The point that "a great deal of significant information will be lost if only a single job description is applied to each person" (Friesen 1990:29) is important, and all jobs of a person should be recorded and coded if resources permit.

The ILO has recommended asking about "main tasks and duties" in addition to occupational title because such information gives the best basis for the coding of occupation. The idea that all tasks could be coded and the computer asked to apply priority rules to them to derive an occupation code (Friesen 1990:29, col. 1) may be feasible, but this approach has not been tested or implemented in any of the existing computer-assisted coding systems that we know about.

It is slightly misleading to state that "the new ISCO standard has been adopted by . . . Australia and New Zealand" (Friesen 1990:11) inasmuch as during the last 10 years Australia, in particular, has been the world's pioneering country in its work on occupational classifications, both with regard to clarifying underlying principles and with regard to statistical implementation and computer-assisted coding. The development of ISCO-88 benefited from the Australian work more than the Australians have benefited from ISCO-88. One can say, however, that the main principles of ISCO-88

have been adopted already, not only by Australia and New Zealand, but also by a large number of countries in Africa, Asia, the Caribbean, and Europe. It should also be mentioned that the ILO instruments have been discussed not only at the SPC 1989 Working Group's meeting, but also at two workshops sponsored by the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) in 1989 and 1990, in which officials from the statistical organizations of the Pacific Island countries participated.

Within the limits set by the resources available the ILO can provide advice and guidance on both the measurement of the economically active population, employment, unemployment, and underemployment, and on the development and use of occupational classifications. For further information, interested persons should contact the ILO Area Office in Suva, Fiji (P.O. Box 14500); the ILO Regional Advisor on Labour Statistics and Surveys (ILO Regional Office for Asia and the Pacific, P.O. Box 1759, Bangkok, Thailand); or the ILO Bureau of Statistics (CH-1211 Geneva 22, Switzerland).

Friesen replies

I welcome Eivind Hoffmann's comments on my article "Economic activity and occupation in the Pacific Islands." When I wrote the article the two ILO manuals mentioned by Hoffmann (Hussmanns et al. 1990; ILO 1990) were not available to me. Some of the ideas I presented were based therefore on work in progress rather than on the final recommended version of ISCO-88. That explains some of the differences be-

tween us he mentions. Others are due to our different perspectives on the issues discussed.

In response to Hoffmann's comments on market versus subsistence production (in the section "Who is 'economically active?'), it is true that the SNA convention of including women who cook something for the market and for their own households in the category of "economically active" but of excluding those who cook only for their own households has no effect on the head counts of economically active persons.

As Hoffmann mentions, however, these conventions are also used in some cases to estimate the number of hours worked and the value of "economic" production. It seems misleading to attribute economic value to production for one's own use in the one case but not in the other. It is not clear to me whether this convention has been adopted for ease of enumeration, coding, and analysis or for an underlying theoretical reason. It will be interesting to see how the revised SNA treats this and similar issues.

As for the underlying concepts versus census practices, I agree with Hoffmann that many of the problems of defining economic activity result from inadequate census practices and resources rather than from the underlying concepts used. The problems of enumerator training are very real, and they emphasize the need for a clear and consistent standard that can be used in questionnaire design. Of course, even when there is one, national adaptations of this standard often are not adequately developed and hence lead to underenumeration, ambiguity, etc. The original article dealt mainly

with the ISCO-88 classification structure, and Hoffmann's description of the components of that structure and elaboration about ISCO-68 ("What is ISCO-88?") are useful additions to that discussion.

Hoffmann's comments on a broader concept of "work" ("Applying ISCO-88 in the Pacific"): It seems to me that if the concept of work were expanded beyond the current SNA and ILO concept of "economic activity," one or more new groups might have to be created. But as Hoffmann suggests, this would involve a considerable amount of development work. The great difficulty in devising meaningful classifications for "subsistence agricultural and fishery workers" illustrates this fact. I agree that it would be useful if any modifications made within the detailed levels of this group in the Pacific Islands were designed to allow aggregation to an alternative international system.

As for group work, it was not intended that work done by groups of people should be incorporated within ISCO-88, since it is clear that the ISCO standard should deal with individuals. My intention was to point out that some problems remain in applying the job concept in all cases. That is, there are circumstances in which a "set of tasks" is *not* "performed or designed to be performed by one individual." In the Pacific these activities tend to be sporadic and occupy a small proportion of most individuals' time, so that most individuals have other jobs that can be identified under the ISCO-88 rules.

The issues of main and secondary jobs and priority rules for classify-

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News and Announcements

Indonesian Census Records Decline in Population Growth Rate

Soetjipto Wirosardjono, vice director general of Indonesia's Central Bureau of Statistics (CBS), reports that the population of Indonesia grew more slowly during the 1981-90 decade, at 1.97 percent annually, than during the previous decade, when the average annual growth rate was 2.32 percent. This is one of the preliminary results of the 1990 census, which took place on 31 October and recorded a total population of 179,321,641. The sex ratio recorded by the census was 99.53 males per 100 females. Indonesian population and family planning officials are pleased by the slower growth rate and view it as evidence of their programs' success in managing population growth.

For the 1990 census the 27 provinces of Indonesia were divided into 191,004 enumeration areas consisting of 200-300 households each. The general enumeration involved 254,688 enumerators and supervisors, and a more detailed sample enumeration of 2,157,000 households employed 47,933 enumerators and supervisors.

Mapping work for the census took place in 1988 and 1989, and information collected at that stage was used to determine the general and sample enumeration areas. The general enumeration was conducted for the most part on a de jure basis, recording the name, sex, and age of every person at the place where he or she normally lived. The sample enumeration recorded more detailed

demographic information and also social and economic characteristics of household members.

For a small fraction of the population a de facto approach was used, enumerating homeless people in urban areas and boat crews where they happened to be at the time of the census. Although local government officials, including police and harbor authorities, coordinated their efforts to maximize coverage of these mobile population segments, a few misunderstandings about their objectives complicated the task.

Some homeless people in several cities thought that the census teams planned to remove them from their shelters. When the enumerators arrived at the sites where the homeless normally stayed, they found the sites empty and had to track down the residents. In one instance a marketplace known to be the home base of a group of homeless people was empty when the enumerator arrived, not because the homeless were afraid to be found there but because local authorities had placed them in jail.

Boat crews were generally cooperative with the enumerators as long as their ship captains were present and gave them permission to answer the enumerators' questions. One crew from an East Asian country, however, was reluctant to answer the enumerator's questions even though a harbor authority was present. Upon further questioning, census officials learned the reason: a few days earlier men wearing harbor authority uniforms had robbed them.

In general, however, the census operation went smoothly. This was the fourth census conducted by Indonesia since independence in 1945.

Hong Kong's First Self-enumeration Produced a Good Response

Joseph Lee of the Hong Kong Census and Statistics Department reports that the field operation of the 1991 Population Census was completed during 15-24 March. For the six-sevenths of Hong Kong's population enumerated by means of a short questionnaire, a self-enumeration method was adopted for the first time. The questionnaire was posted to householders about seven days before the census, and completed forms were collected by enumerators. About 60-70 percent of householders completed the forms prior to collection, a good response rate for the new method.

The short form contained questions about age, sex, and relationship of household members to the household head. A detailed questionnaire covering a wide range of demographic, social, and economic characteristics was administered to the remaining one-seventh of the population by enumerators in face-to-face interviews.

To encourage full participation in the census, extensive publicity was provided through the mass media and special promotional efforts. A classroom education program was designed to promote the census to families through secondary-school students. The students were shown

a video about the census, which was followed by classroom discussion under a teacher's guidance. They were encouraged to support the census among their relatives and friends. A telephone hotline was established to answer enquiries, enable householders to check the identity of enumerators, and make appointments for home visits.

The 1991 census has also relied extensively on computerization, not only in the data-processing stage but also in the preparation of assignments, deployment of enumerators, and control of field work. Hong Kong maintains a computerized frame of living quarters, which was updated before the census to provide the sampling frame for the operation. From the living-quarters frame an assignment data base was created, taking into consideration geographic variations in workload, travel time, and interviewing time for individual enumerators. An enumerator data base was also created for automating much of the work involved in recruitment, training, and deployment of 15,000 temporary staff who were employed for the field work.

During the census operation a field work control system linked to 52 field centers facilitated the monitoring of progress and the selection of sample returns for quality checks. Progress data from individual enumerators were entered daily into the field-center workstations. The data were then consolidated for review by the various levels of supervisors.

Most of the temporary staff were secondary school seniors, university students and students of post-secondary institutions, and primary and secondary school teachers. So

that the teachers and students could participate in the census, most Hong Kong schools declared census holidays during the 14-26 March census period. Selected school premises were used as field centers for the census.

Processing of the completed questionnaires is now in high gear. Short forms are being scanned by optical character recognition devices and the data from them input into the Census and Statistics Department's computer. Data from the detailed questionnaires are being input by the conventional key-to-disk method. Data editing and validation will be computerized by means of an on-line editing system.

A preliminary count of the population by broad area is being compiled for release at the end of April 1991. The census reports will be produced in several phases during the next two years. Summary results will be published in October 1991. Detailed district tabulations will follow in March 1992, and the main report will be released at the end of 1992.

Philippine Census Counted Nearly 60.7 Million

Tomas P. Africa, administrator of the National Statistics Office of the Philippines, reports that the 1990 Census of Population and Housing, conducted on 1 May, recorded a total population of 60,684,887. This figure was announced by Philippine President Corazon Aquino on 12 February 1991. Population totals by *barangay* (village) are available both on diskette, from which they may be copied without charge, and in printed form for a nominal fee.

The government plans to publish for each province a census volume containing detailed population and housing characteristics. The first of these volumes will be released in the latter half of 1991. Special reports on the homeless population, Filipinos in diplomatic missions abroad, the urban population, and the institutionalized population are also in preparation.

In June 1990 a Census Evaluation Survey (CES) was undertaken in sample areas throughout the country. To ensure the independence of the postenumeration survey, data gathering and processing for the CES was subcontracted to the Philippine Social Science Council, a nongovernmental entity. The results are being processed now (March 1991).

1990 U.S. Census Reveals Slower Population Growth Overall but Rapid Growth in West and South

In an address at the annual meeting of the Population Association of America on 22 March 1991 in Washington, D.C., Barbara Everitt Bryant, director of the U.S. Bureau of the Census, reported that the 1990 U.S. census had enumerated a total population of 249,632,692 and a resident population of 248,709,873 as of 1 April 1990. The Department of Commerce is considering whether a statistical adjustment would improve the accuracy of these figures and, if so, will publish corrected counts by 15 July 1991. The Census Bureau is conducting evaluations of a 167,000 housing unit Post-Enumeration Survey, as well as demographic analysis, to aid that decision.

According to Dr. Bryant, the census recorded the second lowest resident population growth rate in U.S. history: 9.8 percent, or an average annual rate of just 0.98 percent. Only during the decade of the Great Depression in the 1930s was the growth rate lower (7.3 percent). Globally, the U.S. decadal growth rate ranks above the 7 percent average for the more developed regions but well below the 19 percent average for the less developed regions. Numerically, however, the 1980s were the fourth largest decade of U.S. population growth, exceeded only by the 1950s, the 1960s, and the 1970s.

The most dramatic change recorded by the 1990 census is the disproportionate growth during the past decade in the West (22 percent) and South (13 percent), compared with the Northeast (3 percent) and the Midwest (1 percent). More than half of the growth during the past decade occurred in just three states—California, Texas, and Florida. Those states also accounted for more than 40 percent of the population growth between 1970 and 1980 and one-third of the growth in the three prior decades. California, which grew by 6 million persons, now has a population of 29.7 million, more than the 21 least populous states combined.

Because the census count determines the apportionment of representatives to the U.S. House of Representatives, one implication of the disproportionate growth is that the West and South are gaining 15 seats in the House whereas the Northeast and Midwest are losing 15. California (+7), Florida (+4), and Texas (+3) are the biggest gainers; New York (-3), Illinois, Michi-

gan, and Ohio (all -2) are the main losers.

Half of the U.S. population now lives in 39 metropolitan areas with populations of more than 1 million. The number of cities with 1 million or more population increased from six to eight in the decade, San Diego and Dallas having achieved that size since 1980. Los Angeles experienced the greatest growth, 17.4 percent. The largest city, New York, grew by a modest 3.5 percent. Three of the country's large cities—Chicago, Philadelphia, and Detroit—declined in size.

Differential growth of racial and ethnic groups is another of the big stories of the 1990 census, Dr. Bryant stated. The white population grew by 6.0 percent, African Americans by 13.2 percent, Asian/Pacific Islanders by 107.8 percent, Hispanics by 53.0 percent, and Indian/Eskimos/Aleuts by 37.9 percent.

The dramatic growth of Asian/Pacific Islanders and Hispanics outstripped Census Bureau projections. Although Asians and Pacific Islanders together represent a small proportion of the total population, that proportion nearly doubled, growing to nearly 3 percent. Hispanics increased from slightly more than 6 percent to 9 percent of the total population.

The growth of the American Indian/Eskimo/Aleut population is larger than can be accounted for by better census counting and natural increase. Clearly, more persons are identifying themselves as American Indians.

Half of the Asians and Pacific Islanders live in California and New York, and two-thirds live in those states and in Hawaii, Texas, and Illinois. Three-quarters of Hispanics

are concentrated in California, Texas, New York, Florida, and Illinois.

Preliminary analysis of census data and current survey figures indicate that the U.S. population is aging. The median age is now 33. The largest population segment, the Baby Boom generation, is approaching middle age. Moreover, Americans are living longer. Whereas the total population was growing at about 1 percent per year during the past decade, the age group 65 and older grew at about 2.1 percent per year and those 85 and older at about 3.3 percent per year.

Average household size is now the lowest in U.S. history, 2.6 persons. Only 26 percent of households consist of married couples with children under age 18—once considered the typical family. Another 26 percent of households consist of one person, more likely elderly than young. Twenty-eight percent of all family groups with children are maintained by one parent, usually the mother.

Three out of four people 25 years of age or older are high school graduates, and about one in five is a college graduate, reflecting a steady rise in educational levels since data on educational attainment were first collected in the 1940 census. The difference in proportions of whites and African Americans who are high school graduates has decreased, but the proportion of whites who were college graduates in 1988 was twice that of African Americans (21 versus 11 percent).

College enrollment has grown over the decade, from 11.4 million in 1980 to 13.1 million in 1988. Interestingly, most of the growth was

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Reviews and Publication Notes

Differential Mortality: Methodological Issues and Biosocial Factors edited by Lado Ruzicka, Guillaume Wunsch, and Penny Kane. Oxford: Clarendon Press, 1989. x, 259 pp. ISBN 0-19-828651-1 (cloth), US \$59.00. Available from Oxford University Press, Walton Street, Oxford OX2 6DP, United Kingdom.

This book contains a selection of papers originally presented at a joint seminar of the Scientific Committee on Biological and Social Correlates of Mortality of the International Union for the Scientific Study of Population and the National Institute for Research Advancement in Tokyo, held during November 1984 in Tokyo. It is divided into four parts and begins with an introduction by Lado Ruzicka that presents the general problems and issues related to the study of differential mortality and an excellent summary of the papers included in the volume.

Part II consists of four papers on methodological aspects of the study of mortality differentials.

Josianne Duchêne and Guillaume Wunsch explore the passage from a conceptual framework to the analysis of empirical data. Although they use the example of the impact of education on child mortality, after Caldwell, the discussion is largely abstract.

Ronald H. Gray considers issues of mortality and morbidity within the framework for analyzing child survival developed by Mosley and Chen, reviews approaches to field studies of health in developing countries, and suggests alternative study strategies. He offers algorithms for identifying diseases,

especially in surveys, that may be used to indicate the proximate determinants of mortality and discusses the measurement of risk factors by odds ratios.

Concurrent structural changes in the population, Shiro Horiuchi points out, can distort the results of analysis of time trends and mortality differentials. Using post-World War II regional data on life expectancy at birth and the infant mortality rate, he discusses six factors that may lead to an underestimation of mortality decline. They are: interrelationships among fertility, mortality, and population growth; population heterogeneity in frailty; differential changes in the age structure of subpopulations; incomplete registration and retrospective reporting of deaths; inaccuracy of age reporting; and the characteristics of mortality measures themselves.

To measure the potential for mortality reduction, Stan D'Souza attempts to develop an index of "preventable deaths," which is a function of the level of infant mortality, its cause-of-death structure, and the cost-feasibility of preventing disease. The index is then applied to several countries.

Part III contains six papers on biological and social factors in mortality, analyzing empirical data. This part occupies nearly half of the volume.

Using a new methodology for estimating the contribution of mortality change by age and cause of death to life expectation, Eduardo E. Arriaga examines changing trends in mortality decline. He finds diver-

sity in the mortality transition of 11 developing countries and the United States.

Jose Miguel Guzman uses an indirect method to estimate infant mortality based on the proportion of children who died in relation to the total number of children ever born of mothers classified by quinquennial age groups. His analysis reveals that the decline in infant mortality in five Latin American countries is a general phenomenon cutting across socioeconomic subgroups.

Two country reports follow, focusing on infant and child mortality in Indonesia (Budi Utomo and Meiwita Budiharsana Iskandar) and in Turkey (Nusret H. Fisek). Both are reviews of past work based on large-scale surveys. The Indonesian study emphasizes temporal changes and geographic and educational differentials. It also presents principal causes of death by age at death. The Turkish study suggests that differences in the use of health services between urban and rural residents is an important factor in the mortality differential.

The effect of short birth intervals on infant and child mortality is pursued by Alberto Palloni, using data from World Fertility Surveys in 12 Latin American and Caribbean countries. His paper is a significant work, conceptually, methodologically, and substantively. Palloni doubts the role of breastfeeding in childhood mortality; he posits that the birth interval effect probably operates through the breastfeeding mechanism.

George C. Myers discusses the im-

plications of the mortality decline and increased survival for the future. He examines changes in mortality patterns at older ages, drawing upon evidence from developed countries.

Part IV, dealing with crisis mortality resulting from disasters, consists of two papers. Although this topic is important, as seen, for example, in the current Kurdish refugee situation, it is somewhat tangential to the theme of the book, differential mortality.

Andre Bouckaert provides a theoretical framework for the study of disasters in human populations, distinguishing man-made from natural origins. Penny Kane presents a careful case study of the effect of China's famine of 1959-61, discussing demographic and social responses to the famine.

The title of *Differential Mortality: Methodological Issues and Biosocial Factors* suggests a comprehensive treatment of differential mortality, but the book's emphasis is on infant and child mortality in the developing world. Most of the factors discussed are socioeconomic.

"Mortality changes simply do not occur in a mechanistic way, they are the product of complex interplay between biological factors and the environment, mediated by social forces" (Myers, p. 190). Unfortunately, most of the substantive papers in the volume are descriptive, although there are important exceptions, such as the work of Palloni.

Of course, modeling a conceptual framework for mortality is much more complicated than modeling one for fertility. As Ruzicka indicates (p. 17), the task could not be accomplished in the course of a

short meeting or in a score of papers. The papers included in the current volume were selected in "an attempt to promote further investigations of determinants of mortality differentials and to invite discussion about more effective ways of doing so" (Ruzicka, pp. 15-16). In this sense the book is a success: it should stimulate further study of differential mortality, integrating biological and social factors.

—Chai Bin Park
East-West Population Institute
and University of Hawaii

Advances in Regional Demography: Information, Forecasts, Models edited by Peter Congdon and Peter Batey. London and New York: Belhaven Press, 1989. xi, 285 pp. ISBN 1-85293-046-2 (cloth), US \$45.00. Available from Belhaven Press, 25 Floral Street, London WC2E 9DS, United Kingdom.

During the past two decades regional demography has emerged as a new discipline concerned with the structure and evolution of human populations within a broad spatial framework. According to the book's editors, regional demography "goes beyond closed and open single-region models by allowing for gross migration flows both internal to the system and externally (through foreign emigration and immigration), and by including their contribution to the past evolution and future projections of the growth of regional populations" (p. 1).

Advances in Regional Demography investigates recent issues in spatial demography and explores new directions for research. Its purpose, as described by the editors, is to

place regional demography in the broader context of regional science, for example by exploring economic-demographic interactions and their implications for spatial population redistribution. A related purpose is to assess the contribution of demographic research to the formulation of spatial policy.

In their introduction, Peter Congdon and Peter Batey summarize scholarly work done in the field of regional demography in the last 10 years. The organization of the book is intended to represent a "conceptual progression from regional demographic systems, which set the basic parameters for demographic analysis and policy formulation; through sub-national forecasts and projections, which while recognising regional interdependencies, are of necessity goal-orientated and require standardised methods for several regions or localities; to a consideration of a range of models of trends and structure, that provide a broader consideration of underlying processes and assumptions, and thereby provide guidance as to the validity of data on forecast-orientated methods" (p. 5).

Fourteen chapters by mostly British and American authors follow, arranged in four parts focusing on demographic information for spatial planning, demographic forecasts and projections at the subnational level, models for settlement and redistribution, and models for migration in the labor market.

This book is intended for readers having a thorough grounding in demography or regional planning, and some of the chapters require knowledge of model construction. The chapters are well documented, however, and I found all of them

interesting. The book includes a subject index. *Advances in Regional Demography* would be a useful purchase for libraries with collections in the fields of population, economics, and regional science.

—Alice D. Harris
Palm City, Florida

Population Matters: People, Resources, Environment and Immigration by Julian L. Simon. New Brunswick, N.J., and London: Transaction Publishers, 1990. xiv, 577 pp. ISBN 0-88738-300-9 (cloth), US \$34.95. Available from Transaction Publishers, Rutgers—The State University, New Brunswick, NJ 08903, U.S.A.

This collection of previously published articles and reviews by economist Julian L. Simon, like his earlier works—*The Economics of Population Growth* (1977), *The Ultimate Resource* (1981), *The Resourceful Earth* with Herman Kahn (1983), *Theory of Population and Economic Growth* (1986), and *The Economic Consequences of Immigration* (1989)—expounds his views that population growth is a positive phenomenon, that people can invent new resources to replace those running out, and that immigration is good for a country. His unqualified positions on these issues are not shared by mainstream demographers and environmentalists, whom he labels “doomsayers.”

The articles, almost all of which have been written since 1981, have two aims: “to disseminate to the widest possible audience the broad fundamental ideas developed earlier, by writing in as lively a style as possible and using vivid illustra-

tions, and to introduce some new ideas” (p. 2). His two main themes are, first, that the economic and social structure of a country is the central factor in its economic development and, second, that population growth has a positive effect on the overall development of civilization in the long run.

Simon believes that Malthusian ideas are sustained by intellectual weakness, doomsaying by groups with parochial interests, the propensity of many to regard any kind of change as unwelcome, a closed rather than an open vision of the world, people's fascination with disasters, and finally our difficulty with breaking long-held beliefs. Yet he argues that such beliefs can and should be changing.

As evidence that they are, he cites the reversal of U.S. policy toward curbing population growth articulated by U.S. delegates to the 1984 World Population Conference in Mexico City, who asserted that population growth is neutral rather than negative in its effect on economic development. Another sign of change was a report by the National Research Council in 1986 reversing an earlier (1971) report in which it had argued that population growth prevents economic growth.

Part 1 presents an overview, explaining why Simon believes the world situation is improving. In the nine selections in Part 2 he shows why food supplies are increasing and how human ingenuity can overcome the scarcity of natural resources. The next five sections respectively present his view of population growth as a positive phenomenon (Part 3), challenge the governments and nongovernmental groups who advocate population

control (Part 4), advance reasons for allowing more immigration to the United States (Part 5), decry the “prophets of doom” and criticize the *Global 2000 Report* prepared for President Carter by the Council on Environmental Quality and the Department of State (Part 6), and discredit long-term forecasts of raw material availability (Part 7). Finally, in Part 8, “Publication, Funding, and the Population Establishment,” Simon takes aim at the *Population and Development Review* and other advocates of fertility reduction.

The articles contain numerous examples supporting Simon's views and are written in a lively style for a popular audience. It is unfortunate, however, that Simon is so critical of others' work, as he himself admits in the introduction. He protests too much, and his extreme positions weaken his arguments about the relationship between population growth and economic development.

He is better represented in his optimistic mood: “The ultimate resource is people—especially skilled, spirited, and hopeful young people—who will exert their wills and imaginations for their own benefit, and so, inevitably, for the benefit of us all” (p. 12).

The book is provocative and will be challenged by many demographers and environmentalists. Some of its statistics are out of date, and most of the articles lack bibliographical references. Nevertheless, libraries specializing in demography or economics should acquire *Population Matters* so that all sides of the population debate can be represented.

—Alice D. Harris
Palm City, Florida

ALSO NOTED

Census of India 1991. Series-1 India. Paper 1 of 1991, Provisional Population Totals by Amulya Ratna Nanda. New Delhi: Registrar General and Census Commissioner, India. iv, 102 pp. Paper. Available from Registrar General and Census Commissioner, India, Ministry of Home Affairs, 2A, Mansingh Road, New Delhi-110011, India.

The 1991 Census of India, the enumeration portion of which was completed on 5 March 1991, was the thirteenth since 1872 and India's eleventh complete and synchronous decennial census since 1881. This is the first of a series of planned publications that will report on the census results.

The volume contains provisional population totals, describes the planning for the census, briefly analyzes major demographic variables (population size, distribution, and growth rate; population projections; population density; sex composition; literacy), and presents six provisional population tables: (1) distribution of population, sex ratio, density, and population growth rate; (2) population and number of literates in 1991 and literacy rates for 1981 and 1991 by sex; (3) percentage decadal variation in population, 1901-11 to 1981-91; (4) states and union territories arranged in descending order of growth rate of population, 1951-61 to 1981-91; (5) sex ratio, 1901-91; and (6) states and union territories arranged in descending order of sex ratio, 1951-91.

Appendix materials include a list of the tables to be generated from the census data, schedules used in

the census, eight colored maps (including a large foldout map of administrative divisions), and nine graphs and charts illustrating India's population size and growth, sex ratios, and literacy rates.

The 1991 census enumerated 843,930,861 persons (437,597,929 males and 406,332,932 females), representing 16 percent of the world's population and an absolute population increase of 160,606,864 since the 1981 census. Average annual growth during the decade was 2.35 percent, compared with 2.47 percent during the 1971-81 decade and 2.48 percent during 1961-71, when India's growth rate reached a historic peak. Among the states and union territories, Uttar Pradesh, with 16.4 percent of the nation's population, and Bihar, with 10.2 percent, are the most populous.

The sex ratio (number of females per 1,000 males) continued a decline, observed since the beginning of the century, in favor of males. At the time of the 1991 census there were only 929 females for every 1,000 males. Kerala is the only state with a sex ratio favoring females, and there it rose slightly over the past decade to 1,040 females per 1,000 males. The sharpest sex ratio decline occurred in Bihar State (912 females per 1,000 males in 1991). Several social and demographic explanations for India's low sex ratio have been advanced, and the author suggests that a combination of factors may be responsible.

Literacy increased over the decade, rising from 43.56 percent of persons 7 years old and older in 1981 to 52.11 percent in 1991. The literacy gap between males (63.86 percent literate) and females (39.42 percent) had narrowed slightly.

World Population Projections, 1989-90 Edition: Short- and Long-Term Estimates by Rodolfo A. Bulatao, Eduard Bos, Patience W. Stephens, and My T. Vu. Baltimore and London: Johns Hopkins University Press for The World Bank, 1990. lxxiv, 421 pp. ISBN 0-8018-4094-5 (paper), US \$34.95. Available from Publications Sales Unit, Department F, The World Bank, 1818 H Street, N.W., Washington, D.C. 20433, U.S.A., or from Publications, The World Bank, 66 avenue d'Iéna, 75116 Paris, France.

The fourth in a series of population projections for all countries prepared annually by the Population and Human Resources Department of The World Bank, this volume contains detailed tables for countries, regions, and income groups. An introductory section describes the projection methodology and summarizes and interprets the projection results. The projections for the entire world span nearly two centuries, from 1985 to 2150. Separate projections were prepared for 187 countries, economies, territories, and small-country groups with data available as of mid-1989. The length of the projection period was chosen to allow all populations to approach stability. Instead of offering several projections for each country or group, the authors have chosen to present their best estimate of the likely demographic future.

The projections cover total population size and age-sex composition, mortality level and trend, fertility level and trend, and migration level and trend. The authors note that the tables on age structure cover broad age groups (0-14, 15-64, and 65 and over), providing a more convenient summary than in previous editions.

World Population Growth and Aging: Demographic Trends in the Late Twentieth Century by Nathan Keyfitz and Wilhelm Flieger. Chicago and London: University of Chicago Press, 1990. viii, 608 pp. ISBN 0-226-43237-8 (cloth), US \$65.00. Available from The University of Chicago Press, 11030 S. Langley Avenue, Chicago, IL 60637, U.S.A.

This volume is a sequel to *World Population: An Analysis of Vital Data* by the same authors, published in 1968. It incorporates data and estimates from official sources for countries with populations of 300,000 or more in 1985 and regions recognized by the United Nations. The data cover the period from 1950 to 1985, especially the 1970s and early 1980s. United Nations Population Division estimates and projections based on its 1988 round of global demographic assessments are included for 152 countries and for 30 groupings of countries, presented at five-year intervals from 1950 to 2020.

An introductory text is followed by a summary table presenting frequently used demographic indicators for nearly all countries (40 pages), tabulations based on UN data and estimates (190 pages), and detailed country tabulations (292 pages). The data, estimates, and projections are presented in a comparative format for easy reference. More than 800 charts have been included to help the reader visualize demographic trends.

Health and Vital Statistics Abstract, July 1990 published by the Ministry of Health Services, Republic of the Marshall Islands. Majuro, 1990. xii, 44 pp. (paper). Available from The Ministry of Health Services, Planning and Statistics Department, P.O. Box 16, Majuro, MH

96960, Republic of the Marshall Islands.

The Marshall Islands began computerizing its health and vital statistics records in 1988. This publication contains tabulations for births and deaths based on birth and death certificates, Majuro Hospital admissions and out-patient data, national syphilis data, national census data, and special reports on diabetes mellitus, malnutrition, and suicide.

Registered births for the entire country are tabulated for the period 1953-89; more detailed tabulations are for shorter periods. The text notes that, because vital events, particularly births, may not be registered until a family requires proof of an event (to enroll a child in school, for example), and at least 20 percent of birth certificates are issued as "delayed" certificates, tabulations for the three most recent years are considered to be incomplete.

The 1988 census enumerated a total population of 43,380, representing a remarkably high (40.5 percent) increase over the 1980 census population of 30,873. The average annual growth rate during the intercensal period was 4.25 percent. Nearly half (45.3 percent) of the population is on Majuro Atoll, the country's political and economic center.

The Marshall Islands comprises 1,225 islands and islets and a total land area of 179 sq km stretching over 1.28 million sq km in the Pacific Ocean.

Health Care of Women and Children in Developing Countries edited by Helen M. Wallace and Kanti Giri. Oakland, Calif.: Third Party Publishing Company, 1990. xxii, 598 pp. ISBN 0-89914-031-9

(paper), US \$32.95 (\$36.95 for orders originating outside the United States). Available from Third Party Publishing Company, P.O. Box 13306, Montclair Station E, Oakland, CA 94661-0306, U.S.A.

This volume contains 48 papers on topics related to the health care of women and children in the developing world. Contributors are health and medical practitioners and academics from a dozen countries who represent international, national, and nongovernmental organizations and universities. Their aim in this book is to improve the health care of women, infants, children, and youth in developing countries by informing those in leadership positions at all levels of government and community activity about the issues discussed.

The papers are organized into five sections: an introductory section containing 15 papers, maternal health (seven papers), infant and child health (16 papers), adolescent health (four papers), and the delivery of care to women and children (six papers). The volume includes author and subject indexes and an appendix containing definitions used in the text.

Unmet Need and Future Needs for Contraceptives in Sri Lanka by Soma De Silva. Population Information Centre Research Paper Series, No. 4. Colombo: Population Information Centre: July 1990. iv, 32 pp. Available from Population Information Centre, Population Division, Ministry of Health and Women's Affairs, 231 De Saram Place, Colombo 10, Sri Lanka.

In the last two to three decades Sri Lanka's fertility level has declined considerably. The total fertility rate

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News and Announcements

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due to the enrollment of persons 25 years old and older, whose numbers rose from 3.9 to 5.1 million.

Two technological changes are expected to revolutionize user access to U.S. census data. The first is the availability of data on CD-ROMs, laser discs that can be used on personal computers. Anyone with a personal computer (PC) who is willing to spend \$500 for a CD-ROM reader and about \$150 per disc will be able to access the data. For \$500 more the PC owner can acquire menu-driven software making it possible to manipulate the data. This "democratization of the data," Dr. Bryant stated, will permit many new groups to use census results. "If knowledge is power, then a lot more people are going to be empowered," she said.

The second technological breakthrough is the digital, coast-to-coast geographic data base known as TIGER (Topologically Integrated Geographic Encoding and Referencing system). Developed by the Census Bureau and the U.S. Geological Survey, TIGER is a seamless system that maps geographic features and political boundaries for every level at which the census collects data in the United States. It is being used to produce all the maps for data collection, tabulation, and dissemination needs of the 1990 census.

Anyone can purchase TIGER-generated statistical data or TIGER/Line files on tape or CD-ROM at the cost of reproduction. These files can be combined with other files, such as mailing lists, for individual needs. A new technology called GIS (geographic information

system) allows PC users to connect their own files with the TIGER files. The Census Bureau's Data User Services Division (telephone 301 763-1580) can provide those interested with a list of vendors who sell the GIS software.

Korean Central Statistical Agency Is Upgraded from Bureau to Office Status

From Seung-Kon Lim, director of the Statistical Standards Division, National Statistical Office of the Republic of Korea, comes word that The National Bureau of Statistics was reorganized and upgraded to the level of office on 1 January 1991. Now called the National Statistical Office (NSO), it has three bureaus, 14 divisions, and 16 local branch offices.

The reorganization produced several personnel changes. Tai-Hyung Min was inaugurated as the first administrator of NSO. Kang-Woo Lee, former director-general of the National Bureau of Statistics, is now chief secretary for both the deputy prime minister and the minister of the Economic Planning Board. Il-Hyun Kim, former director of the Population Statistics Division, was appointed director-general of the Planning Bureau. Byung-Hak Kim and Hak-Hyung Kim became director-general of the Census and Survey Bureau and director-general of the Data Processing Bureau, respectively.

Preliminary Report on Korea's 1990 Census Available in April

A preliminary report on the 1990 Population and Housing Census of

the Republic of Korea is to be issued on 12 April 1991. Based on control forms completed by enumerators, the report contains provisional counts of the population, households, and housing units classified by local administrative units. The census took place on 1 November 1990.

An advance report based on a 2 percent sample tabulation will be released in June 1991. It will contain tabulations on the main characteristics of the population, including its size and structure, commuting status, migration, fertility, economic activity, households, and housing units.

A report based on a 10 percent sample of the population and the final report will follow. The final report, to be based upon tabulations of basic characteristics for the entire population, will actually consist of several reports—a report for the whole country and separate reports for the 15 provinces and special cities. They and the 10 percent sample report are to be released by December 1991. Three volumes providing information on migration, fertility, and economic activity will be published by February 1993.

Cheung Named to Head Department of Statistics, Singapore

Paul Cheung, former director of the Population Planning Unit, Ministry of Health, Singapore, was appointed chief statistician of Singapore's Department of Statistics, Ministry of Trade and Industry, on 1 March 1991. He succeeds Khoo Chian Kim, who retired from the post. □

THE AIDS PREVENTION DILEMMA . . .

(continued from page 8)

percent being teenagers. The heterosexual transmission is of particular concern because few brothel patrons use condoms every time they have intercourse with a prostitute.

The high rate of HIV infection among teenage girls in the North may be unique. In the United States, although the prevalence of infection among females in that age group is substantially higher in New York City than in other U.S. cities and heterosexual transmission is thought to be a significant factor in that pattern, even in New York City HIV infection is more prevalent among teenage boys than teenage girls (Nicholas et al. 1989:299). Another difference between the Thai and U.S. situations is that in the United States, female prostitutes who are not intravenous drug users have low HIV infection rates (Cohen et al. 1988; Rosenberg and Weiner 1988).

Evidence of HIV diffusion into the general population. The escalation of HIV prevalence rates among Thai prostitutes presages the diffusion of the virus into the general population. Data are beginning to appear that indicate diffusion has already occurred.

A recent national survey of 26,000 men between ages 20 and 22 and eligible for Thai military service found that 2 percent of these young males nationwide, and up to 11.5 percent in Chiang Mai, were HIV positive (*Bangkok Post* 31 August 1990).³ Other studies report that 3 to 10 percent of 20–24 year-old males in the lower and tourist-destination Northern provinces who have been tested are HIV positive

(Usher and Ross 1990).

Researchers at Chiang Mai University Hospital found 1 percent of pregnant women in Chiang Mai Province to be HIV positive (Vicharn 1990). In 1990 there were unofficial reports from reliable sources that over 4 percent of pregnant women seen at certain Bangkok hospitals were found to be HIV positive. But statistics on pediatric AIDS are tentative: it takes up to 18 months to determine whether a newborn's antibodies to HIV are to the virus in its own body (signifying HIV infection), or residual from a response to HIV in its mother (signifying noninfection in the infant).

■ Thailand's response to the evidence

The threat that AIDS poses to societies is not only economic and demographic, involving huge medical costs and the loss of adults in the most productive ages. Because AIDS is transmitted by human behavior, its occurrence also implicates social mores and the institutions that sustain them. In its response to the emerging AIDS epidemic, the Thai government has tended to focus on a medical interpretation of the epidemic rather

3. The 2 percent for young Thai males is considerably higher than the corresponding rate for military recruit applicants in the United States, where several studies report a cumulative seropositive prevalence for ages 17–24 of 1.4 per 1,000, although the monthly rates have progressively dropped to less than 1.0 per 1,000—a phenomenon that researchers suspect reflects self-referral by applicants who believe they may be seropositive (Kelley et al. 1990:405).

than grappling with its social aspects.

A National Advisory Committee was established in 1985, and was reorganized in 1987 (Thailand, Dept. of CDC, 1988:13); it has played a minor role. More important was the Cabinet's approval, in August 1987, of a National Medium Term Programme for the Prevention and Control of AIDS for the period 1988–91 (Thailand, Dept. of CDC, 1988). It created within the Department of CDC a Center for Prevention and Control of AIDS, which serves as the nation's center for AIDS information and programming. In 1990 the name of the center was changed to the AIDS Division.

HIV testing and AIDS education. Major funding for CPCA has come from WHO, the U.S. Agency for International Development (USAID), and the United Nations Development Program (UNDP). Between June 1988 and September 1990, total funding for AIDS control in Thailand from all sources was over \$10.8 million. These funds have been committed largely to HIV testing. They have enabled the government to conduct a national HIV surveillance survey in 14 sentinel areas twice a year since 1988, and in 31 since December 1989. (See also box on page 22.)

There are signs that governmental agencies are beginning to move toward intersectoral collaboration in mounting a defense against the epidemic. Other ministries, such as the Ministry of Education and the large and powerful Ministry of Interior, have begun externally funded AIDS-

Thai and U.S. Researchers Collaborate on Study of HIV's Spread in Thailand

A Thai Working Group on HIV/AIDS Projection was established in March 1991 to work with the U.S. Department of State's Interagency Working Group (IWG) on creating a detailed model for the spread of HIV and AIDS in Thailand. The U.S. team, comprising demographers, mathematicians, and computer programmers, has developed a sophisticated and flexible computer model of the epidemic based on specific behavioral inputs. The Thai team's first task has been to compile and review available data on the demography, sexual behavior, intravenous drug use, and epidemiology of the Thai population, and also blood bank procedures used in Thailand. Thailand is the first country to use input data reflecting the actual AIDS epidemic to run the model, which is referred to as the iwgAIDS model. An initial review of the data indicates that there were between 150,000 and 175,000 HIV infected individuals in Thailand as of mid-1990.

Output from the model will be updated regularly and presented to the Thai Cabinet and health policymakers so that national policies on AIDS can be responsive to the current and future dynamics of the epidemic. The model will also allow AIDS program managers to test the impacts of various interventions. It is flexible enough to incorporate the effects of increased condom use, changing levels of sexually transmitted diseases, and increased blood screening on the epidemic's spread.

The U.S. team is headed by Peter Way of the U.S. Bureau of the Census, who went to Thailand in March at the invitation of the Thai Working Group to install the software, train staff, and review the available data. Besides Dr. Way, the U.S. team includes P. West, E. A. Stanley, and S. T. Seitz.

Copies of the software have now been installed at the Population and Community Development Association (PDA), which functions as the administrative base for the Thai Working Group, and at the Ministry of Public Health.

Werasit Sittitrai of the Thai Red Cross Society and Chulalongkorn University and Stasia Obremskey of PDA are the coordinators of the Thai Working Group. Other members are Praphan Phanuphak, Suphachai Rerk-Ngarm, Vichai Chokeyivat, Sombat Thanprasertsuk, John Knodel, George Loth, and Tim Brown. Mechai Viravaidya is the adviser to the Thai Working Group.

The Thai Working Group will produce a preliminary report on the results of the model in May 1991. As a consequence of the collaboration, several research studies have been planned to improve the quality of the input data. The results will be incorporated into the model to refine it. Because the model uses data on heterosexual and homosexual behavior and on intravenous drug use as modes of epidemic transmission, the Thai team expects that other countries where the AIDS epidemic is unfolding can use the model and the data-gathering methodology as a valuable tool.

Copies of the preliminary report on the model, which is to be published by the Thai Working Group under the Prime Minister's Office, can be requested from:

Ms. Benjamat Terramatvanit
Population and Development Association
8 Sukhumvit soi 12
Bangkok 10110, Thailand

—by Stasia Obremskey and Werasit Sittitrai

related activities, including AIDS-prevention education.

Supported activities include the AIDS training of health workers, provincial governors, and district officers; efforts to incorporate AIDS information into the secondary

school curriculum; screening of donated blood; and AIDS education spots on Armed Forces radio stations and commercial television channels. Government television channels began carrying AIDS information in early 1991.

USAID has also provided funding to other Thai programs for AIDS-prevention activities. In 1989 it donated 43 million condoms to the Ministry of Public Health for distribution. Since 1988 it has awarded several small grants to the Program

for Appropriate Technology in Health (PATH) directed toward conveying AIDS-prevention messages to intravenous drug users, their sex partners, and low-priced prostitutes. USAID funds the AIDSTECH and AIDSCOM projects for technological and communications assistance activities related to AIDS, and it supports activities of the CPCA.

The emphasis of the CPCA has been surveillance through blood testing, particularly of high-risk groups, intravenous drug users, and STD clinic clients.

The interest of the two royal princesses in the problem of AIDS has helped to legitimate AIDS-related programs, and private organizations are becoming increasingly involved in AIDS-prevention activities, especially education and training (Table 6). Her Royal Highness (HRH) Maha Chakri Sirindhorn is director of the Thai Red Cross Society, which will begin the first anonymous HIV counseling and testing program in April 1991. The Red Cross is also producing materials for AIDS information, education,

and communication. Until December 1990 HRH Chulabhorn was a special ambassador for the WHO, and in that capacity supported its AIDS-control mission. She continues to head the Chulabhorn Research Institute, which supports AIDS education programs.

Proposed legal controls over suspected HIV carriers. In 1990 the government's AIDS-containment strategies included the introduction of a bill to monitor and control HIV carriers or suspected carriers. Persons targeted were drug addicts, prostitutes, and "promiscuous persons" (including homosexuals). The bill provided for householders to report persons with AIDS to authorities, and for the arrest with up to one year's detention of prostitutes and intravenous drug users if they did not report for regular medical checkups and HIV testing, or if they became HIV positive and did not stop their high-risk practices.

There are several difficulties with the bill. First, the term "promiscuous" fails to capture the dilemmas of persons who resort to prostitution for their livelihood (Farmer and Kleinman 1989:150) or who feel that they are innately homosexual. Second, it would criminalize only selected persons, those of the lowest socioeconomic sector, while overlooking others who are HIV carriers. Third, a negative HIV test result means only that the person tested has not developed antibodies to the virus; it does not necessarily mean that the person is uninfected with the HIV and cannot transmit it to a sex or drug partner. Most medical AIDS experts believe there is a latency period of up to six months between receipt of the virus and

Table 6. AIDS-prevention activities of nongovernmental organizations in Thailand

Organization	Activities
EMPOWER	Provides AIDS education to the 5,000 female bar workers of Patpong (a district of Bangkok), and through them, to their clients and employers
Family Health International	Conducts small-scale studies of AIDS transmission; administers the USAID-funded AIDSTECH program, which supports the Ministry of Public Health's CPCA, and the USAID-funded AIDSCOM program, which supports the ministry's activities in AIDS education and counseling training
Planned Parenthood Association of Thailand (PPAT)	Provides AIDS education to prison officials
Population and Community Development Association (PDA)	Since 1987, has developed a large arsenal of AIDS education materials for schools, businesses, factories, and the general public; has the largest AIDS-prevention education program in the nation
Program for Appropriate Technology in Health (PATH)	Offers training for AIDS counselors working primarily in detoxification and rehabilitation centers, and AIDS education for government officials; produces high-quality condoms; develops and tests AIDS-education materials
Purple String Dancers	Provides AIDS education in Bangkok's gay bars and on television
Thai Red Cross Society	Conducts HIV testing and offers AIDS education
Thai Volunteer Service (TVS)	Trains AIDS program personnel

seroconversion, that is, between having the virus and developing the antibodies to it that can be identified through blood tests.

It is therefore wrong to use HIV test results as a basis for identifying risk-free groups who are "safe" for promiscuity. A coalition of 18 non-governmental organizations protested and halted passage of the bill (Wasant 1990), but as of early January 1991 the bill remained alive.

It is wrong to use HIV test results as a basis for identifying risk-free groups who are "safe" for promiscuity.

Also in 1990 the Ministry of Public Health declared that all (female) prostitutes working in brothels would be required to carry a "health card" (Ampa and Suvit 1990). The requirement targets the lowest-paid prostitutes and excludes those working in nightclubs, bars, private escort services, massage parlors, etc. The health card would include the woman's name, photograph, a code denoting her home district and province, and the date she was last tested for HIV.

Prostitutes testing HIV positive would have their cards seized and be barred from the sex industry; those testing negative could continue to ply their trade. By September the futility of this scheme became clear to the ministry, which announced that the health card program had not succeeded in curtailing the spread of AIDS and could be discontinued (Prakobpong 1990).

In mid-1990 the government announced a plan to establish a re-

habilitation center for HIV carriers and AIDS patients. It stressed that the site was to be "far from water sources, populated communities and tourist spots." Unfortunately, these site-selection criteria pandered to the irrational fears of the uninformed public because they implied that HIV can be transmitted through the water supply or carried by wind (Ungphakorn 1990b). Designating rehabilitation centers as a primary strategy for dealing with the AIDS epidemic also reinforced the public's belief that people can be protected from AIDS merely by quarantining its victims.

Thailand's use of coercion and legal controls are less stringent than those of some other countries—e.g., Cuba, Czechoslovakia, and the Soviet Union (Bayer and Gostin 1990). It has targeted selected high-risk groups for special restrictive policies. Targeting only high-risk groups overlooks the vulnerability of the general public. It also has the disadvantage of penalizing people instead of promoting changes in social norms that sanction high-risk sexual behavior and drug use.

Such discriminatory public health policies promote intolerance toward the stigmatized groups rather than protect the public's health (Brandt 1988; Sontag 1989). The history of public response to other epidemics indicates that the greater the perceived threat of an epidemic, the greater the attitudes of intolerance (Bateson and Goldsby 1988; Blendon and Donelan 1988). Other, nonstigmatizing policies of informing the public are therefore needed.

■ Discussion and recommendations

The Thai government faces a dilem-

ma of trying to meet incompatible needs: a need to maintain the stability of the economy and a need to contain the spread of HIV infection. Tourism and export labor are major components of the successful economy, yet both are major contributors to the AIDS epidemic. As in most countries, the government has responded to the AIDS threat with a variety of strategies: testing, denial, targeted prevention education, and coercion. The strategies do not add up to a comprehensive attack on the problem, and some are even counterproductive.

In the absence of an HIV vaccine or cure, the only way to prevent its devastating a society is to restrict its interpersonal transmission. Except for maternal transmission (from a mother to her fetus or newborn), all modes of HIV transmission involve voluntary human behaviors, which can be modified by those engaging in them. Therefore, informing the populace about AIDS—its deadliness, the means of transmission, and ways to minimize the risk of getting it—is prerequisite to behavioral change.

AIDS thrives on ignorance. "You cannot make something safe if you pretend it isn't there" (Bateson and Goldsby 1988:128). Programs to prevent the spread of AIDS can be stalemated by policies that prevent it from being mentioned in the mass media, and by government officials' refusal to recognize that casual sex is a regular diversion for a large segment of Thai society, regardless of marital status and laws about monogamy and prostitution.

Currently Thai sexual ideology denies the existence of casual sex. In 1990, for example, an assistant professor at Khon Kaen University

was suspended from her post because her master's degree thesis (Sawangjit 1988) documented sexual activities of students at her university, such as premarital liaisons and the hiring of prostitutes for freshmen hazing.⁴ A 1990 newspaper report that the Army Medical Department had found 512 Army soldiers to be HIV positive and that four of them had developed AIDS was retracted by the Army the next day (*Bangkok Post* 1 June 1990, 2 June 1990.)

The epidemic cannot be stopped in Thailand unless all sexually active Thais, including monogamous women, understand they need to protect themselves from HIV transmission during sexual intercourse (Ungphakorn 1990a). Men especially must take precautions because they generally have more sex partners than women do, and consequently more opportunities to contract HIV and transmit it to their wives, lovers, and recreational sex partners, and through them to their children.

The Ministry of Public Health advocates the use of condoms by (female) prostitutes as an AIDS preventive measure. Condom use is important, even vital, but the emphasis on prostitutes is one-sided. It targets women with responsibility for condom use even though it is men who have control over such use. Programs supporting the use of condoms must also be directed to boys and men (Ngugi et al. 1988; WHO 1989).

4. Excerpts from the thesis were published in the respected newspaper *Maitichon* and prompted a protest demonstration by some 2,000 Khon Kaen University students. The university administration filed a defamation suit against the researcher and her thesis advisor.

To ignore male participation in prostitution—as clients and as male or transvestite prostitutes—is to render ineffective other efforts to contain HIV transmission through prostitution. Unless conception is intended, condom use should be recommended for all sexual activity in which there is a potential for exchange of semen or vaginal fluid between partners. Men who hold positions of leadership in society, the government, the military, and religious organizations could help make condom use respectable by advocating its use.

But advocating condom use is not enough. Condoms must be used correctly in order to be effective barriers to HIV transmission. And people need to understand that some sex practices are safer than others, and to avoid highest-risk sex acts, such as anal intercourse, sex with multiple partners, and sex with persons infected with STDs.

The current illegal status of prostitution in Thailand prevents the government from regulating that industry. If it were legalized, the government could require condoms to be provided in all places of prostitution, and could protect prostitutes from abusive customers and those refusing to use condoms.

Condom use is negatively associated with the use of drugs and alcohol (Stall et al. 1986; Valdiserri et al. 1988). Among the lowland Thai, prostitute visiting is often associated with male drinking parties. Therefore the effectiveness of a condom policy for prostitutes depends upon prostitutes' ability to refuse inebriated clients who resist using condoms.

To reduce the risk of HIV transmission through needle sharing, the

heroin-substitute methadon should continue to be given to all intravenous drug users who test HIV positive.

Perhaps the greatest challenge in AIDS prevention the world over is to reduce the stigma of AIDS. It is particularly difficult to do so in a society where AIDS is equated with moral degradation and stigmatized groups are blamed for its spread (Sontag 1989), and where a double standard exists for male and female sexual behavior (Muecke 1989). AIDS touches on sensitive nerves that only a humane and realistic national policy and an effective mass education program can heal (Bateson and Goldsby 1988).

Perhaps the greatest challenge in AIDS prevention the world over is to reduce the stigma of AIDS.

Denying the sexual mores of the populace and denying the vulnerability of the elite lets AIDS spread from person to person, from intravenous drug user to prostitute to male client to monogamous wife to unborn child. Informing the populace about ways to minimize the risk of contracting AIDS allows choice and retards the epidemic's diffusion.

On 9 January 1991 then Prime Minister Chatichai Choonhavan announced in a statement of health policy to Parliament that official campaigns to control and prevent AIDS would be regarded as national policy. It is to be hoped that the new government will endorse that policy expeditiously.

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COMMENTS . . .

(continued from page 11)

ing a job epitomize the difficulty of classification within a mixed cash-subsistence economy. Deciding which set of tasks comprises a discrete job is difficult. Hoffmann points out that priority rules are used when there is a combination of tasks within the same job, a point that was not made clear in my article.

Still, the issue of defining job boundaries remains. Should food gardening, copra production, fishing, and house building be considered as separate jobs, or only as the set of tasks within a job done by a typical Pacific Islands villager? Complicating the problem of definition is the fact that there is usually no formal institution of employ-

ment to assist in delineating job boundaries, unless a household can be considered in this way.

Although I was aware of the considerable work done on developing ISCO-88 and computer-assisted coding (CAC) in Australia, I was not aware that that country was "the world's pioneering country in its work on occupational classifications."

The idea in the original article that each task a person did could be coded and that, where necessary, priority rules could be applied with CAC to derive a single occupational code derived mainly from the considerable flexibility displayed by the Australian system (see Embury 1988).

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Reviews and Publication Notes

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dropped from a high of 5 to around 2.7 children per woman during the period 1963–87. Overall contraceptive prevalence increased to an impressive high of 62 percent of currently married women. A characteristic feature of contraceptive use, however, has been a heavy dependence on traditional methods and on female sterilization.

This publication provides two alternative estimates of the current unmet need for contraceptives: a low estimate of 6 percent counting users of traditional methods as having their contraceptive needs met, and a high estimate of 19 percent counting traditional users as those having need of an efficient method. It also presents a set of estimates for the prevalence of future contraceptive use required to reduce Sri Lanka's total fertility rate to replacement level by the year 2001. Contraceptive prevalence would have to rise to 71 percent, a level implying an increase in the number of users from an estimated 1.2 million in 1981 to 2.26 million by 2001.

If one takes into consideration the heavy discontinuation for some methods and replacement for aging, the annual number of new users required is about 74,000 for all methods initially; this figure would gradually decline to 38,000. If a method mixture less weighted toward traditional methods is to be achieved, however, users of all modern methods must continue to increase steadily. User increases required from the year 1981 until 2001 are 60 percent for tubectomy, 200 percent for vasectomy, 50 percent for the IUD (intrauterine device), 100

percent for oral contraceptives, and 400 percent for injectables.

Labour Force and Socio-economic Survey—1985/86, Sri Lanka: Preliminary Report published by the Department of Census and Statistics, Ministry of Plan Implementation, Sri Lanka. Colombo: 1987. viii, 312 pp. (paper). Available from Department of Census and Statistics, Ministry of Plan Implementation, Colombo 7, Sri Lanka.

This report provides preliminary data from the third in a series of surveys conducted by the Department of Census and Statistics under the National Household Survey Capability Programme of the United Nations for the purpose of gathering information on living levels in Sri Lanka. The information is intended for use by economic policymakers, researchers, and the public.

Approximately 25,000 housing units were covered in 12 monthly subrounds beginning in April 1985. A sample of this magnitude was used to permit reasonably accurate estimates at the district level.

The report is based on data collected in the first six months of the survey and contains results of data analysis of some key indicators at the sector and national levels. Subsequent reports based on all 12 rounds of the survey will provide more detailed information and estimates at the district level.

This report is organized into three sections, the first two describing the survey methodology and the results, and the third containing tabulations. Sixteen appendixes document the survey methodology.

Lactation Education for Health Professionals edited by Rosalia Rodriguez-Garcia, Lois A Schaefer, and Joao Yunes. Washington, D.C.: Georgetown University, U.S. Agency for International Development, and Pan American Health Organization, 1990. xii, 213 pp. ISBN 92-75-12024-2 (paper). Available from Institute for International Studies in Natural Family Planning, Georgetown University, Washington, D.C. 20007, U.S.A. (Attention Ms. Lois A. Schaefer, FAX 202 687-6846).

This book is the product of a collaborative effort by nurses, physicians, nutritionists, and other health professionals worldwide to develop a curriculum for teaching students of medical, nursing, and nutrition schools the basic skills necessary to teach and promote breastfeeding. The curriculum is targeted to a mid-level audience: students of basic nursing programs.

The volume includes a teaching module and scientific and support articles. The teaching module consists of breastfeeding curriculum and a teacher's guide. The curriculum includes the core content areas for lactation and breastfeeding education, and includes a unit on the Lactational Amenorrhea Method (LAM) for child spacing. The teacher's guide follows the format of the module, which has been designed to identify easily the objectives, methodologies, and evaluation questions for each topic.

A Spanish-language edition with the title *Educacion en Lactancia para los Profesionales de la Salud* is also available. □

ASIAN AND PACIFIC POPULATION FORUM

Volume 5, Number 1

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1990 Census Round: Meeting Users' Needs Is Seen As Key to Successful Dissemination

With the enumeration phase of the 1990 round of censuses nearly complete, census organizations in Asia and the Pacific are focusing on processing the voluminous data collected and producing tabulations for a multitude of purposes. Getting the results out to users quickly in a variety of formats has high priority. As the demand for census information grows, census officials are experimenting with new approaches to dissemination. New technologies are available in most of the countries of the region, and in some, marketing strategies similar to those used in the private sector are being tried in an effort to recover some of the costs of the census operation.

Dissemination and marketing of census products were therefore major topics at the Thirteenth Population Census Conference of census directors from the Asian-Pacific region, held in Honolulu in December 1990. Drawing upon papers presented at the conference, in particular those by representatives of Australia, the Philippines, and the United States, this article describes technological developments and marketing techniques being used in the region to increase the demand for census information.

ASIAN AND PACIFIC POPULATION FORUM

Editor Sandra E. Ward
Editorial Board Fred Arnold, Minja Kim Choe, Robert D. Retherford, Robert C. Schmitt
Production Clifford Takara, Lois M. Bender

The *Asian and Pacific Population Forum*, published quarterly by the East-West Population Institute, contains policy-relevant and technical articles on population issues affecting the Asia-Pacific region, reviews of demographic publications, and news about population activities in the region. Guidelines on manuscript submission are available from the editor. All manuscripts are peer-reviewed. Readers are invited to submit articles, news items, reviews, and letters to:

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Single copies of the *Forum* are free to individuals and organizations engaged in population-related work. The subscription rate for the general public is \$12 per year. Send/add \$5 for overseas airmail delivery.

The EAST-WEST POPULATION INSTITUTE, a unit of the East-West Center, conducts research, training, and related activities in the population field, with emphasis on economic, social, psychological, and environmental aspects of population problems in the Asia-Pacific region.

The EAST-WEST CENTER was established in Hawaii in 1960 by the United States Congress "to promote better relations and understanding between the United States and the nations of Asia and the Pacific through cooperative study, training, and research."

Some 2,000 research fellows, graduate students, and professionals in business and government each year work with the Center's international staff on major Asia-Pacific issues relating to population, economic and trade policies, resources and the environment, culture and communication, and international relations. Since 1960, more than 27,000 men and women from the region have participated in the Center's cooperative programs.

Officially known as the Center for Cultural and Technical Interchange Between East and West, Inc., the Center is a public, nonprofit institution with an international board of governors. Principal funding comes from the United States Congress. Support also comes from more than twenty Asian and Pacific governments, as well as from private agencies and corporations.

by Sandra E. Ward

MOST countries of the Asian and Pacific region have either taken their 1990-round censuses by now or are just about to do so. The attention of national census organizations therefore is shifting from the fieldwork and data-processing phases of the census operations to the tabulation and publication of the results. The census organizations are placing more emphasis than ever before on meeting data users' needs for timely information and for an increasing amount of information in a variety of formats. Several are introducing marketing techniques characteristic of the private sector in an effort to offset the costs of providing a wider range of census products.

Disseminating census data was a major topic at the Thirteenth Population Census Conference, held in Honolulu during 10-14 December 1990 under the auspices of the East-West Population Institute.¹ Since 1972 the census conferences have provided an opportunity for the census officials to compare operations and share problems, solutions, and innovations.

Attending the latest conference were census officials and authorities

1. Much of the information in this article has come from selected papers presented at the Thirteenth Population Census Conference. Copies of those and other conference papers, the titles of which are listed in the box on pages 5-7, may be requested directly from the authors.

Sandra E. Ward is Senior Editor at the East-West Population Institute and Editor of the Asian and Pacific Population Forum.

from 21 countries and territories in the Asian-Pacific region, representing more than half of the world's population. Participants included for the first time census officials from Mexico and Vietnam. Also present were a representative of the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) and an expert on the populations of French territories of the Pacific. (For a list of participants, see the box on pages 5-7.)

Why the Census Is So Important

Most national governments are required by law to conduct an official population count every five or ten years. In many countries, including the United States, the census is constitutionally mandated for the purpose of determining legislative district boundaries and apportioning political representation in parliament or congress.

The census is also a primary source of information about a country's people. As a snapshot of a population on a given date, it provides a wealth of data about the population's size, geographic distribution, sex and age structure, family composition, social and economic characteristics, and housing, all of which are essential for informed planning and demographic research. The census reveals which localities, ethnic groups, labor force sectors, and age groups are doing relatively well and which are falling behind in the development process. In countries with incomplete or inaccurate registration of births and deaths, the demographic information yielded by the census enables demographers to estimate vital rates

and make projections of future population change.

These statistics and projections are used by national and local governments, international and non-governmental organizations, community groups, businesses, and individuals for a multitude of planning purposes—from allocating public funds for essential services such as transportation and school systems to deciding upon the location of new enterprises financed by the private sector.

Statistics and projections based on censuses are used for planning everything from essential government services to the location of new enterprises financed by the private sector.

Census dates, population totals, and estimated annual rates of population growth for countries and territories represented at the Thirteenth Population Census Conference that have completed their 1990-round enumerations appear in Table 1.

Planning the Census to Meet Users' Needs

In preparing for the census, officials routinely seek advice from many user groups, in government and outside it, so as to maximize the usefulness of the information collected. Government agencies, professional and business organizations, and local communities are polled for their concerns and interests. Because the success of the census depends upon the cooperation of individual citizens, broad consultation in the design of the

census questionnaire and field trials prior to the actual enumeration enable census officials to refine the instrument and avoid costly blunders.

The United Nations Population

Division recommends the inclusion of certain topics and standardized questions, for international comparability, just as it encourages all countries to conduct their censuses

Table 1. 1990 census round: census dates and provisional results

Country	Census reference date	Population total (thousands)	Intercensal growth rate (av. annual %)
Asia			
Bangladesh	March 91	u	u
China	1 July 90	1,160,017 ^a	1.48
Hong Kong	15 March 91	5,698	1.1
India	1 March 91		
Indonesia	31 October 90	179,322	1.97
Japan	1 October 90	123,612	0.4
Republic of Korea	1 November 90	43,520	0.99
Malaysia	14 August 91	u	u
Nepal	22 June 91	u ^b	
Philippines	1 May 90	60,685	2.35
Sri Lanka	? ^c		
Thailand	1 April 90		
Vietnam	1 April 89	64,376	2.10
Oceania and Pacific			
Australia	6 August 91	u	u
Fiji	31 August 86	715 ^d	1.97
French Polynesia	6 September 88	189	2.6
New Caledonia	4 April 89	164	2.1
Papua New Guinea	9–14 July 90	3,529 ^e	2.03
U.S. Pacific Islands	1 April 90		
Northern Mariana Islands		43.3	15.8
Palau		15.1	2.5
American Samoa		46.8	4.5
Wallis and Futuna	9 October 90	14	1.3
North America			
Mexico	12–16 March 90	81,141	2.3
United States	1 April 90	249,633	0.98

u—unavailable at present.

a. Mainland total: 1,133,683 thousand.

b. Projected total: 19.5 million.

c. Sri Lanka's census, originally scheduled for March 1991, has been postponed because of political unrest; a new date has not yet been set.

d. Final count.

e. Excluding North Solomons Province, where the census could not be taken on account of political unrest.

in years ending in 0 or 1. Consistency in the wording of standard questions permits comparability not only between countries but also between one census and another in the same country.

Although census officials go to great pains to ensure a complete and accurate census, they have tended to give less attention during the pre-enumeration planning phase to how the census information will be communicated to the public. The types of tabulations to be prepared, appropriate formats, and the media used to deliver them to users must all be considered.

Typically, census tabulations are issued in several stages. Preliminary results, based on sample data and tabulated manually in many countries, provide basic information about the population's size and main characteristics. The release of this information may have to meet deadlines imposed by law for electoral or planning purposes. Final tabulations of main characteristics based on 100% of the census returns usually take another year or so to complete, even with the advantage of computer editing and processing. Detailed tabulations of special characteristics follow, based on samples or, in the case of small areas, 100% of the returns. (See box beginning on page 8 for major reports and their release dates planned by the countries attending the Thirteenth Population Census Conference.) Budgetary considerations naturally limit the amount of census information that can be processed, tabulated, and disseminated, and also the speed at which the various stages are completed.

China's population of 1,160 million, for example, poses a daunting



Thirteenth Population Census Conference participants Chintana Pejaranonda (Thailand), Krishna Prasad Shrestha (Nepal), and Sasithorn Jotikasthira (Thailand) take a coffee break between sessions.

challenge to officials charged with processing and disseminating the largest census ever conducted. To illustrate, Mr. Sun Jingxin, deputy director-general of the State Statistical Bureau (SSB), told conference participants that even if only one set of tables were printed for each county, prefecture, and province and for the country as a whole, the resulting document would total 9.85 million pages.

To meet the needs of users who require detailed demographic data for social and economic analysis, Chinese officials plan to integrate population data bases derived from the census with other data bases maintained by the government's statistical system, such as information on industry, agriculture, investment, trade, culture, education, and health. They plan to select small fractions (e.g., 1%) of records from

census data tapes for detailed analysis of particular characteristics of the population. By focusing on subjects known to be of greatest interest to prospective users, the SSB believes it can satisfy most data needs while controlling costs.

Dissemination a Neglected Concern

"One of the often neglected aspects of census planning is in data dissemination," stated Ms. Luisa T. Engracia of the Philippines National Statistics Office in her conference paper. "In most cases, only tabulation plans for the printed output are considered prior to census taking." "The real test of the success of a census," she asserted, "lies in the extent to which the vast amount of information obtained

(continued on page 7)

Presentations and Participants at Thirteenth Population Census Conference

Readers wishing to obtain copies of the conference papers, which are designated with an asterisk (*) in the list of presentations below, should direct requests to the authors, whose addresses are included in the list of participants.

PAPERS AND PRESENTATIONS

Opening Ceremony

A. R. Nanda, *Chair*

Opening Remarks, by *Lee-Jay Cho and Griffith Feeney*

Highlights of Recent Population Censuses

A. R. Nanda, Barbara Everitt Bryant, and Soetjipto Wirosardjono, *Chairs*

*Some Ideas on the Utilization of Data from China's 1990 Population Census, by *Sun Jingxin*

*The 1990 U.S. Census: Soon It Will Be the User's Turn, by *Barbara Everitt Bryant*

*Outline of the 1990 Population Census of Japan, by *Takanobu Negi*

*Outline of the 1990 Population and Housing Census in the Republic of Korea, by *Il-Hyun Kim*

*An Overview of the Population and Housing Census of Malaysia 1991, by *Teik Huat Khoo*

*Population and Housing Census of Mexico, 1990: A Preliminary Program of Dissemination of Results, by *María Elena Figueroa*

*The Vietnam Population Census—1989, by *Le Van Toan*

Tabulation and Dissemination Planning

Teik Huat Khoo and Luisa T. Engracia, Chairs; Glenn Cocking and Frederick W. H. Ho, Commentators

*The Plan of Tabulation and Dissemination of Census Data [in India], by *A. R. Nanda*

*Tabulation Planning [in Thailand], by *Sasitorn Jotikasthira and Chintana Pejaranonda*

*Dissemination of the 1986 Census Data [of Fiji], by *Vasemaca Lewai*

*Data Processing and Publication Plans for the 1991 Census of Population and Housing of Sri Lanka, by *Soma De Silva*

*The Use of Census Data for Household Projections: An Overview of Results from the HOMES Project, by *Andrew Mason and Rachel Raceis*

*Tabulation Plans for the 1991 Census of Bangladesh, by *Abdus Salam*

*The Tabulation Plans and Dissemination of 1991 Population Census of Nepal, by *Krishna Prasad Shrestha*

*The 1990 Population Census of Indonesia as the Main Source of Small Area Statistics, by *Azwar Rasjid*

Marketing Census Data

Chintana Pejaranonda and Glenn D. Cocking, Chairs; Bryant Robey and A. R. Nanda, Commentators

*Australian Initiatives in Design and Marketing of Population Census Products and Services, by *Glenn D. Cocking*

*Marketing Strategies for Philippine Population Census Data, by *Luisa T. Engracia*

Small-Area Data, Fertility and Mortality Estimation, and Editing

Glenn D. Cocking, Chair; A. R. Nanda, Commentator

*Small Area Data for Social Planning in Hong Kong, by *Frederick Wing Huen Ho*

*Plans for Utilization of Small-Area Data from the 1990 Census of Papua New Guinea, by *Nick Suwulo*

*The Effect of Female Literacy on Fertility: A Case Study of the Use of Small Area Data in India, by *Robert D. Retherford and O. P. Sharma*

Fertility and Mortality Estimation from the 1990 Round Censuses

Abdus Salam, Chair; Soetjipto Wirosardjono, Commentator

*Fertility and Child Mortality Estimation from the Census Data in India: Experience of 1981 Census and Plans for 1991 Census, by *K. S. Natarajan*

Reconstructing Birth Histories from Census Data: An Extension of the Own-Children Method of Fertility Estimation, presentation by *Griffith Feeney and Norman Y. Luther*

*To Edit or Not to Edit, That Is the Question: Some Thoughts on the Current State of Computer Editing, by *Michael J. Levin*

Censuses and Demography in the Pacific Islands

Nick Suwulo, Chair

*The Population of the French Territories of the Pacific: An Overview, by *Gerard P. Baudchon*

*The Depopulation of Polynesia: Migration to New Zealand, by *Laurie H. Lewis*

*Census and Demography in the U.S. Pacific Islands, by *Michael J. Levin*

Plans for Future Work

Lee-Jay Cho, Chair

Future Activities, presented by *Lee-Jay Cho and Griffith Feeney*

Plans for the *Asian and Pacific Population Forum*, discussion led by *Sandra E. Ward*

Closing Ceremony

Additional papers made available to participants at the conference

**Effect of Female Literacy on Fertility in India*, by *O.P. Sharma and Robert D. Retherford* (Occasional Paper No. 1 of 1990, Office of the Registrar General & Census Commissioner, India)

**One-Child Families or a Baby Boom? Evidence from China's 1987 One-per-Hundred Survey*, by *Norman Y. Luther, Griffith Feeney, and Weimin Zhang* (Reprints of the East-West Population Institute, No. 261)

**Reconstruction of Birth Histories from Census and Household Survey Data*, by *Norman Y. Luther and Lee-Jay Cho* (Reprints of the East-West Population Institute, No. 235)

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1990 Census Round . . .

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from it is accessed and utilized in meaningful ways."

"The real test of the success of a census lies in the extent to which the vast amount of information obtained from it is accessed and utilized in meaningful ways."

Potential users of census statistics may be unaware of the many kinds of information that the census can provide. The Australian government, suspecting that its census statistics were underutilized, commissioned a market research study in 1987 to assess the census's commercial value. The study revealed that many organizations knew little about what the census had to offer them.

Among the potential applications of census data identified by the study were research for social and economic policy, policy and program evaluation, planning for service delivery, location studies, urban planning, labor market planning, market analysis, volume impact studies, demographic studies, and education.

Media Used to Convey Census Information

The traditional method of releasing census results is in printed reports containing standardized tables. Print continues to be the main medium for disseminating census information, but during the past several decades most governments have also released their tabulations on

microfiche and, for users with computers, on computer tapes after first ensuring that the confidentiality of individual census returns is protected. Computer tapes containing individual-level census data enable users to manipulate, aggregate, and process the data as they wish for analysis. Much more data can be packed onto a computer tape than into a printed report.

Developments in computer technology not only have speeded up the processes of data entry, editing, and tabulation and increased their accuracy, but also have led to new methods of delivering census data to users. In countries at the forefront of these developments, users can access census data through computer networks and software that permit remarkable flexibility in manipulating the data for statistical analysis.

The U.S. Bureau of the Census, for example, in 1984 introduced an on-line computer information service called CENDATA™. The service provides information about data products as they become available and offers basic 1990 census data. CENDATA is available through the computer networks DIALOG Information Services and CompuServe.

For the first time a number of countries in the region are releasing selected census products on laser disks called CD-ROMs (Compact Disk-Read Only Memory). One CD-ROM measuring 4 3/4 inches in diameter can hold the contents of 1,500 floppy diskettes or three or four high-density tapes.

Addressing conference participants, U.S. Bureau of the Census

Director Barbara Everitt Bryant declared that the availability of census data on CD-ROMs leads to what she calls "democratization of the data." Previously only users of mainframe computer systems could manipulate census data. "Now anyone with a personal computer and a CD-ROM reader will be able to do so." Cost of the compact disc readers has been dropping, she added, making this technology even more accessible. Users can now purchase a reader and basic software for less than US \$1,000.

Technological developments such as CD-ROMs enable users to access census data through computer networks and software that permit remarkable flexibility in manipulating the data for statistical analysis.

Optical disks, another high-density medium for storing large amounts of information, are also being considered for census data storage, for example by Malaysia's Department of Statistics.

Dr. Bryant described the U.S. census geographic data base known as the TIGER file, designed for the 1991 census to provide users with a new tool for mapping, analyzing, and displaying census data. An acronym for the mapping system Topographically Integrated Geographic Encoding and Referencing, TIGER was developed by the Census Bureau in cooperation with the U.S. Geological Survey. The file integrates in a coordinate-based digital map all the geographic information compiled for the United States,

Projected Dates for Releasing Census Data

ASIA

Bangladesh

Prior to the disastrous cyclone and floods that struck Bangladesh early in 1991, the government planned to publish all census reports in about four years. Reports were to consist of summary tables, household tables, population tables, and community tables.

China

Manual tabulations:

Basic population indicators (population by sex, household size, nationality, educational attainment and literacy, urban-rural residence): 30 October 1990

Geographic distribution of population by province: 6 November 1990

Population by nationality: 14 November 1990

Population by educational attainment (university, secondary, primary, illiterate and semi-literate) by province: 21 November 1990

Computer tabulations:

Advance sample tabulation, based on 10% sample, for national, provincial, prefecture, and county volumes: May 1991

Tabulation of all census data: end of September 1992

Hong Kong

Summary results, including information on the population and on households and living quarters, classified by several socioeconomic and demographic characteristics, for small areas: October 1991

Detailed tabulations: March 1992

India

Provisional population totals for country, states, and union territories (India, Paper 1 of 1991, described in *Asian and Pacific Population Forum*, Vol. 4, No. 4, Winter 1990, p. 18): March 1991

Provisional report on rural-urban distribution for country, states, and union territories (India, Paper 2 of 1991): July 1991

Provisional report on workers and nonworkers (India, Paper 3 of 1991): September 1991

Tabulation on households and household amenities (H-Series): December 1991

Primary census abstract (basic data by smallest area): September 1992

General population tables (A-Series): 1993-95 in phased sequence

Tabulation on religion and mother tongue (C-Series): mid-1993

General economic tables (B-Series), based on 10% tabulation: mid-1993

General economic tables (B-Series), based on 100% tabulation: June 1994

Social and cultural tables (C-Series): mid-1993

Migration tables (D-Series): mid-1993

Fertility tables (F-Series): mid-1993

Special tables for scheduled castes (SC-Series): December 1995

Special tables for scheduled tribes (ST-Series): December 1995

Village and town directories: mid-1993

Tables C-10 on household composition, based on manual tabulation of household schedules: December 1995

Indonesia

Tabulations, based on short form, of population by province, regency/municipality, district, village, and urban-rural area: December 1990

Detailed tables by province, in two stages:

Stage 1, preliminary tables based on 10% sample: by end of 1991

Stage 2, final results (70 tables): by end of 1992

Japan

Preliminary results based on summary sheets (population by sex and number of households by prefecture and municipality): December 1990

Complete tabulation, in three phases:

Phase 1, basic demographic and household characteristics by prefecture: June to November 1991

Phase 2, industries (major groups), labor force, employment, place of work or study, time spent commuting: July 1992

Phase 3, occupations (major groups): by end of 1994

Republic of Korea

Preliminary count of population, households, and housing units by minor administrative units (*dong, eup, and myeon*): April 1991

Advance estimates of population and housing: July 1991

Estimates of population, housing, migration, fertility, and economic activity based on 10% sample: in series during 1992

Final report based on complete enumeration: September 1992

Special reports on economic activities, including industry and occupation classified by submajor and minor group (10% sample): February 1993

Malaysia

Field count summary of living quarters, households, and population by state and administrative district: end of December 1991

Provisional report based on a 5% sample tabulation (distribution may be limited to key agencies of Malaysian government): end of March 1993

Final reports on major characteristics by state, district, and *mukim*: December 1994

Special reports on selected topics: December 1995

Nepal

Preliminary population counts: late September or early October 1991

Tables on general population characteristics: early 1993

Puerto Rico, the Virgin Islands, and the U.S. Pacific territories.

More than 65,000 individual maps will be prepared by the bureau and made available to census data users. In addition, extracts from the TIGER data base allow users with appropriate computer software to analyze 1990 census data geographically and to generate maps at various scales for any U.S. geographic area.

Bryant told conference participants that "the TIGER extracts are becoming a catalyst for new and exciting geographic information system (GIS) applications. Precensus releases of TIGER extract information are being used to route vehicles, analyze markets, draw new political, administrative, and service area boundaries, delineate high-crime areas, pinpoint emergency service users, study environmental impact issues, and undertake a great variety of other applications."

Not all efforts to improve the communication of census results depend upon new technologies. South Korea's National Bureau of Statistics is collaborating with university faculty and researchers on a variety of research projects and is sponsoring seminars on census results. Mexico, which had a highly successful publicity campaign for its census before the enumeration, is capitalizing on the public's interest in the census's outcome with a media blitz: radio and television news stories, newspaper and magazine articles, informational leaflets tailored to specific groups, materials for school curricula.

The Department of Census and Statistics in Sri Lanka, a country with a multilingual population, has investigated the possibility of pro-

ducing census tabulations in the official languages of English, Sinhala, and Tamil. Senior Deputy Director Soma De Silva reported that experiments to transport output tables (produced with the computer program CENTS on an IBM PS/2) to a Macintosh system, using an editor to overlay the text area of the tables in the local languages, "have proved promising, and further work is under way."

Marketing Census Products

As users' needs for census data have become more varied, the demand for specialized data sets and tabulations has proliferated, challenging census organizations to meet the demand while keeping their operating costs within reasonable bounds. The solution in many cases has been to make standard tabulations available to the public without charge or for a minimal fee and to charge cost-recovery fees for tabulations tailored to individual users' needs. Among the countries represented at the Census Conference, Australia and the United States are taking the lead in offering and marketing specialized census products and services.

Australia's marketing strategy.

Besides releasing the broad results of the census in traditional printed publications, the Australian Bureau of Statistics (ABS) has adopted the policy of charging users the marginal cost of standard products and services and charging them a market price for products and services designed to meet their individual needs. The purpose is to provide "a high-quality, user-oriented and dynamic statistical service," as expressed in the bureau's mission

Tables on social characteristics of population, on fertility and mortality characteristics of population, on economic characteristics of population, and on household characteristics: end of 1993

Philippines

Preliminary population count by province and city: August 1990

Population count by *barangay*: December 1990

Detailed provincial reports: July 1991 to July 1992

National summary: July or August 1992

Other special reports (homeless population; Filipinos in consulates, embassies, and missions abroad; urban-rural classification of *barangays*; population density by municipality): December 1991

Sri Lanka

Preliminary report—population by sex, broad age group, ethnicity, religion, and citizenship: one month after the enumeration (which has been postponed)

Report on disabled population: three months after the enumeration

District reports: beginning 10–12 months after the enumeration

Series of special reports on the urban population, rural agricultural workers, children, women, housing, etc.: to be scheduled

Demographic atlas: to be scheduled

Thailand

Preliminary report (population by sex; households by province, region, and whole kingdom; population growth during 1980–90): December 1990

Advance report on population by sex, age, marital status, literacy, education, number of children ever born, economic activity, type and average size of household, and housing characteristics, based on 1.5% sample: September 1991

Final report on basic characteristics of the population, in 78 volumes (whole kingdom, regions, and provinces): within two years

Vietnam

Provisional results, based on 5% sample, of population and housing: March 1990

Final results: by end of 1991

OCEANIA AND PACIFIC

Australia

Preliminary reports by state: between March and September 1992

First series of publications on key variables for local areas by state: second half of 1992

User-specified, detailed, cross-classified tables for individual states and the country: late 1992

CDATA91 (an extensive profile data base of simple tables for local areas with data-manipulation and statistical-mapping software on a CD-ROM): early 1993

Series of thematic publications, including *Australia in Profile* and social atlases containing statistical maps and commentary for the state capital cities; series of reference publications on the census: from 1993 onward

Note: The quarterly publication *Census Update* (ABS Catalogue No. 2902.0, first issued in September 1991) provides information about 1991 census products and services, release times, and customer-specified tables already released. To obtain subscription information, write to: Statistical and Information Services Division, Australian Bureau of Statistics, P.O. Box 10, Belconnen, ACT 2616, Australia.

Fiji

Provisional report on total population by ethnic group, province, and urban-rural distribution (*Statistical News* No. 27/86): June 1986

Provisional report on infant mortality, life expectancy, and fertility (*Statistical News* No. 24/88: September 1988

Final results, part 1, summary of population size and growth, racial and age-sex composition, spatial distribution, households and families, migration, religion, economic activity, fertility, and housing and services (*Statistical News* No. 20/87): July 1987

Final results, part 2, tables for topics covered in part 1 (*Statistical News* No. 27/87): September 1987

Volume 1, general tables and administrative report: December 1987

Volume 2, small-area data, population density, maps of rural enumeration areas: August 1986

Volume 3, economic characteristics: August 1988

Volume 4, fertility and mortality: February 1988

Volume 5, internal migration: May 1988

Volume 6, housing and services: February 1988

Summary analysis of 1986 census (*Statistical News* No. 7/89): March 1989

French Polynesia

Preliminary results (legal population): January 1989

Tabulations: April 1991

Analysis: August 1991

New Caledonia

Preliminary results (legal population): September 1989

Tabulations and analysis: December 1989 to December 1991

Papua New Guinea

Preliminary figures compiled manually: 30 April 1991

Final figures for the whole country and all 19 provinces except North Solomons: end of June 1991

U.S. Pacific Islands

Preliminary results: 18 July 1991

statement. This policy has advantages for both the government and the public, according to ABS Assistant Statistician Glenn Cocking. "It gives ABS managers the incentive to design and produce products and services that users will pay for, thus justifying their production, and it disciplines users to order from the ABS only those statistics for which they have sufficient need."

Charging users all or most of the cost of tabulations designed to meet their specialized needs, Cocking added, means that those users can have a greater influence on the available census products than they can by having to argue for the priority of their own information needs. At the same time, "products and services and collections designed principally to raise revenue can also make important contributions to the ABS mission because in most cases they significantly assist decision-making by government or others."

The policy of charging for its services has enabled the ABS to increase the proportion of its costs that are recovered. During fiscal year 1989-90 revenues from the sale of ABS products totaled \$7 million Australian dollars. The ABS's primary mission remains meeting the information needs of the government, however, and specialized needs of other groups and individuals affect the ABS's tabulation program only at the margin. The \$7 million in revenues raised last fiscal year amounted to less than 5% of the agency's costs. ABS was required to turn over 70% of its revenues to the government's general revenue account and kept only 30% for its own operations.

Among the modestly priced

products from the 1991 census the ABS plans to offer to the public will be population estimates, available in printed form, and summary information for specific areas. Summary statistics for small areas, called "community profiles," will also be available. They can be used by all levels of government and by businesses and the communities themselves for planning and evaluation. The price of the profiles will depend upon the amount of data users wish to access. The ABS plans to place in major public libraries copies of all the 1991 census publications in print form and microfiche copies of small area summary data.

The market survey conducted for the ABS in 1987 found that the business community in general regarded information published by the ABS to be "of a high quality and authoritative," that the ABS was giving increased emphasis to providing statistics that met the needs of individual clients, and that the prices charged represented "value for money." Weaknesses identified by the survey were a low awareness of the range of ABS products and services, insufficient education by the ABS on the benefits of using reliable statistical information, and several negative perceptions of the ABS—that it was not a dynamic and responsive organization, its electronic data services were "user unfriendly," and its staff needed training in sales techniques.

These findings from the market research, combined with a poor distribution performance of standard products from the 1986 census, have forced the ABS to conclude that, in Cocking's words, "we

Detailed reports on general social, economic, and housing characteristics: beginning in fall 1991

Wallis and Futuna

Preliminary results (legal population): December 1990

Main results: June 1991

Tables and analysis: November 1991

NORTH AMERICA

Mexico

Preliminary report on total population by sex, state, and municipality and population density by state: July 1990

United States

Summary population and housing characteristics (100% data) for states and the U.S.: 1991-92

Population and housing unit counts for states and the U.S.: 1991-92

General population and general housing characteristics: 1992

Summary population and housing characteristics for the U.S.: 1992

Population and housing characteristics for census tracts and block numbering areas: 1992-93

General population and housing characteristics for the U.S., for American Indian and Alaska Native areas, for metropolitan statistical areas, and for urbanized areas: 1992

Summary social, economic, and housing characteristics for the U.S.: 1993

Social and economic characteristics: 1993

Detailed housing characteristics: 1993

Population and housing characteristics for Congressional districts of the 103rd Congress: 1993

Social and economic characteristics for the U.S., for American Indian and Alaska Native areas, for metropolitan statistical areas, and for urbanized areas: 1993

Detailed housing characteristics for the U.S., for American Indian and Alaska native areas, for metropolitan statistical areas, and for urbanized areas: 1993

Population and housing subject reports: 1993

Using Census Data for Household Projections: An Overview of Results from the HOMES Project

This article provides an overview of the household projection model HOMES and presents new household projections for six countries—China, Indonesia, Japan, the Republic of Korea, Thailand, and the Philippines. The household projections are based on recently released population projections from The World Bank and on rules governing living arrangements quantified with the latest available census or demographic survey for each country. Growth in the number of households to the year 2030 is projected along with changes in household membership and the dependency burden.

by Andrew Mason and
Rachel Racelis

What is HOMES?

HOMES, Household Model for Economic and Social Studies, is a computer model developed at the East-West Center to forecast the number and demographic characteristics of households. By applying the model to standard population projections, the user is provided with projections of the number of households in the projected populations and

such household characteristics as the age and sex of the household head, average household size, and the number, age, and sex of household members. This demographic information is used, in turn, to forecast related social and economic trends and to examine the links between population growth and economic development.

Although one of the primary objectives of the model is to project the total number of households, four types of households are distinguished in the analysis: (1) intact households, i.e., those in which the head and spouse are both present; (2) single-head households, i.e., households in which the head's spouse is not present; (3) one-person households; and (4) primary-individual households, i.e., those consisting of unrelated members.

These four categories, further distinguished by the sex of the household head, encompass all members of the population except the military and institutionalized populations, which are projected separately.

Why the need for household projections?

Why is it important to have this information? Changes in the number and demographic characteristics of households are known to influence saving and labor force participation rates, school enrollment, the demand for housing and consumer spending patterns, and systems of familial support. HOMES provides basic demographic information necessary to analyze these issues and assess the importance of demographic change for the development of a wide range of social and economic policies.

An increasing body of research points to the importance of the household as a determinant of social and economic behavior.

An increasing body of research points to the importance of the household as a determinant of so-

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cial and economic behavior (Keilman et al. 1987; Bongaarts et al. 1987; Ermisch and Overton 1985). Women who have young children behave differently from women who do not. Children raised in homes with both parents present differ from those raised by a single parent. What the household buys and what it owns vary with the number of members, their ages, and their sex. The standard of living of most people depends as much on the earning of other members of the household as it does on their own. Thus improving the availability of information about households and how they will change can help policymakers develop more effective policies and improve social and economic planning.

Change in the supply of labor provides one example. In many countries changes in labor force participation are dominated by the employment decisions of women, which in turn are closely connected to childrearing responsibilities and the presence of other wage earners in the household. Accurate forecasts of labor supply cannot be prepared therefore if the changing family circumstances of women are ignored.

Another example is economic security. In industrialized and developing countries alike, but particularly in developing countries where extended or multigenerational households prevail and government-sponsored social security programs are limited, the household is the basic provider of economic security. Household members are protected from bouts of unemployment if there are many workers in the household. Old-age security is also effectively handled by multi-earner, extended house-

holds. For example, in Thailand family households with a head over age 65 typically have two or more wage earners, reducing the need to rely on saving and government support.

Many developing countries are experiencing major demographic changes that are having a profound impact on the household.

Few would deny that the household is an important institution, but many might argue that its role need not be explicitly modelled except in a limited number of cases, such as its effect on the demand for housing. This view would have merit if the household were a stable and unchanging institution, but such is not the case. Many developing countries, especially those in Asia, are experiencing major demographic changes that are having a profound impact on the household. Throughout East and Southeast Asia (Japan aside), the average size of households is dropping rapidly, the average age of the head is increasing, the number of dependent children is declining, and so on. Moreover, in some countries, such as Japan, the extended family may be declining in importance, replaced by nuclear households.

Where HOMES has been applied

HOMES has been applied to problems of national planning and to the analysis of interactions between economic and demographic

change in Japan in collaboration with the Statistics Bureau of the Management and Coordination Agency and the Population Research Institute of Nihon University; in Thailand in collaboration with the National Statistics Office, the National Economic and Social Development Board, and Thammasat University; and in the Republic of Korea in collaboration with Yonsei University. Additional studies are planned or under way using HOMES in Indonesia, Singapore, China, Nepal, Sri Lanka, and the Philippines.

Scope of this article

The remainder of this article has two purposes, to provide an overview of the HOMES projection model and to present new household projections for six countries—China, Indonesia, Japan, the Republic of Korea, Thailand, and the Philippines. The rules governing living arrangements are based on special tabulations from China's 1987 1% Population Sample Survey, the 1988 National Demographic Survey for the Philippines, and the most recently available censuses for Indonesia, Japan, and Thailand. Recently published World Bank population projections are used to describe the underlying demographic trends for each country (Bulatao et al. 1989; Bos et al. 1991).

An appendix provides a selection of summary tables and figures for each of the six countries. More comprehensive reports are available for Indonesia (BAPPENAS and EWPI 1990), Korea (Mason 1987), and Thailand (Mason, Phananimai, and Poapongsakorn 1987; Mason, Woramontri, and Kleinbaum 1987a; Mason, Woramontri, and Kleinbaum

1987b; Phananimamai and Mason 1987; Bauer et al. 1988). Similar reports will soon be available for the Philippines and Japan, and detailed projections will be prepared for China at a later date.

Forecasting with HOMES

A detailed discussion of the HOMES methodology is given in Mason (1987). HOMES can be conceptualized as consisting of two stages. In the first stage the rules governing household formation and composition are determined with the use of base-year data tabulated from a census or demographic survey. In stage two the number and composition of households are projected by combining the results of stage one with population projections. Stage two is run repeatedly to assess the implications of alternative population projections. But stage one is run only when new information from a major survey or census becomes available.

The data requirements for HOMES are fairly modest. The package can be applied if the following are available: population projections, including age-specific fertility rates, and a recent census or large, representative survey that includes a household roster with the age, sex, and relationship to the household head of each household member.

Projecting households in the six Asian countries. Four types of household—intact, single-headed, primary-individual, and one-person—are projected. For all but intact households, male-headed and female-headed households are projected separately and a standard headship rate approach is used. For the base year, headship rates are cal-

culated as the ratio of the number of households, by age of household head in standard five-year age groups, to the male or female household population in the corresponding age group. The projected number is obtained by multiplying the headship rate by the projected population in the corresponding age and sex group.

The projection of intact households is more complicated. Intact households are identified by the ages of both husband and wife who jointly head the household. Constant headship rates cannot be employed because of changes in the sex ratio that can be traced to changes in fertility, mortality, and migration that all countries experience. We have experimented with a number of methods, which are described in Mason and Racelis (1991). The projections presented here are based on an iterative procedure that minimizes the extent to which changes in the sex ratio affect the proportions of males or females who "head" intact households.

For both sexes, overall headship rates rise to a peak as men and women marry and establish households, often living separately from their parents (Figures 1–6). Later in life, headship rates decline as the elderly move in with their children or the headship title passes to children with whom the elderly are already residing. In all countries, the age pattern is quite different for males and females. Among young adults, headship rates for women are higher, mostly reflecting age differences between husbands and wives. Among older adults, males are much more likely than females to head households, even though

we have included women who are the spouse of a household head in our calculation of headship rates.

Figures 1–6 show three of the four household types. Primary-individual households are so rare that they do not even show up in the headship rate figures. Intact households, those with the head and spouse present, dominate, making up between 70% and 80% of all households. Single-head households are the next most prevalent group, except in Japan, where one-person households are much more common. In most countries, approximately 5% of all households are one-person households, but among the young and the old, one-person households are more common.

Population and household projections. For all the countries except Japan, population growth during the coming years will continue to be substantial. Table 1

Between 1990 and 2030 the number of households will grow much faster than the population in China, Indonesia, Korea, the Philippines, and Thailand, whereas in Japan the number of households is projected to increase only slightly until the year 2010 and then decline.

presents population projections released recently by the World Bank for 1990–2030. The average annual rate of growth for the entire four decades is pegged at between 0.9% and 1.2% for China, Indonesia, the

Philippines, and Thailand; at 0.6% for Korea; and at 0.1% for Japan.

The number of households will grow much faster than will the population in all the countries except Japan. The number of households in the Philippines is projected to increase at an average rate of 2.6% annually during the next 40 years, resulting in nearly a threefold

Table 1. World Bank population projections (in thousands): 1990-2030

Country	1990	1995	2000	2010	2020	2030
China	1,121,980	1,201,556	1,275,464	1,399,884	1,512,424	1,614,430
Indonesia	181,580	197,878	213,458	241,568	269,088	293,694
Japan	123,504	126,112	128,723	131,888	131,543	129,821
Rep. of Korea	42,790	44,770	46,720	50,107	52,543	54,509
Philippines	62,609	68,865	74,894	86,259	97,214	102,507
Thailand	55,801	59,765	63,802	72,065	79,336	82,584

Source: Bos et al. (1991).

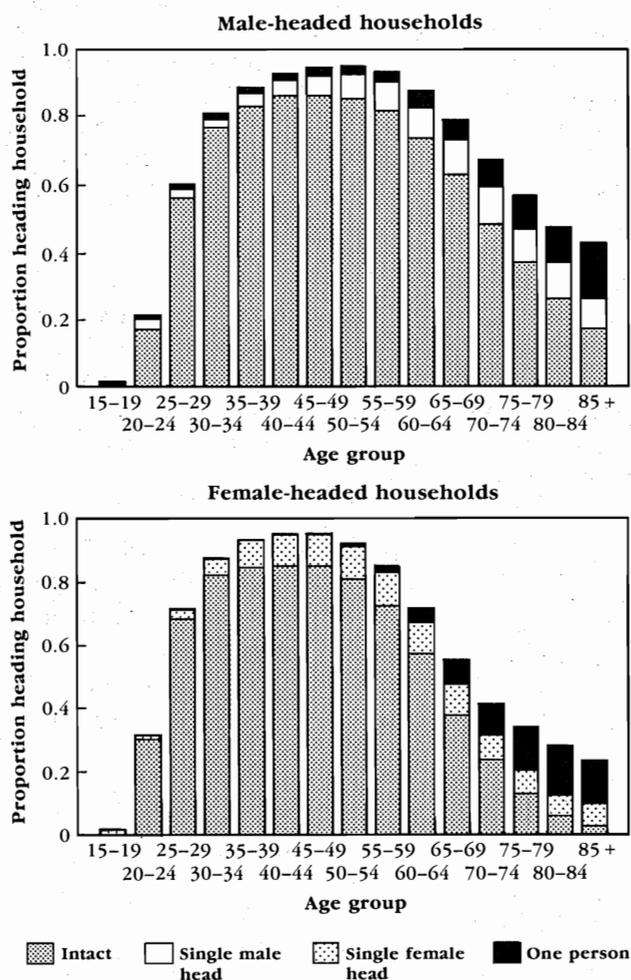


Figure 1. Base-year headship rates: China

Note: Intact household category includes spouse of head.

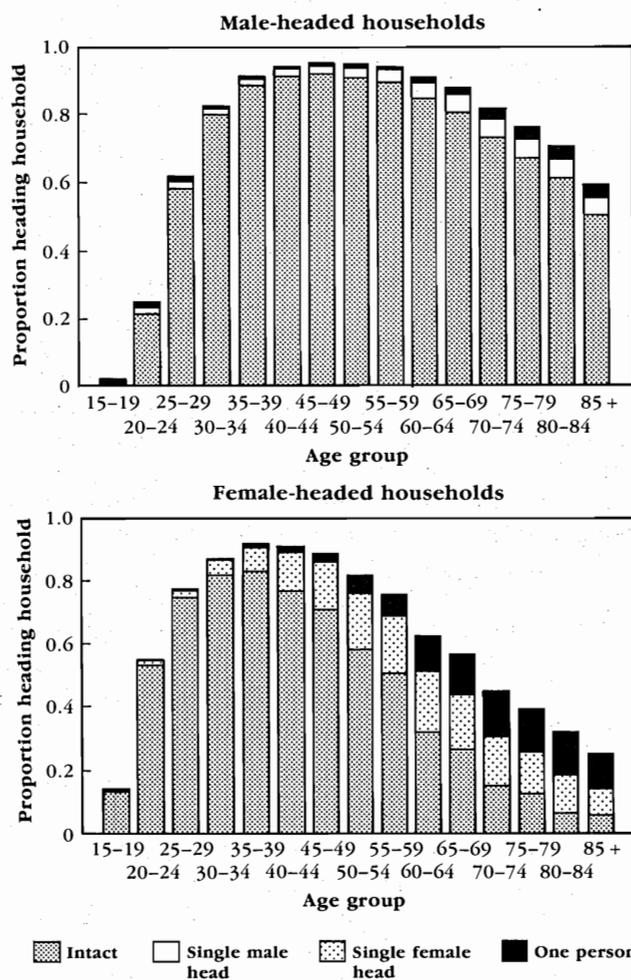


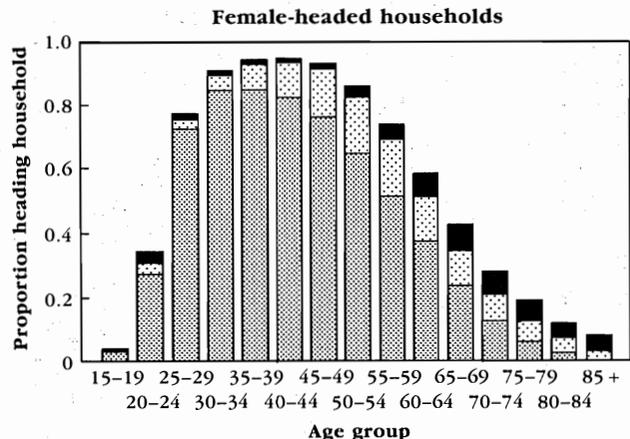
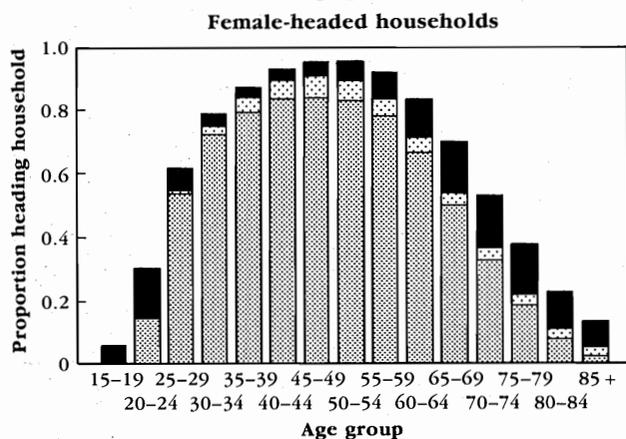
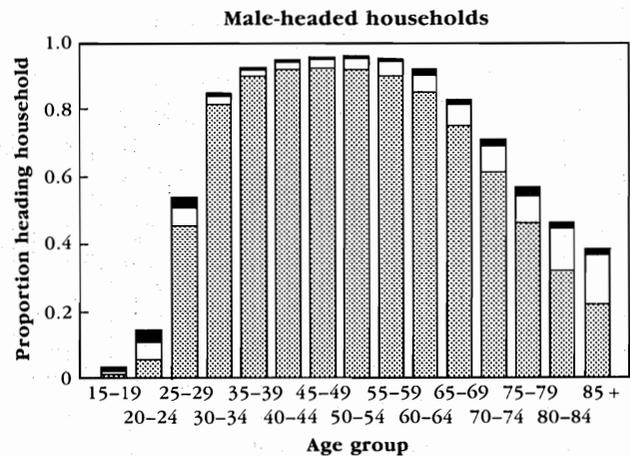
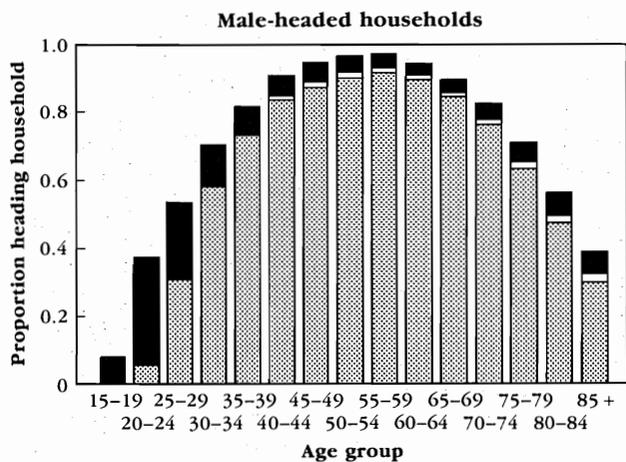
Figure 2. Base-year headship rates: Indonesia

Note: Intact household category includes spouse of head. For male-headed households, age group 15-19 consists mostly of one-person households but includes other types as well.

Table 2. Household projections (in thousands): 1990-2030

Country	1990	1995	2000	2010	2020	2030
China	278,340	316,170	353,470	410,770	461,670	497,120
Indonesia	40,487	42,294	52,705	66,656	79,454	90,168
Japan	40,214	42,121	43,369	44,824	44,324	43,179
Rep. of Korea	11,094	12,466	13,697	15,483	16,513	16,837
Philippines	11,634	13,639	15,876	21,033	26,852	32,649
Thailand	11,836	13,745	15,757	19,786	23,371	26,318

increase in the number of households (Table 2). The number of households in Thailand and Indonesia is projected to more than double during the period as they increase at 2% per year. In China and Korea the average household growth rate is projected to be 1.5% and 1.0% per year, respectively. In contrast, the number of households in Japan



Intact Single male head Single female head One person head

Intact Single male head Single female head One person head

Figure 3. Base-year headship rates: Japan

Note: Intact household category includes spouse of head.

Figure 4. Base-year headship rates: Republic of Korea

Note: Intact household category includes spouse of head. Age-group 15-19 consists mostly of one-person households but includes other types as well.

is projected to increase by only 0.2% annually until the year 2010, and thereafter to decline. The relative changes are plotted in Figure 7.

Projected household age structure. The growth in the number of households has obvious implications for housing and urban infrastructure among other sectors of the

economy. In addition, we can anticipate important changes in the "age structure" of households that will also have important implications for aggregate saving and spending patterns. The projected changes are illustrated with two cases, Thailand and Japan.

Currently Thailand has a relatively young age structure with a high

percentage of households whose heads are concentrated in the under-40 age category (Figure 8). During the next 25 years there will be a considerable change. The number of very young households will hardly grow at all, whereas those headed by the 35-59 age groups will experience substantial growth. In absolute terms, the number of

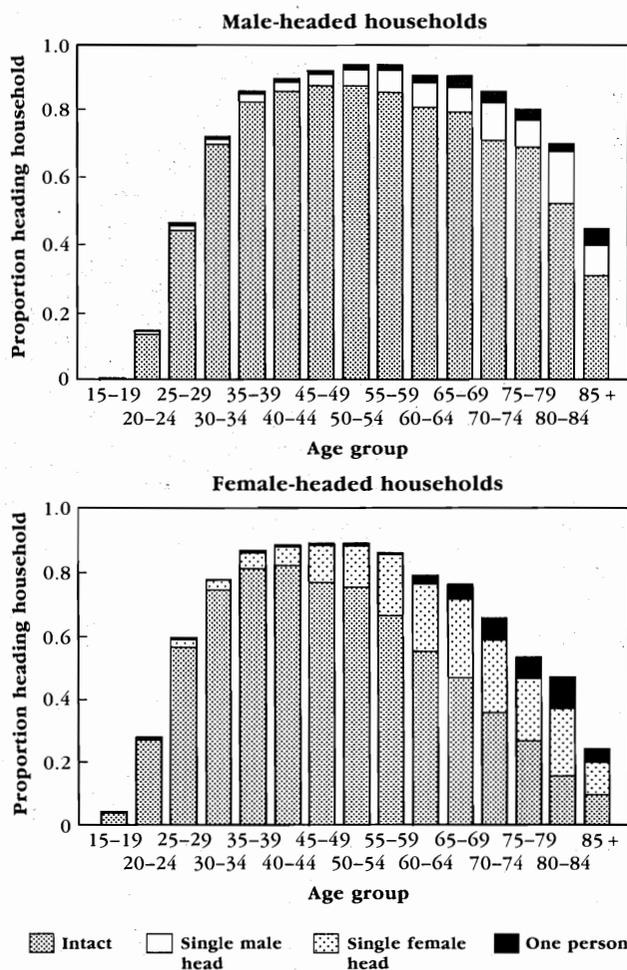


Figure 5. Base-year headship rates: Philippines

Note: Intact household category includes spouse of head. For male-headed households, age group 15-19 consists mostly of one-person households but includes other types as well.

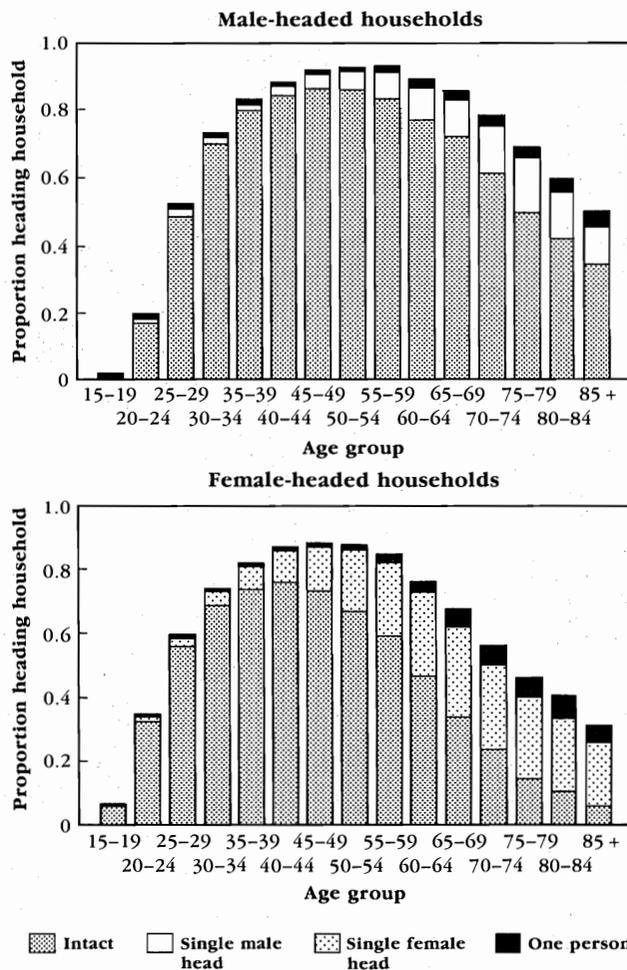


Figure 6. Base-year headship rates: Thailand

Note: For male-headed households, age group 15-19 consists mostly of one-person households but includes other types as well.

households headed by persons over age 60 will not grow much during the period, but in percentage terms such households will grow fairly rapidly.

Japan represents a later stage in the demographic transition. In 1990 the age distribution of household heads is much older than in Thailand, and considerable addi-

tional aging will occur during the ensuing 25 years (Figure 9). In fact, the number of households will decline for every age group of household heads under age 45. The number of households headed by persons 45-59 will be nearly constant, but the number headed by persons 60 and older will increase substantially.

Projected household membership. One of the unique features of HOMES is the projection of household membership, which provides the user with the average number of members and the age and sex distributions for each household group. HOMES uses a kinship-based approach for projecting household membership. In addition to the household head, it projects the number of spouses, children, grandchildren, parents, and other household members.

A similar procedure is followed for each category of relationship to the head. First, the number of potential household members is quantified. Then, rules governing coresidence are used to determine which individuals are living in which households. For example, for each household group the numbers of surviving male offspring in each five-year category are calculated. These values are then multiplied by the proportion of surviving male offspring of a given age living in households headed by their parents.

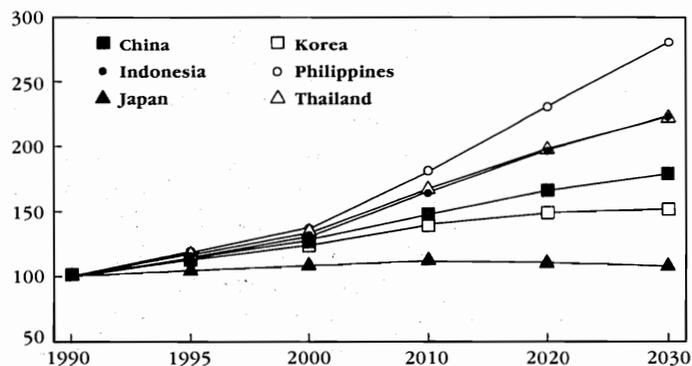


Figure 7. Projected growth in number of households for the six countries: 1990-2030

(Base year 1990 = 100)

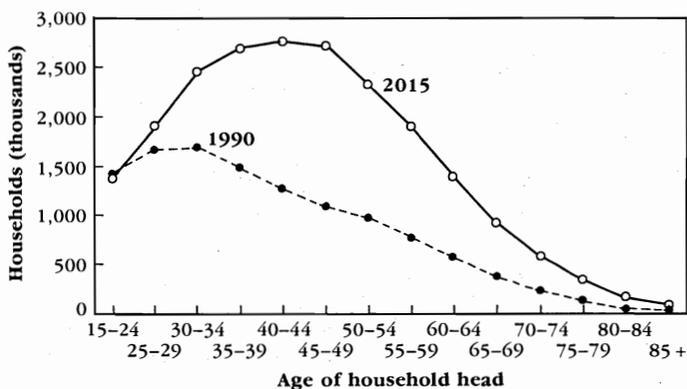


Figure 8. Actual and projected number of households, by age of household head: Thailand, 1990 and 2015

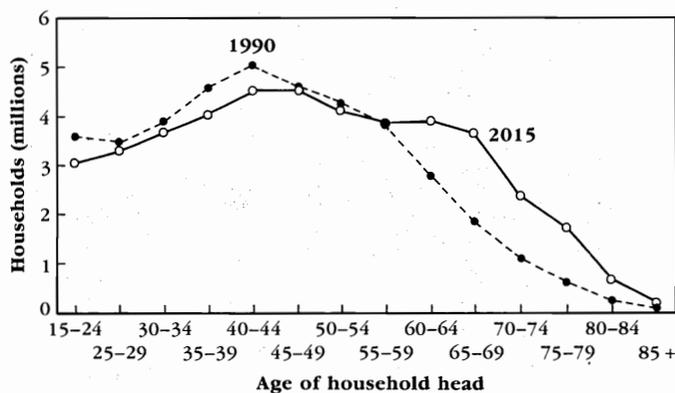


Figure 9. Actual and projected number of households, by age of household head: Japan, 1990 and 2015

An overview of the differences between Indonesia and Japan in household membership is shown in Figure 10. In Indonesia children dominate. Average household size rises from almost four members for households headed by persons in the 20-24 age group and reaches six members at the peak of the childrearing years, 35-39. There-

after, average household size declines as children leave home. In many cases, however, children continue to live with their parents and start their own families. Among older households, grandchildren constitute the largest category after the household head.

Japan shows a different pattern. Among young households, average

size is small because there are few family households. Once family households begin to be established, by adults in their late 20s, average household size rises quickly to a peak at about four household members. The decline in average household size is much more gradual than in Indonesia or the other countries because survival among spouses is higher and a higher percentage of children continue to live at home.

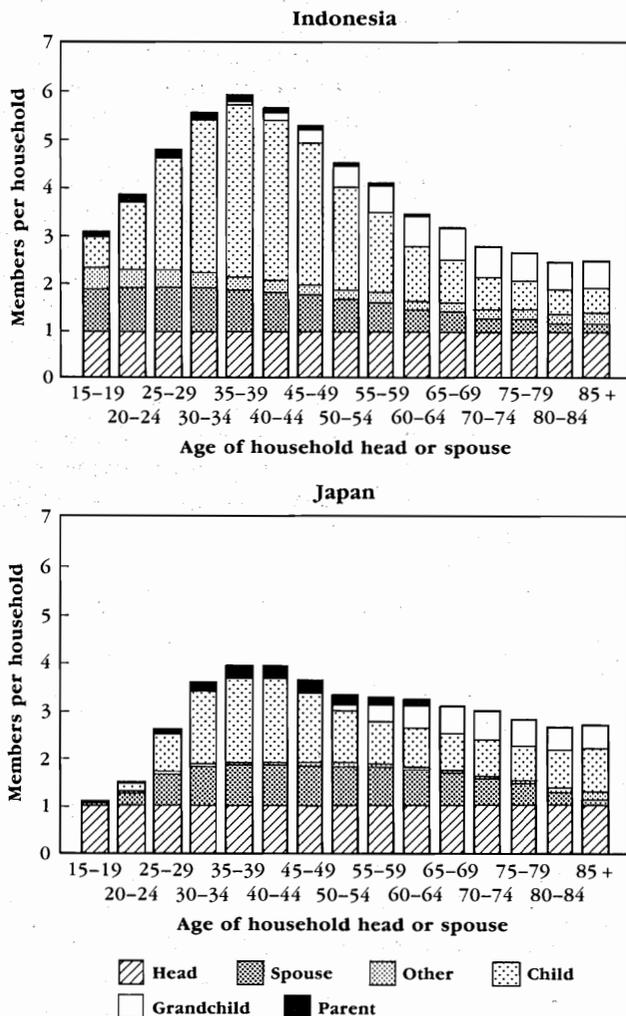


Figure 10. Household membership, by age of head or spouse: Indonesia and Japan, 1980s

Projected household size. Projected average household size is presented for each country in Table 3. In 1990 the average size varies from only three members in Japan to 5.3 members in the Philippines. Average size for China, Indonesia, Korea, and Thailand ranges from 3.8 to 4.6 members. Over the 40 years of the projection, average household size in Japan is essentially unchanged, but it converges at a slightly higher level in the other countries (Figure 11). By the year

(continued on page 33)

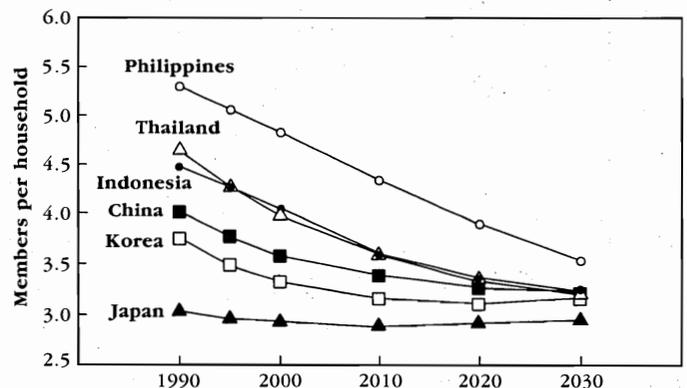


Figure 11. Projected average household size for the six countries: 1990-2030

Comments on Marjorie A. Muecke's "The AIDS Prevention Dilemma in Thailand"

*by Werasit Sittitrai
and Tim Brown*

IN HER article appearing in the Winter issue of the *Forum* (Volume 4, No. 4), Marjorie A. Muecke presents evidence of the rapid spread of AIDS in Asia, using Thailand as a case study, and describes an emerging pattern of heterosexual transmission in Thailand involving female prostitutes and their male clients. She argues for increased governmental and private efforts to improve the public's understanding of how to avoid contracting and transmitting HIV and recommends measures to encourage the adoption of AIDS-preventive measures by individuals.

We agree that the predominant pattern of transmission has shifted from intravenous drug use and sex-

Werasit Sittitrai is Assistant Professor of Political Science and Anthropology, Institute of Population Studies, Chulalongkorn University, and Deputy Director of the Program on AIDS, Thai Red Cross Society. Tim Brown is Assistant Professor of Electrical Engineering, University of Hawaii, Manoa. Marjorie A. Muecke, on whose article they comment, is Professor of Nursing, Adjunct Professor of Anthropology, and Adjunct Professor of Health Services, University of Washington at Seattle.

ual contact among homosexual men to heterosexual contact between prostitutes and their clientele. We also agree that eliminating unsafe sexual practices by individuals is the key to containing the epidemic's spread. However, the article contains some incorrect statements based on incomplete information available to Dr. Muecke at the time she prepared the article. Our comments are intended to clarify several points and provide an update on the current situation.

The results of the Survey of Partner Relations and Risk of HIV Infection in Thailand, mentioned on page 6 of the article, are not correctly described. This was a complicated survey, and the findings must be carefully qualified. Dr. Muecke states that over half of the married men interviewed had had up to five sex partners other than their wives in a 12-month period. What was actually found was that, among males who were married or had a regular partner, 17.3% reported having had sexual contact with persons other than their spouse or regular partner in the preceding 12 months. Of this 17.3%, 72.5% reported five or fewer partners during this time. (It should be noted that the shaded boxes on the Partner Relations Survey, the Thai Working Group, and the survey of foreign tourists, which accompanied the article,

were prepared independently of it.)

Muecke estimates the number of female commercial sex workers in Thailand at between one-half million and 1 million (p. 6), although she acknowledges in a footnote that the Thai government's estimates are closer to 100,000. Besides the government's semiannual survey, the only other survey of the number of sex workers was conducted in 1990-91 by the Thai Red Cross Society Program on AIDS, which was funded by the American Foundation for AIDS Research through the AIDS and Reproductive Health Network chaired by Jonathan Mann at Harvard University. That survey used ethnographic and mapping methods to arrive at an estimate of between 150,000 and 200,000 female commercial sex workers. Most female sex workers are between the ages of 15 and 24 (Sittitrai 1991). The 1990 Thai female population in the 15-24 age range was approximately 6 million. If one accepts the author's estimate of 1 million female sex workers and assumes most of them to be in the 15-24 age group, this yields the implausible conclusion that more than 15% of Thai women in this age group—that is, one out of every six—are sex workers.

The AIDS situation in Thailand is extremely dynamic, and some of the figures in the article do not

reflect the current situation. For example, in presenting information about AIDS knowledge among Thais the author cites (p. 2) a 1990 survey conducted by the Faculty of Public Health, Mahidol University, which found that fewer than half of a sample of 1,500 people in Bangkok knew that condoms could reduce HIV spread and one-third did not realize that AIDS was a fatal disease. Several other studies conducted around the same time have shown substantially higher levels of knowledge about AIDS, however, and provide a better picture of the situation.

For example, another 1990 study, entitled "Knowledge, Attitudes, and Practices Study on AIDS in Urban Thailand" was done by DEEMAR, a social-marketing firm in Bangkok, with financial support from AIDS-COM at the Academy for Educational Development, Washington, D.C. The investigators chose a random sample of 504 individuals in Bangkok and 809 in up-country urban areas and found that 89% of respondents knew that most or all HIV-infected persons would die, 95% of the respondents rated AIDS a "very serious" disease, and 67% rated use of condoms as a "very effective" method of reducing the risk of contracting AIDS. Only 16% of respondents agreed strongly or moderately with the statement that "AIDS is a Western disease, Thais need not worry."

Another study conducted by the Health Education Division of the Ministry of Public Health in late 1989 and early 1990, which canvassed 18,480 urban and rural respondents, found that 84.6% knew that condom use during each sexual contact with nonregular part-

ners prevented HIV transmission.

A high level of AIDS knowledge, however, does not necessarily result in behavioral change, as is evident from the extremely rapid spread of HIV in Thailand today. Efforts must also be made to increase individuals' perceptions of personal risk, to increase their motivation to change their behavior and sustain those changes, to alter the social norms governing sexual behavior, and to provide appropriate tools and support such as condoms and counseling services (Sittitrai, Brown, and Sterns 1990).

Much of the increase in knowledge about AIDS has been due to strong efforts by governmental and nongovernmental agencies to promote health education since 1989. Recently the effort has shifted toward dealing with AIDS as a social as well as a medical problem. Early in 1991 the Thai government issued a National Health Education Policy on AIDS, which emphasizes risk behaviors rather than risk groups, and education and support (e.g., condoms and counseling) rather than case detection. It also mandates reduction of the stigmatization of persons with HIV or AIDS, accelerated mass media campaigns on public television and radio, and targeted campaigns for youth education, both inside and outside schools, for men who are customers of sex workers. By 1991, some innovative programs, such as the 100% condom use campaigns in brothels, have been successful in a number of provinces because of cooperation from and enforcement through brothel owners.

Muecke's article incorrectly implies that virtually all AIDS funding in Thailand has been spent on HIV

testing and case detection. Only a small fraction of the money spent on AIDS has gone for this purpose. Other actions in 1990 and early 1991 include the distribution of a large supply of free condoms (up from 19 million pieces in 1989 to 26 million in 1990), training for health personnel on care and treatment, the training of counsellors and health educators, and a large budget for health education materials. These developments represent a clear shift in emphasis from the early days of AIDS prevention and control in Thailand.

The interim government has been moving to make AIDS a priority in public policy. In the policy statement delivered by Prime Minister Anand Panyarachun to the National Legislative Assembly, two of the goals were to "accelerate the containment of communicable diseases, particularly AIDS, [and to] cooperate with private sector and charity organizations in publicizing dangers of the disease to create among the public an awareness that it is everyone's duty to help contain the disease" (*Bangkok Post*, 4 April 1991, p. 4). The establishment of a National Committee on AIDS chaired by the Prime Minister is currently in process.

Earlier this year Minister Mechai Viravaidya of the Prime Minister's Office launched an aggressive program through the Public Mass Media Authority and the Tourist Authority of Thailand to inform foreign and local tourists of the AIDS situation, rather than downplaying its seriousness as has been done in the past. The goal is to make clear that tourists who come to Thailand for sex are not welcome and to emphasize that everyone must take respon-

sibility for protecting others against HIV, rather than focusing efforts on just the sex workers or other stigmatized groups.

The legal controls over some of these groups, discussed on page 23, have always faced opposition from those working directly to curb the epidemic in Thailand. The monitoring and control bill has not been enacted into law. In April 1991, at the invitation of the Thai government, legal experts of the World Health Organization participated in a public hearing at the Prime Minister's Office on the new draft bill on AIDS. The preponderance of opinion expressed at the meeting was that, on both epidemiological and human rights grounds, the bill as proposed should not be passed. The balance of power has shifted strongly against it, and it has little chance of passage.

The word "dilemma" in the title of Muecke's article implies that attempts to contain this epidemic would harm economic and other interests in Thailand. Although such interests may have influenced the government's policy toward AIDS in the past and will continue to have limited influence in the future, there is now a more realistic assessment of the epidemic's impact on the kingdom. The magnitude of the problem is such that many people in decision-making positions realize they cannot continue with business as usual. Accordingly, most of the concerned parties are joining hands with the health community and emphasizing the social and behavioral aspects of the epidemic and its containment, nondiscrimination, and humane treatment of HIV infected individuals. As Muecke correctly points out, there is still much work

to be done, but there *are* many good people working to see that Thailand takes an enlightened approach to the problem.

Muecke replies

The update of information on AIDS-related research and programs provided by Drs. Sittitrai and Brown is a useful complement to my article in the Winter 1990 *Forum*. Reflecting what they aptly call the "extremely dynamic" nature of the AIDS situation in Thailand, there have been shifts of policy (and government) since the article was written, and there have been advances in AIDS-related research. Consequently the story of AIDS in Thailand requires an ongoing narrative. I am pleased to see it continue in this issue of the *Forum*.

Curiously, the commentators take a posture of blame for my excluding information that has emerged only since the time of writing. They cite as "incorrect" the omission of the findings of the Thai Red Cross Society 1990-91 survey of the number of sex workers; of the Royal Thai Government's National Health Education Policy on AIDS, issued in 1991; of the very recent shift of AIDS funding from surveillance to prevention education; and the April 1991 hearing on the new draft bill on AIDS. Each of these clearly merits recognition. But the commentators' treating as "incorrect" what was not knowable at time of writing is a misleading choice of word. It bears mention that findings from Dr. Sittitrai's studies, including those that accompanied my article (in shaded boxes), were not made

available to me so that they could be referred to in my article.

As to the issue of the "true" number of (female) sex workers in Thailand, ethnographic evidence along with the wide range of findings from previous surveys (cited in the original article, page 6) document the difficulty of enumerating such a disguised, transitory, and mobile population. The new survey (1991) funded by the AIDS Reproductive Health Network is a long-needed solution to that difficulty. But making an issue of the precision of numbers when we already have sufficient information to be certain that the numbers constitute a primary HIV risk factor diverts attention from the foremost issue: the necessity for immediate change of societal norms related to sexual behaviors that spread HIV and other sexually transmitted diseases.

As the findings of Sittitrai and Phanuphak's June 1991 Survey of Partner Relations and Risk of HIV Infection in Thailand show, Thai as well as tourist men must use condoms with regular and transient sex partners alike, and must modify their recreational behavior in accord with the fact that casual sex and casual attitudes toward sex are lethal.

AIDS prevention is a worldwide dilemma for individuals and governments alike. The predicament is a choice between conserving or converting social norms in the face of a threat so overwhelming that there is a natural tendency to deny it. Thailand—and here I reiterate what I wrote in the introduction to my article—is a frontrunner in its region in terms of acknowledging

(continued on page 40)

Activities and Announcements

Branch Offices of Department of Statistics, Malaysia, to Have Larger Role in 1991 Census

The 1991 Population and Housing Census of Malaysia, which takes place in August, will feature several new approaches, according to Mr. Teik Huat Khoo of the Department of Statistics. The branch offices of the department will take part in the field verification of census maps, training, and providing technical assistance to district officers, dealing with problems that arise in the districts during the enumeration, enhancing supervisory controls, and compiling preliminary field count summaries. They will also be responsible for the processing centers. During the 1980 census their role was limited to helping the central office supply census questionnaires to the states and districts.

Japan's Census Expected to Shed New Light on Country's Changing Demographic and Economic Structure

Reporting on the 1990 Japanese census at the Thirteenth Population Census Conference (see the lead article in this issue), Mr. Takanobu Negi, Director of the Population Census Division, identified population aging, a shift in industrial and occupational structures from manufacturing to service industries, growing urbanization, and a rapid increase in the number of foreigners

living in Japan as four major trends that will be the focus of analysis based on 1990 census data.

Between 1950 and 1985 the number of persons 65 years old and over increased from less than 5% to 10.3% of the total population, making Japan's population one of the most rapidly aging in the world. This trend is continuing, and census statistics on aging are expected to play an important role in shaping public policy.

Census officials believe that analysis of detailed census data on economic and residential patterns will provide valuable insights into the rapid growth of service industries at both the national and regional levels, and into Japan's continuing internal migration to metropolitan areas. An emergent trend is the widening of commuter zones, as people who work in urban centers are forced by the high cost of land and housing there to move to the suburbs. The Statistics Division is compiling and analyzing census data on migration over the past five years, commuter destinations, transportation, and time spent commuting.

Mr. Negi also reported that, as Japan's economic and social links with the international community have increased in recent years, the number of foreigners living in Japan has grown rapidly. To gain a better understanding of this trend, the Statistics Division is expanding its analysis of census data on the age structure, employment, and household composition, by nationality.

U.S. Census Bureau's International Statistical Programs Center Announces Training Programs

The International Statistical Programs Center (ISPC) of the U.S. Bureau of the Census plans to offer a variety of training programs and workshops for population specialists during late 1991 and early 1992. The topics to be covered, specific programs, starting dates, and length of program are listed below. For more information, contact:

Mr. Thomas C. Walsh
Chief, International Statistical
Programs Center
U.S. Bureau of the Census
Washington, D.C. 20233
Fax: (301) 763-7589
Telex: 9102509167 ISPC
Census Wsh

Sampling and Statistical Methods

Analyzing and Interpreting Data and Measuring Data Reliability: 2 January 1992 (11 weeks)

Managing Survey/Census Activities and Controlling Data Quality: 16 March 1992 (10 weeks)

Demonstration Survey: Sampling Emphasis: 26 May 1992 (10 weeks)

Population Data Analysis, Dissemination, and Utilization

Population Analysis : 3 February 1992 (4 weeks)

Population Dissemination and Utilization: 5 March 1992 (11 weeks)

Economic Statistics

Tools for Economic Statisticians: 2 January 1992 (11 weeks)

Theory and Applications of Management in Economic Statistical Activities: 16 March 1992 (10 weeks)

Demonstration Survey: Survey Design/Management Emphasis: 26 May 1992 (10 weeks)

Computer Processing and Information Systems (CPIS)

Microcomputer Applications for Statisticians: 2 December 1991 (3 weeks)

Design and Implementation of CPIS: 2 January 1992 (11 weeks)

Applications in Information Technology: 16 March 1992 (10 weeks)

Computer Systems for Processing and Statistical Analysis of Census/Survey Data (IMPS Emphasis): 16 March 1992 (10 weeks)

Individualized IMPS: 26 May 1992 (1-3 weeks)

Demonstration Survey: IMPS and Information Management Emphases: 26 May 1992 (10 weeks)

Applications in Information Technology: 20 July 1992 (3 weeks)

Survey and Census Methods

Planning an Income and Expenditure Survey: 28 October 1991 (2 weeks)

Management of Statistical Activities: 12 November 1991 (2.5 weeks)

Design of Collection and Processing Forms and Controls: 2 January 1992 (11 weeks)

Management and Training for Survey and Census Activities: 16 March 1992 (10 weeks)

Demonstration Survey: Design and Management Emphasis: 26 May 1992 (10 weeks)

Population and Health Management Information Systems

Management Information Systems Tools II: 2 January 1992 (11 weeks)

Additional Tools and Simulation Exercise: 16 March 1992 (10 weeks)

Boston University Offers Training Program for Increasing the Effectiveness of Women Health Managers in Developing Countries

The School of Medicine, School of Public Health, and Center for International Health at Boston University have announced an eight-week certificate program entitled Women Managers of Health Programs in Developing Countries: Increasing Their Effectiveness, to be held at the Center for International Health, Boston University, 4 October to 30 November 1991. The program is intended for women who manage health programs in their countries and for women and men who supervise women managers.

All health personnel are eligible to apply. The course will be particularly relevant for nurses, clinicians, and technicians who have assumed or will assume management responsibility. Applicants should have several years of relevant work experience in the health field and have completed at least two years of technical or professional training after secondary school or have a bachelor's degree.

Program faculty are experts in financial and human resources management and have extensive experience working in developing countries.

Tuition, course materials, and

computer laboratory fees total \$4,975. Estimated living expenses, including health insurance, total \$3,500.

Application deadline is 15 September 1991. For more information, contact:

Women Managers of Health Programs

Center for International Health
Boston University
53 Bay State Road
Boston, MA 02215, U.S.A.

Telephone: (617) 353-4524;

Fax: (617) 353-6330;

Telex: 200191 BU UR

Sharma Succeeds Regmi at Nepal's Central Bureau of Statistics

Mr. K. R. Sharma, formerly Deputy Director of the Population Division, Central Bureau of Statistics, Nepal, was named Acting Director General in April 1991. He succeeds Mr. B. R. Regmi, who held the post of Director General for six years. In April Mr. Regmi became Director General of the Department of Industry.

Mr. Sharma joined the Central Bureau of Statistics in 1966 as Section Officer and was promoted to Deputy Director of the Population Division in 1975. A seasoned administrator and demographer, he was in charge of the National Population Censuses of 1981 and 1991.

Min-Kyung Kim Appointed to Head Korea's Population Statistics Division

Ms. Min-Kyung Kim, former Director of the Industrial Statistics Divi-

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Reviews and Publications Notes

Rural Development and Population: Institutions and Policy edited by Geoffrey McNicoll and Mead Cain. New York: Oxford University Press, 1990. viii, 366 pp. ISBN 0-19-506847-5 (cloth), US \$29.95; 0-29-506849-1 (paper), \$12.00. Available from Oxford University Press, 200 Madison Avenue, New York, NY 10016, U.S.A.

This volume was designed to discuss the interrelationships between demographic change and rural development so as to facilitate an integrated approach to rural development and population policy. The underlying premise is that relationships between population and rural development are mediated through institutional structures. When population pressure is accommodated by appropriate institutional change, sustainable development is possible. When institutions fail to adjust or change perversely, development and the demographic transition may be blocked, resulting in increased poverty and environmental degradation. The key, then, is to discover what types of institutions are appropriate for which situations and to enlist governmental policy to "get the institutions right."

Following the editors' overview of the conceptual framework, the contributions of 14 distinguished development specialists are grouped according to institutional domain. Esther Boserup sets the tone in the first of these essays, showing how the effects of population growth on rural welfare depend on the property-right regime and the customary rights of women relative to

those of men. She also explains how population growth tends to cause common property systems to give way to private property, even without formal government action, and how the failure of family legislation to protect the relative power of women undermines the voluntary restriction of fertility that privatization otherwise affords. Thus, on the one hand, the impact of population pressure on development is regarded as contingent on exogenous institutions. On the other hand, institutions change in response to population growth.

This ambiguity regarding the role of institutions as both the object and the means of explanation detracts from the cohesion of the underlying framework. What is missing is a set of principles that classify institutions into endogenous and exogenous categories, known elsewhere as institutional arrangements and institutional environment.

Some of the papers make further contributions to solving the continuing puzzle entailing the consequences of population growth on development. Michael Lipton notes the close relationship between the positive Boserupian effects on labor intensification and the Hayami-Ruttan-Binswanger induced technological change due to relative factor scarcities and discusses some of the limitations on these processes, including the unequal distribution of assets. Prabhu Pingali similarly notes how these productivity-enhancing responses to population pressure may be undermined when property rights are inappropriate.

For example, when land tenure is insecure, population pressure may lead to resource degradation, which actually decreases labor productivity instead of increasing it.

Geoffrey McNichol also borrows from the induced institutional change paradigm in dispelling the myth that external forces of population pressure and commercialization have destroyed a harmonious, communitarian, and "green" indigenous society. Nevertheless, efficient adjustment to population pressure, new trade opportunities, and other changes in the socioeconomic environment is by no means guaranteed. There are many examples of local communities adopting constitutional controls that promote efficient common property management, but these seem to require sufficient social cohesion for self-imposed collective coercion.

Overall, this collection of essays demonstrates the promise of a multidisciplinary approach to the interrelationships among population, well-being of the present and future generations, and socioeconomic organization. It also demonstrates the need for more precise theoretical models for which restrictive assumptions are chosen to illuminate particular stylized facts of development. Since population affects development, development affects population, and both affect and are affected by institutions, a model that attempts to embrace all possible relationships is not likely to produce many insights. Rather than search for a universal model, it may be better to craft relatively simple

models to explain particular patterns of structural change and to analyze the consequences of alternative policy strategies.

—James A. Roumasset
Department of Economics
University of Hawaii

Immigrant America: A Portrait by Alejandro Portes and Rubén G. Rumbaut. Berkeley and Los Angeles: University of California Press, 1990. xviv, 300 pp. ISBN 0-520-06894-7 (cloth), US \$35; ISBN 0-520-07038 (paper), US \$9.95. Available from University of California Press, 2120 Berkeley Way, Berkeley, CA 94720, U.S.A.

The United States has become a nation of new immigrants once again. An average of 600,000 newcomers entered the country legally per year during the 1980s, along with large numbers of undocumented aliens who entered and for the most part stayed. The attraction of America remains as strong as ever—as does the ambivalence of native Americans toward the newest arrivals.

Whereas nineteenth century flows of immigrants were European, the newer groups come overwhelmingly from the Third World, especially from developing countries of Asia and Latin America. These immigrants are different in other ways from previous migration streams, motivated by twentieth century aspirations. The America that receives them is also different from the one that welcomed the "huddled masses" passing through Ellis Island. Theories that sought to explain the assimilation of yesterday's immigrants do not explain contemporary immigration.

The aim of *Immigrant America* is to pull together the "many strands of available knowledge about the migrants, to grasp at once the diversity and underlying structures of the new immigration, and to make it accessible to the general public" (p. xviii).

The authors realize that a subject as complex and controversial cannot be explored fully in a single volume. They have therefore "sought to comb through a vast literature and to offer a synthesis of its major aspects in a way that is both comprehensive and comprehensible" (p. xviii). Focusing on the diversity of immigrant origins and of the immigrants' adaptation experiences, they seek to understand contemporary immigration in historical perspective and within the context of competing theories of the American experience.

Both authors have written extensively about immigrants before. Alejandro Portes is John Dewey Professor of Sociology and International Relations at Johns Hopkins University and coauthor of *Latin Journey: Cuban and Mexican Immigrants in the United States* (1985). Ruben G. Rumbaut is Professor of Sociology at San Diego State University and author of several studies on the adaptation of refugees from Vietnam, Laos, and Cambodia.

In Chapter 1 of *Immigrant America*, "Who They Are and Why They Come," the authors propose a typology of contemporary immigrants that serves to organize the subsequent analysis of the processes of economic, political, social, cultural, and psychological adaptation by immigrants to life in the United States. Chapter 2, "Moving," exam-

ines immigrants' points of destination and the formation of new ethnic communities in urban America. Chapter 3, "Making It in America," looks at the incorporation of the new immigrants into the American economy and seeks to explain differences among them in education, occupation, entrepreneurship, and income within specific receiving contexts. Immigrants' economic adaptation depends not only upon their resources and skills but also on how those are shaped by specific government policies, labor market conditions, and the characteristics of ethnic communities.

Chapter 4, "From Immigrants to Ethnic," analyzes immigrant politics, including the underlying questions of identity, loyalty, and determinants of current patterns of naturalization among newcomers who are "in the society but not of it." Chapter 5, "A Foreign World," focuses on the psychology of immigrant adaptation, in particular the emotional consequences of varying modes of migration and acculturation, the major determinants of immigrants' psychological responses to their changed circumstances, and immigrant patterns of mental health and help-seeking in various social settings. A detailed discussion of learning the English language, the loss or maintenance of bilingualism across generations, and new data on educational attainments of diverse groups of young immigrants in U.S. public schools is presented in Chapter 6, "Learning the Ropes." The concluding chapter assesses the origin and flow of the illegal immigrants, and speculates on their impact on future American ethnic groups.

The text is augmented by maps, graphs, photographs, charts, and notes. The book contains a comprehensive bibliography and an index. Portes and Rumbaut write with scholarly authority, yet succeed in their goal of "reaching a broader audience whose understanding of today's immigrants can be clouded by common media clichés and widespread stereotypes" (p. xx). The book is an excellent choice for large public libraries, college libraries, and special collections in the population field. It could also serve as a textbook in undergraduate studies of migration.

—Alice D. Harris
Palm City, Florida

ALSO NOTED

The Sex and Age Distributions of Population: The 1990 Revision of the United Nations Global Population Estimates and Projections by the Department of International Economic and Social Affairs. Population Studies, No. 122. New York: United Nations, 1991. viii, 391 pp. ISBN 92-1-151220-4 (paper), US \$49.00. Available from United Nations, Sales Section, 2 United Nations Plaza, New York, NY 10017, U.S.A.

This report presents the estimated and projected sex and age distributions based on the medium, high, and low variants for the period 1950-2025 for countries and areas with populations of 300,000 and more in 1985. The data for smaller countries and areas are included in the regional population totals but are not presented separately. The sex and age distributions are based on the twelfth round of population

estimates and projections undertaken by the United Nations Secretariat; the figures supersede those previously published by the United Nations.

The report supplements a forthcoming UN report entitled *World Population Prospects, 1990*, which presents the methods, data, and assumptions employed for the estimates and projections, a summary of the major findings, and selected demographic indicators for every country and area of the world. The most salient results are presented in the *United Nations World Population chart 1990* (United Nations, 1990).

A magnetic tape and a set of diskettes containing the major results of the estimates and projections contained in the report are also available from the United Nations.

Annual Review of Population Law, 1987: International Resolutions and Agreements, Constitutional Provisions, Legislation, Regulations, Judicial Decisions, Legal Pronouncements edited by Reed Boland (editor-in-chief) and Jan Stepan (contributing editor). New York: United Nations Population Fund; and Cambridge, Mass.: Harvard Law School Library, 1990. xvi, 608 pp. ISSN-0364-34-17 (paper), US \$45.00. Available from United Nations Population Fund, 220 East 42nd Street, New York, NY 10017, and Harvard Law School Library, 1557 Massachusetts Avenue, Cambridge, MA 02138, U.S.A.

An editor's preface presents current highlights and trends in population law worldwide, comparing developed and developing countries. Population policy, contraception and sterilization, termination of pregnancy, assisted reproduction,

family law, women's rights, and migration are each examined. The main body of the volume consists of short texts and summaries of laws (construed to include not only legislation but also international resolutions, constitutional provisions, regulations, judicial decisions, legal pronouncements, government statements, and official documents), and an appendix is composed of longer texts. Entries are listed in the table of contents by subject and, within each subject, by country or organization. In the text they are listed within jurisdictions by date, legislation preceding case law. Some entries are reproduced almost verbatim from other UN publications, such as the *Social and Labour Bulletin* of the International Labour Organisation and the *International Digest of Health Legislation* of the World Health Organisation.

Induced Abortion: A World Review, 1990 Supplement by Stanley K. Henshaw and Evelyn Morrow. New York: The Alan Guttmacher Institute, 1990. 120 pp. ISBN 0-939253-18-6 (paper), US \$31.00. Available from The Alan Guttmacher Institute, 111 Fifth Avenue, New York, NY 10003, U.S.A.

This report, which is reprinted from *Family Planning Perspectives* (vol. 22, No. 2, March/April 1990), supplements and updates *Induced Abortion: A World Review, 1986*, by Christopher Tietze and Stanley K. Henshaw, the sixth edition in a series of status reports on abortion worldwide. Focusing on changes that have occurred since 1986, it reviews abortion laws and policies in countries and territories with populations of 1 million or more.

and presents statistics on the incidence of legal abortion and estimates of its illegal incidence. Also discussed are mortality and other health issues related to abortion, the provision of abortion services in the countries studied, and the demographic characteristics of women who choose abortion. Nineteen detailed tables augment the text.

Australia's Population Trends and Prospects, 1990 published by the Australian Government Publishing Service for the Bureau of Immigration Research. Canberra: 1991. xiv, 119 pp. ISBN 06644-13745-2 (paper). Available from Commonwealth and university book shops throughout Australia.

This volume aims to fulfill the need for comprehensive information on demographic trends that is essential for policymaking and planning at all government levels, and to foster awareness of population trends and their underlying causes and implications. It is the seventh annual report in a series and the second prepared by the Bureau of Immigration Research, which was established in May 1989 as an independent research body within the Department of Immigration, Local Government and Ethnic Affairs.

The report examines give major topics: population size and growth; natural increase, including fertility and mortality; net migration, including settler arrivals and emigration; age structure; and short-term and long-term population projections. Its scope and depth of coverage have been expanded from those of earlier editions. For example, it

offers material that places Australia's population growth in an international perspective, examines illegal immigration, and considers the issue of Australia's aging population. The text is supplemented with tables, charts, a glossary of demographic terms, references, and an index.

Indonesia: Family Planning Perspectives in the 1990s [by Nydia Maraviglia]. Washington, D.C.: The World Bank, 1990. A World Bank Country Study. xxii, 143 pp. ISBN 0-8213-1595-1 (paper), US \$10.95. Available from The World Bank, 1818 H Street, N.W., Washington, D.C. 20433, U.S.A.

The preface states that this report focuses on the managerial, organizational, manpower, and financial requirements of the National Family Planning Coordinating Board (BKKBN) as Indonesia prepares to undertake major strategic changes in response to the challenge of further reducing fertility during the next decade. A main consideration by the government is the use of the private sector for service provision and expansion. The report assesses program costs and possible roles for commercial service providers, non-governmental organizations, and employment-based family planning programs.

Major topics covered in the report are the population situation and projections; the demand for family planning; the role of the private sector in family planning service provision; the family planning program: organization and performance; and family planning financial resource requirements. An

introductory section provides a summary and conclusions.

Besides the author, contributors to the report include Susan Cochran, Eduard Bos, R. Wickham, and G. Kenney.

South Asia Conference on Population Trends and Family Planning (New Delhi, March 14-20, 1989): Proceedings of the Conference edited by V. S. Verma, Lee-Jay Cho, N. Rama Rao, and Robert D. Retherford. Delhi: Controller of Publications, 1990. vi, 354 pp. Paper, Rs. 28.00, £3.26, US \$10.08. Available from Controller of Publications, Government of India, Civil Lines, Delhi, 110054 India.

The South Asian Conference on Population Trends and Family Planning, sponsored by the Office of the Registrar General and Census Commissioner, India (ORGI), and the East-West Population Institute (EWPI) with support from the U.S. Agency for International Development (USAID), was part of an ongoing collaborative research activity between the two institutions. A previous Conference on Recent Population Trends in South Asia, organized by the ORGI and EWPI in February 1983 had proved productive. In their introduction the editors state that "The present conference had the additional advantage of having before it, a wide range of analysis of data of 1981 round of censuses and demographic surveys which the previous conference, held within about two years of those censuses, did not have" (p. 1).

The 1989 conference was organized to provide an opportunity for in-depth discussions of popula-

tion policies and family planning issues peculiar to countries and subregions of South Asia. It brought together 56 population experts from Bangladesh, Bhutan, India, Nepal, Pakistan, Sri Lanka, Indonesia, and the East-West Population Institute, The Population Council, the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), USAID, and other organizations within and outside India.

The conference consisted of five sessions, a round-table discussion of the 1990 round of censuses, and a panel discussion entitled "Prospects for population growth and development in South Asia in the 1990s in light of recent trends in fertility and mortality." Session I comprised country papers on the 1990 round of censuses in Bhutan, Nepal, Pakistan, and India and an oral report on the 1981 census of Bangladesh. Session II included 13 papers on fertility, mortality, and family planning in the region. Session III, consisting of five papers, was devoted to the topic of women, children, and the elderly. In Session IV two papers were presented on survey methods used in the World Fertility Survey and in Indian sample surveys. Session V included six papers focusing on projections and implications of population growth.

State of Hawai'i Department of Health Annual Report Statistical Supplement, 1989 by Office of Health Status Monitoring, Department of Health, State of Hawai'i. Honolulu: 1991. iv, 237 pp. (paper). Available from Department of Health, Office of Health Status Monitoring, P.O. Box 3378, Honolulu, HI 96801, U.S.A.

This volume contains a wealth of information on the health status of Hawaii's population as of mid-1989, presented in tables and figures prepared by the state's Health Resources Administration, Health Promotion and Disease Prevention Administration, Personal Health Services Administration, Environmental Health Administration, Behavioral Health Services Administration, and attached agencies. Includes statistics on topics ranging from resident deaths by county and causes of death to prevalence of chronic alcoholic consumption by demographic characteristics. A companion report entitled *State of Hawaii Department of Health Annual Report, 1990*, issued in 1991 by the Communication Office, Department of Health, provides a narrative discussion of the statistics.

Passages. Quarterly newsletter published since 1978 by the International Center on Adolescent Fertility (ICAF), a project of the Center for Population Options. Editors: Gary Barker and Marjorie Macieira. Free. Available in English, Spanish, and French from Center for Population Options, 1025 Vermont Avenue, NW, Suite 210, Washington, DC 20005, U.S.A. (Telephone 202 347-5700; FAX 202 347-2263).

The Center for Population Options works to reduce unintended teenage pregnancy and the spread of HIV/AIDS among adolescents through programs to enhance decision making in key areas of their lives; to promote family planning; and to improve access to health care. Through ICAF, the center supports adolescent reproductive health programs worldwide by

providing seed grants, training, educational materials, and technical assistance. *Passages* contains news items, field notes, and announcements of activities on the subject of adolescent sexuality and fertility.

Condoms—Now More Than Ever by Laurie Liskin, Chris Wharton, and Richard Blackburn with the assistance of Philip Kestelman. Population Reports, Series H, No. 8, September 1990, 36 pp. Free to health care providers in developing countries. Baltimore: Johns Hopkins University, Population Information Program. Available in English, French, Portuguese, and Spanish from Population Information Program, The Johns Hopkins University, 527 St. Paul Place, Baltimore, MD 21202, U.S.A.

This latest report from the Johns Hopkins School of Public Health's Population Information Program calls for broad action to increase condom use. Assuming that condoms should always be used by unmarried sexual partners and by about 9% of married couples, the report estimates that condoms were needed in roughly 13,000 million acts of sexual intercourse in 1990 but were used in only about 6,000 million. "The gap is not in condom supplies," state the authors. "There are no obvious manufacturing shortages. The gap is in public access to, demand for, and use of condoms." (p. 3)

The report documents low rates of condom use in most countries (Japan and the Scandinavian countries being an exception), presents evidence of the effectiveness of condoms in preventing pregnancy and sexually transmitted diseases such as AIDS, suggests ways to pro-

mote condom use and to counsel condom users, and recommends ways to make high-quality condoms more readily available. Policy recommendations are aimed not just at policymakers, government agencies, and managers of family planning and sexually transmitted disease programs, but also at condom providers, manufacturers, marketers, and distributors, and at donor agencies and the communication industry.

Assessing Housing Needs and Policy Alternatives in Developing Countries

by Raymond J. Struyk. Urban Institute Report 88-4. Washington, D.C.: The Urban Institute Press, 1988. viii, 124 pp. ISBN 0-87766-423-4 (paper). Available from The Urban Institute Press, 2100 M Street, N.W., Washington, D.C. 20037, U.S.A.

Author's abstract: High rates of population growth and urbanization throughout the world are putting

pressure on housing, pressure that will continue through the end of the century and into the next. Even so, housing needs in many countries can be met with the resources now available—if the countries adopt policies that are economically realistic and rely on individual initiative.

This report describes a model for developing such policies by determining housing needs in developing countries. It also discusses applications of the model in a set of developing countries in Africa, Latin America, and elsewhere, and provides guidelines for use by shelter donor organizations and others in the field.

Development of the Housing Needs Assessment Model was sponsored by the U.S. Agency for International Development (USAID) as a contribution to the United Nations International Year of Shelter for the Homeless (IYSH). For the past 25 years, USAID has helped developing

countries establish policies to meet their housing needs. USAID shares with IYSH an understanding of the importance of reliable information about the shelter problem and the implications of adopting alternative policies.

The model is a useful tool for policy analysis. Completed applications, as reviewed in this monograph, have helped substantiate the efficacy of shelter strategies that do not rely on government subsidy. These applications show that the keys to meeting housing needs with minimal government involvement are developing appropriate, low-cost building standards and managing the economy to assure growth and adequate credit.

In addition to an executive summary, the text, and references, the report contains four appendices, including estimates of total housing needs in developing countries and a questionnaire for a survey of experience in applying the model. □

Activities and Announcements . . .

(continued from page 25)

sion, National Statistical Office, Republic of Korea, was named Director of the Population Statistics Division in April 1991. She succeeds Mr. Byung-Il Kim, who has been assigned to direct the Economic Policy Information Division of the Economic Information Bureau, Economic Planning Board.

Under Ms. Kim's direction, the Population Statistics Division is responsible for analyzing and publishing the results of the 1990 Population and Housing Census of Korea, making population and household projections for the

whole country and its administrative units, producing vital and migration statistics, and conducting a variety of surveys.

McDevitt Assumes Additional Duties at U.S. Census Bureau

Dr. Thomas McDevitt, Demographic Data Collection and Analysis Adviser at the International Statistical Programs Center (ISPC), U.S. Bureau of the Census, during 1986-89, has been named—take a deep breath before reading this

aloud—Population and Health Management Information Systems and Population Data Analysis, Dissemination, and Utilization Adviser. According to the *ISPC Training Branch Update*, Dr. McDevitt served as a technical adviser to, and member of, the U.S. delegation to the 1991 meetings of the United Nations Population Commission. He also served in various consultant capacities on population and health management information systems to the UN in Uganda in 1989, Bangladesh in 1990, and New York (ongoing). □

1990 Census Round . . .

(continued from page 12)

should be preparing fewer standard products "to be sold 'off the shelf,' including a smaller number of printed publications, and turning our efforts to providing customised services whereby individual clients tell us what they want to meet their particular needs, and we produce it quickly." The ABS is attempting to provide almost immediate response to requests for profile data on topics defined by clients and much faster response than previously to requests for cross-classified tables specified by clients.

The Australian Bureau of Statistics has decided to prepare fewer standard census products to be sold "off the shelf" and to provide a greater number of customized services, meeting clients' individual needs quickly.

The ABS has been consulting traditional clients and potential new clients on the types of products and services they would like to have. It is doing this in one-on-one discussions, conferences, and seminars during which the ABS "puts its broad plans on the table and asks our clients to help us work out the details, or indeed change the broad directions if necessary," Cocking reported.

As a result of its 1986 census experience and the recent market research, the ABS is planning to issue about half as many 1991 census publications as it produced after the 1986 census. But preliminary data at national and state levels will be available to the public, thanks to cost reductions made possible by the ABS's optical mark reading technology. Preliminary data were not released from the 1986 census to keep costs down.

The Philippines' Marketing Approach. Data from previous Philippine censuses have found limited use, according to National Statistics Office (NSO) representative Engracia. Copies of provincial tabulations were distributed without charge mostly to government agencies, several international organizations, and a few libraries in the Philippines and abroad. Local offices of the NSO received a copy of each volume. But little effort was made to advertise the availability of census results, with the result that census data were underutilized. The passive distribution scheme for the 1980 census volumes, she stated, led to a situation in which, 10 years later, the NSO finds itself overstocked with voluminous quantities of publications that must now be given away free.

The Philippines National Statistics Office is taking an active marketing approach to disseminating its 1990 census results, offering a wide range of products in a variety of formats. The rationale for pricing census products is not so much to recover costs as to increase the perception of the products' worth.



Participants hold round-table discussions over lunch during the final day of the conference. In foreground are Takanobu Negi (Japan); Professor Buu Truong Lam of the University of Hawaii History Department, who served as Le Van Toan's translator; Le Van Toan (Vietnam), and conference coordinator Griffith Feeney.

The NSO is taking an active marketing approach to disseminating the 1990 census results. It plans to identify potential users and spark their interest in census statistics data by conducting an awareness-

raising campaign and offering better-packaged products. Acknowledging that users have varying interests, the census organization is planning to offer a wide range of products in a variety of formats. For the first time regional and provincial branches will be involved along with the central office in promoting the products.

Every effort will be made to release the census data promptly. Priority will be given to meeting the information needs of national and local government agencies and election officials. Other targeted groups are research institutions, scholars and educators, business people, and journalists. Except for government personnel, selected libraries, and the news media, users of census data will be charged for the census products they request. The rationale for pricing census products is not so much to recover part of the cost of conducting the census as to increase the perception of the products' worth.

The Philippines plans to supplement printed reports on the 1990 census with information in the form of floppy diskettes, magnetic tapes, video tapes, thematic maps, and fact sheets.

Reaction to Marketing Mixed

During the discussion of marketing census products that followed the presentations by Cocking and Engracia, several conference participants raised questions about the appropriateness of commercializing the census. Mr. Abdus Salam, director general of the Bangladesh Bureau of Statistics, suggested that too much emphasis on marketing census products could undermine the original purpose of the census—that is, serving the information needs of governmental agencies. Other participants, however, saw marketing as a means of increasing public awareness of the census's value and its many applications.

Commenting on the session afterward, Griffith Feeney, research associate at the East-West Population Institute and coordinator of the conference, told a reporter that this was the first time that dissemination and marketing had been session topics at a Census Conference. "Traditionally government agencies haven't thought of their role in that way."

In her concluding remarks to conference participants, María Elena Figueroa, director of Census Communication for Mexico's National Institute of Statistics, summed up the importance of dissemination as the final step in the census process. "[It] constitutes not a simple by-product of the census itself, but an integral aspect of the whole endeavour of census taking. . . . An appropriate dissemination program enlarges the value and the usefulness [of information] that, without a significant effort in this regard, may remain hidden in the census." □

Results from the HOMES Project . . .

(continued from page 20)

2030 the average size lies between 3.18 and 3.25 members per household in China, Indonesia, Korea, and Thailand. In the Philippines it is a bit higher, 3.55 members per household, but is dropping rapidly.

Changes in the average household size are the product of various demographic forces. First, the aging of households described above affects the relative number of households in the childrearing stage of the life cycle during which house-

By the year 2030 average household size is projected to shrink to between 3.18 and 3.25 members in China, Indonesia, Korea, and Thailand. In the Philippines it will be slightly higher, 3.55 members, but dropping rapidly.

hold size is at its peak. Second, improved mortality conditions lead to

an increased "supply" of surviving parents, which affects the number of elderly living in households headed by their children. Third, and most important, fertility decline reduces the number of children in the typical household. Because three-generation households are so prevalent in Asia, fertility decline affects average size at all stages of the life cycle, not just the childrearing years.

The decline in fertility, along

with increased longevity, also accounts for another of the most important changes in the demography of the Asian household—the change in dependency. Figure 12 presents dependency ratios for the 1990–2030 period. Four of the countries plotted—Indonesia, Korea, the Philippines, and Thailand—are in the midst of a major transition from high to low dependency. Each country is at a different point in that transition, however.

Korea has nearly completed the transition. Its dependency ratio is lowest among the four and will

Lower fertility and increased longevity are responsible for a major transition now under way from high to low dependency in Indonesia, Korea, the Philippines, and Thailand. In contrast, the ratio of dependents to working-age household members is currently lowest in Japan but will be highest there by the year 2010 owing to that country's aging population.

continue to decline only until the year 2000. The Philippines is at the

earliest point in the transition and is projected to experience declining dependency for the next four decades. Japan is at the other end of the dependency spectrum. Its current dependency ratio is lowest among the six countries but is increasing rapidly as a result of population aging. By the year 2010, Japan will have the highest dependency ratio, and by 2030 its dependency will reach 0.7 dependents per working-age adult, a level not too different from that in the Philippines today. China's dependency ratio stands out from the others by having no clear trend over the 20 to 30 years. But starting in 2010, population aging will begin to dominate dependency and the dependency ratio will start to rise.

A final point on dependency is illustrated in Figure 13, which shows the change in dependency for the Philippines for households at various stages of the life cycle. Even in a country where overall dependency is so clearly declining, the dependency ratio for some

Table 3. Average household size: 1990–2030

Country	1990	1995	2000	2010	2020	2030
China	4.02	3.78	3.59	3.40	3.27	3.24
Indonesia	4.48	4.27	4.05	3.62	3.39	3.25
Japan	3.02	2.95	2.92	2.89	2.91	2.94
Rep. of Korea	3.75	3.49	3.33	3.17	3.12	3.18
Philippines	5.29	5.06	4.83	4.36	3.91	3.55
Thailand	4.64	4.28	3.99	3.60	3.35	3.21

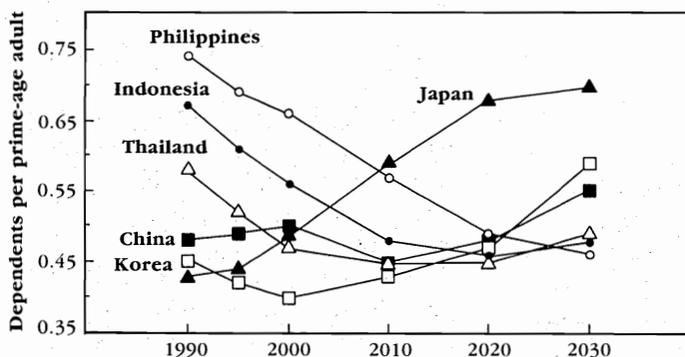


Figure 12. Projected dependency ratios for the six countries: 1990–2030

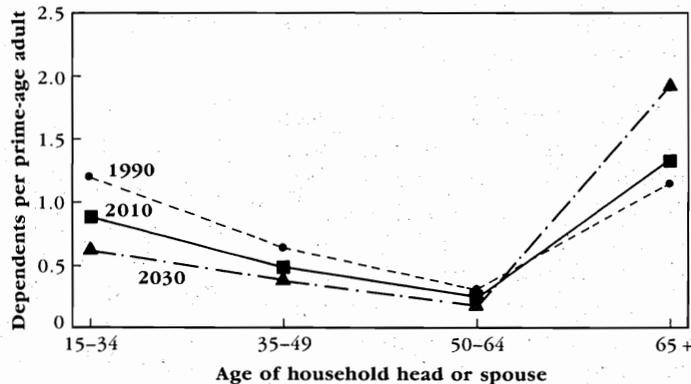


Figure 13. Projected dependency ratios, by age of household head or spouse: Philippines, 1990, 2010, and 2030

households is rising. The greatest decline is among the youngest households, those headed by persons in the 15–34 age group. As growing numbers of elderly live separately from their adult children, households headed by persons 65 or older are projected to experience a substantial increase in elderly dependency.

Concluding remarks

The demographic experiences of the six East and Southeast Asian countries described here are varied. Japan is well along in its demographic transition; the Philippines lags behind; and South Korea, Thailand, Indonesia, and China are

in between. But each country is experiencing important changes in the demographic character of its households that may have far-reaching implications for its social and economic structure.

Four important changes have been highlighted here. First, even though population growth is slowing rapidly in many of these countries, the number of households will continue to grow rapidly for several decades. Second, aging of the underlying population is affecting the relative importance of different life-cycle stages. In particular, post-childrearing households are growing relative to households headed by younger adults. Third, average household size is dropping

steadily toward the three-person household that currently prevails in Japan. Fourth, countries are experiencing a dependency transition from high child dependency to low overall dependency and then to high elderly dependency.

This discussion of recent and projected trends in the demography of households in six Asian countries has focused on the salient and broad trends. It has ignored many of the detailed changes that can be anticipated, along with their social and economic implications. Unresolved issues about the effects of demographic, social, and economic changes on the rules governing living arrangements will be the focus of continuing research on this topic.

APPENDIX: SUMMARY TABLES

China

Table 1. Household projections (in millions): 1990–2030

Variable	1990	1995	2000	2010	2020	2030
Number of households	278	316	353	410	461	497
Household population	1,116	1,196	1,270	1,394	1,507	1,609
Av. household size	4.02	3.78	3.59	3.40	3.27	3.24
Annual change (%)	7.8	7.4	5.7	5.0	3.6	—

Table 2. Number of households (in millions), by age of head or spouse: 1990–2030

Age	1990	1995	2000	2010	2020	2030
15–34	101	116	121	104	114	113
35–49	98	114	133	167	153	154
50–64	58	62	70	102	137	151
65+	21	24	28	37	56	79
Total	278	316	353	410	461	497

Table 3. Average household size, by age of head or spouse: 1990–2030

Age	1990	1995	2000	2010	2020	2030
15–34	3.54	3.53	3.47	3.39	3.56	3.68
35–49	4.92	4.38	3.98	3.89	3.78	3.95
50–64	3.78	3.64	3.59	3.05	2.99	2.87
65+	2.85	2.51	2.29	2.18	1.98	1.92
Total	4.02	3.78	3.59	3.40	3.27	3.24

Table 4. Average number of members 0–14 years old, by age of head or spouse: 1990–2030

Age of head or spouse	1990	1995	2000	2010	2020	2030
15–34	1.36	1.28	1.24	1.07	1.14	1.12
35–49	1.30	1.16	1.11	1.03	0.90	0.98
50–64	0.40	0.46	0.44	0.29	0.28	0.24
65+	0.38	0.26	0.21	0.17	0.12	0.13
Total	1.06	0.99	0.95	0.78	0.68	0.65

China (continued)**Table 5. Average number of members 65 and older, by age of head or spouse: 1990-2030**

Age of head or spouse	1990	1995	2000	2010	2020	2030
15-34	0.10	0.11	0.11	0.11	0.21	0.30
35-49	0.16	0.16	0.17	0.19	0.25	0.36
50-64	0.19	0.20	0.20	0.19	0.22	0.32
65+	1.38	1.38	1.39	1.38	1.40	1.39
Total	0.24	0.24	0.25	0.28	0.37	0.50

Table 6. Dependency ratio, by age of head or spouse: 1990-2030

Age	1990	1995	2000	2010	2020	2030
15-34	0.70	0.64	0.64	0.54	0.61	0.62
35-49	0.42	0.43	0.47	0.46	0.44	0.51
50-64	0.19	0.22	0.22	0.19	0.21	0.24
65+	1.63	1.90	2.32	2.50	3.33	3.82
Total	0.48	0.49	0.50	0.45	0.48	0.55

Note: Dependency ratio is the number of persons under age 15 or over age 64 divided by the number of persons 15-64 years old.

Japan**Table 1. Household projections (in thousands): 1990-2030**

Variable	1990	1995	2000	2010	2020	2030
Number of households	40,214	42,121	43,369	44,824	44,324	43,179
Household population	121,625	124,087	126,595	129,452	128,830	126,983
Av. household size	3.02	2.95	2.92	2.89	2.91	2.94
Annual change (%)	3.8	2.5	1.5	-0.5	-1.1	-

Table 2. Number of households (in thousands), by age of head or spouse: 1990-2030

Age	1990	1995	2000	2010	2020	2030
15-34	10,194	10,651	10,842	9,759	9,366	9,240
35-49	14,377	13,948	12,798	13,204	12,579	11,084
50-64	11,205	12,205	13,448	13,320	12,197	12,827
65+	4,438	5,317	6,281	8,541	10,182	10,028
Total	40,214	42,121	43,369	44,824	44,324	43,179

Table 3. Average household size, by age of head or spouse: 1990-2030

Age	1990	1995	2000	2010	2020	2030
15-34	2.28	2.25	2.41	2.48	2.49	2.63
35-49	3.81	3.77	3.62	3.59	3.76	3.87
50-64	2.98	2.98	3.10	3.09	3.07	3.16
65+	2.30	2.08	1.98	1.95	2.04	1.92
Total	3.02	2.95	2.92	2.89	2.91	2.94

Table 4. Average number of members 0-14 years old, by age of head or spouse: 1990-2030

Age of head or spouse	1990	1995	2000	2010	2020	2030
15-34	0.63	0.61	0.73	0.74	0.72	0.82
35-49	0.93	0.84	0.72	0.81	0.81	0.83
50-64	0.19	0.21	0.28	0.25	0.24	0.27
65+	0.16	0.07	0.05	0.06	0.08	0.05
Total	0.56	0.50	0.49	0.48	0.47	0.48

Table 5. Average number of members 65 and older, by age of head or spouse: 1990-2030

Age of head or spouse	1990	1995	2000	2010	2020	2030
15-34	0.04	0.04	0.05	0.06	0.13	0.15
35-49	0.23	0.29	0.35	0.42	0.49	0.57
50-64	0.31	0.34	0.40	0.49	0.62	0.60
65+	1.55	1.56	1.58	1.60	1.63	1.61
Total	0.35	0.40	0.47	0.59	0.71	0.73

Table 6. Dependency ratio, by age of head or spouse: 1990-2030

Age	1990	1995	2000	2010	2020	2030
15-34	0.42	0.41	0.48	0.48	0.51	0.58
35-49	0.44	0.43	0.42	0.52	0.53	0.57
50-64	0.20	0.22	0.28	0.31	0.39	0.38
65+	2.95	3.65	4.71	5.61	5.20	6.59
Total	0.43	0.44	0.49	0.59	0.68	0.70

Note: Dependency ratio is the number of persons under age 15 or over age 64 divided by the number of persons 15-64 years old.

Indonesia**Table 1. Household projections (in thousands): 1990-2030**

Variable	1990	1995	2000	2010	2020	2030
Number of households	40,487	46,294	52,705	66,656	79,454	90,168
Household population	181,363	197,752	213,329	241,456	268,958	292,652
Av. household size	4.48	4.27	4.05	3.62	3.39	3.25
Annual change (%)	11.6	12.8	14.0	12.8	10.7	—

Table 3. Average household size, by age of head or spouse: 1990-2030

Age	1990	1995	2000	2010	2020	2030
15-34	4.77	4.46	4.06	3.38	3.38	3.41
35-49	4.82	4.72	4.63	4.41	3.91	3.81
50-64	3.45	3.34	3.28	3.14	2.93	2.80
65+	3.08	2.81	2.62	2.27	2.00	1.76
Total	4.48	4.27	4.05	3.62	3.39	3.25

Table 5. Average number of members 65 and older, by age of head or spouse: 1990-2030

Age of head or spouse	1990	1995	2000	2010	2020	2030
15-34	0.07	0.07	0.08	0.08	0.10	0.14
35-49	0.11	0.12	0.12	0.14	0.16	0.19
50-64	0.25	0.26	0.26	0.27	0.29	0.32
65+	1.33	1.33	1.33	1.34	1.35	1.38
Total	0.17	0.18	0.19	0.21	0.25	0.32

Republic of Korea**Table 1. Household projections (in thousands): 1990-2030**

Variable	1990	1995	2000	2010	2020	2030
Number of households	11,094	12,466	13,697	15,483	16,513	16,837
Household population	41,588	43,557	45,584	49,109	51,541	53,536
Av. household size	3.75	3.49	3.33	3.17	3.12	3.18
Annual change (%)	2.7	2.5	1.8	1.0	0.3	—

Table 2. Number of households (in thousands), by age of head or spouse: 1990-2030

Age	1990	1995	2000	2010	2020	2030
15-34	18,639	20,983	23,453	27,923	28,746	27,598
35-49	13,054	15,251	17,802	22,890	28,967	32,206
50-64	6,775	7,617	8,547	11,802	16,030	21,614
65+	2,019	2,443	2,903	4,041	5,711	8,750
Total	40,487	46,294	52,705	66,656	79,454	90,168

Table 4. Average number of members 0-14 years old, by age of head or spouse: 1990-2030

Age of head of spouse	1990	1995	2000	2010	2020	2030
15-34	1.99	1.68	1.42	0.98	0.94	0.92
35-49	1.74	1.67	1.57	1.32	1.08	1.02
50-64	0.69	0.60	0.54	0.44	0.35	0.30
65+	0.64	0.42	0.36	0.22	0.12	0.08
Total	1.62	1.43	1.27	0.96	0.81	0.73

Table 6. Dependency ratio, by age of head or spouse: 1990-2030

Age	1990	1995	2000	2010	2020	2030
15-34	0.76	0.65	0.58	0.46	0.44	0.46
35-49	0.62	0.61	0.58	0.50	0.46	0.46
50-64	0.38	0.35	0.32	0.29	0.28	0.28
65+	1.77	1.65	1.84	2.19	2.77	4.82
Total	0.67	0.61	0.56	0.48	0.46	0.48

Note: Dependency ratio is the number of persons under age 15 or over age 64 divided by the number of persons 15-64 years old.

Table 2. Number of households (in thousands), by age of head or spouse: 1990-2030

Age	1990	1995	2000	2010	2020	2030
15-34	4,765	5,034	5,046	4,452	3,950	4,115
35-49	3,770	4,447	5,216	6,161	5,800	4,903
50-64	2,078	2,413	2,695	3,759	5,108	5,294
65+	481	572	740	1,111	1,655	2,525
Total	11,094	12,466	13,697	15,483	16,513	16,837

Republic of Korea (continued)

Table 3. Average household size, by age of head or spouse: 1990-2030

Age	1990	1995	2000	2010	2020	2030
15-34	3.30	3.23	3.22	3.31	3.43	3.58
35-49	4.45	3.99	3.68	3.52	3.65	3.95
50-64	3.74	3.32	3.10	2.74	2.65	2.72
65+	2.72	2.70	2.41	2.13	1.99	1.99
Total	3.75	3.49	3.33	3.17	3.12	3.18

Table 4. Average number of members 0-14 years old, by age of head or spouse: 1990-2030

Age of head or spouse	1990	1995	2000	2010	2020	2030
15-34	1.03	0.99	0.94	0.96	1.01	1.03
35-49	1.31	0.98	0.83	0.78	0.77	0.86
50-64	0.41	0.33	0.29	0.24	0.21	0.20
65+	0.38	0.24	0.21	0.11	0.08	0.08
Total	0.98	0.83	0.73	0.65	0.58	0.58

Table 5. Average number of members 65 and older, by age of head or spouse: 1990-2030

Age of head or spouse	1990	1995	2000	2010	2020	2030
15-34	0.07	0.08	0.09	0.10	0.16	0.30
35-49	0.17	0.18	0.20	0.27	0.38	0.58
50-64	0.22	0.22	0.19	0.25	0.29	0.38
65+	1.43	1.42	1.46	1.51	1.51	1.62
Total	0.19	0.20	0.23	0.31	0.41	0.60

Table 6. Dependency ratio, by age of head or spouse: 1990-2030

Age	1990	1995	2000	2010	2020	2030
15-34	0.50	0.49	0.47	0.47	0.51	0.59
35-49	0.50	0.41	0.39	0.42	0.46	0.57
50-64	0.20	0.20	0.18	0.22	0.23	0.27
65+	1.97	1.62	2.22	3.15	4.04	5.69
Total	0.45	0.42	0.40	0.43	0.47	0.59

Note: Dependency ratio is the number of persons under age 15 or over age 64 divided by the number of persons 15-64 years old.

Philippines

Table 1. Household projections (in thousands): 1990-2030

Variable	1990	1995	2000	2010	2020	2030
Number of households	11,634	13,639	15,876	21,033	26,852	32,649
Household population	61,514	68,955	76,609	91,698	104,928	115,928
Av. household size	5.29	5.06	4.83	4.36	3.91	3.55
Annual change (%)	4.0	4.5	5.2	5.8	5.8	—

Table 2. Number of households (in thousands), by age of head or spouse: 1990-2030

Age	1990	1995	2000	2010	2020	2030
15-34	4,530	5,066	5,551	6,729	7,923	8,710
35-49	4,063	5,013	6,071	7,873	9,568	11,403
50-64	2,182	2,557	3,072	4,711	6,687	8,385
65+	859	1,003	1,182	1,720	2,673	4,150
Total	11,634	13,639	15,876	21,033	26,852	32,649

Table 3. Average household size, by age of head or spouse: 1990-2030

Age	1990	1995	2000	2010	2020	2030
15-34	5.08	5.17	5.02	4.31	3.91	3.63
35-49	5.55	5.03	4.78	4.74	4.27	3.87
50-64	5.75	5.35	4.91	4.13	3.79	3.51
65+	4.01	3.86	3.92	3.45	2.91	2.59
Total	5.29	5.06	4.83	4.36	3.91	3.55

Table 4. Average number of members 0-14 years old, by age of head or spouse: 1990-2030

Age of head or spouse	1990	1995	2000	2010	2020	2030
15-34	2.74	2.83	2.53	1.98	1.59	1.33
35-49	2.09	1.68	1.62	1.48	1.21	0.98
50-64	1.19	0.94	0.91	0.67	0.49	0.39
65+	0.69	0.55	0.66	0.52	0.30	0.21
Total	2.07	1.89	1.73	1.38	1.05	0.82

Philippines (continued)**Table 5. Average number of members 65 years and older, by age of head or spouse: 1990-2030**

Age of head or spouse	1990	1995	2000	2010	2020	2030
15-34	0.04	0.04	0.04	0.04	0.05	0.07
35-49	0.07	0.07	0.07	0.07	0.09	0.12
50-64	0.19	0.18	0.17	0.16	0.18	0.21
65+	1.46	1.46	1.46	1.46	1.48	1.50
Total	0.18	0.18	0.18	0.20	0.24	0.30

Thailand**Table 1. Household projections (in thousands): 1990-2030**

Variable	1990	1995	2000	2010	2020	2030
Number of households	11,836	13,745	15,757	19,786	23,371	26,318
Household population	54,932	58,878	62,802	71,137	78,342	84,478
Av. household size	4.64	4.28	3.99	3.60	3.35	3.21
Annual change (%)	3.8	4.0	4.0	3.6	2.9	—

Table 3. Average household size by age of head or spouse: 1990-2030

Age	1990	1995	2000	2010	2020	2030
15-34	3.92	3.64	3.47	3.37	3.38	3.4
35-49	5.55	5.09	4.61	4.05	3.92	3.96
50-64	4.73	4.29	3.95	3.40	3.00	2.86
65+	4.29	3.93	3.56	2.88	2.41	2.11
Total	4.64	4.28	3.99	3.60	3.35	3.21

Table 5. Average number of members 65 and older, by age of head or spouse: 1990-2030

Age of head or spouse	1990	1995	2000	2010	2020	2030
15-34	0.05	0.05	0.06	0.06	0.09	0.15
35-49	0.09	0.09	0.09	0.11	0.14	0.22
50-64	0.16	0.16	0.16	0.16	0.18	0.23
65+	1.32	1.32	1.31	1.33	1.34	1.37
Total	0.17	0.18	0.19	0.21	0.28	0.39

Table 6. Dependency ratio, by age of head or spouse: 1990-2030

Age	1990	1995	2000	2010	2020	2030
15-34	1.20	1.25	1.04	0.88	0.72	0.63
35-49	0.64	0.53	0.55	0.49	0.44	0.40
50-64	0.31	0.27	0.28	0.25	0.22	0.20
65+	1.16	1.09	1.17	1.34	1.57	1.93
Total	0.74	0.69	0.66	0.57	0.49	0.46

Note: Dependency ratio is the number of persons under age 15 or over age 64 divided by the number of persons 15-64 years old.

Table 2. Number of households (in thousands), by age of head or spouse: 1990-2030

Age	1990	1995	2000	2010	2020	2030
15-34	4,791	5,386	5,774	5,870	5,598	5,708
35-49	3,869	4,701	5,705	7,615	8,371	8,157
50-64	2,359	2,680	3,093	4,598	6,746	8,187
65+	817	978	1,185	1,703	2,656	4,266
Total	11,836	13,745	15,757	19,786	23,371	26,318

Table 4. Average number of members 0-14 years old, by age of head or spouse: 1990-2030

Age of head or spouse	1990	1995	2000	2010	2020	2030
15-34	1.61	1.36	1.21	1.13	1.07	1.0
35-49	1.90	1.60	1.32	1.09	1.03	0.99
50-64	0.98	0.76	0.64	0.48	0.36	0.31
65+	1.01	0.80	0.63	0.41	0.26	0.18
Total	1.54	1.28	1.09	0.90	0.76	0.67

Table 6. Dependency ratio, by age of head or spouse: 1990-2030

Age	1990	1995	2000	2010	2020	2030
15-34	0.73	0.64	0.57	0.54	0.52	0.55
35-49	0.56	0.49	0.44	0.42	0.43	0.44
50-64	0.32	0.27	0.25	0.23	0.22	0.23
65+	1.18	1.17	1.20	1.50	1.96	2.72
Total	0.58	0.52	0.47	0.45	0.45	0.49

Note: Dependency ratio is the number of persons under age 15 or over age 64 divided by the number of persons 15-64 years old.

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Comments . . .

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and responding to the threat of AIDS. It is to be commended and respected for the foresight of some of its key decision makers. But even Thailand, with its continued shift toward preventive intervention, confronts escalating numbers of persons for whom prevention comes too late. Under such pressure of time, policies and programs providing preventive measures that affect the entire populace are imperative. May Prime Minister Anand Panyarachun's National Committee on AIDS meet every success in reaching its goal of containing the spread of communicable diseases, particularly AIDS.

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Age and Birth Date Reporting in Thailand

Most ever-married Thai women of reproductive age, when interviewed in a survey, can accurately state their own age and the ages of their children within a year of the actual completed ages. This ability reflects the fact that almost all Thais know their year of birth, an event having significance within the Thai cultural context, most notably in connection with astrology.

Thais do not necessarily think of age, however, strictly in terms of completed years. Rather, patterns of age reporting are best understood as the outcome of several coexisting practices for determining age. Only a minority of Thais apparently consider their age to be the age reached at their last birthday, and some think of their age as the age they will reach at their next birthday. More commonly, Thais simply equate their age with the difference between the current year and their year of birth without taking into account whether the current year's birthday has already passed. This practice is undoubtedly related to the fact that, at least among most rural Thais, birthdays are not celebrated and often pass unnoticed.

The extent to which the practice of equating age with the difference between the current year and the year of birth leads to a substantial proportion of the population for whom stated age is one year older than completed age will depend upon when, during the year, a particular inquiry into age occurs. Age data are far more likely to be affected when based on inquiries made early in the year, before most respondents have passed their birthday, than when the data are collected later in the year.

Informants also have a tendency to report ages of young children in units of less than whole years. The extent to which this

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happens declines rapidly with the age of the child. As a result, the proportion of children who are actually under 1 year old (in completed age) but are reported as having reached age 1 is smaller than the proportion of children who are actually age 1 but are reported as having reached age 2, and so on until the age at which children's ages are no longer reported in greater detail than whole years. Thus age misstatement is likely to lead to undercounts of children in the first few years of age in cases where stated age serves as the basis for age tabulations. Moreover, the ages of very young children, when stated in units smaller than years, are especially at risk of being miscoded because, unlike ages stated in whole years, they require conversion from the stated units into years.

*by John Knodel
 and Napaporn Chayovan*

NO POPULATION characteristics are more basic to demographic studies than age and sex. Whereas a person's sex is easily observed and rarely misreported, age reporting is well known to be problematic and the extent and types of errors in age statements to vary substantially among populations. Nevertheless, as Ewbank (1981: 1) observed in his extensive review of the subject, despite the implications of age misreporting for demographic research, "studies that document the extent and nature of such reporting problems are few and far between."

In comparison with the situation in many other developing countries, age and birth date reporting in

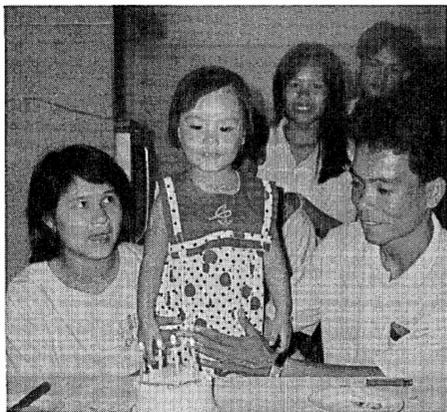
Thailand are considered to be relatively accurate and complete. Indeed, within the Thai cultural context, knowing how old you are and when you were born is of considerable importance. Forms of address and kinship terms generally depend on the relative ages of the persons involved. In addition, when Thais consult a fortune teller, which they often do, especially when setting the date for important events such as a wedding or ordination, they usually must provide the fortune teller with information on when the persons involved were born. The celebration or marking of birthdays, however, has not been a traditional practice among the rural population, although the practice appears to be growing more common (probably as a result of cultural diffusion from the West) and is not unusual among urban dwellers.

Previous research has revealed a systematic bias in age reporting in Thailand, age often being stated as one year greater than the completed age at last birthday, the definition normally used by demographers. One reason suggested for the bias is that some Thais appear to think of

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current age as the age at next birthday and may indicate this interpretation, when asked their age, by prefacing their stated age with the word *yaang*, meaning "going on to" (Chamrathirong et al. 1978). Others who do not initially qualify their meaning will often acknowledge that they are referring to their "going on age" when directly probed.

As the present study illustrates, however, a potentially more important reason for the bias is that current age is often determined by comparing the year of birth with the current year and equating current age with the difference without taking into account whether the current year's birthday has been passed. This practice is probably related to the lack of importance of birthdays as markers of the passage of age (Phongphit and Hewison, 1990: 24).



Birthday celebrations such as this are becoming common in urban areas of Thailand but are still unusual among the majority rural population. This three-year-old's cake has four candles, the fourth representing her "going-to-be" age.

The fact that a traditional calendar system, based on lunar months and a twelve-year cycle of animal years, coexists with a modern system, based on Western months and Buddhist Era years, complicates for the demographic researcher the determination of birth dates and the calculation of age based on birth dates. Both systems have importance for the average Thai, especially with respect to birth dates.

In Thailand age at next birthday is often reported instead of age at last birthday. The coexistence of a traditional calendar system based on animal years and lunar months with a modern calendar system complicates for researchers the determination of birth dates and hence the calculation of age based on birth dates.

For example, when reporting one's birth date in interactions with the official bureaucracy, one would normally use the modern system. However, when consulting a fortune teller or astrologer, one uses the traditional system. It is noteworthy that birth registration forms have spaces for recording the birth date in both the modern and traditional systems.

Buddhist Era (B.E.) years together with Western months permit direct calculation of age and are readily translated into Christian Era (A.D.) years by subtracting the difference of 543 years and allowing for the change in the start of B.E. years from April 1 to January 1 beginning

in A.D. 1941.¹ Conversion of animal years and lunar months to the modern system (whether in A.D or B.E. years) is somewhat more problematic, however, because of confusion as to when the animal year changes and because the lunar calendar is not fixed in relation to the Western system of months. In addition, the first lunar month traditionally starts two lunar cycles earlier in the Upper Northern Region than in the rest of the country. (See Appendix.)

The present study examines age and birth date reporting in Thailand, using data from the 1987 Thailand Demographic and Health Survey. Any detailed analysis of age and birth date reporting must take into account the cultural context of the particular population under study. As a result, most findings presented here are necessarily specific to Thailand. Even so, several are likely to be generalizable. Probably the most important general lesson to be learned from the following analysis is that age and birth date reporting are more complex phenomena than may be suspected initially, even in a society where age and birth dates are relatively well known.

Source and description of the data

The Thailand Demographic and Health Survey (TDHS) was conducted between March and June 1987 by the Institute of Population

1. As a result of the change of the start of the B.E. year from April 1 to January 1, the year B.E. 2483 (A.D. 1940) is only nine months long (since the period from January 1 to March 31 that would have been allocated to B.E. 2483 as the end of the year is instead treated as the first months of B.E. 2484).

Studies of Chulalongkorn University. Detailed interviews were conducted with a representative sample of 6,775 ever-married women 15-49 years of age on a variety of topics relevant to the study of demographic behavior and health. The sample was designed to provide independent estimates for the four major regions of Thailand and the Bangkok Metropolis, as well as for the urban and rural sectors of the population collectively.

Nationally representative results can be obtained by applying appropriate weights. (For a full description of the survey methodology see Chayovan et al. 1988.) Here we present weighted results when the tabulation is intended to provide substantive findings representative of the total population or specific subgroups but use unweighted results to illustrate methodological points.

Several features were incorporated into the TDHS that make the data particularly suitable for an analysis of age and birth date reporting. Each respondent was asked to report her birth date (month and year) and age. Interviewers were instructed to record responses to these items as actually stated. When the questionnaires were processed into computer-readable form, information was entered indicating the type of year (animal or B.E.) and type of month (lunar or Western) reported by the woman when indicating her birth date.² Both the originally stated age and the age as calculated from the birth date were entered.

Respondents were also asked to report the birth date (year and month) and age of each of their live-born children as well as the

current ages of those still living. Interviewers were instructed to obtain whenever possible the birth dates of children from documentary evidence in the form of birth certificates or household registration forms and to indicate whether or not they were able to do so for each child recorded. Overall, documentation was obtained for about half of the births recorded. The ages of living children were to be recorded exactly as stated. Both the recorded age and the age as calculated from the birth date were entered during the processing of the questionnaires into computer-readable form.

A major question addressed by the present study is the extent to which stated ages in Thailand correspond to "accurate" ages as defined by demographers, namely completed age in years as of last birthday. Because the TDHS recorded both age as actually stated and birth date information, the extent of error in age reporting can be directly assessed, provided the birth date information is correct, through comparisons between the stated age and the age calculated from year and month of birth. Although we

have no independent proof that the information on year and month of birth is correct, it is reasonable to assume that it is in most cases, given the importance of this information within the Thai cultural context. Moreover, in the case of the respondents' children, the information was often based on documentary evidence.

In a small number of cases, the birth dates of eligible women were also based on documents, primarily the household registration form or a personal identity card. Although the official status of these documents does not guarantee that they are accurate, they undoubtedly are in the large majority of cases.

As for the household registration form or the personal identity card, the official who issues the document may have to estimate the birth date if the person registering cannot provide the date. However, once a birth date is recorded in the household registration, it is transferred directly from that form to any subsequent official documents issued (such as the identity card, which at present is issued when the person reaches age 15, or subsequent household registration forms if the person changes households).

Since in recent generations the birth date recorded in the household registration form has usually been based on the birth registration form, it is likely to be accurate. For older people, especially the elderly, birth dates in the household registration form are often less precise and based on a verbal account when originally entered.

Undoubtedly some of the documented information on birth year and month is in error and additional errors were introduced in

2. Animal years and B.E. years can be unambiguously distinguished from each other. Lunar months can also be distinguished easily from Western (Gregorian calendar) months because the latter are typically referred to by Thai names that correspond to January, February, etc., whereas lunar months are referred to by number. It is possible that some respondents confused the two systems and referred to Western months by their ordinal number or converted the month from one system to the other before providing an answer. In such cases, some respondents may have erroneously equated a lunar month with the Western month of the same ordinal order (e.g., the first lunar month with January).

the course of data entry. Thus not all of the calculated ages are indeed correct. Nevertheless, the extent to which calculated ages are in error is probably negligible compared with the extent to which stated age deviates from the true completed age.

Birth date reporting

As already stated, the TDHS solicited the month and year of birth for both respondents and their children. We now examine the reporting of these birth dates as recorded in the questionnaire responses, starting with the birth date of the woman herself and then that of each child based on the birth histories.

Eligible women. All women identified as present in a household on the night prior to interview who had ever been married and were between 15 and 49 years of age were defined as eligible for a detailed interview about various demographic and health matters. Of the eligible women identified, 94% were successfully interviewed.

In the course of the interview, each woman was asked her month and year of birth and then her current age. Interviewers were instructed not to obtain the woman's birth date from a documentary source, such as the household registration form or the woman's personal identity card, unless she could not remember it. Although interviewers noted on the questionnaire when documents were consulted, this information was not coded into the data set.

Thus, in the results presented below, the percentages "reporting" birth dates include both cases in which respondents stated their birth

dates and those in which the interviewers consulted some form of documentation. In cases where documentation was provided, the interviewers often simply copied the birth year and month directly from the document without necessarily having the respondent orally confirm the date. To the extent that documentation was consulted, results are biased toward the modern system of reporting dates (in B.E. years and Western months) since that is the system normally used to record birth dates in official documents. A spot check of completed questionnaires revealed that the number of women for whom birth dates were derived from documentation was quite small, probably no more than a few percent.

As Table 1 indicates, birth years were obtained for almost all women (98%) and both a month and a year of birth were obtained for the vast majority (87%). Table 1 also shows results in relation to several background variables that may be expected to be associated with birth date reporting. There is little variation by age or rural-urban residence in the percentage for whom a birth year was recorded. Several ethnic groups (defined by language and religion), in particular Malay Muslims and hill tribes, are characterized by distinctly lower proportions able to report the year of birth. In addition, women with three or fewer years of education were somewhat less likely than others to report a birth year.³

Somewhat more pronounced differentials are apparent when one examines the percentage of women who reported both a birth year and a birth month. In particular, educa-

Educational attainment and urban residence are positively associated with completeness of birth date reporting by respondents to the Thailand Demographic and Health Survey. In addition, younger, more urban, and more educated women were more likely than other women to report their birth dates with reference to the modern calendar system.

tional attainment and urban residence are positively associated with the completeness of birth date reporting, although both a birth year and a birth month were reported even by large majorities of the deeply rural population (85%) and of women with less than four years of primary school (72%). In addition, distinctly lower percentages of several ethnic minority groups—in particular Thai and Malay Muslims, Cambodians, and hill tribes—were able to provide complete birth date reporting. Even for the hill tribes, however, the group with the lowest

3. Where the analysis relates to background variables, "provincial urban" refers to the population residing in officially defined municipal areas outside the Bangkok metropolis, "semi-urban" to the population residing in officially designated sanitary districts, and "deep rural" to the population residing outside municipal areas and sanitary districts. Ethnicity is defined by both language and religion. Among Buddhists, the four major regional dialects are distinguished. Thai-speaking Buddhists make up 88% of the weighted TDHS sample of eligible women. With respect to educational attainment, the compulsory level that prevailed when most of the women included in the sample passed through the school ages was four years of primary schooling (Knodel and Wongsith 1990).

percentage reporting both a year and a month of birth, this information was available for more than half (55%).

The results in Table 1 also indicate the distribution of respondents according to the type of birth year

reported (among those who reported a birth year) and according to the type of birth month reported (among those who reported a birth month). Before commenting on these results, we should note that women who were able to report

both a birth year and a birth month typically combined animal years with lunar months or B.E. years with Western months.

For the overall sample, weighted results indicate the following distribution of such respondents accord-

Table 1. Percentage of ever-married women 15-49 years old able to report birth year and month, and percentage distribution of type of birth year and type of month reported, by selected characteristics

Characteristic	Number of cases	% able to report		If birth year reported, % reporting			If birth month reported, % reporting		
		Birth year	Birth year and month	Animal year	B.E. year	Total	Lunar month	Western month	Total
Total	6,775	98	87	55	45	100	41	59	100
Age of women									
15-19	308	97	88	37	63	100	16	84	100
20-24	1,017	98	90	39	61	100	20	80	100
25-29	1,320	98	90	45	55	100	29	71	100
30-34	1,341	99	87	55	45	100	39	61	100
35-39	1,137	98	87	59	41	100	50	50	100
40-44	871	99	86	67	33	100	61	39	100
45-49	781	99	83	73	27	100	63	37	100
Residence									
Deep rural	3,711	98	85	60	40	100	47	53	100
Semi-urban	641	99	92	55	45	100	40	60	100
Provincial urban	1,175	99	94	36	64	100	16	84	100
Bangkok	1,248	99	92	29	71	100	14	86	100
Education									
0-3 years	941	94	72	65	35	100	60	40	100
4-7 years	4,642	99	88	58	42	100	43	57	100
Secondary or beyond	1,182	100	99	16	84	100	4	96	100
Religio-linguistic ethnicity									
Central Thai Buddhist	3,068	99	90	52	48	100	38	62	100
Northeastern Thai Buddhist	1,525	99	89	59	41	100	50	50	100
Northern Thai Buddhist	653	99	85	49	51	100	20	80	100
Southern Thai Buddhist	779	100	91	67	33	100	51	49	100
Thai Muslim	348	98	78	48	51	100	36	64	100
Malay Muslim	124	84	62	7	93	100	5	95	100
Cambodian	85	99	77	53	47	100	18	82	100
Hill tribe	84	75	55	44	56	100	31	69	100
Other	109	97	91	26	74	100	10	90	100

Note: Results in this table are based on weighted tabulations. Number of cases shown refers to the unweighted number of women in the total sample.

B.E.—Buddhist Era.

ing to the type of year and month reported: animal year and lunar month, 36%; animal year and Western month, 16%; B.E. year and lunar month, 4%; and B.E. year and Western month, 44%. Thus about seven out of 10 women who reported their birth year in animal year terms reported their birth month in lunar terms, and about nine out of 10 women who reported their birth year in B.E. terms reported their birth month in Western terms.

The results in Table 1 show that both the type of year and the type of month reported vary systematically with respondents' age, residence, and education. The percentage of women reporting the year or month of birth in traditional terms (animal year or lunar month) is positively related to age and negatively related to both urban residence and level of educational attainment, whereas the reverse is true for the percentage reporting their birth date in modern terms (B.E. year or Western month).

The strong negative association between age and the reporting of year or month in modern terms undoubtedly reflects a trend over time for Thais to think increasingly of birth dates in this manner. Such a trend probably reflects the effects of increasing education and urbanization as well as respondents' increased interactions with the state bureaucracy and other modern organizations requiring date reporting (including reporting of birth dates) in modern terms.

Ethnic differences in the system of date reporting are also apparent. Among Thai Buddhists, the main difference is the low percentage of northern women who reported

their birth dates in lunar months. The reasons for this difference are unclear, however.

Differentials are also apparent among non-Thai-speaking minorities but may be somewhat misleading. As already noted, substantial proportions of several groups did not report a birth year or month. The fact that those respondents are necessarily excluded from this part of the analysis may affect the representativeness of the results.

In addition, interviewers may have been inclined to turn to documentary sources to determine the birth dates of non-Thai-speaking minority respondents if they had difficulty communicating with those women or if there was a tendency for minority respondents to be less able to remember their birth dates on their own. Since birth dates recorded in documents are likely to be based on the modern system, the results for non-Thai-speaking respondents whose birth dates are available could well be biased toward modern date reporting.

Nevertheless, the fact that Malay Muslims do not generally use the traditional Thai calendar, based on animal years and lunar months, undoubtedly accounts for the low percentages reporting birth dates in those terms in their case. For Cambodian and hill tribe women, however, the higher than average percentages reporting in modern terms among those for whom the birth year or month is available may be largely artifactual.

Children. Each eligible woman respondent was asked to report a complete history of each live birth she had experienced, including the month and year of the birth,

whether or not the child had survived, and if the child was still alive, the child's current age. In contrast with the request for the respondent's own birth date, the respondent was specifically asked to show, if possible, documentary evidence (either a birth certificate or the household registration) to verify the birth date for each child. The interviewers were instructed to indicate whether each child's birth date was based on documentary evidence or on the mother's report alone. Overall, respondents showed some form of documentation for 52% of the live births they reported.

Table 2 indicates the percentage of births for which dates were verified through documentation and the percentage of children's birth dates that were incomplete according to various background characteristics of child and mother. Since birth dates are almost universally complete if taken from documentation, the percentage of children with incomplete birth dates is shown for children whose source of birth date information was only the mother's report as well as for all children. The percentage for all children is strongly influenced by the percentage of documented births because in virtually all such cases the birth date was complete.

The birth date was far less likely to be documented if a child had died and the documentation also far more likely to be incomplete for deceased children. For living children, however, even when documentation was not available, the vast majority had complete birth dates reported. Given the focus of the present study on age reporting, results in Table 2 are limited to living chil-

dren except for the initial comparison.

The percentage of living children for whom the birth date could be verified through documentation

varies only modestly with current age of the child. That the percentage is lowest for children over age 20 is probably influenced by the likelihood that an adult child will

have moved out of the household and not be listed in the household register, which was the main source of documentation for birth dates. (In practice it is common for an adult child to move out of the parental household but still remain in the household registration. This effect on birth date documentation is thus less severe than it might otherwise be.)

The more urban an area is, the less likely it is that documentation was produced to confirm a child's birth date. This was probably due both to a greater hesitancy among urban residents than among their rural counterparts to show documentation and to the substantially greater tendency for urban residents to live in residences where they are not registered (and thus would not have a household registration form to show to an interviewer). The concentration of Bangkok residents among central dialect speakers no doubt contributes to their low documentation level as seen in the religio-linguistic ethnic differences.

The main educational differential is the far lower percentage of children of mothers with at least secondary schooling, than of mothers with less education, for whom birth date documentation was shown.

The percentage of children with incomplete birth dates depends both on the percentage for whom documentation was shown (virtually all documentation was complete) and the ability of mothers who did not produce documentation to remember both the month and the year of birth for a child in question. As the results in Table 2 show, the percentage of undocumented birth dates of children that were incompletely reported has little rela-

Table 2. Percentage of children reported in the birth histories for whom birth dates were verified through documentation and percentage with incompletely reported birth dates, by selected characteristics of the child and the mother

Characteristic	% for whom birth dates were verified through documentation	% with incompletely reported birth dates	
		All children ^a	Children with undocumented dates
For all children			
Total	58	9	21
Child still living	62	5	12
Child dead	10	57	63
For living children			
Age of child			
0-4 years	60	2	3
5-9 years	65	4	10
10-14 years	66	4	13
15-19 years	61	6	15
20+ years	55	10	21
Residence			
Deep rural	69	5	13
Semi-urban	60	5	12
Provincial urban	35	5	8
Bangkok	28	8	11
Religio-linguistic ethnicity			
Central Thai Buddhist	50	6	11
Northeastern Thai Buddhist	69	2	7
Northern Thai Buddhist	79	3	14
Southern Thai Buddhist	56	5	11
Thai Muslim	64	8	20
Malay Muslim	62	22	57
Cambodian	76	4	18
Hill tribe	73	21	6
Other	38	2	3
Education of mother			
0-3 years	65	11	28
4-7 years	64	4	10
Secondary or more	30	1	1

Note: Results in this table are weighted and are based on children of women with at least one living child.

a. Includes births for which source of recorded birth date is unknown.

tion to rural versus urban residence. In contrast, the percentage of children's undocumented birth dates that were incompletely reported increases steadily with the age of the child, undoubtedly reflecting the greater difficulty of remembering events that occurred further in the past.

Rural-urban residence has little relation to completeness of reporting by mothers of their children's ages, but mothers reported ages of younger children more completely than ages of older children.

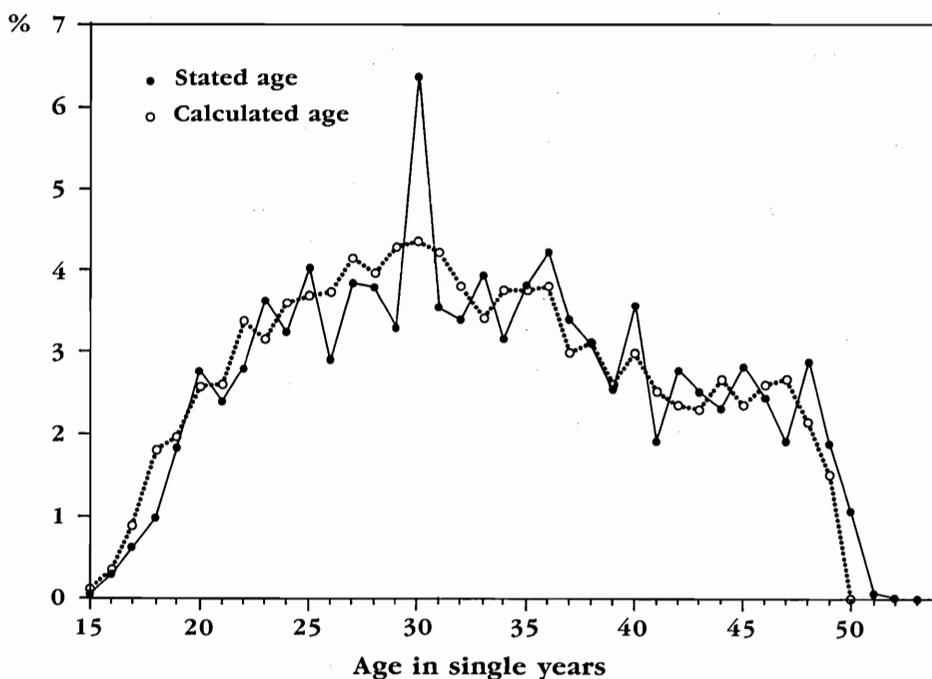
Among ethnic groups, Malay Muslims and hill tribe women were far less likely than others to be able to recall both the month and the year of a child's birth when documentation was unavailable, possibly because of their lower educational levels, given the clear inverse association shown between education and the percentage of undocumented dates that were incompletely reported. In contrast, although women with at least a secondary education were particularly unlikely to show documentation, few of their children's birth dates were incompletely reported.

Aggregate age distributions

Even though the ages of substantial proportions of individuals may be reported incorrectly, the effect of misreporting on the aggregate age distribution can still be moderate or even negligible if the errors are random and thus cancel each other. We were therefore interested in ex-

Figure 1. Percentage distribution of ever-married women interviewed in the TDHS, by single years of stated age and calculated age

Note: Results are based on weighted tabulations.



amining aggregate age distributions of the respondents and their children as reported in the birth histories by comparing results based on stated ages and ages calculated from reported birth dates.

One of the best known features of age misreporting is the tendency for stated ages to be disproportionately concentrated at ages terminating in particular digits, typically zero and five, reflecting a tendency to round ages. Such "age heaping" is clearly evident in Thai census data collected prior to 1970, when the census changed the basis for tabulating age from ages as directly stated to ages as calculated from reported birth dates.

Figure 1, which plots the percentage distribution of respondents' ages as stated in the TDHS questionnaire with that of their ages as calculated from year and month of birth,⁴ shows a clear heaping at age 30 and, to a lesser extent, at age 40 and most other ages ending in zero or five for stated ages. Virtually no

4. Calculated ages of both TDHS respondents and their children are based on the difference between the year and month of the interview and the year and month of birth as stated in the birth histories, without taking the day of the month into account. In cases where the month of interview was the same as the month of birth, the person in question was assumed to have reached the age that would have been reached as of the birthday that month.

age heaping is evident in the distribution of calculated ages, however. If the calculated age can be assumed to be largely accurate, the discrepancies between the proportions of women with a particular calculated and stated age indicates the extent of preference for (or avoidance of) that age. Most of the irregularities in the distribution of stated ages are due to age misreporting rather than to actual fluctuations in the numbers of persons at particular ages.

Figure 2 compares the percentage distribution of children of respondents according to their stated ages and their ages as calculated from their year and month of birth based

on information provided by the respondents when reporting their birth histories. As in the case of the women themselves, no heaping is evident in the distribution of calculated ages, although there are some irregularities, especially in the distribution of ages of children under 12. The slight peaks at ages 1, 5, and 7 in the calculated ages may reflect genuine fluctuations in births over time; but the quality of birth registration in Thailand is not sufficient to determine whether this is the case. Some slight heaping of stated ages, however, is apparent at ages with terminal digits of 0 and 5 starting at age 10, except for age 25. The number of children whose

calculated age is 0 is likely to be slightly underestimated, given that any child whose birth month is the same as the interview month is treated as having reached his or her birthday. As a result, even children whose birthday was later in the month than when the interview took place are calculated to have achieved the age associated with their impending birthday. Thus at each calculated age except age 0, there will be some children who are actually one year younger than the given calculated age according to a strict definition of completed age. At the same time, some number who in actuality are of that completed age will be attributed to the next calculated age.

Presuming that both interviews and birthdays are evenly distributed throughout the month, approximately half of the children whose birthday falls in the month of the interview would not have reached their next birthday and thus, in the strictest sense, be one year younger than their calculated age. The gain and loss at any given calculated age except 0 tend to cancel each other out. In the case of age 0, however, only a loss can occur, since some children would be falsely assigned to age 1 but none could be advanced to age 0 from younger ages.

Perhaps the most striking feature of the comparison of the calculated and stated single-year age distributions of children as presented in Figure 2 is the consistently higher proportion of children at each calculated age up to age 7 compared with the proportion at each equivalent stated age. At least two inter-related practices contribute to this

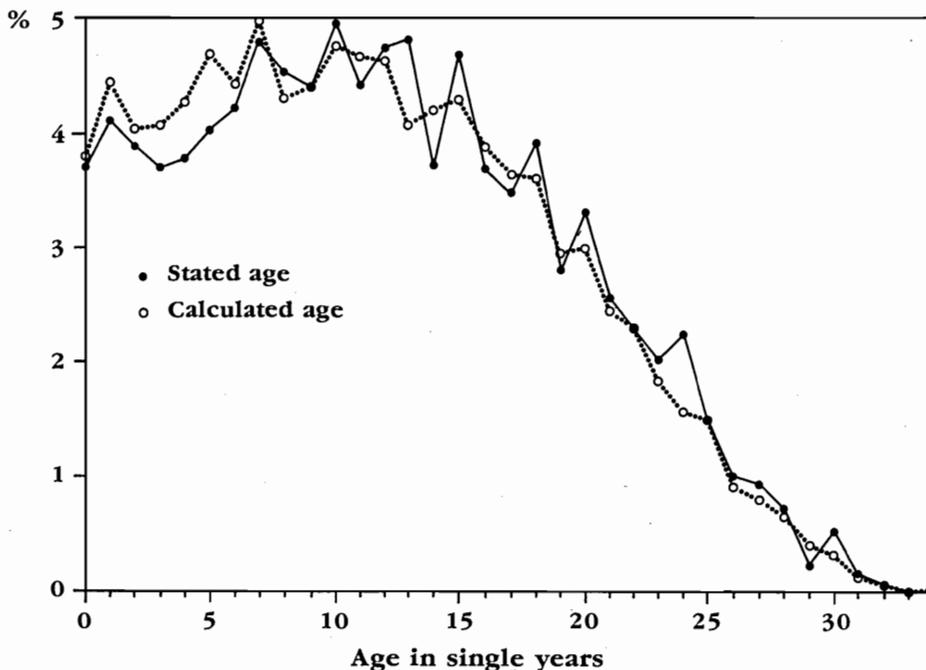


Figure 2. Percentage distribution of living children reported in birth histories, by single years of stated age and calculated age

Note: Results are based on weighted tabulations.

(continued on page 64)

Child Survivorship Estimation: Methods and Data Analysis

The past 20 years have seen extensive elaboration, refinement, and application of the original Brass method for estimating infant and child mortality from child survivorship data. This experience has confirmed the overall usefulness of the methods beyond question, but it has also shown that their application is anything but routine.

It is never sufficient merely to calculate estimates from a single set of data. Estimates must be analyzed in relation to other relevant information before useful conclusions about the level and trend of mortality can be drawn. This data analysis, unlike the calculation of estimates, cannot be reduced to mechanical routine. It requires an ability that comes only with experience, the broader and more catholic the better.

This article aims to illustrate the importance of data analysis through a series of examples, including data for the Eastern Malaysian state of Sarawak, Mexico, Thailand, and Indonesia. Specific maneuvers include plotting completed parity distributions and "time-plotting" mean numbers of children ever born from successive censuses. A substantive conclusion of general interest is that data for older women are not so widely defective as generally supposed.

by Griffith Feeney

MORTALITY estimates based on child survivorship data will be with us for many decades to come. The only definitively superior source is a vital registration system that captures essentially all births and infant deaths. Such systems do not exist for much

of the world's population—not in China, for example, nor in most countries in Asia or Africa, nor in many countries in Latin America—and their development will require efforts over many decades. Thus we will need to rely on child survivorship estimation and other indirect methods, as well as direct methods based on survey data, for the indefinite future.

The past two decades have seen extensive elaboration and refinement of the original Brass methods (Brass 1961; Brass et al. 1968). Indeed, the casual user is likely to be confused by and vexed at the variety of methods to choose from. We have also acquired an extraordinarily broad and varied experience with application. Although this experience has confirmed the overall usefulness of the methods beyond question, it has also shown that their use is anything but routine.

We have learned to distinguish between the various estimates generated in application and the conclusions that eventually result from analyzing these estimates. At best, we may conclude that a particular set of estimates represents the detailed level and trend of mortality. At worst, we may conclude that the data in question are so defective, or conceivably that particular circumstances so invalidate every available method, that no conclusions regarding the level and trend of mortality are possible. Most applications fall somewhere between these two extremes. In the nature of the situation, conclusions concern not only mortality in the population, but errors in the data and the validity of the various methods.

The necessity for data analysis emerges most clearly when different sets of data for the same population yield discrepant results,

proving that at least some of the estimates are defective. How we proceed in such cases depends on the particular circumstances. Data analysis, unlike the calculation of estimates, is not reducible to mechanical routine. It benefits from knowledge of indefinite extent: knowledge of methods, of empirical patterns, of local context.

Data analysis, unlike the calculation of estimates, is not reducible to mechanical routine.

... It requires an ability that comes only with experience, the broader and more catholic the better.

It requires an ability that comes only with experience, the broader and more catholic the better. The only way to learn data analysis is to do it, to disregard methods as such and apply oneself to learning as much as possible about particular cases. The appropriate medium is thus the case study, in which the various possible maneuvers come to life as they are used to extract real conclusions from real data.

Proficiency in data analysis requires some understanding of the logic of the estimation procedures, an obvious point that has nonetheless been too often slighted in practice. No doubt this neglect is due partly to the difficulty of the methods and their profusion. Ironically, however, it is probably due also to Brass's ingenious "multiplier" method and the regression variants later introduced by Sullivan (1972) and Trussell (1975). The multiplier method is a wonderfully

rapid and remarkably accurate computational shortcut that avoids the labor of direct solution of the estimation equations. An unfortunate side effect is the possibility of producing estimates without any understanding of the formal demographic structure of the data or the logic of the estimation procedure. Regression methods, unobjectionable in themselves, compound the danger by introducing a purely statistical procedure for computing multipliers.

This article aims to illustrate the importance of data analysis and to suggest several overlooked possibilities, through a series of examples. Beginning with a particularly intrac-

table set of data for Sarawak, one of the two eastern states of Malaysia on the island of Borneo, I suggest how to move from a set of severely discrepant estimates to several reasonably defensible conclusions. I then discuss two simple graphical procedures for diagnosing data quality, illustrating them with applications to Sarawak, Mexico, and Thailand. The examples cannot be more than suggestive, for a thorough analysis of any one of the cases would require a paper to itself.

Nearly all work on child survivorship estimation to date has dealt with data classified by age of mother. Future work would probably do well to emphasize alternative

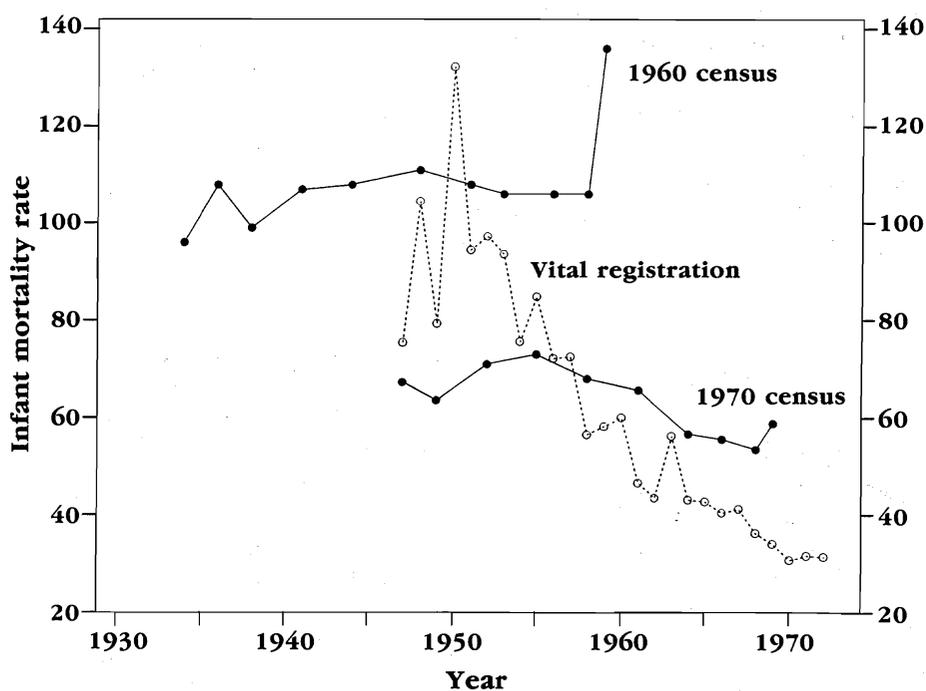


Figure 1. Infant mortality rate estimates for Sarawak, East Malaysia, 1935-70

Sources: Child survivorship estimates from 1960 and 1970 censuses: Table 1 of this article. Infant mortality rates from vital registration: United Nations, *Demographic Yearbook* (1953, 1967, 1975).

classifications, following Sullivan's early initiative with data classified by duration of marriage (1972). Of particular importance is the recent work of Fernandez Castilla (1989), which shows how to use child survivorship data to analyze mortality differentials by family size. The penultimate section of the current article presents a brief example comparing estimates for Indonesia based on data classified by age with estimates based on data classified by year of marriage.

The Sarawak data of 1960 and 1970

Sarawak provides an excellent example of the importance of comparing estimates from various sources and of the kind of analysis that is required when these estimates indicate problems with the data or the estimation procedure. Child survivorship data by five-year age groups of mother are available from the 1960 census, taken under British auspices, and from the 1970 census of Malaysia, Sarawak being one of the two eastern states of the country. Infant mortality rates are also available from vital registration data, though both birth and death registration is incomplete to an unknown but probably substantial degree.

Figure 1 shows infant mortality rates estimated from both censuses together with rates from vital registration. Table 1 presents the child survivorship data and estimates. The vital registration figures are from the United Nations *Demographic Yearbook* series. The estimates were obtained by direct solution of the estimation equations as described in Feeny (1980).

We see at once that the estimates

Table 1. Child survivorship data (by age) and infant mortality rate (IMR) estimates: Sarawak, censuses of 15 June 1960 and 25 August 1970

Age	Women	CEB	CS	IMR	Time
1960 census					
15-19	34,700	8,630	7,420	136	59.1
20-24	28,808	38,630	33,303	106	57.6
25-29	29,372	83,460	70,457	106	55.7
30-34	23,699	94,424	78,467	106	53.5
35-39	20,957	99,273	80,893	108	50.8
40-44	18,399	91,467	72,598	111	47.7
45-49	13,369	66,477	51,805	108	44.4
50-54	12,403	56,611	42,891	107	41.2
55-59	6,812	30,648	22,969	99	38.5
60-64	7,618	31,470	22,172	108	36.0
65-69	3,692	14,996	10,510	96	34.0
1970 census					
15-19	46,619	8,911	8,371	58.8	69.4
20-24	36,614	50,801	47,218	53.4	67.9
25-29	29,806	85,444	78,318	55.5	66.0
30-34	24,830	100,832	91,470	56.6	63.8
35-39	23,421	116,918	103,392	65.6	61.1
40-44	19,652	101,352	88,066	68.0	58.1
45-49	16,119	83,998	70,974	73.0	54.8
50-54	14,860	70,131	58,347	71.0	51.8
55-59	9,329	42,910	35,625	63.6	49.1
60-64	9,122	37,384	29,929	67.3	46.7

Sources: 1960 census: Sarawak: Report on the Census of Population Taken on 15 June 1960, Table 16, p. 233, Women by addition of numbers of single and ever-married women. 1970 census: unpublished tabulations, Department of Statistics, Kuala Lumpur, Malaysia.

CEB—children ever born.

CS—children surviving.

from the two censuses and from vital registration are radically inconsistent. The 1960 census estimates show infant mortality approximately constant at slightly over 100 per thousand through the late 1950s. The 1970 census estimates show slightly declining mortality, but with a level during the 1950s of less than 70 per thousand, some 30 percent below the level indicated by the 1960 census. Both series of estimates turn up sharply just before

the census date, behavior that may be safely attributed to the bias introduced by differential infant mortality by age of mother. The vital registration figures are much lower than the 1970 census estimates during the 1960s and between the 1960 and 1970 census estimates before 1958. They decline sharply over the period as a whole.

Either infant mortality was constant during these decades, or it was changing. Suppose that we

knew that it was constant. What level would we infer from the data in Figure 1?

If the level were that indicated by the 1970 census, the 1960 census must have overstated proportions of deceased children by a factor of nearly two. Since the weakness of child survivorship data is a tendency for deceased children to be underreported, this conclusion is most improbable. We may with confidence rule out the possibility of constant mortality at the level of the 1970 census, a conclusion supported also by the relatively low level that would be so indicated.

If we knew that infant mortality rates were constant, then, we would take the level to be that indicated by the 1960 census, slightly over 100 per thousand. To defend this conclusion, however, we would have to explain both why the estimates from the 1970 census are so much lower and why the vital registration figures are declining if infant mortality was in fact constant. It is possible that the 1970 census did a poorer job than the 1960 census of securing information on deceased children. The census operations were carried out by different authorities, and therefore the default supposition that they were conducted similarly, and so should give similar results, does not apply. Nonetheless, in the absence of any particular reason to suppose a poorer census in 1970, we would be inclined to reject this conclusion. Although the decline in the registration values might be due to an increase in birth registration completeness or to a decline in the completeness of registration of infant deaths, the magnitudes necessary to achieve the result would be

most implausible.

Since the supposition that infant mortality was constant leads to unsatisfactory conclusions, we explore the alternative, that mortality was changing. The vital registration series in Figure 1 shows year-to-year fluctuations that are probably real, as we do not expect registration completeness to vary erratically from one year to the next. These fluctuations cannot appear in the child survivorship estimates, however, because they are absent in the child survivorship data, which average survivorship over many cohorts.

To see this, consider the fundamental tautology

$$Q = \int c(x)q(x)dx \quad (1)$$

where Q is the proportion of some group of children born before time t who are surviving at time t , $c(x)$ is the distribution of these children by time of birth, measured backward from time t , and $q(x)$ is the proportion of children born at time $t-x$ who die before time t . The shape of the function $c(x)$ for the children ever born to various age groups of women is shown in Brass et al. (1968: 110). Year-to-year fluctuations in mortality cannot be reflected in Q because the various cohorts represented, with the exception of those born just prior to time t , will all experience both years of high mortality and years of low mortality.

Information on these fluctuations is thus lost at the level of the data, independently of any particular estimation procedure. Although we can estimate trends, up or down, the estimated trends are necessarily smoothings of the underlying annual series if this series contains year-

to-year fluctuations.

Both the vital registration series and the between-census comparison of the child survivorship estimates indicate a long-term decline in mortality. If this is in fact what happened, how do we explain the various discrepancies in the picture?

Suppose that the 1970 reports of child survivorship for women in the younger age groups are accurate, but that reports for the older age groups deteriorate progressively, with women in the oldest age groups failing to report close to half of their deceased children. This is qualitatively plausible, though the magnitude of the effect is severe. The corresponding correction of the 1970 estimates would rotate the plot upward from the right end of the series, bringing the estimates for the older age groups at the 1970 census into approximate correspondence with the estimates from the younger age groups at the 1960 census.

These corrected child survivorship estimates would lie well above the vital statistics values, but this could be explained by underregistration of infant deaths, relative to births, which we expect in any case. The vital registration values and the child survivorship estimates would indicate similar rates of decline in this case, a consistency that lends support to the interpretation.

If we were to conclude the analysis at this point, we would have reasonably sound indications for the following conclusions. (1) Infant mortality rates in Sarawak were declining during the 1950s and 1960s. (2) The level of mortality was 50-60 per thousand in the late 1960s and 100-110 per thousand in

the late 1950s, indicating a rapid decline of about five deaths per thousand per year. (3) Deceased children were progressively under-reported with increasing age of mothers in the 1970 census, nearly half of all deceased children being unreported by the oldest women. (4) Infant mortality rates based on vital registration are low by something like 50 percent, indicating this order of incompleteness of infant deaths relative to births.

It is difficult to say just how much confidence would attach to these results, and of course different degrees are appropriate to different conclusions. We would probably be fairly confident that infant mortality rates were in fact declining, that reporting of deceased children deteriorates with mothers' age, and that rates based on vital statistics are too low owing to underregistration. We would have less confidence in magnitudes. Nothing in our analysis thus far rules out the possibility that the child survivorship estimates for the younger age groups are too low, for example. Certainly we would not expect any magnitude to be accurate to better than plus or minus 10 percent, so that an infant mortality estimate of 55 per thousand means anywhere between 50 and 60 deaths per thousand. Greater precision may not be attainable with these data, and it certainly is not attainable without further analysis.

The modesty of these results should not be allowed to obscure how much progress we have made with a particularly intractable set of data. Indeed, the point of departure, the data plotted in Figure 1, reflects several fundamental results

and decisions that have allowed us to go much further than we otherwise could have.

The first requisite is the ability to date the child survivorship estimates obtained from each age group of mothers. Without the ability to date, we lose the time dimension in Figure 1 and the possibility of comparing the child survivorship estimates either with themselves or with the vital statistics series. The problem of dating was taken up by Brass (1975: 57-59), but it was solved effectively only with work by Palloni (1977, 1979, 1980, 1981); Preston and Palloni (1978); Palloni and Heligman (1986); and myself (Feeney 1975a, 1976b, 1977, 1980, 1982), pursuing lines similar in intent though different in detail. Brass and Bamgboye (1981) have subsequently given an elegant new solution (see also Brass 1985).

We must also use the data for each age group to estimate a common statistic, for only in this way are comparisons possible. Equation (1) shows that to derive life table mortality statistics from child survivorship data we must first be able to estimate the time distribution of children ever born $c(x)$. Brass developed both the general procedure for doing this and the original implementation based on his fertility polynomial, results given a useful exposition by Retherford (1979). We may now attempt to solve equation (1) for the life table schedule $q(x)$. To obtain a solution, however, we must assume that $q(x)$ conforms to some known one-parameter model life table family, that is, that

$$q(x) = q_M(x;w) \quad (2)$$

for some w , where $q_M(x;w)$ denotes $1-l_x$ in the model life table family

identified by the parameter value w . Substituting (2) in (1) gives

$$Q = \int c(x)q_M(x;w)dx, \quad (3)$$

which will have a unique solution for w on very weak assumptions about the form of the model schedules.

In solving equation (3) we are solving for the model life table parameter w , which determines a particular model life table and hence any particular statistic in this life table. The widespread use of Brass's multiplier method for the calculation of estimates has obscured this generality. The multiplier method provides a convenient way to solve equation (3), and there is no reason not to avail ourselves of it. In doing so, however, we should not forget that the resulting $q(x)$ values may be translated to estimates of the parameter w and hence to any life table statistic we choose.

The extent to which users of these methods have failed to execute this translation is remarkable, for without it the dating result is of little use. To know $q(1)$ at one time, $q(2)$ at some earlier time, $q(3)$ at some earlier time yet, and so on, tells us nothing about the trend of mortality. In some cases this failure may be due to ignorance, to rote application of the multiplier shortcut without understanding what it accomplishes. In other cases it reflects a misplaced fastidiousness having to do with the robustness of various life table statistics. Brass's $q(x)$ values are probably more robust than any other equally convenient statistics, and their translation to any common standard loses some of this robustness. The con-

(continued on page 76)

Reviews and Publication Notes

Determinants and Consequences of Internal Migration in India: Studies in Bihar, Kerala and Uttar Pradesh by

A. S. Oberai, Pradhan H. Prasad, and M. G. Sardana. Delhi: Oxford University Press, 1989. xii, 156 pp. (cloth), Rs. 150. ISBN 0-19-562516-1. Available from Oxford University Press, Walton Street, Oxford OX2 6DP, United Kingdom.

The central objective of this study, which was prepared for the International Labour Organisation's Labour and Population Team for Asia and the Pacific and the Central Statistical Organisation of the Indian Ministry of Planning with financial support of the United Nations Population Fund, was to make a diagnostic survey in three Indian states for a thorough understanding of the process of migration and its interconnections with the developmental process, as a prerequisite for framing appropriate migration-influencing policies. For that purpose, Bihar, Uttar Pradesh, and Kerala were selected. All three are among India's less developed states, but they differ in their socioeconomic and demographic characteristics.

Surveys were conducted in rural and urban areas in 1984-85, and the findings are presented in this book. The authors considered such socioeconomic factors as education, employment, technology, productivity, remittances and their uses, changes in household income, and housing and other amenities, and systematically explored the interrelations of those factors with migration. On the basis of these interlinks, the authors have drawn important conclusions having policy

relevance.

The book, consisting of 14 chapters and four parts, is well organized. Part one, comprising two chapters, presents the objectives, sample survey design, and theoretical framework of the study. Part two, consisting of three chapters, presents the empirical findings of the rural surveys and deals with the characteristics of out-migrants and return migrants, the effects of remittances on the level and distribution of rural household income, and the interlinks between migration, production, and technological change in agriculture. Part three, containing eight chapters, presents empirical findings of the urban surveys and discusses characteristics of urban in-migrants, their labor force participation, absorption into the urban labor market, earnings, remittances, expenditures, impact upon urban household income, the housing and civic amenities available, and so forth. It also discusses briefly special features of international out-migration to Gulf countries from Kerala. In the last part, the authors summarize their main findings and highlight the policy implications. References and an index follow.

Numerous percentage distribution tables and regression analytic tables are used throughout the book to show the relationships between migration and socioeconomic and demographic characteristics. Methodologically, however, no new or novel analytical models were evolved to assess the causal linkages.

The book contains many interesting findings. In general, the analysis

suggests that out-migration from rural areas is largely a survival strategy. Given the high level of urban unemployment in the three states, the chances are indeed low for the rural migrants to achieve minimal standards of employment and consumption in urban areas. But if such people do not move from the rural areas, their struggle for survival may lead to rural violence and chaos. So, according to the authors, "rural out-migration flow cannot, and indeed, should not, be stopped through direct government intervention" (p. 149).

Their analysis also shows that migration provides some benefits to rural areas, through remittances, which lead to improvement in land and labor productivity, the adoption of modern agricultural technology, and a reduction in rural income inequalities. They also found, however, that the use of remittances is heavily consumption-oriented, and little of this money is available for productive use or land development (p. 150). Their findings also indicate that "the lower the level of rural development in general and of infrastructural development in particular, the smaller the gains from migration" (p. 151).

This book provides valuable reading and research materials for those interested in population and development, and especially for migration and urbanization specialists. Similar intensive studies are urgently needed elsewhere in India.

It is not clear how generalizable the findings are either to other areas of the three states studied or to other states in India. Not includ-

ed in this study are the scores of thousands of poor rural migrants from all parts of Bihar who migrate to Dhanbad (inside Bihar), or the millions of Bihari laborers who migrate from Bihar to Calcutta, to eke out their miserable living on city pavements and in urban slums by performing unskilled work in the urban informal sector for low wages and under cut-throat competition.

Similarly, in Bombay are 5 million migrant slum dwellers (50% of the city's population), of whom 20% are migrants from the Varanasi region of Eastern Uttar Pradesh, who somehow survive in stinking slums by performing low-wage informal activities. In Chattisgarh, thousands of migrants work as bonded laborers, brought there and exploited by labor agents. Under such conditions, how great could be their remittances and what positive effects could those remittances have upon rural technology, productivity, and economic equalities?

These examples are mentioned to indicate that "developmental migration," if occurring in India, is still marginal and not yet widespread, either spatially or socially. Migration from rural areas should not be controlled, as the authors have rightly pointed out; but this is not adequate as a policy. The urgent need for rural development and for ameliorating the conditions of poor migrants in urban centers must be addressed, but it remains unattended when focus is given to developmental aspects of migration.

Moreover, this book examines the consequences of migration in great depth but gives less attention to the real causes of migration. Exploratory investigations are necessary to shed light on such questions as,

why do rural people remain poor in the first place, why are they compelled to migrate, what macro socioeconomic processes impel them to move from rural areas, how does spatial disorganization induce migration, why do urban centers fail to provide migrants with gainful employment or even minimal shelter, and which macrolevel processes maintain rural stagnation, rural inequality, urban involution, and extreme urban inequalities? These factors were overlooked in this study.

—*Shekhar Mukberji*
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and Urban Studies
International Institute
for Population Sciences, Bombay

Population Policies and Programmes: Lessons Learned from Two Decades of Experience edited by Nafis Sadik. New York and London: New York University Press for United Nations Population Fund, 1991. xxiv, 464 pp. ISBN 0-8147-8553-0 (cloth), US \$50.00; ISBN 0-8147-8554-9 (paper), US \$25.00. Available from New York University Press, Washington Square, New York, NY 10003, U.S.A.

It was right and proper for the UNFPA, the change-resistant abbreviation used by the United Nations Population Fund, to undertake a review and summation of its experience in the population field since it was established in 1969. Sources include both published and unpublished UNFPA materials as well as findings from the experience of "other agencies."

The review is concerned with programmatic developments, as opposed to scientific findings, in three

broad areas: policy, including the data and research necessary for making policy and assessing performance; maternal and child health, which these days is understood to embrace family planning (MCH/FP); and information, education, and communication (IE&C). These are familiar, group A items on the UNFPA menu which also includes, under group B, such popular flavors-of-the-month, all suitably abbreviated, as Women in Development (WID), Safe Motherhood (SM), and Non-Governmental Organizations (NGOs).

The present volume concentrates on group A but does not resist an occasional nibble from group B. It is divided into two major sections: Part I, which is concerned with general propositions relating to the three major areas of program activity, and a somewhat repetitive Part II, which seeks to impart a "regional perspective." More on that later.

The intended audience is, first of all, the general reader who might want to slake his thirst for information about developments in the worldwide effort to limit population growth. There will be few of these, in my judgment, whose interest would be strong enough to breast the tide of turgid prose, empty paragraphs, repetition, and inconclusive "conclusions" that are to be found throughout the book. It is, by all the usual signs, a book written by a committee even though there were undoubtedly assigned responsibilities for particular sections. In addition to the editor, Dr. Sadik, there was a "Project Coordinator" and 11 homogenized "Principal Contributors."

Other audiences toward whom this compendium is directed are

“specialists” in one or another program area, government agencies involved with population programs, and international donors. For these groups there is much here that will be useful, particularly the identification of issues that experience has shown to be important and indications of the various ways these issues have been addressed.

However, patience and forbearance are required to make use of this volume. The discussion of some issues is scattered, of varied depth and quality, and at times unnervingly wrong. A 26-page computer-generated, nonedited index is all but useless as a key to subjects one might want to find readily.

In approach the book is descriptive and discursive. While it is often discerning, there is little careful testing of the propositions and assertions presented. The implicit canons of proof are closer to the rule of thumb than to the rules of systematic, scientific evidence. Much of what is encountered is conventional wisdom undergirded with observations to help make the point.

For example, the interesting proposition is advanced that the greater the reliance on “non-supply methods,” i.e., methods, largely traditional ones, obtained from sources other than official program channels, the greater the recourse to abortion. This generalization is plausible enough except that, on examination of the “evidence” cited, it turns out to rest entirely on the experience of five East European countries and is not at all qualified by the fact that Japan, Italy, the United States, and the United Kingdom provide evidence to the contrary.

To take another example, the discussion of strong political commitment, generally assumed to be an important ingredient of effective programs, unfavorably contrasts the Philippines to Indonesia, the implication being that the greater success of the Indonesian program is attributable, to some unspecified extent, to this difference. However, the lesser success of the Philippine program is also due to other differences, such as the inability of the Philippine government to cover the recurring costs of its program, a hiring freeze on program personnel, a shortage of funds for the operation of vehicles, the practice of turning over the family planning budget to executive ministries without specification as to use, and the greater reliance of Philippine women on “non-supply methods.” My point is not that political commitment is not important; it generally is, although there are some who will remember the case of Taiwan. My objection, rather, is to a factitiousness that masquerades as analysis.

The book has a strong central planning bias throughout. This is to be expected since the experience of the 1970s and 1980s was, by and large, with this type of organization. That period, despite all that is happening around us today, retains a strong after-image.

To take a case in point, presumably the lesson to be learned from the “problem” of migration induced by administered, artificially low farm prices, is that planning must become more multisectoral so that “concerned” ministries, in this instance agriculture, become aware of the population effects of their policies. But one might just as well

conclude that the lesson to be learned is that governments should consider other mechanisms, such as the market, for setting farm prices.

In the same vein, the tendency here is to see migration not as an equilibrating aspect of development but, because of some of the problems it inevitably creates, as a process to be prevented—through government intervention, of course. Though it receives passing mention throughout the book, the authors give the private sector considerably less attention than others reviewing the same experience might give to it. Surely one of the lessons of the last 20 years is an awareness, *be-wareness* might be a better term, of the deep, structural incapacity of some Third World governments to design and execute effective policies—and not merely for the social service sector.

There is also about this book a *sui generis* quality that presents the history of the population movement as coincident with, if not a creature of, the advent of the UNFPA. An anthropologist might have fun with this, seeing here an institutional culture in the making: The origin legend—“demography emerged as a field of public policy with the adoption of the [UN-sponsored] World Population Plan of Action” (p. 3, pace Malthus, Marx, Sauvy, Notestein, Berelson, . . .). The claims of a defining, all-powerful mythology—“the (sic) turning point in a process which has changed attitudes and promoted decisive action in every part of the developing world” (p. xi) was 1969, the founding year of the UNFPA. The evocation of great events and holy writ—the Amsterdam Declaration, the Beijing Declaration, the afore-

mentioned World Population Plan of Action. The charismatic leader or prophet—"the importance of Asian countries in the history of population programmes was emphasized (in 1972) by Rafael M. Salas, the first UNFPA Executive Director" (p. 311). The denial of false (read "rival") prophets and creeds—USAID is listed nine times in the index, none of them substantive, IDRC three times, and IPPF 11 times, compared with 64 for the Indian Institute of Management, 60 for Literacy House, 47 for the Egyptian Supreme Council for Youth and Sport, and 44 for Indonesian shadow puppets.

The scholars and centers of learning whose work has brought the field of population to its present level of sophistication and knowledge have a gnomish existence in this account. Unless their work has appeared in a UNFPA publication or been blessed with UNFPA funding, they should expect to be overlooked. It would appear that knowledge in this field has proceeded by the grace of the UNFPA and its minions. There is perhaps only good fun in all of this (it is, in any case, characteristic of institutional presentations to sacrifice individual recognition on the altar of corporate deification); but readers should not expect to find here an objective, fairly credited account of what has transpired in the population field in the last 20 years. Their patience will be rewarded, however, by finding in these pages much useful observation and information.

Finally, the book attempts to refine the general lessons learned by means of the "perspective" of particular regions. This results in a

great deal of repetition, much of which could have been avoided by tougher editing. Beyond that, the so-called regional perspective is not always regional and is now and again challengeable on grounds of balance and validity.

To cite several examples, the section dealing with the "Arab perspective" notes, *inter alia*, that health risks for mothers and children are associated with parity and birth interval, hardly a finding peculiar to that part of the world. The "African perspective" ignores the raging AIDS epidemic, which gives singular importance to the problems of that area, especially those having to do with population control. The Asian section presents information that is clearly wrong or badly out of date. For example, India, contrary to what is stated here, no longer aims to achieve replacement fertility by the year 2000 (p. 313); nor does Nepal (p. 314).

Some statements convey so little information as to be misleading (e.g., "the Indian Government offers additional retirement benefits for families having a limited number of children" [p. 316]—yes, if, and only if, you are a regular government employee). Others are vapid to the point of emptiness (e.g., ". . . the health infrastructure in rural areas, where the great majority of the population lived, remained minimal. To develop this infrastructure, decentralization and co-ordination were later emphasized" [p. 317]). Or this: "Today, all countries in the Asia region have policies aimed at reducing morbidity and mortality rates" (p. 317). Regional perspective? Lessons learned?

The critical tone of this review

should not discourage the truly dedicated professional from acquiring this volume as a useful, if not handy, reference. To repeat, there is much good material in it. It is regrettable, and irritating to the reader, that such a well-considered undertaking should have been so marred in the execution. With some reorganization and determined editing a truly valuable reference, half the size of the present volume and with a useable index, could be produced. Should the UNFPA be tempted in that direction, it might do well to contract the job to one of the faceless scholars whose work provides the underpinning for much of the present volume and who might be less constrained by UNFPA orthodoxy.

—John F. Kantner
Professor Emeritus
Department of Population
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ALSO NOTED

Vanuatu National Population Census, May 1989: Main Report. Port Vila: Statistics Office, 1991. xiv, 157 pp. (paper). Available from Statistics Office, Private Mail Bag 19, Port Vila, Vanuatu.

The 1989 National Population Census was the third official national population census conducted in Vanuatu and the first since independence. This report briefly describes the census methodology, provides a descriptive analysis of the main findings, and presents basic tables. More detailed demographic analysis will be issued in a separate publication. An administrative report and a

report on the population by enumeration area are being prepared.

As of the census date, 16 May 1989, Vanuatu had an enumerated de facto population of 142,944 persons, of whom 139,475 were ni-Vanuatu (indigenous). The ni-Vanuatu crude birth rate was 36-38 births per thousand and the total fertility rate, 5.1 per woman. The indigenous population contained 106 males per 100 females, the proportion of both sexes under age 15 being 44%. The intercensal growth rates per annum were 2.4% (total population) and 2.8% (ni-Vanuatu).

Part I of the report contains nine chapters: Introduction; Background to the 1989 Census; The Administrative Framework; Mapping and Listing Operations; Pre-test, Pilot Test and Post-Enumeration Surveys; The Questionnaire; Publicity and Training; Census Field Operations; and Data Processing. Part II, presenting the census results, is divided into six chapters: Population Size and Distribution; Demographic Characteristics of the Population; Internal Migration; Social Profile of the Population; Education; and Economic Activity and Employment. Summary tables, maps, and graphs accompany the text, and detailed tables follow in an appendix. Another appendix defines concepts used in the report.

The AIDS Epidemic and Its Demographic Consequences. Proceedings of the United Nations/World Health Organization Workshop on Modelling the Demographic Impact of the AIDS Epidemic in Pattern II Countries: Progress to Date and Policies for the Future, New York, 13-15 December 1989. New York and Geneva: United

Nations Department of International Economic and Social Affairs and World Health Organization Global Programme on AIDS, 1991. x, 140 pp. ISBN 92-1-151224-7 (paper), US \$37.50. ST/ESA/SER.A/119, Sales No. E.91.XIII.5. Available from United Nations, Sales Section, 2 United Nations Plaza, New York, NY 10017, U.S.A.

According to the preface, the acquired immunodeficiency syndrome (AIDS) is expected to have "a visible demographic impact," in both the short and longer term, that will affect the size of future population increases, the relative size of various age groups, and family structures, especially in less developed regions (p. iii). Most of the efforts made by social scientists during the past five years to develop computerized mathematical models for projecting the longer-term demographic impact of the AIDS epidemic have been applied to what the World Health Organization (WHO) calls pattern II countries, those in which transmission of the disease is primarily heterosexual or perinatal. The results have varied widely, depending upon the models used.

One reason for the discrepant results is that, lacking solid data about the transmission of the disease, modelers have assumed quite different values for the parameters driving their models. "Such data as are available . . . come primarily from select populations in more developed countries. Their applicability to other populations is not known" (p. 1). Attempting to model AIDS transmission in countries of sub-Saharan Africa is made even more difficult by the poor quality of demographic data in much of the region.

WHO's Global Programme on

AIDS and the UN Secretariat's Department of International Economic and Social Affairs organized the December 1989 Workshop on Modelling the Demographic Impact of the AIDS Epidemic in Pattern II Countries in an effort "to compare, understand and classify those factors that account for differences in the results produced by various bio-behavioural models" (p. 2). The goal was to develop a consensus about how best to model the demographic effects of the AIDS epidemic and to promote a dialog between the demographic modelers and public health professionals "to ensure that models would provide the information necessary for health-policy formulation and implementation" (p. 1).

To prevent comparisons among the various models from being affected by different population assumptions, the modelers were asked to use a standard set of input values for a hypothetical population to project demographic and epidemiological outcomes over a 25-year period. Of the eight models represented at the workshop, seven were bio-behavioral and the eighth (the WHO approach) was an extrapolation model. The bio-behavioral models were those developed by R. M. Anderson, Bertram Auvart, Nicolas Brouard, Rodolfo A. Bulatao, Klaus Dietz, Alberto Pallo-ni, and the U.S. Interagency Working Group.

The book's introduction states: "If the exercise had been perfectly designed and if all modellers had adhered strictly to the standard input values, it would have been possible to assign differences in model outcomes to the formulations of the models themselves. As is shown

later in this volume, the exercise succeeded but raised other thorny issues that deserve in-depth investigation" (p.2).

Part One, containing six chapters, describes and discusses the standard input values used in the models, reviews the approaches to modeling the AIDS epidemic, presents the results of the exercise and policy-makers' views of the models' uses, and concludes with technical guidelines for modeling the demographic impact of AIDS. Part Two devotes a chapter to each of the eight modeling approaches. The text is supplemented with 35 tables and 53 figures.

Indochinese Refugees 15 Years Later. Special issue of *Southeast Asian Journal of Social Science*, Vol. 18, No. 1 (September 1990), special issue editor Chan Kwok Bun. 232 pp., S \$30, US \$18. Available from Chopmen Publishers, 865 Mountbatten Road #05-28, Katong Shopping Centre, Singapore 1543.

As described in the publisher's abstract, this special issue, consisting of 11 original essays, attempts to reconstruct and articulate the experience of the Indochinese refugees as it unfolds in various forms in Asia, Australia, and Canada 15 years after Vietnam.

An introductory essay by Chan Kwok Bun poses questions of refugees' motives for flight and of policy responses of various first-asylum countries in Asia and their impact on the everyday life of refugees in camps. It also poses the larger question of the relations between social structure and personal freedom. The second essay, by Graeme Hugo and Chan Kwok Bun, attempts to typologize refugees and forced

migrations, thus raising theoretical, ethical, and practical issues.

Five subsequent essays, by Caroline Lavoie and Raymond Knock, S. Chantavanich and P. Rabe, Mary Yuen, Linda Hitchcox, and Chan Kwok Bun, are country reports that analyze the policy responses of Canada, Hong Kong, Thailand, and Singapore toward the Indochinese refugees and the consequences of those policies.

Two additional essays, by Richard F. Mollica and John Chr. Knudsen, report on conditions of life in refugee camps in Hong Kong, the Philippines, Japan, and Thailand, and the camp residents' responses and coping strategies. The issue concludes with two essays, by Thomas Haven and Graeme Hugo, on patterns of adaptation by Indochinese refugees while resettling in Japan and Australia.

Taken as a whole, the issue raises two sets of questions. The first concerns how state policies of first-asylum countries and the ecological environment and social organization of refugee camps shape the destiny of refugees. The second focuses on how individuals and groups cope with the stressful conditions of camp life. Finally, this collection of essays attempts to stimulate discussion of the social structure surrounding Indochinese refugees, including such evolving concepts as humane deterrence and restrictionism, which seem to threaten to replace the concepts of humanitarianism and compassion.

The Indian Population Problem: A Household Economics Approach by Bahnisikha Ghosh. New Delhi, Newbury Park, and London: Sage Publications, 1990. 180 pp.. ISBN 81-7036-181-8 (In-

dia), 0-8039-9640-3 (U.S.). Available from Sage Publications India Pvt Ltd, 32 M-Block Market, Greater Kailash I, New Delhi 110 048, India; Sage Publications Inc., 2111 West Hillcrest Drive, Newbury Park, CA 91320, U.S.A.; Sage Publications Ltd, 28 Banner Street, London EC1Y 8QE, U.K.

According to the introduction, the objective of this study is to explore the changing relationships among economic and demographic forces that affect fertility in India, and to focus attention on the inherent conflicts and complementarities that exist within those forces. The primary task is to identify the determinants of demand for children, particularly those determinants that would submit to policy interventions. An attempt is also made to assess how far policies for economic development and technological progress have been consistent with and supportive of those formulated to control population growth. Finally, the study suggests guidelines for formulating policies for sustained economic development commensurate with the goals of population growth.

Using standard statistical and economic analytical techniques, the study relies upon data of various levels of aggregation ranging from the Indian census, national sample surveys, and Sample Registration Scheme to village studies and household surveys.

After reviewing the relevant literature (Chapter 2) and tracing the growth of India's population since the beginning of the 20th century (Chapter 3), Ghosh examines Indian women's labor force participation (Chapters 4 and 5). To supplement the cross-sectional evidence in the

(continued on page 88)

Activities and Announcements

U.S. Census Bureau Begins Releasing City and County Data, Printed State Reports, and Population Counts for Guam from the 1990 Census

In mid-September 1991 the U.S. Bureau of the Census began releasing Summary Tape File 1B, containing computer tapes of detailed city and county data from the 1990 Census of Population and Housing. It also released the first series of printed state reports from the 1990 census and the official 1990 census population counts for Guam.

Like Summary Tape File 1A, released earlier in 1991, Tape File 1B provides population and housing information for cities and counties but does so on a block-by-block basis. Included in the file are population statistics on age, race, sex, household relationship, marital status, and Hispanic origin and housing statistics on number of units in structure, number of rooms in unit, tenure (owner-occupied versus renter-occupied), value of home or monthly rent paid, and characteristics of vacant housing units.

Computer files for Arizona, Delaware, Hawaii, Idaho, Montana, Nevada, Vermont, and Wyoming were the first to be released. The remaining files were scheduled to be released on a state-by-state basis during the next few weeks following the bureau's September 12 announcement.

The printed state reports are known as *Summary Population and Housing Characteristics*, or Series CPH-1. Each report provides

total population and housing unit counts. Summary population statistics on age, sex, race, Hispanic origin, and household relationship and housing statistics on units in structure, value and rent, number of rooms, tenure, and characteristics of vacant housing units for counties, incorporated places, county subdivisions such as towns and townships, and American Indian and Alaska Native areas are also included. These data were earlier released on summary computer tapes.

Reports for Washington, D.C., and 15 states—Arkansas, Colorado, Connecticut, Delaware, Idaho, Kentucky, Missouri, Nevada, New Hampshire, North Carolina, Oregon, Rhode Island, Utah, Vermont, and Wyoming—were the first released. Reports on the remaining states were due to be released during the next few weeks.

The census recorded a population of 133,152 for Guam in 1990, up by 27,173, or 26%, since 1980. Detailed data for the territory will be released late in 1991 and in 1992.

Persons interested in purchasing Summary Tape File 1B or printed state reports contained in Series CPH-1 should contact the Data User Services Division, Customer Services Office, Census Bureau, Washington, D.C. 20233 (telephone 301 763-4100).

Twenty-Third Summer Seminar on Population Planned for 1992

The East-West Population Institute is inviting applications to the Twenty-Third Summer Seminar on

Population, to be held in Honolulu and the Republic of Korea from 1 June to 3 July 1992. An annual event since 1970, the Summer Seminar provides an opportunity for professionals in population-related fields to share and expand their knowledge of population and its relation to social and economic change.

The 1992 program begins at the East-West Center with four weeks of intensive workshops, each focusing on a current research topic. Afterward seminar participants will travel to the Republic of Korea for a fifth week of lectures, discussions, and field trips cosponsored by the Korean Women's Development Institute and the Korea Institute for Health and Social Affairs.

Four workshops are planned that will focus, respectively, on analysis of data on contraceptive use and choice, Asian historical demography, comparative studies of the demographic transition in Asia and the Pacific, and family change and aging. Ten to 15 participants will be selected for each workshop.

Analysis of Data on Contraceptive Use and Choice

This workshop will introduce participants to a wide range of techniques for analyzing data on contraceptive use and choice, including logistic regression, multinomial logistic regression, multi-level models, survival analysis, and the analysis of use effectiveness. Participants are expected to design and conduct a research project using one of the methods presented in the workshop. Government per-

sonnel and researchers responsible for evaluation of family planning programs or the analysis of contraceptive use data are encouraged to apply. Coordinators: Ian Diamond, Senior Lecturer in Demography, Southampton University, and Minja Kim Choe, Research Associate and Assistant Director for Professional Education, East-West Population Institute.

Asian Historical Demography

This workshop will bring together researchers experienced in Asian historical demography with others interested in carrying out such studies. By bringing the two groups together, the workshop will provide a critical forum for participants with research results already in hand and offer a venue for presenting and revising research ideas in advance of carrying them out; demographic methods relevant to historical demography will also be demonstrated. Participants will conduct their own projects during the course of the workshop. Coordinators: Peter Xenos, Research Associate, East-West Population Institute, and Tim Dyson, Reader in Population Studies, London School of Economics.

Comparative Studies of the Demographic Transition in the Asia and Pacific Region

The aim of this workshop is to identify and begin to conduct comparative studies of demographic change with a view toward gaining a better understanding of the social, economic, and cultural influences on demographic change in various settings. The workshop will consist of both lectures reviewing demographic transition theories and comparing methodologies used to

measure fertility and mortality decline, and presentations by participants. Each participant will present an empirical paper on the demographic transition in one country. Coordinators: Griffith Feeney and Wang Feng, Research Associates, East-West Population Institute.

Family Change and Aging

This workshop will explore the theoretical literature on life-course, intergenerational relations, and family change from a cross-cultural perspective, focusing on the roles and status of the elderly. Methodological issues, including appropriate types of data collection and analysis, will be addressed. Individuals with active or planned projects that relate to aging issues are especially encouraged to apply. Coordinators: Karen Oppenheim Mason, Research Associate, East-West Population Institute, and Thomas E. Fricke, Assistant Research Scientist, Institute for Social Research, University of Michigan.

Eligibility, Costs, and Application Procedures

Applicants should be university graduates proficient in the English language and have some training in the population field. Preference will be given to persons holding appointments at universities or other research or government organizations involved in population research or planning, and to doctoral candidates whose dissertation research is related to one of the workshop topics.

The cost of the seminar, excluding airfare, is US \$2,560. This amount covers tuition, a mandatory activity fee, dormitory housing, and

a living allowance of \$30 per day in Honolulu and a reduced amount in the Republic of Korea. A limited number of full and partial scholarships are available for applicants who are citizens or permanent residents of Asian and Pacific countries or the United States. Full awards cover round-trip airfare. Because such support is limited, all applicants are encouraged to seek funding from their home organizations or from outside funding agencies.

Detailed information about the seminar and application forms are available from:

Twenty-Third Summer Seminar
on Population
East-West Population Institute
East-West Center
1777 East-West Road
Honolulu, Hawaii 96848, U.S.A.

Telephone: (808) 944-7444
Fax: (808) 944-7490
Cable: EASWESCEN HI VIA WUW
Telex: (230) 989171 EWC UD
EASYLINK: 61932956
BITNET: PI@EWC

In addition to completing an application form, applicants must submit a detailed outline of their previous work on the workshop topic of their choice and of the paper or presentation they would give during the workshop, if one is required. Citizens and permanent residents of Bangladesh, Burma, India, Singapore, Tonga, and Western Samoa may not apply directly to the East-West Population Institute but must apply through their respective East-West Center country representatives.

The deadline for applications to be received at the East-West Population Institute is 14 February 1992.

Third International Population Conference to Be Held in 1994

The United Nations has announced plans for a third international population conference, to take place in 1994 at a still-undetermined site. Two earlier UN-sponsored conferences were held in Bucharest in 1974 and in Mexico City in 1984. The 1994 conference will focus on the relationship between population, family planning, development, and such related issues as the status of women, aging, and migration.

Dr. Nafis Sadik, executive director of the United Nations Population Fund and the 1994 conference's secretary general, has stated that the conference will face greater urgency because of complications arising from the continued rapid rise in population and its uneven distribution, particularly in the Third World. Today's global population of 5.4 billion is expected to reach 8.2 billion by the year 2025 and to continue rising for another century unless fertility is reduced substantially. The 1994 conference will provide an opportunity to set the agenda for effective action in the population field for the 21st century.

In preparation for the conference,

government population experts will hold regional meetings, the first of which will be held in Jakarta, Indonesia, from 28 August to 4 September 1992. (*International Dateline*, September 1991.)

Javid Akram Appointed Chief Census Commissioner of Pakistan

Mr. Javid Akram, former additional secretary to the Government of Pakistan, assumed the post of chief census commissioner for the Population Census Organization, Statistics Division, in June 1991. He replaced Mr. Muhammad Afzal Kahut, who left the Census Organization to become additional secretary to the government's Cabinet Division. Prior to assuming his new position, Mr. Akram was joint secretary to the Government of Pakistan in the Economic Affairs Division, Islamabad. He belongs to the District Management Group and has wide experience in government service, having served as joint secretary of Commerce, of the Prime Minister's Secretariat, and of the Interior Division. He was also deputy commissioner in the Provincial Government.

In his current position Mr. Akram

is responsible for policy, planning, publicity, coordination, and administration of the Population and Housing Census Operation throughout Pakistan.

Mr. Muhammad Aslam Chaudhry, who represented Pakistan at the Twelfth Population Census Conference held in Honolulu in 1988, continues in his post as joint census commissioner.

Mexican Census Organization Names María de los Angeles Valdes as Director of Demographic and Social Statistics

Lic. María de los Angeles Valdes Tamez has been appointed to the post of demographic and social statistics director by the National Institute of Statistics, Geography, and Science, Mexico's census organization. She succeeds Lic. María Elena Figueroa, former director of censal communication, as the census organization's liaison with the East-West Population Institute. Ms. Figueroa, who attended the Thirteenth Population Census Conference in Honolulu last December, left her post in August to pursue graduate studies at Johns Hopkins University.

Age and Birth Date Reporting . . .

(continued from page 50)

pattern: the tendency to state ages in decreasing detail as a child becomes older and the tendency to state ages as one year older than the actual completed age when ages are expressed in whole years (i.e., when some fraction of a year such

as months or weeks of age is not specified).

Table 3 shows the percentage of children under age 10 whose mothers stated the children's ages in terms of whole years when reporting their own birth histories. The

results are shown by single years of calculated age and indicate that children's ages are rarely stated in whole years for infants (that is, children under one year of age) and in fewer than half the cases for children of completed age 1. The ten-

Table 3. Percentage of children reported in the birth histories whose ages were stated in whole years, by age as calculated from year and month of birth

Calculated age (in completed years)	Number of cases	
	%	
0	4	665
1	48	737
2	74	679
3	79	668
4	91	693
5-9	98	3,547

Note: Results in this table are unweighted.

dency to state ages in whole years, however, increases rapidly with the age of the child so that the age of a five-year-old is rarely stated in more detail than whole years.

Table 4, which is based on a special subsample of children coded especially for the present analysis of age and birth date reporting, indicates in greater detail the way infants' ages are reported. It shows that mothers typically state ages of infants who are less than a few months old in terms of days or weeks and the ages of older infants in terms of months. Not until a child is only a month or two from its first birthday does an appreciable proportion of mothers refer to the age of their infants in terms of whole years.

Whenever a child's age is stated in terms that include units of less than a year, the stated age is likely to correspond to the calculated completed age in years. This is true not just for infants but for older children as well. (For example, a child reported to be two years and

Table 4. Percentage distribution of smallest units used to report children's ages in the birth histories, by age as calculated from the month and year of birth, for children under age 1

Calculated age (in months)	Smallest unit used to report age (%)					Number of cases
	Days	Weeks	Months ^a	Years	Total	
0	73	27	0	0	100	11
1	28	22	5	0	100	18
2	17	8	75	0	100	24
3	17	0	83	0	100	12
4	9	14	77	0	100	22
5	6	6	88	0	100	16
6-8	2	0	98	0	100	54
9-11	0	0	85	15	100	61

Note: Results in this table are unweighted and are based on a specially coded subsample of children reported in the birth histories and living in the sample households.

a. Includes ages reported in half years.

When a child's age is stated in days and months, the stated age is likely to correspond to the age calculated from the birth date, whereas when age is stated in whole years, there is a substantial chance that the stated age will differ from the calculated age by a full year or more.

three months old is likely to have truly completed two years of age.) But when age is stated in units of whole years, there is a substantial chance that the stated age will be off by a full year or more. The practice of reporting ages of young children in units of less than whole years therefore reduces substantially the chance that an infant under age 1 will be "transferred" to age 1 as a result of age misreporting.

Likewise the misreporting of whole years of age for young children who have completed their first

year of life is moderated by the fact that some of these children's stated ages include units smaller than a year. The effect of this practice, however, declines rapidly with increasing age of the children.

To understand the implications of this practice for accounting for the observed differences between the number of young children at a particular stated age and the number at the equivalent calculated age, it is important to know that at any stated age, children recorded in the TDHS tended to be made up primarily of two groups: those whose calculated age was the same as their stated age and those whose calculated age was one year less than their stated age. Thus the cohort of children at stated age S_x can be viewed as gaining some children from the previous calculated age C_{x-1} but losing some children from the equivalent calculated age C_x to the next stated age S_{x+1} . In the early ages, the proportion of children at age S_x that is gained from age C_{x-1} tends to be lower than the

proportion of children that is lost from age C_x to age S_{x+1} . This is because a higher proportion of children at age C_{x-1} will have their ages stated in a way that involves units of age smaller than a year than will be the case with children at age C_x .⁵ The calculated age is unaffected by the type of age units used to state the child's age because it is based only on the month and year of birth relative to the time of the interview.

In addition to the practices already discussed, a sharp fertility decline sufficient to result in smaller birth cohorts each year will also contribute to the deficit of young children at a particular stated age relative to the equivalent calculated age. This is so because declines in successive single-year cohort sizes will decrease the gains to stated age S_x from children at calculated age C_{x-1} relative to the

loss from age C_x to S_{x+1} , thereby reducing the numbers (and proportions) at the stated age relative to the number at the equivalent calculated age.

Individual-level differences between reported and calculated ages

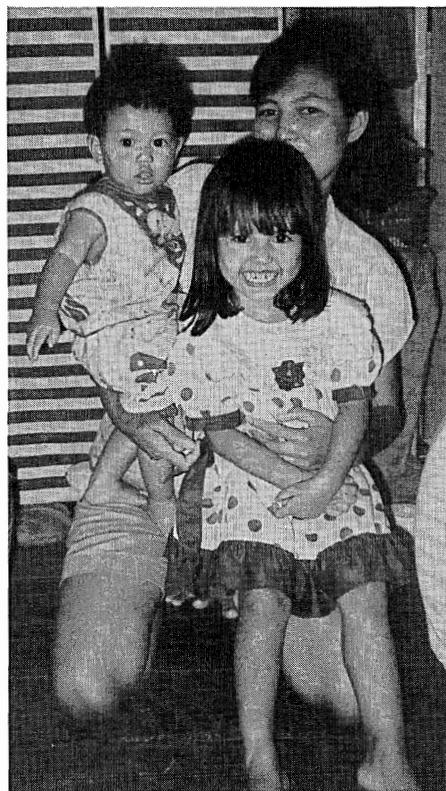
The foregoing analysis of age distributions has examined differences between the aggregated distributions of proportions of persons according to stated and calculated age.

The TDHS data also enable direct comparisons to be made between stated and calculated ages for both individual respondents and their living children (the two categories of persons for whom information on birth dates was recorded). By assuming that the calculated age in most cases represents the true completed age, one can use such comparisons to assess directly the patterns of age misreporting at the individual level.

Women. As indicated in Table 5, considerably fewer than half (37% unweighted) of the women stated an age that was identical to their completed age as calculated from their reported year and month of birth. A larger proportion (43% unweighted) stated their age to be one year older than their completed age at last birthday. Only small proportions reported their age to be one year younger or to differ by more than one year in either direction.

Probably the most important factor underlying this pattern is a tendency for Thais to determine their age by subtracting their birth year from the current year without concern for whether the month (and day) of birth has been passed in the current year. This is equivalent to augmenting one's age when the calendar year changes on New Year's Day. Thais refer to this practice as "counting the whole year" (*nap thang pi*) when figuring their age, meaning that they consider their age to be a function of the current calendar year as a whole. In addition, some Thais consciously think of their current age as the age they will have achieved at their next birthday. This would also lead to stated ages that are one year

5. This can be illustrated by the following example. Assume (1) there are 100 children each at calculated ages 1, 2, and 3; (2) the number of children at each of these ages for whom age is stated in terms that involve units of age less than whole years is 50, 30, and 20, respectively; (3) for all the children whose age is stated in terms that involve units of less than whole years, stated age is correct in terms of completed years or can be easily converted into the correct completed age (e.g., 18 months would be converted to one year in completed age); and (4) for half of the children whose ages are stated in terms of whole years, the stated age is the same as the calculated completed age, but for the remainder it is stated as one year older. Under these circumstances, stated age 2 would gain 25 children from calculated age 1 but lose 35 children from calculated age 2 to stated age 3, whereas stated age 3 would gain 35 children from calculated age 2 and lose 40 children of calculated age 3 to stated age 4. Thus the number of children whose stated age is 2 would be 90 and the number of children whose stated age is 3 would be 95, in both cases less than the number at the equivalent calculated age.



JOHN KNODEL

The Thailand Demographic and Health Survey found greater precision in age reporting for younger children than for older ones. The mother of these two girls reported their ages as "10 months" and "more than three years."

Table 5. Percentage distribution of ever-married women 15-49 years old by differences between age as calculated from birth year and month and age as stated in responses to the women's questionnaire, by timing of the interview relative to birth month and by type of birth year and month

Timing of interview/ type of birth year and month	Difference between stated and calculated age (%)					Total	Number of cases
	Calculated greater by		Both equal	Stated greater by			
	2+ years	1 year		1 year	2+ years		
Total	3	8	37	43	9	100	6,006
Timing of interview relative to birth month							
3+ months later	4	8	52	29	7	100	692
2 months later	4	11	46	33	7	100	569
1 month later	4	17	51	23	5	100	564
Same month	5	19	57	15	4	100	563
1 month earlier	2	4	24	58	13	100	551
2 months earlier	3	2	23	60	12	100	472
3+ months earlier	2	5	29	54	10	100	2,595
Type of birth year and month							
Animal year, lunar month	4	8	33	43	12	100	1,883
Animal year, Western month	3	8	33	46	10	100	1,026
B.E. year, lunar month	5	9	38	39	9	100	203
B.E. year, Western month	3	8	41	43	6	100	2,894

Note: Results in this table are unweighted and are restricted to women who reported both a birth year and a birth month.

greater than actual completed ages.⁶

The importance of the tendency to equate one's age with the difference between the current year and the birth year without reference to when during the year one was

6. The questions on age in the TDHS questionnaire did not explicitly ask for completed age but simply asked about age. However, interviewers were instructed that completed age was being sought and this might have reduced the extent to which the practice of reporting "going-to-be" ages are recorded in the TDHS data set. For example, if a respondent reported her age as "going-to-be" 28, the interviewer may have simply recorded the age as 27, knowing that completed age was being sought, despite instructions to record the age exactly as stated. Few ages recorded in the TDHS are explicitly preceded by the qualifier "going-to-be." Our analysis indicates that a substantial proportion of women appear to consider their age at next birthday as their current age, and this practice suggests that they do not necessarily mention the qualifier when stating their age.

born, can be assessed by examining the relationship between the pattern of age misreporting and the timing of the interview relative to the respondent's birth month. For respondents who follow this practice, stated age will be the same as actual completed age if they are interviewed after their birth month has already passed but will report their age to be one year older than their completed age if they are interviewed prior to their birth month. Cases in which the month of birth and the month of interview are the same should follow a pattern similar to that of cases in which the interview took place after the birth month because in calculating the age on the basis of the birth year and month in the TDHS data set, we took no account of the

day of birth within the month (in effect assuming the birth day had already passed).

The results presented in Table 5 indicate that indeed respondents were far more likely to state their age as one year older than their completed age if the interview took place before their birth month than if it occurred later than or during their month of birth. Thus the practice of determining age by simply comparing the current year with the year of birth without regard to the month or year of birth appears to be common. This is equivalent to adding one year to the current age with the change of the calendar year rather than at the passing of a birthday, although it is not necessarily done consciously as in the Chinese or Korean cultures.

Probably the most important factor underlying the sizable proportion of TDHS respondents who stated their age as one year older than their completed age at last birthday is a tendency for Thais to derive their age by subtracting their birth year from the current year without regard for the day and month of their birth. In addition, some Thais think of their age as the age they will have achieved at their next birthday.

If the tendency to state one's age as one year greater than the actual completed age were due only to the practice of stating one's age as the "going-to-be" age, stated ages should still increase at the passage of the birthday and thus exceed the actual completed age by one year regardless of the timing of the interview relative to the birth month. In contrast to the observed pattern, there would be little association between the proportion of respondents whose stated age was one year in excess of their calculated age and whether or not the interview took place before the respondent's birth month. Nevertheless, even among those respondents who had passed their birth month and whose stated age differed from their calculated age, the most common tendency was to state their age as one year older than their actual completed age. This suggests that thinking of one's age as the "going-to-be" age probably exerts some influence on age misreporting as well.

It is also noteworthy that even when the interview preceded the

month of birth, approximately one-fourth of respondents stated their age correctly in terms of completed years (i.e., their stated and calculated ages are equal). This suggests that a substantial minority of respondents did take the time of year when they were born into account when determining their own age rather than simply basing their age on the difference between the current year and the year of birth. The results thus suggest that the overall pattern of age reporting is the outcome of at least several coexisting practices for determining one's age in Thailand.

The finding that the most common practice appears to be to equate one's age with the difference between the current calendar year and the birth year regardless of the birth month implies that the extent to which stated ages will be equal to completed age in any cross-sectional survey will depend upon the time of year in which the fieldwork takes place. Had the TDHS taken place toward the end of the calendar year, a considerably higher percentage of stated ages presumably would have agreed with calculated ages. Any assessment of the extent of age misreporting in Thailand will depend, therefore, upon the time of year when the data are collected. One should bear this point in mind when considering the results presented in the remainder of this section.

To calculate a respondent's age on the basis of the year and month of birth as provided in the TDHS, it was necessary to convert animal years (which are repeated in 12-year cycles) and lunar months into the modern system of B.E. years and Western months. As we have noted,

the conversion of lunar months into Western months involved some minor imprecision, leading in some cases to an error of one month in either direction. The conversion of animal years into B.E. (or A.D.) years involves a somewhat more serious problem because there is no clear popular consensus as to when the new animal year begins. Opinions differ mainly as to whether the animal year coincides with the B.E. year and thus starts in January or whether it begins around April, coinciding either with an earlier traditional date determined by the lunar calendar or with the Songkran festival, which is typically thought of as a celebration of the Thai New Year (see Appendix). Yet another possible complication is that the Chinese New Year, which typically falls between late January and the middle of February and follows essentially the same 12-year cycle as Thai animal years, is widely publicized and celebrated as an unofficial holiday in Thailand.

Whether the animal year should be considered to begin in January or April has implications for converting animal years into B.E. years and thus can affect the calculation of a person's age based on the year and month of birth. For example, in the case of a person who was born between January and March and whose birth year is stated in terms of the animal cycle, the corresponding B.E. year of birth would be one year later (and hence the person's age would be one year younger) if the animal year starts in April than if it starts in January.⁷ In contrast, for persons whose birth month is after this period there is no ambiguity as to which B.E. year it refers (provided the right 12-year



PHOTO COURTESY OF THE BANGKOK POST

For some Thais, the Songkran Festival in April marks the start of the new animal year. Other Thais equate the animal year with the modern-style Buddhist Era year starting on January 1. The ram on the float signifies the new animal year at this 1991 Songkran parade.

cycle can be identified).

It is likely that TDHS respondents used various assumptions about the beginning of the animal year if they reported their year of birth in animal years and their birth month occurred early in the B.E. year. However, there is no way to know from the simple statement of the

7. For example, if a respondent said she was approximately 30 at the time of the survey (April through June 1987) and reported that she had been born during the third lunar month (approximately February) of the monkey year (*pi wok*), the A.D. birth year for this person would be 1956 if the animal year is considered to have started in January (and hence ran from January 1956 to December 1956) but would be 1957 if the animal year started in April (and hence ran from April 1956 to March 1957). Thus her calculated completed age would be 31 at the time of the survey if the animal year started in January but 30 if the animal year started in April.

animal year which system they used. For the purpose of converting animal years to B.E. years during the initial processing of the TDHS, we assumed the animal year to begin in April. This assumption undoubtedly introduced some error into the calculated ages of respondents and their children whose birth year was reported in animal-year terms.

The distribution of differences between stated and calculated ages for respondents is also shown in Table 5 according to the type of birth date reported. Women who reported both their birth year and birth month in modern terms were most likely to have agreement between their stated age and their calculated age and were least likely to have a discrepancy between the two ages

of two or more years. Nevertheless, even among this group, the most common pattern was to state one's age as one year older than the calculated age. Indeed, only modest differences are seen in Table 5 between the type of birth date reported and the percentage of respondents whose stated age was reported as one year older than the calculated age.

Table 6 examines the pattern of differences between calculated and stated age according to various background characteristics of respondents. The most common error among women whose stated age was different from their calculated completed age was to state their age as one year older. This is true of all age groups, although the tendency appears to be especially pronounced among the youngest women. Likewise, it is true regardless of rural-urban residence category, ethnicity, or education.

The most common error among women whose stated age was different from their calculated age was to state their age as one year older. This tendency is especially pronounced among young women but obtains regardless of rural-urban residence, ethnicity, or education.

Some differences are apparent in Table 6 with respect to the extent of serious age reporting errors (errors of two years or more). For example, the proportion of women whose stated age was more than two years older or younger than their calculated age increases fairly

steadily with the age of the women. Thus none of the women whose calculated age was 15-19 stated that they were two or more years younger than they actually were, and only 5% stated an age two or more years older than their calculated age. In contrast, 18% (5% plus

13%) of women aged 40-44 and 16% (6% plus 10%) of women aged 45-49 stated an age that was either two or more years younger or older than their calculated age. Only rather modest differences in the extent of such serious age misstatement are apparent according to

rural-urban residence.

Among ethnic groups, particularly high percentages of Malay Muslims and Cambodians (22% and 28% respectively) stated ages that deviated by at least two years from their calculated ages. It is somewhat surprising that hill tribe women were the most likely ethnic group to state an age that agreed with their calculated age and to have only moderate levels of serious age misstatement. This finding could be largely artificial, however, reflecting a greater tendency for interviewers to determine age from birth date information in the household registration form either because of communication problems or because hill tribe women were unable to state their age on their own.

Educational attainment also shows a positive relationship to the accuracy of age reporting. The percentage of respondents who stated ages that differed by at least two years from their calculated ages was highest for those with the least education and lowest for those with the most education.

Children. Table 7, which compares the stated and calculated ages of respondents' children, shows that the extent of age misreporting for children as implied by this comparison, at least when measured in whole years, is extremely low for the youngest children and increases with the age of the child. No infant under six months of age and only 1% of those 6-8 months old were reported to be a year old. However, some infants who were close to 1 year old were reported as being age 1. Among each older age group until ages 10-14, increasing proportions were reported as being a year

Table 6. Percentage distribution of ever-married women 15-49 years old by differences between age as calculated from birth year and month and age as stated in response to the women's questionnaire, by selected characteristics

Characteristic	Difference between stated and calculated age (%)					Total
	Calculated greater by		Both equal	Stated greater by		
	2+ years	1 year		1 year	2+ years	
Age (calculated)						
15-19	0	3	29	63	5	100
20-24	0	6	42	45	6	100
25-29	3	6	37	46	8	100
30-34	3	10	41	35	11	100
35-39	5	10	33	42	10	100
40-44	5	8	33	41	13	100
45-49	6	10	34	40	10	100
Residence						
Deep rural	4	9	37	41	10	100
Semi-urban	4	7	35	46	8	100
Provincial urban	2	7	37	47	7	100
Bangkok	2	7	38	44	10	100
Religio-linguistic ethnicity						
Central Thai Buddhist	3	8	38	42	9	100
Northeastern Thai Buddhist	3	7	35	44	11	100
Northern Thai Buddhist	3	7	39	46	6	100
Southern Thai Buddhist	3	11	33	45	8	100
Thai Muslim	7	12	35	38	8	100
Malay Muslim	14	12	35	32	8	100
Cambodian	12	10	31	30	16	100
Hill tribe	2	14	48	24	12	100
Other	8	4	45	33	9	100
Education						
0-3 years	7	10	35	35	14	100
4-7 years	3	8	36	43	9	100
Secondary or beyond	2	7	40	46	5	100

Note: Results in this table are weighted and are restricted to women who reported both a birth year and a birth month.

older than their actual completed age.

Not until age 5, however, do the proportions whose stated age is one year older than their calculated age approach the equivalent proportions of women. The greater accuracy of age reporting for younger than for older children or for the women themselves is undoubtedly a result of the practice of expressing ages of young children in greater detail than whole years.

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Given that respondents provided interviewers with documentary evidence of the children's birth dates for slightly over half of their children, it is of interest to examine whether the accuracy of age reporting is related to the documentation of children's birth dates. As the results in Table 8 show, the pattern of age reporting is similar for children whose birth dates were documented and those whose birth dates were based only on the mother's report. In both cases, stated and calculated ages (in years) are almost always identical for children under age 1. The tendency to state the child's age as one year older than the calculated age is clear for children between ages 1 and 4 but is still considerably below the levels found for children over 5. Whether or not documentation of the birth date was shown to the interviewer

Table 7. Percentage distribution of children by differences between child's age as stated by the mother and child's age as calculated from birth date, by calculated age of child

Calculated age	Difference between stated and calculated age in years (%)					Total	Number of cases
	-2+	-1	0	1	2+		
Under 6 months	0	0	100	0	0	100	307
6-8 months	0	0	99	1	0	100	173
9-11 months	0	0	89	10	1	100	185
1 year	0	1	87	11	1	100	737
2 years	0	3	79	17	1	100	679
3 years	0	2	70	25	3	100	668
4 years	0	4	61	31	3	100	693
5-9 years	0	4	45	44	7	100	3,541
10-14 years	1	7	47	39	5	100	3,376
15-19 years	1	8	48	39	4	100	2,792
20+ years	3	10	44	37	5	100	2,353
All ages	1	6	53	35	5	100	15,504

Note: Results in this table are unweighted.

Table 8. Percentage distribution of children by differences between child's age as stated by the mother and child's age as calculated from the birth date, by calculated age of child and source of birth date information

Calculated age and source of birth date information	Difference between stated and calculated age in years (%)					Total	Number of cases
	-2+	-1	0	1	2+		
Under 1 year							
Documentation	0	0	95	4	1	100	313
Mother's report	0	0	98	2	0	100	345
1-4 years							
Documentation	0	3	72	23	3	100	1,554
Mother's report	0	2	78	19	1	100	1,182
5-9 years							
Documentation	0	4	44	45	7	100	2,109
Mother's report	1	4	47	42	6	100	1,399
10+ years							
Documentation	2	8	45	40	5	100	5,025
Mother's report	2	8	49	36	4	100	3,408

Note: Results in this table are unweighted and exclude cases for which the source of the birth date information is unknown.

has little bearing on the basic pattern of differences between stated and calculated ages and the association of this pattern with the age of the child.

Birth dates based on documentation are likely to be accurate (except for data entry errors). In addition, it seems unlikely that the stated ages of children were influenced to any great extent by whether or not documentation was shown to the interviewer. The finding that the patterns of differences between stated and calculated ages of children are very similar regardless of whether their birth dates were documented can be taken as strong

evidence that the nondocumented birth dates were reported with reasonable accuracy.

Table 9 shows the clear association between the timing of the interview in relation to the birth month of a child and the difference between the child's stated age and calculated age. The stated age tends to agree with the actual completed age (as indicated by the calculated age) in cases in which the interview took place during or after the child's birth month but tends to be one year older if the interview occurred prior to the birth month. This is the same pattern we found for the respondents themselves and

confirms the tendency to equate a person's age with the difference between the current year and the birth year without reference to when during the year the person was born. The pattern is considerably less pronounced for children under 5 than for older children owing to the tendency to state the ages of younger children in units of less than whole years.

The noticeably higher percentages of children whose stated age is one year younger than their calculated age among children whose birth month is the same as the interview month are likely to be an artifact of the way the calculated age was computed. As already noted, the day of the month on which a birth took place was not recorded in the TDHS. Thus calculated ages are based on only the month and year of birth in relation to the month and year of interview. Cases in which the interview month and the birth month were identical were treated as though the person in question had already attained the age associated with the birthday in that month. Since in some cases the interview would have occurred prior to the birthday, the age of the person in question would technically fall short of the completed age by some days and the person would in fact be one year younger than imputed by the age calculation.

A detailed examination of differences between calculated and stated ages for children in the first few years of life revealed that most cases in which the stated age was one year less than the calculated age were concentrated among children whose birth month was identical to the interview month. This suggests that the disagreement be-

Table 9. Percentage distribution of children by differences between child's age as stated by the mother and child's age as calculated from the birth date, by calculated age of child and timing of interview relative to the child's birth month

Child's calculated age and timing of interview relative to child's birth month	Difference between child's stated and calculated ages in years (%)					Total	Number of cases
	-2+	-1	0	1	2+		
0-4 years							
2+ months later	0	2	92	5	1	100	710
1 month later	0	3	91	6	0	100	309
Same month	0	13	83	3	1	100	265
1 month earlier	0	0	51	44	5	100	277
2+ months earlier	0	0	75	22	2	100	1,881
5-9 years							
2+ months later	1	8	71	18	2	100	704
1 month later	0	9	74	15	2	100	272
Same month	2	13	73	11	1	100	295
1 month earlier	0	1	24	61	13	100	309
2+ months earlier	0	2	31	59	8	100	1,961
10+ years							
2+ months later	3	12	64	18	3	100	1,805
1 month later	3	16	66	13	2	100	814
Same month	2	21	65	10	1	100	807
1 month earlier	2	3	26	61	8	100	648
2+ months earlier	1	4	36	53	6	100	4,447

Note: Results in this table are unweighted.

tween calculated and stated age in these cases was probably more a function of the imprecision of the calculation than a genuine age misstatement, especially given the fact that ages of small children tend to be stated in smaller units than whole years. The concentration of cases in which the stated age was one year less than the calculated age among children whose birth month was the same as the interview month is considerably less pronounced for older children, as well as for the respondents themselves.

Conclusions

Thailand must be considered to be one of the developing countries where ages and birth dates are reported with relative accuracy. The results presented here suggest that most ever-married women of reproductive age, when interviewed in a survey, can accurately state their age within a year of their actual completed age. This conclusion reflects the fact that almost all Thais know their year of birth, which in turn is related to the significance of the year of birth within the Thai cultural context, most notably in connection with astrology. Moreover, ever-married women in the reproductive ages are able to state the ages of their children with at least equal accuracy and can also correctly report the birth dates of their children.

We believe the above conclusions are justified even though the birth dates of the TDHS respondents (and thus the basis for assessing their accuracy and that of the women's stated ages) were generally not verified and in slightly more than half of the cases the birth dates of chil-

dren were recorded from documents (and hence not based on the respondents' memory). The pattern of differences between stated and calculated ages of children whose birth dates were documented (and hence can be assumed to be accurate) is virtually identical to the pattern found for children whose birth dates were based only on the mother's report. Moreover, the pattern of differences between stated and calculated ages found for the respondents themselves is very similar to that revealed for older children. For these findings to be the result of mere coincidence, rather than a reflection of relatively accurate reporting of nondocumented birth dates, seems unlikely.

Although most Thais have a reasonably accurate idea of their age, the evidence presented in this article indicates that they do not think of age strictly in terms of completed years. Indeed several methods of reckoning age appear to coexist, and apparently only a minority of Thais consider their age to be the age reached at their last birthday. At least some appear to think of their age as the age they will reach at their next birthday, i.e., the "going-on" age.

The most common practice, however, appears to be to equate one's age simply with the difference between the current year and the year of birth without taking into account whether the current year's birthday has already passed. This practice appears to be a matter of convenience rather than the result of a specific cultural definition of age. In addition, the practice is undoubtedly related to the fact that, at least for most rural Thais, birthdays are not celebrated and indeed often

pass unnoticed.⁸

From the point of view of demographers, for whom the correct statement of age, when expressed in whole years, is generally considered to be defined in completed years, the tendency simply to equate age with the difference between the current year and year of birth is potentially the most common source of age misstatement in Thailand. It is important to recognize, however, that the extent to

Age data based on respondents' statements are far more likely to be inaccurate when they are based on inquiries made early in the year than when they are collected later in the year.

which this practice leads to a substantial proportion of the population for whom stated age is one year older than completed age will depend on when during the year a particular inquiry into age occurs. Age data are far more likely to be affected when they are based on inquiries made early in the year than when they are collected later in the year. The TDHS and recent national

8. According to the ethnographer deYoung (1958: 48-49), "the Thai reckon a person's age from the time of conception rather than from the day he is born." The evidence presented here contradicts this assertion. Ages of infants and young children as stated by their mothers do not incorporate an extra nine months. Although stated ages often are one year greater than completed age, the relationship of this pattern to the timing of the interview relative to the birthday is contrary to the pattern that would be expected if deYoung's claim were correct. Moreover, none of the many Thais with whom we have discussed age determination has ever indicated that age is reckoned from conception.

censuses took place during the first half of the year, making their results susceptible to errors in stated age deriving from this source.

Despite the apparent lack of a clear, culturally mandated specification of how to determine age, the finding that Thais commonly state their age as a year older than their actual completed age in cases where they have yet to pass their birthday in the year in question is nevertheless related to several features specific to the Thai culture. These include the importance of knowing one's birth year for astrological purposes and the unimportance of celebrating birthdays.

Although the cultural context limits the extent to which our finding can be generalized to other populations, we suspect that the underlying practice of determining age from simplified calculations based only on the present year and birth year is by no means unique to Thailand but will be found in a similar form elsewhere (see, e.g., McDonald 1974). The logic of strictly adhering to a definition of age in terms of completed years may be no more compelling to persons in other societies, even where knowledge of age is culturally mandated more strongly, than it is to Thais.

The magnitude of error introduced into age reporting in this manner is relatively insignificant for many purposes. Nevertheless, it can produce perceptible distortions in the age pattern of behavioral correlates that are sensitive to small differences in age, at least within certain ranges of the age span. A distortion of even half a year on average can noticeably affect the proportions married or the mean

cumulative number of children born to women in age groups in which the onset of marriage and child-bearing are concentrated.

Probably the finding of most general relevance is the tendency for informants to report ages of young children in units of less than whole years and for this tendency to decline rapidly with the increasing age of children. Similar studies in many other populations would probably reveal a similar pattern.

A noteworthy consequence of this pattern is that the proportion of infants who are actually under 1 year old (in terms of completed age) but whose age is reported as 1 is smaller than the proportion of children who are in fact 1 year old but are reported as being age 2, and so on until the age at which children's ages are no longer reported in greater detail than whole years. As a result, age misstatement is likely to lead to apparent undercounts of children in the first few years of life in cases where stated age serves as the basis of age tabulations.

In addition, the ages of very young children, when stated in units smaller than years, run an added risk of being miscoded since, unlike ages stated in whole years, they require conversion from the stated units into years. For example, a coder may inadvertently key in as 5 years old the age of a child who has been stated as being 5 months old, further adding to the tendency to incorrectly classify young children by age. Examination of unusually large discrepancies between reported and calculated ages of children revealed that a disproportionate share of coding and data entry errors were involved.

We suspect that the undercount-

ing of infants commonly observed in the censuses and surveys of many countries, including Thailand, is often less the result of underenumeration than of age misclassification arising from a pattern of age reporting for young children similar to the one documented here. This would be the case, of course, only when age tabulations are based on stated ages rather than ages calculated from birth dates.

We suspect that the undercounting of infants commonly observed in many countries is often less the result of underenumeration than of age misclassification arising from a pattern of age reporting for young children similar to that in Thailand.

A comparison of the 1960 and 1970 census age distributions in Thailand illustrates this point (Chamrathirong et al. 1978). As in earlier censuses, the 1960 census tabulated age on the basis of directly stated ages and was characterized by a substantial deficit of children under age 1, that cohort being only 68% as large as the 1-year-old age group. Starting with the 1970 census, age tabulations have since been based on the reported month and year of birth. As a result, the apparent deficit of infants has disappeared; the size of the cohort under age 1 in the 1970 census was 10% larger than the cohort of 1-year-olds. Likewise, little apparent deficit of infants was evident in the 1980 census.

The present study illustrates the

potential for furthering our understanding of age and birth date reporting when analyses of these issues can be based on surveys in which some forethought is given at the time of questionnaire design to the type of information needed. In the case of the TDHS, minor modifications of the questionnaire yielded data that expanded considerably our ability to investigate these issues. Given the fundamental importance of age and birth date information to demographic research, studies that yield insights into these topics, both generally and within the specific cultural contexts of the populations under investigation, deserve encouragement.

Aspects of age reporting in Thailand that could not be assessed by TDHS data might usefully be considered as issues to be addressed in other types of surveys. Of particular interest would be information permitting a detailed exploration of age reporting by or for the elderly, whose stated ages are probably affected by practices specific to their age group (Chayovan et al. 1990; Luther et al. 1986). Further investigation into the sources of the more serious age misstatements in the TDHS would also be of interest, limited though they are. The likelihood that the social and cultural dynamics influencing age and birth date reporting are constantly changing makes the need for continually updating research all the more compelling.

Appendix: Problems in converting animal years and lunar months

There does not appear to be an official beginning for the animal year. At present, guidelines for the

Royal Calendar recommend that the animal year be considered for convenience to start on January 1 along with the B.E. year (The Royal Institute 1987: 10782-10784). Printed wall and desk calendars tend to follow this rule. However, the largest circulation newspaper (*Thai Rath*) indicates the current animal year on the top of every page and changes the animal year on Songkran day.

In the Thai system, lunar years vary between having 12 and 13 months so that a rough synchronization between lunar and solar years can be maintained. A lunar month is defined by a complete cycle of the phases of the moon. Because a cycle lasts 29 days, 12 hours, and 44 minutes, some lunar months have 29 days and others 30 days. Within lunar months, days are reckoned by how far into the waxing and waning halves of the lunar cycle they fall.

Lunar months are referred to by consecutive numbers from the start of the lunar year (which occurs sometime during November or December, except in the Upper Northern Region, where it starts two months earlier). Lunar years with 13 months have a double month 8; i.e., there are two consecutive months known as month 8. This occurs every two or three years. Given the nature of the Thai lunar month system, only a rough correspondence exists between lunar and Western-style months unless account is taken of the specific year involved. Moreover, any particular lunar month is likely to straddle two Western months. Since the first lunar month always occurs during part of December (except in the system used in the Upper North), in the data set used in present study

the first lunar month is equated to December and each subsequent lunar month with the subsequent Western month on a consecutive basis. Thus lunar month 2 is equated with January, lunar month 3 with February, and so on, with lunar month 12 being equated with November. For the Upper North, the conversion is simply shifted forward by two months so that the first lunar month is equated with October.

Differences in when lunar month 1 actually starts during the solar year, differences in the length of lunar and Western months, and the fact that some years include two lunar months 8 mean that this simplified method of conversion may be in error by one month in either direction. In the case of respondents in the Upper North, an additional source of error may result from the possibility that some respondents may have used the more general system rather than the traditional system that we assume for the purpose of conversion to Western months. Given that calendars indicating the more general lunar system are distributed nationally, it is likely that the traditional northern system is being supplanted by the more general system. For example, when government officials record the lunar month and day on birth certificates, presumably they consult a printed calendar, which will be based on the more general system. Unfortunately, it is not possible to determine from a stated lunar month which system a respondent is using.

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Child Survivorship Estimation . . .

(continued from page 55)

sistency checks allowed by translation to a common standard are so powerful, however, that one should not fail to make them.

The infant mortality rate is probably the least robust of any statistic we are likely to choose and should on this ground be avoided. If we do not use the infant mortality rate, however, we lose the comparison with the vital statistics series, for although infant mortality rates are readily available from vital registration data, $q(x)$ values are not.

Here again, the value of the comparison with the vital registration series is so great that it would be foolish not to make it. It is important because it provides evidence that is both independent of and different in kind from the child survivorship estimates and because the consistency of the rate of decline suggested by the vital statistics ser-

ies and the between-census comparison of the child survivorship estimates provides important evidence for our rough but useful picture of rapidly declining infant mortality.

That child survivorship data for older women are frequently defective has led to an undue readiness to dismiss them altogether. There are many cases in which data for older women, though undoubtedly imperfect, provide useful information.

Finally, we would lose a good deal of the picture in Figure 1 if we failed to make estimates for older as well as younger age groups of women. Child survivorship data for older women are frequently defec-

tive, and this has led to an undue readiness to dismiss them altogether. Sullivan (1972) provides an extreme example in giving multipliers only for women under age 30. I have argued elsewhere (Feeney 1987: 361) that this is a mistake, but the point bears repeating. There are many cases in which data for older women, though undoubtedly imperfect, provide useful information.

Estimates for Costa Rica based on data for women well over age 50 compare nearly as favorably with vital registration as data for young women (Feeney 1980: 124). Estimates for Peninsular Malaysia are too low for older women, but no more so than for younger women (Feeney 1980: 125). The problem here turns out to be the Chinese subpopulation, in which women of all ages greatly underreport deceased children. The same

phenomenon is observed in South Korea (Cho and Feeney 1976).

The operative factor is probably a culturally-based reluctance to report deceased children. It is certainly not a matter of memory lapse. For the Malay and Indian subpopulations of Malaysia, the child survivorship estimates for older women compare just as favorably with vital statistics figures as the estimates for younger women. These are only a few of many cases that might be adduced.

The analysis of the Sarawak data given above is of course only a bare beginning. A thorough analysis could go much further in various directions. We would certainly want to examine the child survivorship data from the 1947 and 1980 censuses, including perhaps a look at more detailed "community group," (i.e., ethnic group) classifications.

A parallel analysis of mortality in Sabah, the other East Malaysian state, might prove instructive. The area studies literature could be reviewed for broad changes in social, economic, and public health conditions consistent (or not) with a rapid decline in infant and child mortality. A study of the administration of the vital registration system over the period in question would be useful to the assessment of the level and trend of underregistration, though this would probably require recourse to unpublished government documents and interviews with local officials.

Looking at completed parity distributions: Sarawak and Mexico

One way to carry the Sarawak analysis further is to scrutinize the data

on children born and surviving for evidence of inferior reports for older women. The 1960 census tables give numbers of ever-married women by age (10-14, . . . , 40-44, 45+) and number of children ever born (0, 1, . . . , 9, 10+) cross-classified by literacy and two ethnic

categories, "indigenous" or "Chinese." Figure 2 plots the distribution of women 40-44 in these four groups by the reported number of children ever born.

We see at once that the shape of the parity distributions for the indigenous group is completely un-

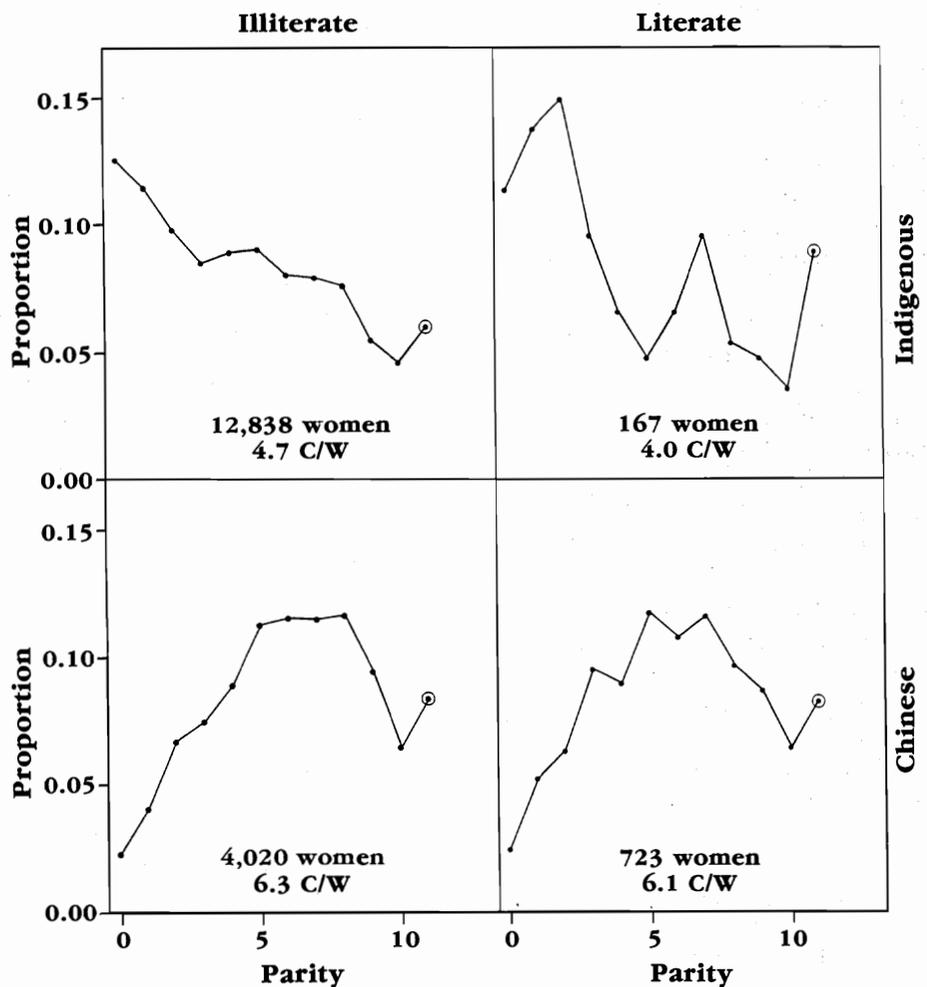


Figure 2. Parity distributions for ever-married women aged 40-44, 1960 census of Sarawak, by literacy and "Indigenous" or "Chinese" ethnicity

Source: Sarawak: Census of Population (1962).

reasonable, indicating serious deficiencies in the reporting of children ever born. Since indigenous women constitute some three quarters of the population, they dominate the whole. As a matter of pure logic, of course, inaccurate reporting of numbers of children ever born does not imply inaccurate figures on child survivorship, for if children ever born and surviving children are both underreported to the same extent, the calculated proportion of deceased children will be unaffected. Evidence of serious misreporting of children ever born nonetheless casts doubt on the reliability of the calculated proportions of deceased children. As far as it goes, then, the parity distributions in Figure 2 confirm the indirect inference of problems with data for older women drawn from Figure 1.

It is notable that the important variation in Figure 2 is between indigenous and Chinese women, with no obvious variation by literacy. Whatever is going wrong with the data for the indigenous women, it is evidently independent of literacy.

The distributions for the Chinese women do not show the obviously defective pattern of the indigenous women. Are the child survivorship data better for the Chinese sub-population? A quick calculation shows that the median infant mortality rate estimate based on the 20-24 through 40-44 age groups is 26 per thousand. This is an unreasonably low value even if we assume that the Chinese are an exceptionally privileged minority.

Evidently numbers of children ever born are underreported by the omission of large numbers of deceased children despite the rela-

tively plausible appearance of the parity distributions. Strong supporting evidence for this conclusion is afforded by case of the Chinese in Peninsular Malaysia.

A distribution of completed parity that looks unreasonable is a good indicator of reporting problems. A

reasonable looking distribution is not an indicator of good reporting, however, because distributions by number of surviving children, which are what we would observe if no deceased children were reported, have a shape similar to distributions by number of children

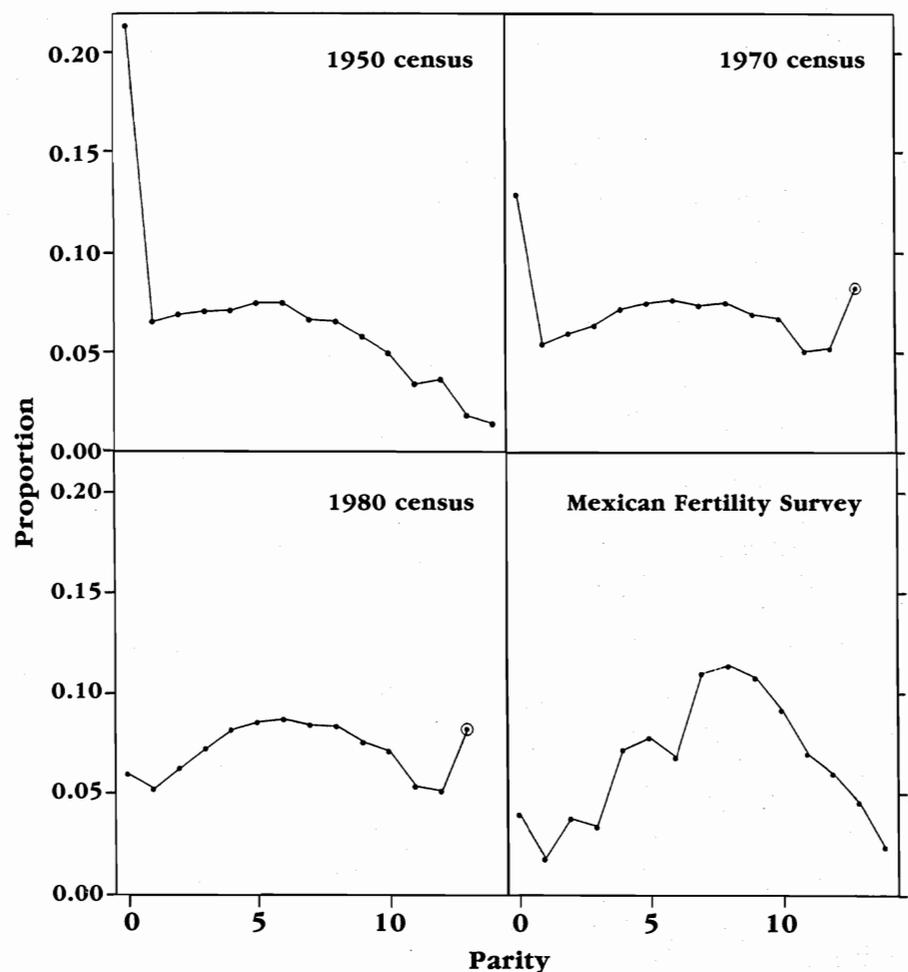


Figure 3. Completed parity distributions for Mexico, from the censuses of 1950, 1970, and 1980 and from the Mexican Fertility Survey

Sources: Mexican censuses of 1950, 1970, and 1980. Mexican Fertility Survey data from Lutz (n.d.).

ever born. Negative indications are useful, however, and looking at parity distributions may yield other insights, as the example of Mexico shows.

Children-ever-born data are available from the Mexican censuses of 1950 through 1980 and from the Mexican Fertility Survey. The distributions of women aged 45-49 by number of children ever born for the 1950, 1970, and 1980 censuses and for the survey are shown in Figure 3. The distribution for the 1960 census, not shown, is similar to that for the 1970 census.

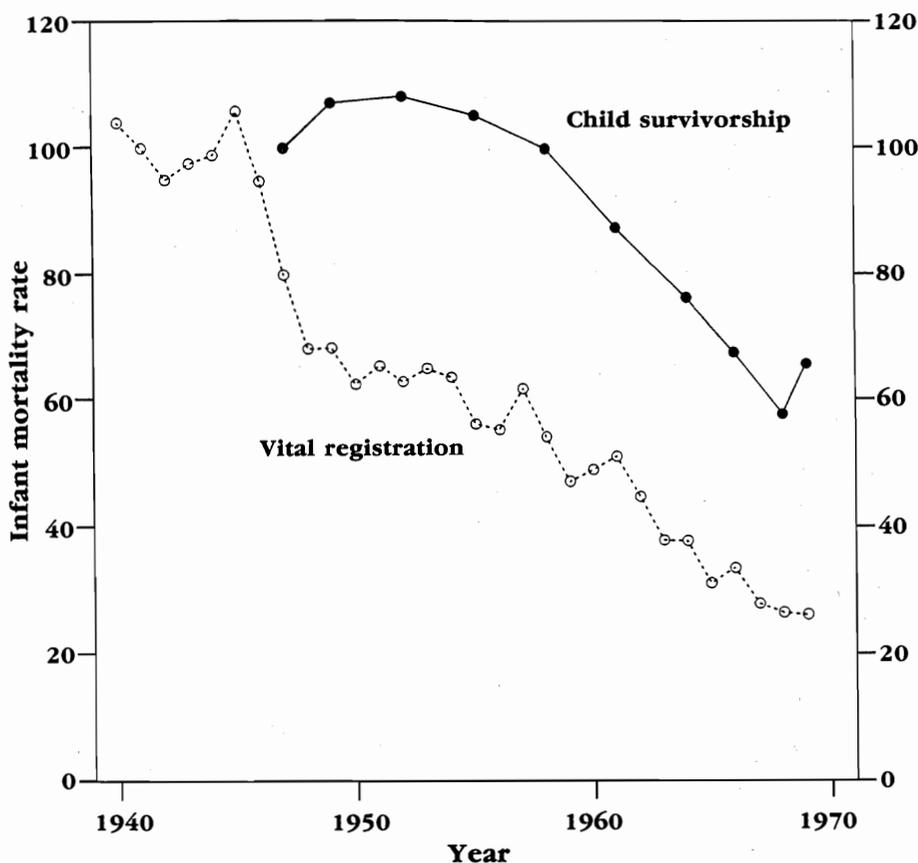
The distributions for 1950 and 1970 are highly atypical in two respects, the high proportions of women shown as childless, and the flatness of the rest of the distribution. The 1980 distribution shows a flatness only slightly less pronounced but a reasonable, though high, proportion childless.

These judgments obviously depend on familiarity with empirical patterns, which cannot be discussed even briefly here. Data are available in abundance in the 1981 United Nations *Demographic Yearbook* as well as in primary sources. Models should prove useful here as well, but the little work done thus far (Brass 1958) seems not to have been particularly useful in the analysis of such patterns.

Inspection of the census tables shows that those for 1950, 1960, and 1970 contain no entry for "children ever born not stated." The table for the 1980 census does include "children ever born not stated" entries, however, and indicates that 6.6 percent of women aged 45-49 did not report number of children ever born. If we add these women to those reporting no

Figure 4. **Infant mortality rates estimated from 1970 census child survivorship data and calculated from vital registration data: Thailand, 1940-70**

Sources: Child survivorship estimates: Table 2 in this article; registration values: United Nations, *Demographic Yearbook* (1953, 1967, 1975).



children ever born, 5.5 percent, we obtain 12.1 percent, slightly below the 14.7 percent reported as childless in the 1970 census. Grouping together women reporting zero children ever born and women not reporting children ever born in the 1980 census thus shows a pattern virtually identical to that of the earlier censuses, in which no "not stated" category is given.

We may safely conclude that the high childlessness indicated by the

earlier censuses is spurious, reflecting the grouping of not stated and zero parity cases. Although similarly high rates of childlessness are observed elsewhere, they generally reflect a high incidence of either nonmarriage or sterility due to venereal disease, both conditions that would be unlikely to disappear in the decade between the 1970 and 1980 censuses.

The flatness of the distributions is not so readily interpreted but proba-

bly indicates some form of mis-reporting. Weak indirect evidence for this inference is provided by the tendency of the distributions to become less flat over time, which is consistent with improvements in reporting at each new census. Stronger and more direct evidence is provided by the distribution from the Mexican Fertility Survey (data from Lutz, n.d.: 44), which would be expected to improve on the census results in this respect. This distribution, shown in the lower right corner of Figure 3, is irregular owing to small numbers of women but shows a more typical shape than any of the census distributions.

Time plots of children-ever-born data: Thailand

Figure 4 shows child survivorship estimates from the 1970 census of Thailand (data from which are

shown in Table 2) plotted together with vital registration figures. It is evident that the vital registration figures are much too low, so that the child survivorship estimates improve greatly on the registration data. The child survivorship estimates are themselves low, however, as shown by comparison with estimates from the 1974 Survey of Population Change (Knodel and Chamrathirong 1978: 23). The apparent increase in mortality just before 1970 is due to the estimate from the 15-19 age group. The pattern is typical, and we can therefore disregard this estimate. The five preceding points, based on women of ages 20-45, rise rapidly as we move back in time, nearly doubling in a decade. Given the rapid rate of decline indicated, about five deaths per thousand per year, it is unlikely that reporting of deceased children for the oldest women in this age range is much inferior to the

reporting of the youngest women, though the comparison with the Survey of Population Change data suggests that both groups are under-reporting deceased children. The estimates for women over age 45 show a leveling off that may well be due to deteriorating reporting by those women.

Direct examination of the children-ever-born data for older women is illuminating. The parity distributions show no indication of faulty reporting; but as we have seen, this finding is inconclusive. Children-ever-born data were collected in the 1960 and 1980 censuses as well as in the 1970 census, however, and the time-plotting device introduced in Feeney (1988: 7.1.20) provides a useful test of the quality of data for older women.

In its simplest form, the technique consists of plotting the parity data for older women in any age group as though all children were born at exactly age 25. Mean number of children ever born to women aged 45-49, for example, is plotted at the time $t - (47.5 - 25)$, where t is the time of the census and 47.5 is the mid-point of the age group.

If women report children ever born completely, the plots from the three censuses will tend to coincide. Discrepancies will be due either to the dating procedure or to mortality selection effects. The dating procedure will work well for comparisons between censuses so long as period fertility does not fluctuate sharply during the period in question. Mortality selection effects come into play only in proportion to the extent of mortality between censuses, which does not become large until older ages. The analysis of children-ever-born data

Table 2. Child survivorship data (by age) and IMR estimates: Thailand census of 1 April 1970

Age	Women (000s)	CEB (000s)	CS (000s)	IMR	Time
15-19	1,864	245	230	65.6	69.2
20-24	1,262	1,367	1,268	57.6	67.9
25-29	1,085	2,795	2,521	67.5	66.1
30-34	1,040	4,175	3,671	76.2	63.9
35-39	930	4,932	4,199	87.4	61.4
40-44	741	4,547	3,718	99.8	58.4
45-49	577	3,651	2,886	105.0	55.1
50-54	465	2,910	2,222	107.9	51.9
55-59	379	2,318	1,718	106.9	49.0
60-64	301	1,761	1,284	99.8	46.6

Source: Unpublished tabulations, 1970 census, courtesy of the National Statistical Office, Thailand. Tabulations include never-married women and ever-married women reporting both number of children ever born and number of children surviving.

CEB—children ever born.

CS—children surviving.

Figure 5. Time plot of mean number of children ever born, based on censuses of Thailand, 1960, 1970, and 1980

Source: Table 3 in this article.

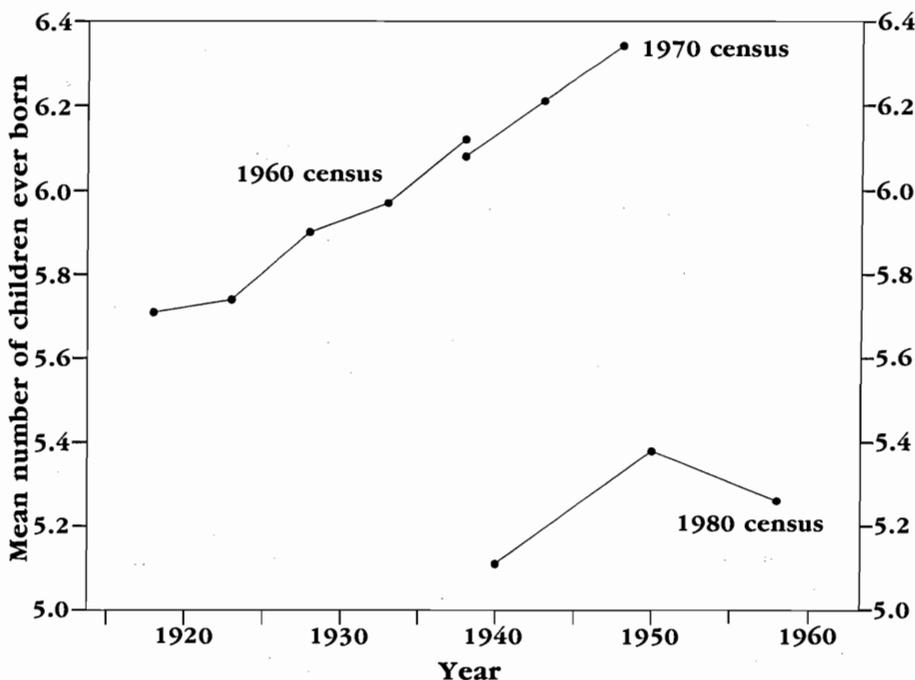


Table 3. Mean number of children ever born to women of ages 45 and over, by age group: Thailand, Whole Kingdom, censuses of 25 April 1960, 1 April 1970, and 1 April 1980

Age group	Mean CEB	Year
1960 census		
45-49	6.12	1938
50-54	5.97	1933
55-59	5.90	1928
60-64	5.74	1923
65-69	5.71	1918
1970 census		
45-49	6.34	1948
50-54	6.21	1943
55-59	6.08	1938
1980 census		
45-49	5.26	1958
50-59	5.38	1950
60-69	5.11	1940

from the Japanese censuses of 1950, 1960, and 1970 presented in Feeney (1990) suggests that, given low mortality, these discrepancies are very minor, no more than a few percent. Complete reporting by older women of children ever born will thus yield consistent time plots from successive censuses.

Figure 5 plots the mean number of children ever born to women over age 45 from the three Thai censuses (data shown in Table 3). The five points from the 1960 census are the mean numbers of children ever born to women in the age groups 45-49 through 65-69. The three points from the 1970 census are mean numbers of children ever born to women in the age groups 45-49 through 55-59.

The 1980 census grouped data for women over age 50 into 10-year age groups; thus the rightmost point is for women 45-49, and the points to its left are for women 50-59 and 60-69. Since older age groups correspond to older cohorts, moving from younger to older age groups corresponds to moving back in time.

If we look at either the 1960 or the 1970 census alone, we see declining mean parity with increasing age of women, suggesting deteriorating reporting. When we put the data from the two censuses together, however, dating and plotting them, we find that they are very consistent, suggesting that the declines are due in fact to increasing fertility. The indication is that

Sources: *Thailand Population Census: 1960, Whole Kingdom*. Census date given in Preface. Mean number of children ever born from Table 14. *1970 Population & Housing Census: Whole Kingdom*. Census date given in Introduction. Mean number of children ever born from Table 7, p. 20. *1980 Population & Housing Census: Whole Kingdom*. Census date given on p. 29. Mean number of children ever born from Table 7, pp. 30-31. CEB—children ever born.

the period total fertility rate in Thailand rose from 5.7 children per woman around 1920 to 6.3 children per woman around 1950.

The data provide only an indication of the level and rate of increase of fertility during these decades, but the evidence that fertility was increasing is quite strong. Though

certainly not definitive, the indication is valuable in that it refers to a period for which there are few alternative sources.

Mean parity for women aged 55-59 at the 1970 census is 0.04 children per woman below mean parity for the same cohort at the 1960 census, when they were ten years younger (Table 3). This may be due to increasing underreporting of children ever born with increasing age or to mortality selection, but in either case it is minor in relation to the overall increase in fertility indicated.

As striking as the consistency of the data from the 1960 and 1970 censuses is the inconsistency of the data from the 1980 census, which indicate a level of fertility fully one child per woman less than the earlier censuses. The inescapable conclusion is that something went seriously wrong with the children-ever-born question in the 1980 census.

We would expect the child survivorship data to be affected as well. The Institute for Population and Social Research (1985: 15-17) and Porapakham (1986: 18-21) show that child survivorship estimates from the 1980 census fall below both those of the 1970 census and the Survey on Population Change results. The 1987 Demographic and Health Survey similarly estimates levels substantially above those estimated from the 1980 census child survivorship data (Chayovan et al. 1988: 90).

The analysis of Figure 5 thus yields three reasonably solid conclusions: (1) the children-ever-born data for the older women in the 1960 and 1970 censuses were evidently quite good; (2) fertility in

Thailand was rising slowly during the first half of this century; and (3) something went seriously wrong with the 1980 children-ever-born data.

Child survivorship data other than by age: Indonesia

Although most child survivorship estimation to date has been done using data for women in standard five-year age groups, the principles expressed in equations (1-3) and the corresponding dating equations are general and yield estimates whenever it is possible to estimate the time distribution of children ever born $c(x)$. Sullivan (1972: 89) explored the use of data classified by duration of marriage. The time distribution of children ever born in this case may be estimated by a simple imitation of Brass's procedure for data classified by age (Feeny 1975b: 7-9). Sullivan's use of regression to compute multipliers does not require this estimation and so tends to obscure the logic of the estimation procedure.

Child survivorship data occur in other forms as well. The case in which the children-ever-born and surviving questions are addressed to women who have a birth during a given period is explored by Brass and Macrae (1984, 1985). A question on date of last live birth together with a question on the survivorship of this birth provides a particularly easy case, since the time distribution of children ever born is degenerate. Such data are available for several censuses and surveys in Indonesia (Das Varma 1983), though problems arise owing to nonreporting of year of last live

birth, and perhaps also to a tendency to report year of birth of youngest surviving child rather than year of last live birth.

A question on the number of births in the year prior to a census or survey combined with a question on survivorship of these births provides a closely related alternative (Johnson 1982). Fertility surveys that include questions about birth histories generally obtain direct information on the survivorship at the time of the survey of the children recorded, whence we may compute child survivorship statistics for children born each year prior to the survey.

In this case also the time distribution of children ever born is degenerate. We simply match the proportion of surviving children Q with an appropriate $1-L_x$ value in a one-parameter model life table family to identify the estimated life table. An extension of this procedure, a variation of which is discussed below, makes it possible in principle to estimate annual trends of mortality without any assumption on the form of the trend (Macura 1982).

It seems both remarkable and unfortunate that Sullivan's initiative in estimating child survivorship with data classified by duration of marriage has not been more vigorously pursued.

In retrospect it seems both remarkable and unfortunate that Sullivan's 1972 initiative with data classified by duration of marriage has not been more vigorously pursued.

sued. One important advantage of using child survivorship by marriage duration seems not to have been clearly recognized at the time. Age-based estimates for young age groups are seriously biased by differential infant and child mortality by age of mother. This bias usually renders data for the 15-19 age group useless for mortality estimation, but the bias for the 20-24 age group can be serious as well, as indicated by Sullivan and Wilson (1982) in the case of Indonesia, and more generally by Fernandez Castilla (1989).

Since estimates from these age groups refer to the several years immediately preceding the census or survey, we are left without estimates for recent years, often the period we are most interested in. One possibility, explored in the case of Bangladesh by Ewbank (1982) and systematically developed in Fernandez Castilla (1989), is to correct for the bias by using additional information or models. Another is to classify women by duration of marriage, aggregating women of all ages who marry during a given time period, which may be expected to reduce the bias by attenuating the concentration of very young women in low-duration groups.

The recommended tabulation for child survivorship data by age of marriage is, for women reporting both children ever born and children surviving, the number of women classified by completed years of marriage and the number of children ever born and surviving to women in each of these duration groups. The restriction of the tabulation to women reporting both children ever born and children surviving eliminates biases due to

Table 4. Illustrative calculation of infant mortality rate estimates using child survivorship data classified by year of first marriage: Indonesia Fertility Survey, 1976

Year of first marriage	Estimated time distributions of CEB						Estimated IMR
	1970	1971	1972	1973	1974	1975	
1974	0	0	0	0	40	60	141
1973	0	0	0	25	37	38	98
1972	0	0	18	27	27	28	106
1971	0	14	22	22	22	20	113
1970	12	18	29	18	17	16	101

Year	Data				
	Women	CEB	CS	MCEB	PDC
1974	319.3	212.7	186.4	0.666	0.124
1973	323.7	251.3	225.9	0.776	0.101
1972	361.9	404.3	355.3	1.117	0.121
1971	321.4	443.0	381.4	1.378	0.139
1970	345.7	574.4	498.6	1.662	0.132

Source: 1976 Indonesia Fertility Survey.

CEB—children ever born.

IMR—infant mortality rate.

CS—children surviving.

MCEB—mean number of children ever born.

PDC—proportion of deceased children.

differential nonresponses to the two questions (Feeney 1976a).

If the census or survey obtains date, rather than duration, of marriage, it may be desirable to replace the duration-of-marriage classification by year of marriage. This would yield the same result if the census or survey were conducted at year's end. Otherwise it will require some adjustment in the $q_M(x;w)$ values in equation (3) to allow for nonsurvival during the year in which the census or survey is taken.

Table 4 illustrates the corresponding estimation procedure with data from the 1976 Indonesia Fertility Survey. The upper panel shows a

set of estimated time distributions of children ever born and the resulting estimates of infant mortality, the lower panel the basic data tabulated from the survey. The time distributions of children ever born were computed by means of a simple graphical smoothing of the mean number of children ever born (MCEB) values, assuming constant fertility. They are intended to be illustrative only. The infant mortality estimates were obtained by direct solution of the estimation equation (3) using tabular values of $q_M(x;w)$ from the Brass General model life table family.

Taking the median of the five estimates gives an estimated infant

mortality rate of 106 infant deaths per thousand births. This may be compared with the two kinds of estimates presented by Sullivan and Wilson (1982), based on the same source. On the one hand, estimation from survivorship of children ever born to women aged 20-24 gives values of 116, 134, 119, and 125 per thousand, respectively, using the Coale-Demeny North, East, South, and West model life table families (Sullivan and Wilson 1982: 5). On the other hand, direct calculation from the birth history data yields a value of 94 per thousand for the period 1971-74. Sullivan and Wilson show that the high mortality estimated for children of women aged 20-24 is due to a high proportion (nearly three quarters) of those children being born to mothers under age 20 and relatively high mortality risks for those children. (Sullivan and Wilson 1982: 11).

The indirect IMR estimate of 106 per thousand from Table 4 lies well below the various indirect estimates based on child survivorship data classified by age, but also significantly above the value given by direct calculation from the birth history data. The first comparison suggests that the classification by year or duration of first marriage substantially reduces the bias due to differential mortality by age of mother. The second comparison suggests that it does not entirely eliminate it. Although it is possible that the directly calculated value is too low on account of misreporting of ages at death, some residual bias in the indirect estimates based on data by year or duration of marriage is to be expected. Children ever born to women recently married will include disproportionate

numbers of children of younger women and of low birth orders. The use of child survivorship data classified by duration or year of first marriage substantially reduces the bias due to differential mortality by age of mother but does not eliminate it.

Data of the form shown in Table 4 may be used to estimate mortality for each year prior to the census or survey without any assumption about mortality change other than that the period life table each year conforms to a given model life table family. The idea is due to Macura (1982).

Assume data classified by completed years of marriage, and let Q_i denote the proportion of deceased children among all children born to women with i completed years of marriage. Then

$$Q_0 = q_M(1; w_1)$$

$$Q_1 = q_M(1; w_1, w_2)c_1(1) + q_M(2; w_1, w_2)c_1(2)$$

$$Q_2 = q_M(1; w_1, w_2, w_3)c_2(1) + q_M(2; w_1, w_2, w_3)c_2(2) + q_M(3; w_1, w_2, w_3)c_2(3)$$

and so on, where $\{c_i(x): x=1,2,\dots\}$ denotes the time distribution of children ever born to women with i completed years' duration of marriage and $q_M(x; w_1, w_2, \dots)$ is the proportion of children born in the x th year prior to time t who die before time t if w_i is the level of mortality level in the i th year prior to time t . The $c_i(x)$ may be estimated as in the above example, with appropriate refinements. Solving the first equation yields an estimate of w_1 , the level of mortality in the year prior to the survey. This may be entered in the second equation, which may then be solved for w_2 ,

and so on. The data in Table 4 represent too few cases to apply this more demanding procedure.

Conclusion

The four examples presented here exemplify several lessons for the estimation of infant and child mortality from child survivorship data. First and most important is the importance of analyzing the mortality estimates that result from applying whichever method is used. It is never sufficient merely to calculate estimates from a single set of data, for there are numerous examples in which doing so gives disastrously bad results. Estimates must always be analyzed in relation to other relevant information before we can proceed to conclusions about the level and trend of mortality. In those rare cases where no other information is available, conclusions will necessarily be weak. If there was ever an Age of Innocence in these endeavors, we have emerged from it.

The Sarawak and Mexico examples both show the value of plotting and scrutinizing completed parity distributions. Despite the utter simplicity of this proceeding, it yields important conclusions in both cases, suggesting that it ought to be done routinely. That it is not now done routinely is suggested by its not being mentioned in the United Nations *Manual X: Indirect Techniques for Demographic Estimation*, with its explicitly pedagogical intent, as well as by the absence of examples in the literature.

The Mexico example shows also the importance of not restricting attention too narrowly to the data immediately at hand. The completed

parity distributions from the 1970 census look suspicious, but it is only after comparing them with the distributions from the 1950, 1960, and 1980 censuses and those from the Mexican Fertility Survey that conclusions become clear.

A blunder that could have been avoided by executing this elementary maneuver appeared some years ago in a paper presenting a mathematical model for parity distributions "characterized by high fertility combined with high zero parity" (Golbeck 1981). The application was to the 1970 Mexican census, and the model fits the (faulty) data very well.

The widely observed tendency for the mean number of children ever born to decline with increasing age for older women is generally believed to indicate deteriorating completeness of reporting. Although this is no doubt true in some cases, perhaps even in most cases, the analysis of the Thai data from the 1960, 1970, and 1980 censuses suggests that the presumption should be revised. Data for older women remain suspect, but they should not be dismissed out of hand. When children-ever-born data are available for two or more censuses, there is much to be learned by time-plotting them. Nor does this conclusion apply only to populations with exceptionally good data. Japanese children-ever-born data for older women appear to be excellent (Feeney 1990); but data for Kenya, though obviously erroneous, suggest important conclusions for which there is little alternative evidence (Feeney 1988).

Data producers should take care not to discard the children-ever-born information for older women

in tabulation. We cannot look at children-ever-born data for older women in India, for example, because the relevant age classification ends with a 50+ open-ended age group. The same applies to Mexico, and there are many other cases in which the open-ended age group is lower than it should be. This is a great pity, given the vast expense at which census and survey data are collected and the vanishingly small marginal cost of slightly more detailed tabulations. It should hardly be necessary to add that data should not be discarded in tabulation on the mere suspicion that it may prove to be faulty.

The final lesson, illustrated by the Indonesian example, concerns the exploration of alternatives to the almost universal tabulation of child survivorship data by age of mother. While there may be little call to add to the arsenal of methods now available for data classified by age, the field is wide open for the development and application of methods for alternative classifications.

An obvious first step would be to pick up where Sullivan left off with data classified by duration of marriage. For those more interested in substantive than methodological investigations, the important results of Fernandez Castilla (1989) allow the estimation of mortality by family size by suitable tabulation of information contained in scores of population censuses for countries the world over.

Child survivorship data will be providing important evidence on levels and trends of mortality for much of the world's population well into the next century. Although we have made significant advances

in learning to extract useful information from this data, we can learn to do better in the future what we have already done well in the past.

The distinction between methods and data analysis is important because learning a method is so much simpler and easier than becoming proficient in its use. Learning a method is a matter of acquiring a clearly defined locus of demographic and mathematical knowledge, knowledge that may be mastered completely with sufficient study. Data analysis is an ability cultivated by experience, with each engagement an opportunity to broaden one's knowledge and sharpen one's acumen. When studying methods, there is generally a single and unambiguously correct answer to every question that arises. When analyzing data, significant conclusions are usually judgments on which even the most experienced analysts may differ to some degree.

Perhaps for these reasons, research and pedagogy seem to have favored the development and understanding of technique over knowledge and experience of application. Or have we simply been in the grip of a long swing of intellectual fashion? However this may be, data analysis merits more attention than it has received. We will certainly benefit from the continuing development of new methods, and they should be welcomed. Viewing the demographic enterprise as a whole, however, we may benefit even more by learning better how to use the methods we already have.

ACKNOWLEDGMENTS

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[1960 Census of Mexico] Numbers of women aged 12 and over by age and number of children born alive given in Table 37.

[1970 Census of Mexico] Numbers of women aged 12 and over by age and number of children born alive given in Table 29.

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Reviews and Publication Notes

(continued from page 61)

preceding chapters, she presents a case study of economic and demographic change in the state of West Bengal (Chapter 6). In Chapter 7 she integrates the individual factors into an economic-demographic framework to formulate and estimate a household decisions model aimed at explaining variations in fertility behavior.

A concluding chapter summarizes the findings under the headings of population growth, birth and death rates, determinants, and household decisions, and finally suggests "insights that can be woven together to constitute a significant component of a meaningful development-cum-population policy" (p. 139). Example: "In the long run it would perhaps be more effective to promote technologies that would specifically preclude child labour from the production process. This study has shown . . . that technological progress in agriculture in this country has done just that, and has not only lowered the opportunity cost of education, thereby raising child investment, but has also had the direct effect of lowering parents' expectations of income from children, all these effects combining to substantially depress the desire for children" (p. 140). Ghosh also recommends that microlevel studies be done to identify community environments that invariably determine the effectiveness of individual policies.

Numerous tables, graphs, references, and a subject index supplement the text.

Census of India 1991. Series-1 India. Paper 2 of 1991, Provisional Population Totals by Amulya Ratna Nanda. New Delhi: Registrar General and Census Commissioner, India. vi, 425 pp. Paper. Available from Registrar General and Census Commissioner, India, Ministry of Home Affairs, Government of India, 2A Mansingh Road, New Delhi-110011, India.

This is a companion volume of an earlier publication entitled Paper 1 (annotated in the *Forum*, Vol. 4, No. 4, Winter 1990) containing the provisional population totals based on the 1991 Census of India.

The present volume contains 10 provisional tables and a brief analysis of various aspects of urbanization as revealed by data from the latest Indian census. The urban population of India according to the census was 217,177,625, spread over 3,768 urban agglomerations and towns. This figure includes the estimated urban population of 1,839,400 for Jammu and Kashmir State, where the census could not be conducted. The urban population constituted 25.72% of India's total population.

The annual growth rate of the urban population declined from 3.83% during 1971-81 to 3.09% during 1981-91. The level of urbanization increased by only 2.38 percentage points during the last decade as against an increase of 3.43 percentage points during the earlier decade (1971-81). "As a consequence," according to the author (p. 11), "the annual rate of gain in percentage of urban population has

also declined from 1.72 to 1.02. This indicates that the tempo of urbanisation in India has slowed down during the decade 1981-1991 as compared to the previous decade."

An official projection, made in 1989, put the urban proportion of India's population in 1991 at 27.48%, about 1.76 percentage points more than what the 1991 census recorded. A decline in the urban-rural growth differential in most states during the 1981-91 decade belied expectations.

Of 3,696 urban agglomerations and towns in India (excluding Jammu and Kashmir), 300 have populations of more than 100,000. As much as 65% of the country's urban population was accounted for by these Class I cities.

India has four megacities, each with a population of more than 5 million. These are the urban agglomerations of Greater Bombay, Calcutta, Delhi, and Madras. Greater Bombay (12.6 million) ranks sixth and Calcutta (10.9 million) ranks tenth in population size among the world's metropolises.

The introductory text is divided into six brief chapters containing additional tables and several maps and charts, most of which are in color.

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China Unveils Its Monumental Two per Thousand Fertility Survey

The largest fertility survey ever conducted—China's Two per Thousand Survey of 1988—was the centerpiece of a recent seminar in Beijing. Seminar papers confirmed the high quality of the survey and its potential for research on topics ranging from rates of sterility to the demography of Tibet. They also suggested that family planning in China is moving on to a wider agenda. The interest of family planners is turning to issues of health, motivation for family planning, and contraception prior to a couple's first birth.

by William R. Lavelly

THE LARGEST fertility survey ever conducted made its international debut at a seminar sponsored by the Chinese government in Beijing last August. The National Survey of Fertility and Contraception, often referred to as the "Two per Thousand Survey," was conducted by China's State Family Planning Commission (SFPC) in

June 1988. Some 50 scholars and family planning administrators, including 12 from abroad, took part in the four-day (August 26–29) International Seminar on Fertility and Contraception in China, which provided insights about the new survey, about developments in China's birth planning program, and about China's research environment.

The survey, representing a sample of two ever-married women between the ages of 15 and 57 for ev-

ASIAN AND PACIFIC POPULATION FORUM

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The *Asian and Pacific Population Forum*, published quarterly by the Population Institute of the East-West Center, contains policy-relevant and technical articles on population issues affecting the Asia-Pacific region, reviews of demographic publications, and news about population activities in the region. Guidelines on manuscript submission are available from the editor. All manuscripts are peer-reviewed. Readers are invited to submit articles, news items, reviews, and letters to:

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The EAST-WEST POPULATION INSTITUTE, a unit of the East-West Center, conducts research, training, and related activities in the population field, with emphasis on economic, social, psychological, and environmental aspects of population problems in the Asia-Pacific region.

The EAST-WEST CENTER was established in Hawaii in 1960 by the United States Congress "to promote better relations and understanding between the United States and the nations of Asia and the Pacific through cooperative study, training, and research."

Some 2,000 research fellows, graduate students, and professionals in business and government each year work with the Center's international staff on major Asia-Pacific issues relating to population, economic and trade policies, resources and the environment, culture and communication, and international relations. Since 1960, more than 27,000 men and women from the region have participated in the Center's cooperative programs.

Officially known as the Center for Cultural and Technical Interchange Between East and West, Inc., the Center is a public, nonprofit institution with an international board of governors. Principal funding comes from the United States Congress. Support also comes from more than twenty Asian and Pacific governments, as well as from private agencies and corporations.

ery 1,000 such women in the Chinese population, is the largest survey of its kind ever made. All provinces in the Chinese mainland took part in the survey, including, for the first time, Tibet. Within provinces, various sample fractions were employed, with the aim of obtaining representative data for each province. The average number of persons sampled per province was 75,000. Altogether 2.1 million individuals were surveyed, for whom more than half a million pregnancy histories were recorded. In contrast, the World Fertility Survey, which was conducted in 40 countries during the 1970s and early 1980s, included roughly half that number of women.

The design of the Two per Thousand Survey, an indigenous effort, reflected an accumulated expertise in the practical application of sampling theory and built on extensive experience gained during the 1980s in the conduct of sample surveys in China. Thus, although the sample size was twice as large as that of its forerunner, the One per Thousand Survey of 1982, the Two per Thousand design was less clustered and therefore more efficient. The sampling unit of the One per Thousand Survey was the brigade (now village) and urban street committees, of which 815 were covered in all of China. The Two per Thousand Survey sampled 13,966 small groups, or two out of every 1,000 such groups. The survey sample points fell within 95 percent of China's counties.

The central element of the survey was a pregnancy history, but data on the husband and wife, other household members, and characteristics of the small residence

group were also gathered. Among the survey's innovations was a birth history that integrated questions on the adoption of children and on the policy auspices under which each child was born.

Although the survey is a fundamental source of data on fertility, family planning, and contraception in China, its design offers numerous other analytic possibilities. It contains important data on mortality, sex ratios, the biology of reproduction, migration, shifts in nationality status, and other topics. The retrospective depth of the survey also makes it a repository of data for historical reconstruction, and its size and geographic coverage make it an unusual vehicle for the study of demographic variation at provincial levels and below.

Containing data not only on fertility and family planning but also on adoption, mortality, sex ratios, the biology of reproduction, migration, and other topics, the Two per Thousand Survey design offers numerous analytic possibilities.

Several seminar papers describing the design and conduct of the survey should be of great value to the survey's users, since little documentation of survey methods have heretofore been available. Papers by Li Honggui and Zhao Xuan of SFPC provided important background. From them one learned, for example, that a special design was used for the survey in Tibet. Because the SFPC has no organization in Tibet,

the survey was conducted there by the Health Department, and some topics were dropped (e.g., family planning), whereas others were added (e.g., women's health and parturition). Some areas of Tibet were omitted. But as the survey was a unique opportunity to gather data on Tibet's demographic past, all women in the areas covered were included in the sample, regardless of age. The one seminar paper focusing on Tibet unfortunately contained few data. So far the SFPC has not, to my knowledge, released the Tibetan data to scholars inside or outside China.

Other papers, directly or inferentially, assessed the quality of the Two per Thousand Survey data. One by Zhang Erli and Lu Lei contained particularly striking findings. Using the Preston-Bennett method of estimating intercensal adult mortality from the 1982 and 1990 censuses, they found a remarkably close concordance between those rates and the ones constructed from the Two per Thousand Survey. Although much work remains to be done in the assessment of Two per Thousand data quality, this and other studies tend to reinforce confidence in the data quality.

According to one study based on the survey, an estimated 385 million births have been averted by China's birth planning program since 1971.

Although the primary aim of the survey was to monitor progress in the government's birth planning

program, the survey data are providing insights on a wide range of other topics as well. A study by Zhao Xuan estimated that 385 million births had been averted by the birth planning program since 1971. Researchers from the Shanghai Institute of Planned Parenthood Research presented analyses of spontaneous abortion, age at menarche, and rates of infertility that revealed general declines in all three. Wang Shaoxian, Weng Shi-Gui, and Zhang Ming of Beijing Medical University presented findings on contraceptive effectiveness indicating that use effectiveness of the IUD and the pill was lower in China than in other countries. From the numerous papers devoted to fertility, marriage, and contraception, several recurrent themes emerged.

One such theme was the timing of childbirth as a major determinant of fertility change in the 1980s. Chinese population policy encourages couples to postpone marriage, but a decline in ages at marriage during the 1980s has impeded fertility control. Moreover, age at first birth is determined not only by age at marriage but also by the length of the interval between marriage and first birth, and this interval has become shorter.

Since attempts to reduce completed family size to below two children per family has met with resistance in the countryside, the results of these analyses suggest that more policy emphasis might be placed on the timing of the first birth and on birth spacing as an alternative approach. It was noted that in Hong Kong, 40 percent of couples use contraception prior to having their first child; but among recent marriage cohorts in Beijing

studied by Lin Deliang, Tian Meiyang, and Gao Ersheng, only 24 percent do so.

With age at marriage declining and the interval between marriage and first births growing shorter in China, policy efforts to reduce completed family size may need to focus more on birth spacing. One study indicates that even in Beijing only 24 percent of recently married couples use contraception.

Another theme was the usefulness of period parity progression measures, adopted in several papers, including that by Griffith Feeney, one of its important developers. Because China's policy goals are expressed and implemented in terms of the number of children born per couple (or parity), parity progression offers especially relevant insights into program performance. Feeney and Wang Feng of the East-West Center's Population Institute found that the Two per Thousand data concur with earlier studies that have shown a mild rise in total fertility in the late 1980s due to a rising progression to second births.

But the rise was sharper in some regions than in others. In an analysis of parity progression in the eastern province of Anhui, Xie Zhenming of Anhui University found that there had been a distinct rise in completed family size during the 1985-87 period, with the result that more than half of rural women are projected to bear a total of three

or more children. In a different connection, the Feeney and Wang paper pointed out that the Two per Thousand Survey's inclusion of an adoption question improved the quality of the birth histories and has permitted better estimates of the true rate of childlessness in China (about 4 percent).

Concern over women's and children's health issues also emerged during the seminar. Contraceptive side effects, the most appropriate and cost-effective IUD, and the "ideal contraceptive mix" came up for discussion several times. China employs the stainless steel loop (the *danbuan*, or "single-ring IUD"), but its use effectiveness is low. Seminar participants debated whether this might be due to misplacement of the IUDs (in the cervix rather than the uterus) or to poor training of birth planning workers. Others raised the issue of whether the program was using the most appropriate IUD. One participant argued that the Copper T 220, although 10 times the price of the stainless steel loop—one yuan versus one mao—might be more cost-effective, particularly if costs to women's health were taken into account. Related issues were vividly raised in a slide presentation on rural health care in India by Dr. R. Rajaram.

Although many of the concerns about health effects were raised by foreign rather than Chinese scholars, to this observer the ensuing discussions about the quality and health effects of the birth planning program seemed to reflect the increasing maturity and routinization of China's program. Family planning work in China, and research on it, appear to be moving on to a

wider agenda. Program performance is beginning to be defined in broader terms than just fertility or contraceptive inputs, and the interest of family planners is turning to issues of health, cost effectiveness, motivation for family planning, and contraception prior to the first birth and even prior to marriage.

Family planning work and research in China appear to be moving to a wider agenda. Interest is turning to issues of health, cost effectiveness, motivation for family planning, and contraception prior to the first birth and even prior to marriage.

The growing number of demographic studies in the 1980s have focused overwhelmingly on fertility, with little attention being paid to mortality—a fact pointed out at the seminar. The Two per Thousand Survey birth histories contain survivorship data that will be fundamental to mortality studies.

One of several papers on infant mortality demonstrated a technique for analyzing sex differentials in survivorship. The preliminary analysis revealed strong regional variations in infant survivorship by sex of the infant. In general, girls in south China fare less well than boys, a phenomenon that seems to reflect social rather than biological factors.

A related issue, that of unusually high sex ratios at birth in China, was raised in an analysis of Two per

Thousand data by Sten Johansson and Ola Nygren of Statistik Sweden. Their analysis shows that nearly all in-adopted children in China are girls. (No corresponding data on out-adoption are available.) If these in-adopted girls go unreported by their birth mothers, which is a possibility if it is assumed that most of the births are illicit, they account for approximately half of the discrepancy in the sex ratio at birth. In the ensuing discussion, one participant questioned the assumption that birth mothers fail to report out-adopted girls in their birth histories, while another maintained that other research in China shows that some "adopted" children are really women's own children.

The sex ratio and infanticide issue remains highly charged. The Two per Thousand Survey has a high potential for illuminating the issue because it posed direct questions on the incidence of infanticide and abandonment of infants to local-level cadres. But the data have yet to be released, and, perhaps in deference to host sensitivities, no seminar participant inquired about the results of those questions.

The issue of areal differences in China's population was also highlighted at the seminar. There has been a tendency, even within China, to treat China as monolithic or at best "bilitic," divided between urban and rural societies—constructions often forced on the analyst by data limitations. Provincial aggregates are sometimes available, but systematic subprovincial analysis is seldom possible.

The Two per Thousand Survey provides data not only about

(continued on page 116)

Young Women's Work and Family Formation in Sri Lanka

Patterns of family formation in Sri Lanka resemble those of wealthier nations, with late marriage, delayed childbearing, and moderately low fertility. This article addresses two questions: How have these family formation patterns emerged in the absence of the normally expected levels of economic development? And what activities have occupied young women in the premarital, prechildbearing period? Answers are suggested by data from three sources: the 1981 census; a set of focus-group discussions on the rights, obligations, and aspirations of young women related to marriage, work, childbearing, and child care; and a sample survey of 1,535 women of ages 15–30 in Kalutara District. The article describes the interplay of socioeconomic and familial forces that have affected the status of young Sri Lankan women.

by Amy Ong Tsui,
Paul Stupp, Victor de Silva,
and Soma de Silva

Sri Lanka has made significant gains in reducing gender inequality in access to such life-improving conditions as education, nutrition, health, and housing. Some expansion of female participation in the labor force has also enhanced the social and economic position of women. Pat-

terns of family formation resemble those of wealthier nations, with late marriage, delayed childbearing, and moderately low fertility, despite Sri Lanka's low per capita income levels. Yet other indicators of industrial and economic progress reflect stagnation during the 1980s.

Neither marriage nor employment dominates the activities of Sri Lankan women during the period between school and parenthood. The typical woman leaves school at

age 15 or 16 and does not marry until age 24. The birth of her first child follows approximately 18 months later. A large proportion of the female labor force consists of unpaid family workers. According to the 1981 census, an estimated 32 percent of women were currently unemployed (Sri Lanka, DCS, 1986).

Accounting for the activities that occupy educated women who are not gainfully employed during the eight-year interval between school and marriage poses a sociological challenge, particularly for understanding how norms and opportunity structures influence women's roles and status. Most societies do not "tolerate" the extended presence of fecund single women in the natal household. Sri Lanka's low-income, low-fertility scenario therefore represents an anomalous data point in the conventionally hypothesized relationship between economic development and fertility.

The basic proposition this study explores is that, by reducing gender inequalities in education and opportunities for employment, public-sector measures to improve the welfare of Sri Lankan society can outweigh household-level economic factors in shaping women's expectations about their adulthood roles and standard of living. The study traces through three levels the influence of key status-enhancing

Amy Tsui is Associate Professor of Maternal and Child Health and Fellow of the Carolina Population Center, University of North Carolina at Chapel Hill. Paul Stupp is Statistician, Division of Reproductive Health, Centers for Disease Control, Atlanta, Georgia. Victor de Silva is Senior Evaluation Consultant, Family Planning Association of Sri Lanka, Colombo. Soma de Silva was Senior Deputy Director, Department of Census and Statistics, Colombo, Sri Lanka, at the time of the study and is now Program Officer, UNICEF, Colombo.

events, such as schooling and employment, on women's expectations about work, marriage, and child-

bearing: the macrolevel, where public-sector investments have raised the quality of life and re-

duced gender inequality; the community, or district, level, where education and employment can heighten women's aspirations for their personal, marital, and economic welfare; and the micro-, or household, level, where the opinions of significant others in the lives of young women—including parents, community leaders, and eligible male partners—help to define the normative climate for family-formation decisions. Of principal interest is understanding how young women's high educational achievement, inert employment activity, late marriage, and low-fertility expectations are related to their status.

To gain insight into these issues, we use a combination of published census and sample survey results, data from a district survey fielded in late 1989, and focus-group commentary. The study setting is Kalutara District, which lies on the southwestern coast of Sri Lanka (Figure 1). We first report on social, economic, and demographic changes that have affected the structure of opportunities available to young women in Sri Lanka, particularly in Kalutara. This discussion highlights public investments in education, nutrition, health, and employment, which have reduced gender inequality and improved the position of young women in Sri Lankan and Kalutara society. The second half of the article focuses on the microlevel context, illustrating how young women's status is viewed by the women themselves, their mothers, social leaders, and young men. The focus-group discussions reveal the normative support that exists for young women's improved position in modern society.

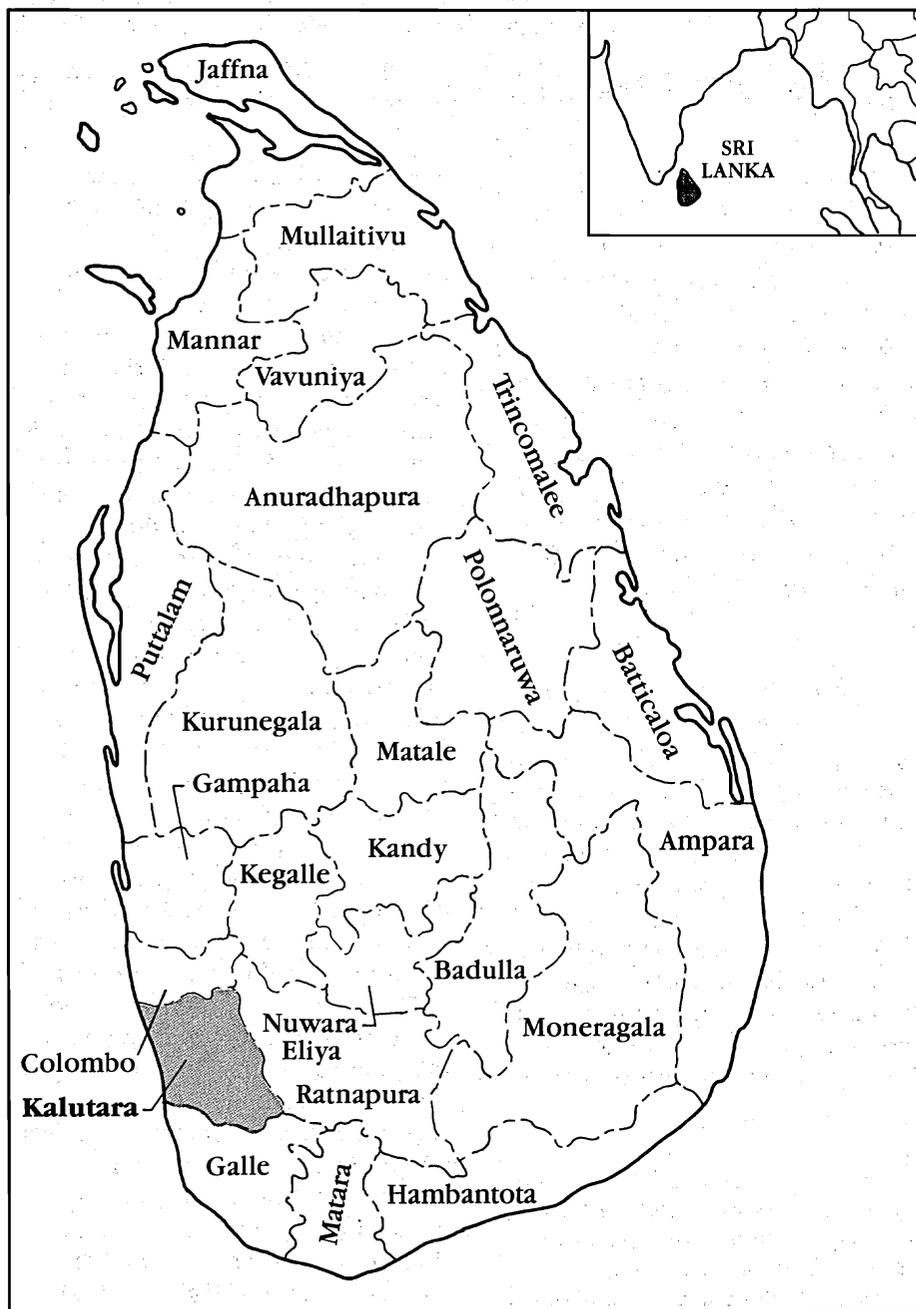


Figure 1. Districts of Sri Lanka

The context of economic, social, and demographic change in Sri Lanka

Sri Lanka, a former British colony that gained its independence in 1948, is an island nation having an estimated 16.9 million inhabitants as of 1991 (UN 1991). A 1986 United Nations study of patterns of social and economic development in Sri Lanka notes that the fertility transition there coincided with a decade of serious economic problems. Earlier rapid population growth exacerbated high unemployment in the 1960s, when insufficient jobs were available to meet the increased labor supply. Adverse trade conditions, reduced foreign-exchange earnings, rising prices, and the high level of unemployment precipitated a series of economic crises that persisted into the 1970s.

In 1977 a change of government and shift in development strategy led to liberalized trade and exchange, strengthened the private sector and created incentives for private investment, and reduced subsidies on food and other consumer goods. Several major irrigation and rural development programs were launched, and a free-trade zone was established. Between 1977 and 1984 the gross domestic product grew at an average annual rate of nearly 6%, up from 3.0% during the early 1970s and 4.3% in the 1960s. Per capita gross national product increased from US \$230 to the present \$420.

Social indicators today portray a positive situation in Sri Lanka, reflecting the welfare-oriented development strategies of past and present governments in the areas of

health and education. The most recent estimate (for 1982–87) of the infant mortality rate is 25 deaths per thousand, which is considerably below that of Thailand (43) and even lower than that of South Korea (27). The government's expansion of free health and medical services undoubtedly accounts for much of the improvement in morbidity and mortality levels. A study by de A. Samarasinghe (1988) identifies several other programs of significance—major emphasis on housing construction during 1978–84; provision of pipe-borne water, especially to rural areas, with cost-recovery measures applied after 1981; and earmarking of funds to improve the health and living standards of estate (plantation) workers and their families. Although further inputs in specific areas of health care are needed, the service infrastructure is much better developed in Sri Lanka than in other countries with similar resource capacities.

On the education front, the policy of free education adopted in 1944 has been translated successfully into an expansion of school facilities, increased student enrollment, and substantial expenditure on education. Adult literacy is high, at 87%. Gender differences exist, but they are diminishing. Female literacy is estimated to be 83% and male literacy 91%, according to 1981 census figures; these levels represent roughly a 30% and a 15% increase, respectively, since 1953. A program to provide free textbooks to school children has been in place since 1981.

A United Nations (1986) review observes that the female labor force grew noticeably between 1946 and 1980 but not at a continuous pace.

A 64% increase was recorded during the intercensal period of 1963–71, but the number of females in the labor force declined slightly (by 1.2%) between 1953 and 1963. Unemployment, as best as it can be measured for women, grew at a rate almost double that for men during 1963–71, at 22% per year versus 11%. Age-specific activity rates for females of ages 15–19 increased from 22% in 1963 to 27% in 1971 and then declined to 21% in 1980–81. Women of ages 20–29 also experienced a decline in economic activity during that period, from about 41% to 37%.

Analysis of the 1975 World Fertility Survey (UN 1985) shows that only 35% of currently married women were working at the time of the survey, the percentages being highest for women between the ages of 30 and 44. The overall picture is somewhat unclear and merits further consideration in light of the difficulty of measuring women's employment.

The nutritional status of the population has benefited from a national food subsidy scheme begun during World War II. Although the program eventually placed a severe fiscal burden on government resources, it maintained adequate food availability to low-income and rural households (UN 1986:58). The UN study suggests that the program may have also lowered child-rearing costs to parents.

Other rural development programs, such as land settlement, electrification, and a guaranteed agricultural price scheme, have been shown to reduce fertility in recent years as the beneficiaries of those programs increasingly adopted birth control methods (Srisena and

Table 1. Singulate mean age at marriage, by sex and region: Sri Lanka, 1946-81

Year	Sri Lanka			Colombo			Kalutara		
	Male	Female	Diff.	Male	Female	Diff.	Male	Female	Diff.
1946	27.0	20.7	6.3	u	u	u	u	u	u
1953	27.2	20.9	6.3	28.6	22.4	6.2	28.5	23.0	5.5
1963	27.9	22.1	5.8	u	u	u	u	u	u
1971	28.0	23.5	4.5	29.0	24.3	4.7	29.1	24.8	4.3
1981	27.9	24.4	3.5	28.9	25.4	3.4	28.8	25.4	3.4

Source: Sri Lanka, DCS (1986), tables 8.11, 8.12.

u—unavailable.

Stoeckel 1986). It is widely acknowledged that Sri Lanka, with its emphasis on public-sector investments, has achieved a degree of social progress that exceeds that of other countries with comparable per capita incomes (UNFPA 1986; UN 1986; World Bank 1978).

Postponement of marriage, which has been a dominant factor in Sri Lanka's fertility decline, may be attributable in part to gains in women's status; but the country's economic depression is also likely to have played a role (Namboodiri 1981, 1983; Fernando 1985; UN 1986), leading not only to lower fertility but also to rising age at marriage among both women and men well into the 1970s. The sex differential in singulate mean age at marriage (SMAM), shown in Table 1, declined from 6.3 years in 1946 to 3.5 years by 1981, when SMAMs for males and females were 27.9 and 24.4, respectively. The female SMAM for 1987 has been estimated to be 24.8 (Sri Lanka, DCS, and DHS 1988), indicating little change in the female age pattern of entry into marriage over the 1981-86 period. What is striking is that Sri

Lankan marriage ages, even in 1963, were already quite high, approaching those in the United States, a country with an annual per capita income level almost 40 times that of Sri Lanka.

As early as the 1960s, ages at which women were marrying began to rise in Sri Lanka, approaching those in the United States, a country with almost 40 times Sri Lanka's per capita income level.

The total fertility rate for the period of 1982-86 was 2.83 children per woman, down from 3.38 during 1980-82 and 5.0 in 1963. An important factor in the fertility decline has been marriage postponement (Alam and Cleland 1981), but since 1980 another prominent factor has been the use of contraception within marriage (Thapa et al. 1988; Dangalle 1989). Age at marriage and age at first birth have shifted upward (Table 2), the inter-

val between the two events remaining more or less constant at 19-20 months.

Recent international migration streams to oil-producing nations in the Middle East have greatly increased employment opportunities for Sri Lankans. Korale (1986) cites the loss of skilled professionals to Gulf States as an instance of the "brain drain" problem. Although the quality of outgoing labor is of concern to the government, demand for Sri Lankan labor in the Middle East has unquestionably relieved the serious problem of domestic unemployment. Remittances from citizens working abroad have become the second largest source of foreign revenues for the country. Women constitute the largest single group of labor migrants (Brochmann 1987; Eelens and Schampers 1990). Korale estimates that in 1981 about 20,000 women migrated to the Gulf area to serve as domestic workers in Arab households.¹

Table 2. Median age at first marriage and first birth, by current age, for all women 25-49: Sri Lanka, 1987

Current age	Median age at 1st marriage	Median age at 1st birth	Difference
25-29	23.1	24.7	1.6
30-34	22.6	24.1	1.5
35-39	23.1	24.9	1.8
40-44	21.4	23.1	1.7
45-49	20.0	21.8	1.8

Source: Sri Lanka, DCS, and DHS (1988), tables 2.2, 3.8.

The context of economic, social, and demographic change in Kalutara District

Kalutara District, located on the southwestern coast of Sri Lanka, had about 830,000 inhabitants in 1981, or 7% of the total population. Although it is not entirely representative of the country's population composition, being primarily Sinhalese and Buddhist, 79% of its population is agricultural (about the same proportion as nationally) and it closely mirrors the marriage and fertility patterns of the country as a whole (ESCAP 1986). We selected Kalutara for our study because it has sufficient compositional heterogeneity to serve as a social microcosm within which to investigate the correlates of young women's status. According to the 1981 census, women between the ages of 15 and 29 constituted 14% of the district's population.

To consider changes in women's status in Kalutara since 1946 as reflected by age at marriage, school enrollment, and economic activity, we have relied primarily on district-level data from the most recent available census, that of 1981.² The sex differential in age at marriage, which narrowed considerably at the national level, behaved similarly in

1. Although male migration shows signs of abatement, female migration is expected to grow. Brochmann suggests that this dependency on transitory income can be a potential future problem. Eelens and Schampers note that migration hampers the social emancipation of the individual migrant because women's status in destination countries is generally lower than in Sri Lanka.

2. The 1991 census was postponed on account of political disturbances in the northern part of the country. There has not been another DHS since 1987.

Kalutara (Table 1). Postponement of marriage apparently began earlier in Kalutara and the capital city of Colombo than in the nation at large. The SMAM in those two places is about a year older than the national average for both males and females.

Table 3, presenting fertility and family planning indicators based on 1987 DHS data for Sri Lanka, Colombo, and zone 3 (which includes the three southwesternmost districts of Kalutara, Galle, and Matara), indicates that women in those three districts marry later, delay their first birth slightly longer, are more likely to be currently using contraception and less likely to be using sterilization, regard a somewhat smaller family size to be ideal, and want fewer births but experience more unwanted births on average than their counterparts in Colombo and the country at large. The women in zone 3, in other words, exhibit family-formation behaviors rivaling those in the industrialized nations.

Examining the activities of Kalutara males and females 10+

years of age at the time of the 1971 and 1981 censuses (Table 4), we find that gender differences in literacy favoring males have narrowed in Kalutara as much as they have nationally. More notable is the finding that in 1981, both nationally and in Kalutara, slightly higher percentages of females of ages 15–19 (43% in Sri Lanka and 47% in Kalutara) were attending school than males (41% and 45%, respectively)—a reversal of the ratio in 1971, when female attendance was below that of males.

The census data on employment activity reveal that females were only about two-fifths as active as males, nationally and in Kalutara, during both periods. Unemployment levels for males were high nationally, at 13%, in 1981, and 2.5 times as high for females, at 32%. The situation was aggravated in Kalutara, where female unemployment was about 13 percentage points higher than the national level and male unemployment was about seven points higher. Moreover, between 1971 and 1981 the gender difference in unemployment in-

Table 3. Fertility and family planning indicators among ever-married women of ages 25–49, by region: Sri Lanka, 1987

Area	Median age		% now using FP ^a	% sterilized ^a	Ideal no. of children ^b	TFR	
	1st marriage	1st birth				Real	Wanted
Sri Lanka	22.4	24.0	61.7	29.8	3.1	2.8	2.4
Colombo	23.8	25.3	62.6	29.8	2.8	2.2	1.9
Zone 3 ^c	24.6	26.4	63.7	24.7	2.9	2.6	2.1

Source: Sri Lanka, DCS, and DHS (1988).

TFR—total fertility rate per woman.

a. Among currently married women, ages 15–49.

b. Among ever-married women, ages 15–49.

c. Zone 3 consists of Kalutara, Galle, and Matara districts (see Figure 1).

creased to the detriment of females. Their unfavorable prospects for employment probably influenced them to remain in school.

These differentials can be seen more clearly for 1981 in Figures 2 and 3, in which we have subdivided the economically active into the employed and the unemployed (that is, those not currently working but seeking work.) The economically nonactive population is subdivided into students and a residual "other" category.

Nearly half of males and females were enrolled in school in the 15-19 age group, but this proportion was less than one-tenth for both sexes in the 20-24 age group. The percentage of males who were employed was consistently higher than that of females in all age groups, and at ages 25-44 the percentage of women who were unemployed was higher than that of men.

The percentage of females in the "other" category rose persistently with age. This category includes persons who state that they work in their own home or are retired or unable to work. The "other" category thus claimed a greater proportion of older women as larger numbers of women formerly in the labor force left it either because they could not find employment or because they chose to concentrate their activities in the household.

These cross-sectional data suggest that labor force participation for women is a transitional stage between leaving school and starting families. It would be unwise, however, to treat the cross-sectional data as describing the experience of real cohorts of women, especially when we know that school atten-

Table 4. Sex differences in educational and employment indicators: Sri Lanka and Kalutara District, 1971 and 1981

Indicator and year	Sri Lanka				Kalutara District			
	Total	Male	Female	F-M diff.	Total	Male	Female	F-M diff.
% literate (ages 10+)								
1971	78.5	85.6	70.9	-14.7	83.2	88.6	77.7	-10.9
1981	87.2	91.1	83.2	-7.9	90.3	93.2	87.5	-5.7
% attending school (ages 15-19)								
1971	34.5	36.5	32.4	-4.1	38.7	41.1	36.4	-4.7
1981	42.1	41.3	42.9	+1.6	46.3	45.2	47.4	+2.2
% economically active (ages 10+)								
1971	48.0	68.5	26.0	-42.5	47.8	67.9	27.5	-40.4
1981	44.4	64.8	23.1	-41.7	44.9	64.2	26.1	-38.1
% unemployed (ages 10+)								
1971	18.7	14.3	31.1	+16.8	26.2	19.8	42.4	+22.6
1981	17.9	13.1	32.0	+18.9	27.7	20.3	45.4	+25.1

Source: Sri Lanka, DCS (1986), tables 10.5, 10.12, 11.15, 11.25.

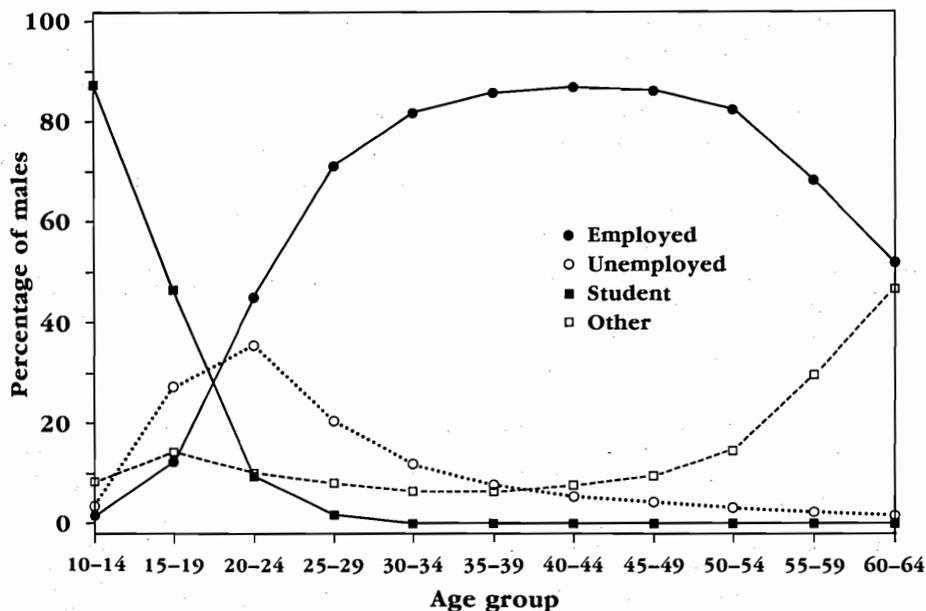


Figure 2. Percentage distribution of Kalutara males by economic activity within age groups

Source: Sri Lanka, DCS (1984)

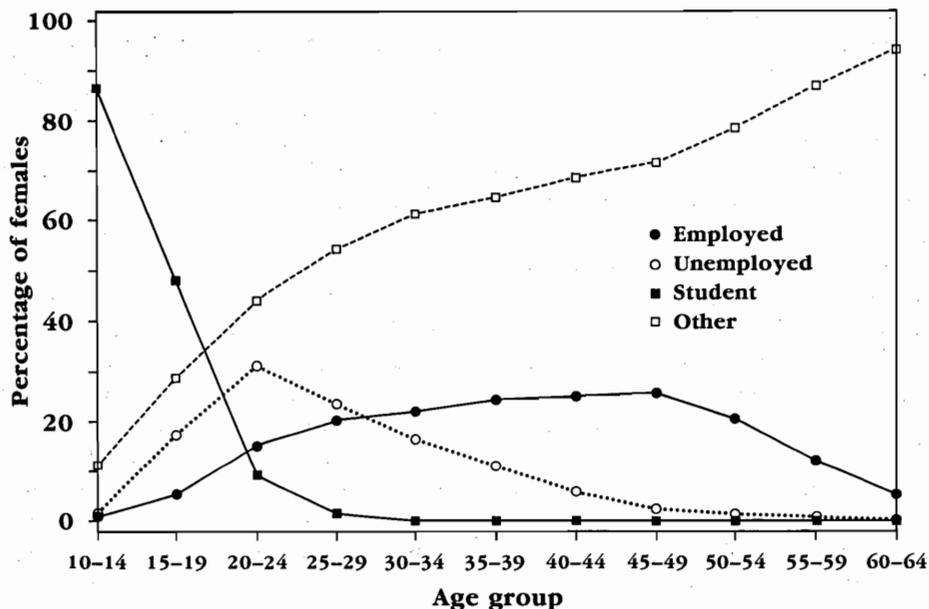


Figure 3. Percentage distribution of Kalutara females by economic activity within age groups

Sri Lanka, DCS (1984)

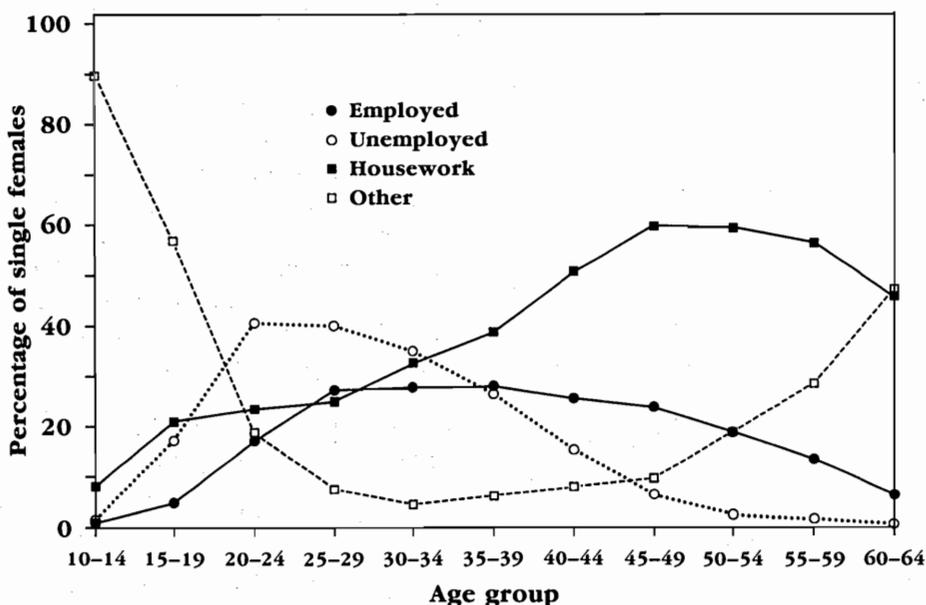


Figure 4. Percentage distribution of single Kalutara females by economic activity within age groups

Source: Sri Lanka, DCS (1984)

dance at older ages has been increasing and age at marriage has been rising.

Figures 4 and 5 show the four categories of economic activity for the female population of Kalutara subdivided into those single and those ever married or in a union at the time of the 1981 census. Unfortunately, tabulations by marital status were not available that included the student category. Instead we have divided the activities of those not in the labor force into the categories of housework and "other." At ages under 30, those engaged in "other" activities are mostly students, but at older ages they include those unable to work and the retired.

By age 50, some 95% of the female population of Kalutara had ever married, so that the distribution of the older single population by economic activity has little bearing on the distribution of the total female population at older ages. Among single females, 57% of the 15-19-year-olds and 19% of the 20-24-year-olds were engaged in "other" activities, compared with only 5.8% and 3.2%, respectively, of those age groups among the ever-married, indicating that few women who married stayed in school.

Among single Kalutara women between ages 20 and 39, the proportion who were economically active (that is, in the labor force and either employed or unemployed) outweighed the proportion engaged in housework. In contrast, some two-thirds of all ever-married women at those ages were engaged in housework. Remarkably high percentages of single women—40% at ages 20-29, 35% at age 30-34, and

27% at ages 35–39—reported themselves as economically active but unemployed. Among married women the percentages unemployed at those ages were less than half as large. But the percentages of employed women in the 20–39 age groups were only slightly higher for single women than for those ever married.

All of this suggests that Kalutara women are strongly inclined to remain in the work force, holding or seeking employment, until they marry. After marriage those who have been unsuccessful at finding employment probably drop out of the economically active population and define themselves as homemakers. A notable 20–25% of married women between ages 35 and 55, however, remained employed in 1981.

The microlevel context for young women's status in Kalutara

What are the actual experiences of young women in Kalutara? In an effort to assess both their own and the community's perceptions of their social position, work opportunities, timing of marriage, and family size, we have drawn upon the results of a survey of young women fielded between August and November 1989 by the Family Planning Association of Lanka. This was a self-weighted probability sample of 2,729 households in which all females between ages 15 and 29 were interviewed.

Trained staff from the Family Planning Association also led discussions with focus groups in Kalutara to explore perceptions of

the rights, obligations, and aspirations of young women. Participants in the focus groups included young, unmarried, employed and unemployed women; young men; community leaders; and the mothers of women in the 15–29 age group.

Average age of the 1,535 women interviewed was 21.5 years. Approximately one-fifth were currently married. A majority (78%) of the young women were Sinhalese, and the next largest ethnic group consisted of Moors (20%), who are predominately Muslim. Only 11% had less than a primary school education; 24% had completed primary school, 34% had completed 10 years of schooling constituting the ordinary, or O, level, and the balance (31%) had had some higher secondary education. Among the last group, 17% had completed 12 years of schooling (the advanced, or A, level). More than four-fifths of the sample listened to the radio daily or read a newspaper each week.

Only 14% reported themselves as currently working, for either an unrelated employer or a family business or farm, whereas 35% were seeking work. Of the 2,729 households sampled, about one-third had members who were working away from home; one-half of the absent workers were women, of whom 30% were married. About 40% of those working elsewhere had jobs abroad, whereas the rest were working in Sri Lanka. The most common local destination was Colombo (40%); the most likely foreign destination was the Middle East (36%). These findings are consistent with the results of other

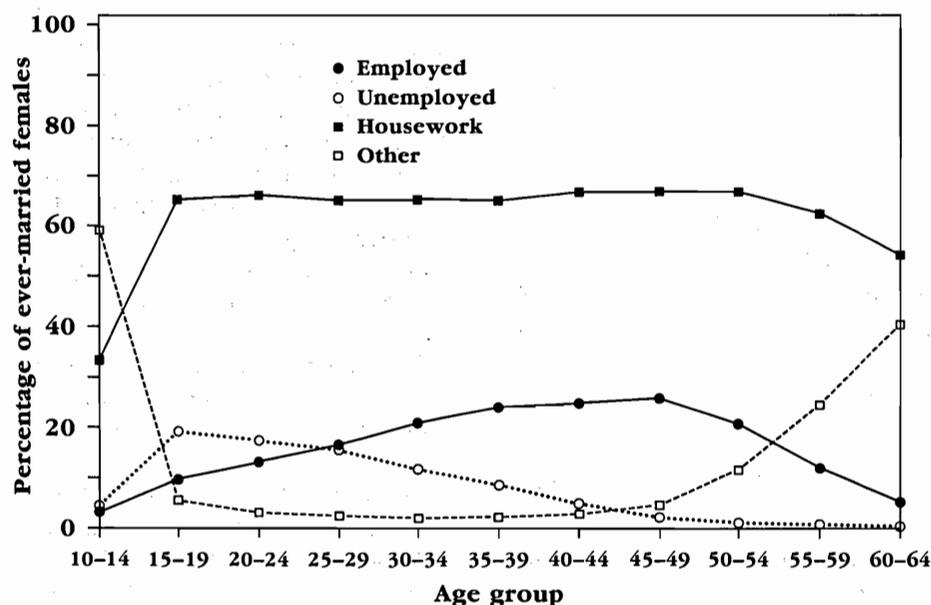


Figure 5. Percentage distribution of ever-married Kalutara females by economic activity within age groups

Source: Sri Lanka, DCS (1984)

(continued on page 109)

Reviews and Publication Notes

The City in the Village: The In-situ Urbanization of Villages, Villagers, and Their Land around Kuala Lumpur, Malaysia by Harold Brookfield, Abdul Samad Hadi, and Zaharah Mahmud. Singapore: Oxford University Press, 1991. ix, 185 pp. (cloth). ISBN 0-19-588976-2, US \$56.00. Available from Oxford University Press Pte. Ltd., Unit 221, Ubi Avenue 4, Singapore 1440.

This book is the result of research initiated in 1986-87 and partially updated in 1989. It views urbanization processes from a rural perspective, and, as stated by the authors, can be read on two levels. The more universal level concerns transformations of peasant life and livelihood generated by the expanding influences of large urban agglomerations. The authors are careful to point out that these transformations precede actual absorption of rural areas into the "limits of city growth." In other words, they are concerned with areas that still look rural but have begun in many ways to act urban. They are thus not focusing on urbanization as a physical process marked by the expansion of a built environment that is familiarly urban, but rather on what Pearse and others long ago referred to as an incorporative drive whereby peasant societies are transformed through their inclusion in the orbit of an expanding metropolitan-centered market economy and the increasing reach of a modernized bureaucratic state.

At this level, and contrary to the authors' assertion (p. 3) that because the book "breaks new ground" they cannot relate it to other past or present rural studies,

the adopted framework is closely associated with a large body of literature on rural transformations that covers such themes as the penetration of capitalist modes of production into precapitalist agrarian societies; the collapse of the "moral economy" of the peasantry; the liberation of the "rational" peasant; the commercialization of agriculture stimulated by the urbanization process; and the transfer of labor from agriculture to nonagricultural occupations, along with an expanding bid-rent curve of urban land uses. The book does not sustain discourse on this level, however, and gives only indirect hints about how the richness of data that fills it can also provide insights into the many theoretical debates that have been central to much of the literature on agrarian change.

The book's main contributions are to be gleaned from the second level of discussion, namely, the presentation of an impressive amount of data on *in situ* urbanization of villagers in selected villages around the expanding metropolitan region of Kuala Lumpur. As the subtitle of the book declares, it is concerned with what happens to "villages, villagers and their land" as forces of urbanization move into rural areas. It explores the ways in which land relations are transformed in a dynamic matrix of dissolving customary land uses, the presence of state regulation, and the increasing dominance of market forces.

One of the more interesting aspects of these relationships revealed in the analysis is how the

commodification of land has created twists in government regulations that, instead of fulfilling their intended purpose of protecting the Malay from land price inflation, actually result in widespread rises of land prices and the inability of peasants to resist processes of social stratification associated with inequalities in access to land. But, again, the ramifications of these processes are largely left to the reader to pursue outside of the text of the book.

Chapter 1, "Problem, Context and Approach," puts forth a major, and often-repeated, observation that contemporary transportation revolutions have made the rural-urban dichotomy of decreasing utility as rural areas are "swallowed" and experience *in-situ* urbanization. The theme is well taken, and had the authors given more attention to the wider literature on it, they could have made valuable contributions to such current discussions as those put forth by McGee and others on *desakotasasi* (rural-urban-ization), on new forms of labor mobility and circular migration, and on such questions as whether these processes are uniquely Asian (e.g., associated with "rice cultures"), pertinent only to developing countries, or are occurring on a world scale.

Chapter 2, "Malays and Their Land," characterizes the arrival of capitalism as a radically transforming process that, inter alia, initiates freedom of individual ownership and land speculation, which undermine the self-sufficient corporate village in which usufruct rights traditionally prevailed. Some of the

most interesting discussions about changes in land use are found here. The precolonial social classification of unused land as "dead," which allowed it then to be used by someone other than the "owner," is contrasted with the market system's allowance of holding idle land. The commodification of land is found to have undermined the communal *adat* system and, along with it, the common-property aspects of land use (which, unfortunately, are not discussed).

Changes in the institutional arrangements regulating land use also induced new forms of social conflict, enabling the British and Chinese subsequently to use the new rules governing land ownership to accumulate land. Thus the theme is presented that the Malay are marginalized in the colonial economy, and this marginalization is further aggravated by Malay land losses and exacerbated by the emergence of a cash economy, the ability to use land as collateral for loans, and new patterns of consumption linked to the need for cash—all of this despite the establishment of Malay land reservations and the adoption of many laws designed to protect the Malay.

This conflict between *bumiputra* (indigenous Malay) and other racial and ethnic groups is a long-standing theme in Malaysian politics and academic studies. Although it is captivating, there is a tendency to treat the Malay population as having little internal stratification—a tendency reminiscent of Geertz's classic study of agricultural involution on Java.

Chapter 3, "Changes in Land Use," and Chapter 4, "Land Tenure, Transfer and Sale," continue the

analysis into postcolonial times through a study of four communities, each within the orbit of but at a different distance from Kuala Lumpur. Rich in historical detail in changes in land use, the discussion is useful for bringing home a much overlooked feature of what is often summarized as "rural," namely the great variation among villages even within a relatively small geographical area.

Most of this detail is discussed in relation to a single proposition: distance from the metropolitan core explains, to a great extent, degree of commercialization and changes in land-use and land-ownership patterns. Given the focus on land-use changes, one of the many dimensions that could have been added is the changing built environment they bring. Elsewhere, such as in the rural areas being incorporated into the Bangkok metropolis, *in situ* urbanization is producing land-use changes that are overlaid by a topsy-turvy "postmodern" pattern in which large areas of paddy land are taken over by grass grown for golf courses and are dotted with second homes with subsistence gardens sprouting huge science-fiction-like satellite dishes for weekenders from the city. More attention to this layer of change would have given the reader a more complete understanding of the ramifications of *in situ* urbanization.

The main point brought out in the focus on land-use changes is that great spatial variation exists in the levels of external ownership and the health of the agricultural economy. Price inflation of land in the 1970s and 1980s led to the withdrawal of labor inputs in agriculture, which, particularly near Kuala

Lumpur, facilitated land transfers to urban uses and a boom in nonagricultural employment. Similarly, urbanization is found to be on a continuum in the four communities, ranging from incipient in the periphery to almost total near the outer edges of the capital city. In assessing winners and losers in the *in situ* urbanization process, the authors group households into four categories: residents with a landed stake in the community; residents who have purchased land outside the community; absentee landholders; and tenants. Since land laws protect Malay from outright eviction, they are brought into the urban sphere in other, more subtle ways: through the growth of new employment opportunities, new land uses, undreamed of prices for land, access to urban facilities, and new outlooks and patterns of consumption.

The analysis provides a useful feel of the socio-spatial texture of ongoing changes. The reader's understanding is further increased by Chapter 5, "The People of the Four Communities," which is based on observations made by the various authors during two- to three-week stays and the undertaking of a survey covering a total of 731 households in the communities. The authors are careful to note that the survey was not random and therefore the findings cannot be said to be representative of the communities in question.

The findings themselves contain few, if any, surprises, and are not directed toward raising points of theory or debate. They mostly serve to confirm what a vast body of research has documented elsewhere. Demographic conditions, for exam-

ple, are found to be closely related to economic ones; thus children missing from the household are found to be working in the city or in other locations.

Chapter 6, "Inequality within and between Communities," expands on the theme that inequality in land ownership is the basis for inequalities in income, which are pronounced. Rice farmers and rubber smallholders comprise 45 percent of the poor in Malaysia, and more than two-fifths of the households in these sectors were found to be living still in poverty at the time of the study in 1988. But around Kuala Lumpur, the rapid growth of off-farm employment severely limits the use of employment classifications to describe relations between poverty and work. In the four villages 63 percent of the average household income is from nonagricultural employment; this proportion ranges from more than 90 percent in the nearest communities to slightly less than 50 percent in the communities farthest from Kuala Lumpur. The chapter provides income and expenditure data by occupation and shows that the proportion of family earners away from home declines with income as well as with degree of urbanization.

Again, the data do not suggest new insights; they are presented in a descriptive manner to reveal, for example, that poor households have more migrants not residing at home than do better-off households, which the authors claim is the most important revelation of the survey. The poorest households are also found to have agriculture as their main source of income, and this fact is used to support the conclusion that access to the city, or,

more correctly, *in situ* urbanization, rather than ties to the land, has become the greatest determinant of income inequality. Thus the sources of income inequalities are found to be going through a rural-to-urban transition, i.e., from a basis in ownership of agricultural land to a basis in access to nonagricultural (residential) land and employment and in the ability to pay for urban goods and services.

What may amaze readers from other parts of Southeast and South Asia is the high level of consumer durables owned by even the poorest household: from one-third to one-half of the poorest 25 percent of the households in the communities surveyed owned televisions, refrigerators, and motor vehicles. A gold mine of data is made available to the reader; but, with the exception of a few generalized explanations, most remains untapped by the authors. Most surprising of all is the absence of any discussion of gender issues and the changing position of Malay women, who have been the vanguard of Malaysia's integration into the global factory and associated processes of proletarianization of the peasantry.

The text of the concluding chapter, "The Body of a Village; the Mind of a City," is extremely brief and is absorbed by observations about changing attitudes toward land and land use. The section "Implications for Method and Theory" repeats the observation that the dichotomy between rural and urban is breaking down in mega-urban regions. Since this is already a well-established view among many geographers and regional planners, the absence of any effort either to extend it theoretically or to draw im-

plications for policy and planning makes the exhortation to overcome the limitations of the rural-urban dichotomy of less use than the authors proclaim it to be.

The one policy issue touched upon in the concluding chapter is the authors' advocacy of the removal of what they see as an anachronistic and counterproductive Malay land reservation system. The implicit acceptance of private ownership and commodification of land seems, however, to be at odds with the general tone of the foregoing historical analysis. Without further elaboration, it remains a curiosity rather than a cogently presented position. It is linked neither to the larger context of social and economic inequalities nor, since the first author of the book has written extensively on the topic elsewhere, to the recent interest in the relationship between property regimes and environmental management questions. The latter topic has generated much concern in view of the environmentally threatening expansion of the urban-industrial economy of Kuala Lumpur and the Klang Valley.

In sum, the book is likely to be of most use as a reference and data source for an audience of readers interested in on-going transformations in Malaysia. It is rich in statistics on changes in land use, access to land, employment structures, and social and economic inequality. Many of the data and themes suggested in the book can be linked with existing literature and debates on agrarian change; but, as indicated by the almost complete absence of references to this literature in the book's bibliography, making these linkages is left largely to the reader.

What the book does successfully portray are many of the land-related impacts of an accelerated pace of urbanization in a country that once had one of the smallest capital city regions in Asia. For that reason alone, it is a useful addition to the library of work on contemporary urbanization processes in Asia.

—Mike Douglass
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World Urbanization Prospects 1990: Estimates and Projections of Urban and Rural Populations and of Urban Agglomerations by the Department of International Economic and Social Affairs, United Nations. New York, 1991. United Nations, 1991. viii, 223 pp. ISBN 92-1-151232-8 (paper), US \$29.00. Available from United Nations, Sales Section, New York, NY 10017, U.S.A.

This is the latest of the biennial population updates for urban and rural areas prepared by the Population Division of the UN's Department of International Economic and Social Affairs. Data from new censuses and surveys have been used to estimate and project the size and growth of the urban and rural populations for all countries of the world, and for urban agglomerations with populations of at least one million by 1900.

Chapter 1 describes past trends and prospects of future growth for national urban and rural populations. Mid-1900 figures show 45% (2.4 billion) of the world's population living in urban areas and nearly two-thirds of urban dwellers living in less developed regions.

Thirty-seven percent of the population in the less developed regions (1.5 billion) and 73% of the population in the more developed regions (0.9 billion) were urban. The projections indicate that the level of urbanization for the world as a whole will reach 51% by the year 2000 and 65% in 2025. The less developed regions will contain 70% of the world's urban population by the year 2000 and 80% by 2025.

Although the urban population growth rate is now declining in both developed and developing regions, the urban population growth rate for the world as a whole has continued to rise. This anomaly is due to the increasing proportion of the world's population living in the less developed regions, which are exhibiting faster urban and total growth rates than the developed regions.

Chapter II presents trends and prospects for the world's largest urban agglomerations and describes their regional distributions. By 1990 one-third of the world urban population was living in agglomerations of 1 million or more inhabitants and one-tenth lived in agglomerations of 8 million or more. Mexico City, with a population of approximately 20.2 million, had become the world's largest urban agglomeration, surpassing Tokyo/Yokohama, São Paulo, and New York in population size.

In 1950 seven of the 10 largest urban agglomerations were in the more developed regions. By 1990 only three of the 10 were in more developed regions. By the year 2000 there are projected to be 28 mega-cities (urban agglomerations with 8 million or more inhabitants each), only six of which will be in

the more developed regions. Many of these cities will be primate cities, containing sizable proportions of their countries' populations. Population growth rates between 1970 and 1980 indicate a generally strong statistical relationship between total population growth and mega-city growth.

Chapter III provides the sources of data for each country and adjustment procedures used for estimating the population of urban areas and urban agglomerations. This information should be of interest to researchers and planners who wish to do further analysis of urbanization trends.

Fifteen annex tables present detailed characteristics of urban and rural populations and urban agglomerations. Annex tables A.1 to A.4 provide, for each country and regional aggregate, the percentage of the national population residing in urban areas and the sizes of urban, rural, and total populations. Annex tables A.5 to A.7 present average annual rates of change for urban, rural, and total populations in every country and regional aggregate. Annex tables A.8 and A.9 give the rate of urbanization and ruralization for countries and regions. Population trends of urban agglomerations from 1950 to 2000 and related indices are shown in annex tables A.10 to A.15.

United Nations monographs such as this provide authoritative statistics that are extremely useful to researchers and planners. Persons wishing to use the data in computer format have the option of buying diskettes formatted in ASCII and Lotus 1-2-3 for IBM-PCs and compatible microcomputers or in ASCII (text) and Microsoft Excel for the

Apple Macintosh. For further information about this option contact: Director, Population Division, Room DC2-1950, United Nations, New York, NY 10017, USA.

—Alice D. Harris
former Resource Materials
Specialist for the
East-West Population Institute

Landlessness and Migration in Nepal

by Nanda R. Shrestha. Boulder: Westview Press, 1990. xx, 284 pp. ISBN 0-8133-7677-7 (paper), US \$29.95. Available from Westview Press, 5500 Central Avenue, Boulder, CO 80301, U.S.A.

An increasing volume of migration from the hills of Nepal to the Tarai lowlands, a region of endemic malaria until the 1950s, has been the most conspicuous feature of Nepal's population dynamics in recent decades. In 1981 nearly 400,000 hill people were recorded as intercensal lifetime migrants in the Tarai. This migration occurs overwhelmingly between rural areas and traditionally has taken the form of frontier land colonization. As a consequence, the forests of the northern Tarai and inner Tarai are rapidly being lost or degraded.

The conventional view of this phenomenal migration, which regards migration as an amalgamation of individual movements, has tended to offer a simple explanation: high population-land ratios and consequent economic and ecological problems "push" people out of the hills, whereas low population-land ratios, relatively high productivity of agriculture, and prospects for spontaneous settle-

ments "pull" land-hungry hill folk to the Tarai. Rarely has Nepalese frontier migration been seen as a socioeconomic and eco-demographic process, or have explanations been sought in the realm of the social relations of production borne out of Nepal's policies as a dependent, patrimonial state.

Nanda Shrestha's book *Landlessness and Migration in Nepal* breaks new ground in providing an essential political-economy perspective, and in so doing provides the most cogent and comprehensive analysis available on the causes, consequences, and implications of frontier migration in Nepal. Unlike others who had dealt with Nepal's migration issue, Shrestha situates the problem in its proper context and provides altogether new and novel insights.

He reformulates theoretical constructs and makes them relevant to the Nepalese situation. In its approach and methodology, in its theoretical rigor and innovative uses of census and survey data, his book is a landmark for Nepalese studies in general and Nepalese migration studies in particular. Its central thesis is that frontier migration in Nepal has helped to propagate landlessness, near-landlessness, and spontaneous settlement at the frontier, thereby undermining local as well as national development.

Chapter 1 presents a profile of Nepal's agrarian economy and an overview of interregional migration. Chapter 2 provides the theoretical basis for analyzing the Nepalese migration process. Shrestha describes how, in the course of the last century or so, the politically dominant hill region of Nepal has degenerated into an economic

periphery. He attributes contemporary hill underdevelopment to a biased allocation of resources in a context in which underdevelopment, dependency, and migration reinforce each other. In that context migration "is a manifestation of, and necessary response to, the social and spatial arrangements and rearrangements of the national economy in which the dependent state plays a determinate role through its control over the social as well as spatial distribution of capital" (p. 53).

In his theoretical analysis of migration in relation to the social factors of production and uneven geographical development, Shrestha discerns three major issues: who migrates, why migration occurs, and how migration affects migrants and developments. The class position of migrants and their consequent migration choice (strategic versus survival) form the basis of the author's structural theory of migration. For the migrants of the lower classes migration becomes merely a holding action, "a transitory spatial escape from the harsh realities of one regressive social structure to a different but equally prohibitive one" (p. 65).

With this theoretical background, he presents in chapter 3 a lucid historical analysis of external migration and underdevelopment in the context of Nepalese state policies. He regards contemporary migration as the perpetuation of a process begun in the early phase of underdevelopment in the hills, which resulted largely from regressive institutional arrangements.

Chapter 4 provides the theoretical basis for analyzing landlessness and near-landlessness in the context of

frontier migration. The author presents an innovative theory of landlessness and near-landlessness anchored to the concept of eco-demographic relations of production. Viewing people's production relationships with land within the context of the existing class structure, Shrestha argues that high population growth tends to aggravate eco-demographic problems of production and creates conditions for an increase in landlessness and near-landlessness, which in turn induce outmigration. These conditions can be seen in the Nepalese hills.

Whereas the first four chapters provide an overview of the causes of landlessness and migration, the last three deal more directly with the process and consequences of frontier migration. Chapter 5 analyzes the social and economic origins of Nepal's land-colonization policy, showing how in recent years the policy has been the "great conciliator between the vested interests of large landowners and the survival needs of the land hungry peasants" (p. 146). The author demonstrates how a patrimonial state is inherently incapable of solving poverty and its attendant problems of landlessness, and how planning has failed to effectively convert the potential for surplus production to an actual surplus.

How has frontier migration affected hill migrants? The answer to this question, which is central to Shrestha's thesis, forms the core of chapter 6. After tracing a brief history of the colonial and peripheral status of the Tarai during the evolution of the Nepalese state, he presents an analysis of data from a survey he did of how hill migrant households

fared at the Tarai frontier in the two Tarai districts of Chitwan and Nawal Parasi in 1988. The analysis reveals that for most migrants migration has been a "transitory spatial escape" from the harsh social and economic realities of the hills. The same socioeconomic and demographic processes, however, are operative in the destination, making the structural trap complete. In spite of increasing migration, settlement, and land encroachment, near-landlessness is on the rise.

The final chapter focuses on the politics of land and explores the prospects for an agrarian revolution in the frontier. The politics of common land in the Tarai has given rise to "professional landless" and "pretenders" to landlessness. Middle peasants, who historically have formed the core of a peasant revolution, in Nepal are conspicuous by their absence. Ironically, spontaneous settlements have acted as the immediate roadblock to an agrarian revolution. Shrestha concludes that despite persistent near-landlessness, the likelihood of an agrarian revolution in the frontier appears remote, though not entirely out of the question.

Landlessness and Migration in Nepal should be required reading for students of contemporary Nepalese affairs, and for Nepalese policymakers whose task it is to make a break from the policies and designs of a patrimonial state.

Nevertheless, three issues that deserve attention do not find an adequate place in the author's analysis.

The first relates to the root cause of frontier migration: the underdevelopment of the hills. Underdevelopment indicates the existence

of potential that remains to be realized. Given the absence of an analysis of that potential and of the conditions under which it might come into use, one wonders whether the underdevelopment of the hills is a *fait accompli*.

The second issue concerns the social classes in Nepal's hills. Although class structure remains central to the study, the distinctive characteristics of the hill people and their social relations of production are not addressed explicitly in this study.

The third issue relates to the increasing urbanization of the Tarai. Many frontier settlements are emerging as market centers and small towns. Their growth has been facilitated by the development of roads. Rural-to-urban migration also appears to be on the rise in Nepal. What are the implications of this process for the contemporary class configuration in the Tarai? Does it have the potential to hasten the proletarianization of the near-landless that has been postponed thus far? One hopes that Nanda Shrestha will provide scholarly insight to these issues in the future.

—Pitamber Sharma
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Changing Your Address?

Please send us your old address label for the *Forum* when you notify us of your new address. This will enable us to update the change without delay.

Activities and Announcements

Michel Oksenberg Assumes Post of East-West Center President

Michel Oksenberg, a noted Asia scholar and former White House adviser, was selected by the East-West Center's board of governors to head the Center and began his tenure as president on 6 January 1992, replacing Interim President Kenji Sumida. Oksenberg came to the Center from the University of Michigan, where he had been director of the Center for Chinese Studies and professor of political science.

Oksenberg, 53, received his Ph.D. in political science from Columbia University in 1969. He joined the Michigan faculty in 1973, after teaching at Stanford University for two years and Columbia University for eight years. From 1977 to 1980, on leave from Michigan, he served as a senior staff member of the National Security Council in Washington, D.C., with special responsibility for China and Indochina. He has been a member of the Council on Foreign Relations since 1973, serves on the editorial boards of two scholarly journals, and is the author of numerous publications on China's domestic affairs, foreign policy, and relations with the United States.

During his first months as president, Oksenberg plans to interview individual researchers and key staff members and to hold meetings with community leaders to discuss the Center's roles and mission. At his request, Sumida has agreed to serve as executive vice president for several months.

Fourteenth Population Census Conference Scheduled for Tokyo in May

The East-West Center's Population Institute and the Statistics Bureau of Japan will hold the Fourteenth Population Census Conference in Tokyo, Japan, during 26-29 May 1992. The conference will focus on two broad themes—use of data from the 1990 round of censuses and planning for intercensal surveys. Heads of national statistical offices or their designees from 20 countries and several organizations are expected to attend. Takayuki Sasajima of the Statistics Bureau of Japan and Griffith Feeney of the East-West Population Institute will coordinate the meeting. The conference is being held in conjunction with the Sixth Meeting of the Heads of National Statistical Offices of East Asian countries, which immediately precedes the Census Conference.

Conference sessions will include status reports on the recent censuses, data processing, sample surveys, planning for future operations, analysis of census data, and dissemination and use of the data.

Countries to be represented at the conference are Australia, Bangladesh, China, Fiji, Hong Kong, India, Indonesia, Japan, the Republic of Korea, Malaysia, Mexico, Nepal, Pakistan, Papua New Guinea, the Philippines, Singapore, Thailand, the United States, and Vietnam. Organizations taking part include the Economic and Social Commission for Asia and the Pacific, the Statistical Institute of Asia and the Pacific, and the South Pacific Commission.

Fertility Estimation Programs Available from the East-West Population Institute

EASWESPOP — Fertility Estimate Programs Version 2.0, an interactive software package, is now available from the Population Institute of the East-West Center. The package contains the following indirect methods of fertility estimation:

- P/F Ratio Method from United Nations Manual X
- Parity Increment Method from United Nations Manual X
- Relé's Method
- Palmore's Regression Method
- Gunasekaran-Palmore Method
- Complete Own-Children Method by Cho et al.

Features new to Version 2.0 include:

- On-line help
- A menu-driven interface
- A full-screen text editor
- The ability to save input data to a hard disk

Minimum system requirements are IBM compatibility, DOS 3.0 or higher, and 512K RAM. The software is available on a 5¼-inch diskette and comes with a user's manual. Price is US \$15.00. Send orders to:

Distribution Office
East-West Center
1777 East-West Road
Honolulu, HI 96844, U.S.A.

Institutions and individuals in developing countries of the Asian-Pacific region are eligible to receive the package without charge. Address requests to:

Data Analysis Officer
Population Institute
East-West Center
1777 East-West Road
Honolulu, Hawaii 96848, U.S.A.

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ALSO NOTED

HRV Health Research Network. Newsletter published bimonthly (every two months) since September 1991 by the Health Research Network Project of the Philippine Population Association and the Department of Health. Editorial staff: Ma. Florina I. Dumlao, Anna Maria Leida N. Pacano, and Lourdes A. Cabrias. Available from HRN Health Research Network, Philippine Population Association, No. 81, Matahimik St., Teachers' Village, Quezon City, Philippines.

This English-language newsletter contains articles on a variety of topics likely to be of interest to health and population professionals in the Philippines, such as the national health plan and the transmission of the AIDS virus through commercial blood banks, to mention two from a recent issue. It also contains announcements of new publications and descriptions of research projects and proposals.

Diarrheal Diseases in the Southern Philippines: A Case Study Approach by Marilou Palabrica-Costello and Michael A. Costello. Ottawa: International Development Research Centre, 1992. Available from International Development Research Centre, 250 Albert Street, P.O. Box 8500, Ottawa, Ontario K1G 3H9, Canada; and from the authors, c/o Research Institute for Mindanao Culture, Xavier University, Cagayan de Oro City, Philippines.

According to a recent announcement in the *HRV Health Research Network* (see item above), this report by two researchers at the Research Institute for Mindanao Culture, Xavier University, in Cagayan de Oro City "analyzes the factors involved in the transmission

and case management of diarrhea, particularly as found among lower income families in Cagayan de Oro and a rural municipality in Bukidnon province. Unlike previous researchers, Palabrica-Costello and Costello utilized an anthropological-type approach, so as to discover in a better way the deep-seated attitudes . . . held about diarrheal disease by the respondents. The emphasis is therefore upon both disease-related behaviors and the reasons given by the people for acting the way they do."

Asian and Pacific Migration Journal. Published quarterly beginning in 1992 by the Scalabrini Migration Center, Manila. Editor: Graziano Battistella. P600 (US \$25) per year. Available from Scalabrini Migration Center, P.O. Box 10541 Broadway Centrum, 1113 Quezon City, Philippines.

The Scalabrini Migration Center (SMC) is a nonprofit research institute founded in 1987 to encourage and facilitate the study of socio-demographic, economic, political, psychological, historical, legislative, and religious aspects of human migration and refugee movements from and within Asia. According to Editor Battistella, "the *Asian and Pacific Migration Journal* is expressly dedicated to an interdisciplinary approach to the topic [of migration] and the region and aims to gather and foster the interest of scholars, policymakers and practitioners for a more thorough and informed analysis of migration and its relevance" (Vol. 1, No. 1, p. iv).

The first issue contains six articles: "Migration and Development: A Critical Relationship," by R. T. Appleyard; "International Migration Within and From the East and

Southeast Asian Region: A Review Essay," by Ronald Skeldon; "Asian Immigration: The View from the United States," by Robert W. Gardner; "Knocking at the Door: Asian Immigration to Australia," by Graeme Hugo; "The Troublesome Gulf: Research on Migration to the Middle East," by Manolo Abella; and "Migration in India," by J. P. Singh.

Meeting Your Statistical Development Needs: International Statistical Programs Center, ISPC Training for 1992-93. Washington, D.C.: Bureau of the Census, U.S. Department of Commerce, January 1992. ii, 30 pp. (paper), free. Available from Chief, International Statistical Programs Center, U.S. Bureau of the Census, Scuderi Building, Washington, D.C. 20233-0001, U.S.A. Telephone (301) 763-2860; FAX (301) 763-7589; Telex 9102509167.

The International Statistical Programs Center (ISPC) of the U.S. Bureau of the Census has trained more than 11,000 statisticians, computer specialists, and data users in its Washington, D.C., headquarters and throughout the world during the past 46 years. This publication describes its 1992-93 training program, which offers 32 options for long-term training and workshops. Course descriptions cover the subject areas of computer technology, data collection and dissemination, sampling and statistical methods, demography, and economic statistics. The booklet also contains a quick reference guide to the available training options; information about the ISPC and an overview of the training programs; information about costs, admission procedures, and sponsorship; and two application forms, a reply card, and a calendar of activities.

Young Women's Work and Family Formation . . .

(continued from page 100)

studies mentioned earlier, which reported substantial overseas female labor migration. Three-quarters of the households with labor migrants reported receiving remitted earnings from the absent workers.

Social position. The survey results confirmed the strong educational achievements of young women in Kalutara, as did focus-group comments from mothers acknowledging their daughters' acquisition of education-based skills. Referring to differences between their daughters' social status compared with their own at the same age, several mothers commented on their daughters' superior knowledge:

In education they [the daughters] have improved. They know more about health than we do.

They know many things we didn't know then.

With progress in science they have come to know many things.

We say that something is not good. They think it is good. When we think about it, they turn out to be right.

Some mothers identified their daughters' ability to interact with others in public as a significant aspect of the change in their daughters' social roles:

Our daughters say "We know how to move in society, unlike our mothers."

In those days we were [too] shy to face society, even to talk. Now they are not.

They go out and mix with people.

They speak boldly.

The mothers perceived their daughters' education as empowering the daughters to deal with barriers:

They are not afraid to face problems and find problems.

If they stay with us [at home], they will not have a future.

Some mothers, however, tempered their enthusiasm about the extent of change between their own generation and that of their daughters:

Today they are also headstrong.

There are times when some children use their freedom in the wrong way.

Unmarried young men (ages 25–29), when asked about the social position of young women, also expressed ambivalence about the changes:

This is happening all over the world, not only here. They [young women] think of equal status. They think once they are educated, they should invariably have a job also.

They get together and mix in large numbers. Their freedom has increased. They exchange ideas and build up their own world and values.

They tend to disregard and give up the restrictions imposed on them earlier and enjoy their new freedom. It is not a good thing. They are not using their freedom in a beneficial way.

Freedom is necessary, but there must be limits. Full freedom must not be given. They take advantage. They are not mature enough to de-

cide on their own.

With respect to the optimal means for guiding young women in exercising their new freedom, however, the young men had differing views:

Usually parents are responsible for these affairs. They must be more tactful with their children. They should treat their children and speak to them like friends and discuss and settle their personal problems.

But these things cannot be 100% successful. Rules must be laid down and [young women] made to follow [them] strictly or otherwise [be] punished.

You cannot expect them [young women] to be of good behavior by enacting a set of rules or by compulsion. They must be made to understand [the rules'] usefulness and follow them on their own.

Among community leaders, one, a businessman, commented,

Young women now enjoy much more freedom, and with freedom can come more privileges. But with freedom can also come more complications for them. Twenty years ago you never saw so many young women getting about very freely, very differently dressed [from the way they are] now, and you never saw them moving so freely with young men. With this freedom some may be creating complications, but generally I think it is for the better.

Another proprietor remarked, *It is quite clear that not only*

young women but even young men have more rights and privileges. This is a good thing. They are generally better educated now, and it is only fair that they should have a greater part in deciding their own future.

The focus-group comments suggest the existence of considerable communal and maternal support for the new social skills that young women have acquired along with higher levels of education. The comments of young men, on the other hand, evidence concern about the ability of the young women to use their new social freedom appropriately. The discussions provided insights into the relationship between young women's education and work that could not be easily explored in the survey questionnaire. At the same time, they suggested that those closest to young women must make social adjustments in response to changes in the women's social status.

Work opportunities. In the focus-group discussions young unmarried and unemployed Kalutara women were asked how they felt about working outside the home. Virtually none of them identified any barriers to such employment. Typical of their comments were the following:

If I can get a job I like, I can work outside. There would be no restrictions.

Even if there are difficulties, I do not mind going outside to work.

We have decided to get a job, and it will help us economically. So we don't mind going outside and may not listen to our parents sometimes.

Some of the women recognized potential problems caused by working away from home, particularly in the growing garment-manufacturing industry, which provides the largest source of nonagricultural female employment:

We have heard stories about girls who have gone outside and had trouble, but if we have self-confidence and persist, then we can face the problems and be safe.

There may be problems if we get jobs in the garment factories. Because if we go there, there is no freedom and the workload is heavy. Although the work finishes at 5 o'clock, sometimes you have to stay longer.

The young women had a strong desire to find employment, as the survey results shown in Table 5 indicate. More than half of them stated that it was very difficult to find regular paid employment, and another third judged it to be difficult. Comments from the focus-group participants illustrate the problems they faced:

I left school in 1986, and since then I have been sending in [job] applications but have not yet been successful.

I have sent in many applications, but I have received a reply for only one. That one was from the Apprenticeship Board [AB]; they asked if I would like to go for dressmaking. I applied for other jobs under the AB but so far have not received any appointments.

I apply for all the jobs that I see in the papers, but I haven't gotten one so far.

Whenever we meet anybody from

Table 5. Responses of Kalutara women, ages 15–29, to questions about work opportunities

Question	% distribution or % responding
How difficult do you think it is to find regular paid work these days?	
Very difficult	55
Difficult	38
After leaving school did you plan to work right away?	
Yes	37
Do you feel there are enough work opportunities locally for persons with such skills as yours?	
Yes	24
If not, what about in a nearby or larger town or city?	
Yes	35
(For those not currently working:) Are you now looking for work?	
Yes	35
Duration of employment search	
Less than 12 months	17
12–23 months	35
24–35 months	23
36 months or more	24
Number of times respondent applied for jobs	
Once	5
Twice	19
Three times	21
Four to six times	31
Seven or more times	24
How confident are you that you will find a paying job soon?	
Confident	2
Somewhat confident	32
Not confident	52
Don't know	15

No. of respondents = 1,535

Colombo, we ask them to find a job for us.

A teacher's comment confirms the young women's perceptions:

The main issue is employment. This is the main reason for the youth unrest. This applies to both men and women. We have provided them with a good education and left them in the lurch.

When asked about work opportunities, 93% of young Kalutara women replied that it was difficult or very difficult to find regular paid work. Eighty-two percent had been looking for work for at least 12 months. Only 34% had any confidence that they would find a job soon.

More than one-third of the women surveyed planned to work after completing their education. Only one-fourth believed that adequate job opportunities existed locally or that more jobs might be available in a larger town or city nearby. Forty percent were currently seeking employment, and more than half had applied for jobs at least four times. About half had been seeking work for two or more years. As a result, about as many were dubious about finding employment soon.

Volunteerism as a job substitute. We hypothesized that for young women a possible alternative to employment in Kalutara's sluggish labor market might be civic

volunteerism. In an environment of limited paid job opportunities, we reasoned, volunteerism might function as a shadow domain offering work experiences qualitatively similar to formal employment and would have similar effects on fertility aspirations. A recent study by de Silva (1988) of the 4,092 volunteers of the Family Planning Association of Sri Lanka found that 85% were females, 87% had a tenth-grade or higher education, and 85% were single. Moreover, a great majority of volunteers were young: one-fourth were under age 20 and another 62% were in their 20s.

We could find little formal documentation of the extent of volunteerism in Sri Lanka, but informal observations made to us by Sri Lankans indicate that young women with a secondary education represent an important source of unremunerated labor for community development initiatives, serving as local agents for public health, community, and other social service programs. Because such activities may have work-related value for young women, by providing them with training in useful skills and giving them opportunities for interaction with the public, we aimed to assess its prevalence in the posteducation, premarital period.

The survey results indicate that only 13% of the young women had such experience. Nevertheless, that percentage is as high as the percentage of young women who were gainfully employed at the time of the survey. Of the 205 women with volunteer experience, 76% had worked or were working with government-sponsored programs. More than 90% of them believed their volunteer service would help

their chances of finding paying jobs because of the skills training (89%) and the job references they could expect from their volunteer organizations (67%). Other advantages of their volunteer service mentioned by the woman included making a contribution to community welfare (52%), having something meaningful to do (44%), and being able to work away from home (40%). The following comments from volunteers in a focus group illustrate their desire to be socially useful:

I was doing nothing at home. I thought of doing some service. When a youth committee was formed in the village, I joined it.



Many young, unmarried women in Sri Lanka work as volunteers for service organizations. Those shown here are volunteers for the Family Planning Association in Kalutara District.

After leaving school, I wasn't doing anything at home. I volunteered willingly.

There are a variety of deficiencies in our village, such as health problems, and so on. I thought that some service could be done to the community through such an association. I got them latrines, etc. I thought we could share what we learned and be useful.

When I was young, I had an idea to get a job in a health institution. I took the course at St. John's Ambulance. Unfortunately, I couldn't continue my studies. There are many problems facing the villages. Children suffer from illnesses due to the mothers' ignorance. The health officer held meetings; we were asked to help at the family planning and immunization clinics, distribute Thripasha (weaning foods), and so on. I couldn't proceed further in my studies. I thought this service would be helpful. We derive some satisfaction from this work.

Young women who were in the job market but unemployed were asked if they thought the volunteer experience would help them find jobs. Although some of the responses were positive, others were equivocal or pessimistic:

We have some freedom. We get to know people. We get away from the monotony at home.

Earlier I had hopes like that, but now I don't know. Now I have served for about five years. I have not lost hope.

We want jobs, but no, we don't expect them through voluntary service. We have a record book and officers have made entries regard-

ing our work. There are commendations. We can present them when we go for interviews.

In our village almost 90% of the youth are engaged in voluntary work. How can all these people get jobs?

The young women's perceptions of their family members' reactions varied as well:

Our mother likes it. She thinks it will help in getting a job, especially for my older sister.

My mother also approves. she thinks that some sort of job could come from this work.

[My family members] don't like it. People at home scold us. They say it's better to stay at home and attend to household work. They think, particularly the old folks, that as in the old days the woman should stay at home. They say we have been working so long but have gained nothing. Our brothers and others, however, don't condemn us as much.

When there is plenty of work to do at home, my sister scolds me, saying that I am going out and she can't attend to all the work at home alone.

Community leaders emphasized the training value of voluntary work:

Most young women want particular jobs to do. They won't do just any job that is available. Most of them that I know want to become nurses, but that is a very difficult job to get. You can't get trained for it. You have to first get the job and then they will train you.

Mr. P. [quoted above] is correct. That is why so many do voluntary

work with the Health Department, hoping this will help them to become nurses.

The remarks of the young women quoted above suggest that volunteer work is as much an important community service as it is potentially a means of qualifying for gainful employment. Buddhism's strong emphasis on community work reinforces this notion. The Kalutara survey did not ask women to judge the relative benefits of such service but did confirm that for young women volunteer activity was at least as prevalent as employment. Even more important, the data from the survey and focus-group discussions reveal that the increased opportunities for young women to interact with the public have gradually removed their domestic confines.

Work, marriage, and child-bearing. The focus-group discussions were perhaps most revealing of young Kalutara women's aspirations as productive and reproductive adults. The women regarded employment income as both a means of replacing marriage dowries provided by their parents and as a means of supporting themselves and their families after marriage. Comments from mothers generally supported the daughters' desire for self-reliance through work, whereas prospective husbands were less enthusiastic about the idea of having wives in the labor force.

The mothers regarded employment as important for their daughters' economic security. All the mothers interviewed wanted their daughters to have a job, implying that working was essential in to-

day's society. Typical of their comments were the following:

We would like them to marry, but then we want them to find a job because of the poor economic situation. They still have time [for marriage].

They must be able to live without trouble, our daughters say. If they have a job, they can see to their needs at least.

Not all jobs would be acceptable, however, especially for women with a good education. Daughters reported that their parents preferred them to have jobs appropriate for their educational level. Examples of jobs mentioned as acceptable to their parents were clerical positions and government service. Jobs considered inappropriate included garment work and other manufacturing assembly work. The mothers confirmed these biases.

As for the appropriate age for marriage and motherhood, most young women stated that women should marry around age 25 and wait two years before having a child. Young men on average recommended age 25 for women and age 28–30 for themselves.

The following comment by a young single woman reflects the economic reality faced by many like herself:

In the past [women] married quite young, at 16 or 18. Now our parents think we should marry between [ages] 22 and 28. But to tell you the truth, we are not in a position to do that. Our economic position doesn't permit it. When we marry, we expect [to have] children. Married life is not complete without a child, and the child must

be brought up in good health and given a good education. To face this, we must enter marriage only after strengthening our economic position.

The female survey respondents were asked to identify and rank the important qualities they desired in husbands. By far the most important requirements of a husband were that he have a job (mentioned by 73% of respondents) and a good character (71%). Least important were such traits as caste, physical appearance, and horoscope (mentioned by only 1% or 2%). Their work experience and the importance to them of having their own jobs colored some young women's perceptions of their marriage prospects or the type of husband who would be appropriate.

I will have to select a husband now considering the status of my job. My husband must have a similar job status.

When a girl works, she gets to know people, how to behave and how to deal with different situations, and that also will help her to find a husband. Some men prefer a bride who has had some social experience.

"I will have to select a husband considering the status of my job. My husband must have a similar job status."

When describing the traits they desired in a wife, some men downplayed the importance of the wife's level of formal education. A typical comment was the following:

I don't think a very high level of education is necessary for a successful married life. I think that more than education, she should have a wide understanding of society.

Others felt that having an educated wife was desirable:

Nowadays we have to mix in society and keep company. For that [my wife] must have sufficient knowledge and education. That is important.

Should women work after marriage? Should they work after having children? The comments from employed women were surprisingly "modern," echoing many of the tensions expressed by working couples in Western societies.

Today it is difficult to live on one person's wages. If two persons rely on that salary, it may be possible but not indefinitely. Therefore the wife has to work.

I can't think of a transfer in the kind of work I do. So the husband I select will have to be a person who will work and live near me.

I know someone whose husband asked his wife to leave her job in order to live with him near his workplace. Although he could request a transfer to work near her job, he wouldn't do that.

Before I went to work, I thought that a husband and a wife must have jobs. But after working, I think that only the husband need to have a job. If both are employed, there can be problems. When both work, it is troublesome and you can't lead a peaceful life.

Focus-group participants expressed ambivalence about whether

the costs of women's labor force participation outweighs the benefits when children's welfare is at issue. Young men expressed the least enthusiasm for the idea of mothers holding jobs, viewing child rearing as a primary responsibility of women.

If our economic position is good, the wife needn't have a job. She has to look after the children. When she goes to work early and returns home late, she has no time to attend to the children. There must be someone responsible to look after the children. [The mother's absence] is one reason why children go astray. The mother's influence is more important than the father's.

Because of economic difficulties at present, many mothers are prompted to seek employment overseas. Thus many children are subject to stress and strain. I know of many such cases. One mother near our home was bringing up the children quite well [until] she went overseas for a job. Now [there is] nobody to care for or control them. Mothers' love and kindness actually has a great influence on the children. If a mother does [have] a job, she must choose one which will enable her to devote enough attention and time to the children.

The women also expressed concern about the problems of working mothers, especially when the children are young.

It can be troublesome. I know a woman who must bring her children to her mother to care for while she works, and she doesn't arrive at work until 9:30 or 10:00 and can't work very well. She fights with the people in the office because she is late. In these instances, the wife should not work.

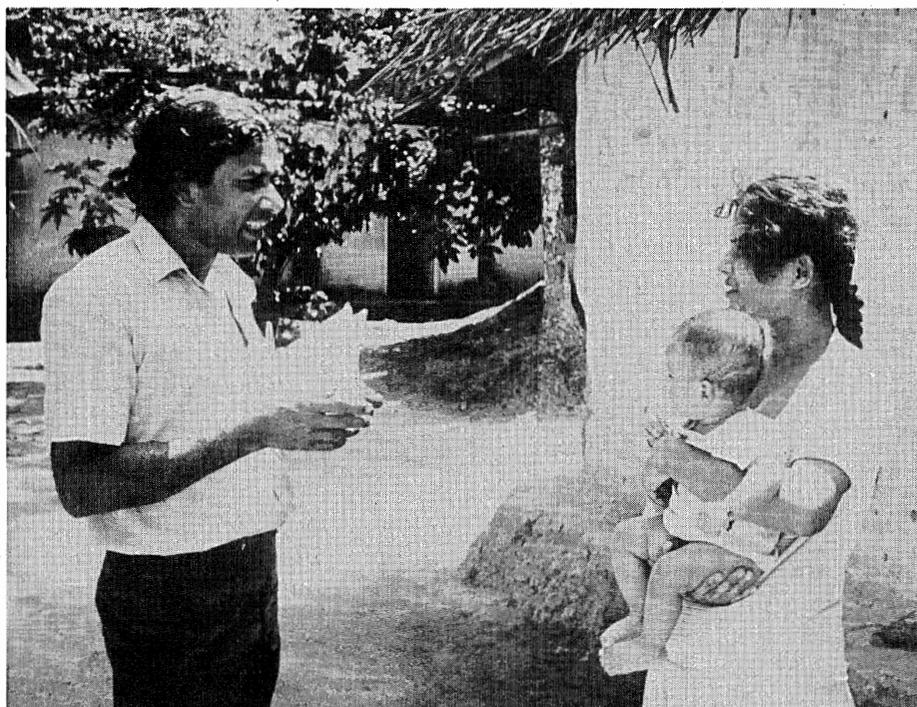
These problems arise when the children are small. But when the children are big, the wife may sometimes want to find a job because she feels lonely staying at home.

Although the survey data provided only limited insight about respondents' views on the timing of childbearing and family size, the focus-group commentaries illuminated the conflicts that young Kalutara women face in attempting to juggle their work, marriage, and childbearing goals.

Discussion

Given the issues discussed in the focus groups, someone unfamiliar with the context might assume that the participants were from an economically developed country. It is necessary to be reminded that annual per capita income in Sri Lanka is less than US \$500 and that the patterns observed in women's status measure coexist with fundamentally poor economic circumstances.

Females between ages 15 and 29, a subpopulation that represents 13% of Sri Lanka's population, are highly literate and well educated compared with their counterparts in other South Asian nations. They marry at age 24, on average, and bear their first child one and a half years later. Their ideal family size ranges between 2.1 and 2.5 chil-



Information about women's economic activities in Sri Lanka comes from a variety of sources, including the census and national surveys. Here a government enumerator interviews a young wife in Kandy District.

dren, depending upon the age group. In spite of the formal education they have received, fewer than one-fourth are employed and nearly one-third report themselves to be in the labor market but unemployed. In Kalutara District the percentages unemployed are somewhat higher, particularly among single women, among whom job demand is strong.

Social programs established by Sri Lanka's Socialist government prior to 1977 improved the welfare of most Sri Lankans, at the expense of private entrepreneurship and industrial economic growth. The Socialist efforts appear to have paid off in reducing gender inequality in health and educational status. The slow economic recovery in the post-1977 period, however, has been unable to absorb the expanding labor force and meet job demand, especially that of young women.

At the individual level, the strongest impact of the social programs was perhaps to raise women's expectations about their personal, marital, and economic well-being. As the young man quoted earlier commented, "They think once they are educated, they should invariably have a job also." Maternal support for their aspirations and the tolerance of other family members and the community, reflective of the social status accorded to Sri Lankan women, have enabled Sri Lankan women to delay marriage. In addition, high unemployment among eligible males and opportunities for women to serve as volunteers have contributed to the postponement of marriage, even after women have completed their schooling.

The Sri Lankan case does not fit modernization theories of development, according to which social,

economic, and demographic changes proceed together through predictable stages. Instead, social and demographic changes have outpaced economic development in this still largely agrarian island nation. Besides the social welfare policies of the state, we may also need to consider historical and cultural factors in searching for an explanatory framework that includes the Sri Lankan case. Political economy models of fertility change, for example, appear promising (Rouyer 1989; Greenhalgh 1990). de A. Samarasinghe (1988) calls attention to an important fact, that Sri Lankan women, as well as men, were first allowed to vote in a national election in 1931.

We have peered through a social microscope to gain a view of the aspirations and expectations of young Kalutara women, their mothers, and their male counterparts regarding work, marriage, and children as portrayed against the broad social and economic patterns of the country. The exercise has revealed how "modern" are conditions in Sri Lanka, where poor economic prospects have created job demand for women as well as men and expectations of the need to coordinate women's labor force participations and childbearing.

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China Unveils . . .

(continued from page 92)

provinces, but also about regions, localities, and communities throughout China. It thus holds out the opportunity for analyzing demographic processes within specific economic and cultural contexts. Although none of the seminar papers analyzed data below the provincial level, there was a clearly expressed interest in extending demographic research to explore socioeconomic and cultural variations in China.

Another impression gained from the seminar concerns the state of demographic studies in China, scarcely more than a decade since their political restoration. One mark of progress is the increasing accumulation of demographic knowledge. To an unprecedented degree, papers presented at the seminar compared and juxtaposed

data from a number of censuses and surveys. This feedback process has resulted in work of improved quality and value, as was repeatedly mentioned in the seminar discussions. It also bears emphasizing that the Two per Thousand Survey itself represents a new level of achievement in survey design and organization in China. The same may be said about the technical sophistication of many of the analyses presented at the seminar. It was especially gratifying to observe the considerable accomplishments of a new generation of young scholars, many of whom had returned to China after study abroad.

The seminar environment was also notable for its openness. Compared with earlier population conferences in China, this seminar had a strong scholarly orientation and

discussions with a healthy amount of give and take. There were also ample opportunities to meet our Chinese counterparts in informal settings, a valuable aspect of the meeting. Although the environment for international collaboration on research has deteriorated recently in some government ministries, the State Family Planning Commission and its subordinate units have continued to pursue linkages with foreign researchers, and there were no signs that this would change.

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Population Aging and the Demand for Hospital Care in Thailand

Thailand's fertility and mortality trends in recent decades have produced a population structure in which the elderly represent a growing segment. Although population aging reflects the positive achievement of lower birth rates and greater longevity, it is creating new challenges, among them increased demand for health services for the elderly. This article examines the reported age patterns of illness and use of health services as documented by a 1986 health and welfare survey, discusses the United Nations' 1990 population projections for Thailand, and then applies the age-specific rates of in-patient hospital use derived from the survey to the UN projections to illustrate the impact that Thailand's growing population and changing age structure could have on hospitalization. The analysis suggests that the aging of Thailand's population that is now under way will make major demands on in-patient hospital services.

by John Knodel,
Napaporn Chayovan,
and Siriwan Siriboon

THE COMBINATION of high fertility and falling mortality during much of the present century in Thailand ensures that there will be large and rapid increases in the elderly population as

successively larger cohorts enter the span of older ages. Furthermore, the recent sharp decline in fertility ensures that the proportionate share of the total population that is in the elderly ages will also increase substantially.

(In accordance with the definition usually applied in Thailand, the term "elderly" in this study refers to persons 60 years old and

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over. Selecting a somewhat older or younger age to demarcate the elderly age group would have little bearing on the basic conclusions of our analysis, however.)

The growth in the numbers of older persons and their proportionate share of the population is a reflection of the success Thailand has had in meeting the goals of improving mortality and reducing population growth rates by lowering fertility. Although the process of population aging is a welcome development in this sense, it poses a variety of new challenges to Thai society. Among the most important will be an increased demand for health services, particularly for in-patient hospital care. The increased demand is a virtually inevitable consequence, given that the elderly tend to be far more likely to need and use such services than the population in general.

To examine the contribution that population aging will make toward increased demand for hospitalization in Thailand, we apply the rates of in-patient hospital use for various age groups, as documented by the 1986 Survey of Health, Welfare and Use of Traditional Medicine, to the most recent set of projections of the Thai population issued by the United Nations. The survey, conducted by the National Statistical

Office, was based on a nationally representative sample of more than 19,000 households comprising 80,000 individuals. The results of the analysis demonstrate that the process of population aging that is now under way will add significantly to the demand for in-patient hospital care in the coming decades.

Of course other factors besides changes in population size and age structure will affect future rates of hospitalization and age-specific rates of hospital use. They include changes on both the supply and the demand side. Examples are the increased availability of hospitals; the shift in population distribution from rural to urban areas, where hospitals are disproportionately concentrated; the progress of medical technology; rising income per capita; and the changing prevalence of specific diseases, especially AIDS in the case of Thailand. Several studies have considered at least some of these factors in efforts to assess the future costs of health care in Thailand (e.g., Ogawa et al. 1988; Jones and Boonpratuang 1972; Jones 1975), but we do not attempt to address those issues here. The present study thus is not intended to assess the actual amount of future hospital use but rather has the more limited goal of illustrating the important role that population aging will play in generating demand for hospital care.

Age patterns of illness and health-service use

Although life expectancy has increased from 47 to 65 years in Thailand over the last four decades, mortality declines at the older ages appear to be modest at best (United

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Nations 1991a; Luther et al. 1986; Chayovan et al. 1990). Moreover, mortality improvements that do occur among the elderly do not necessarily translate into better health for those who are living longer. Evidence that recent increases in life expectancy at the older ages in the more developed countries have resulted in longer periods of chronic disease and disability among the elderly (Crimmins et al. 1989) is a cause for concern. On the positive side, the spread of modern medicine and public health measures that accompany the socioeconomic development taking place in Thailand and many Third World countries today may well lead to improved health for the elderly as well as for the population in general.

A series of six household surveys conducted in Thailand between 1974 and 1986 by the National Statistical Office and focusing on health and welfare provides some basis for assessing trends in the prevalence of self-reported illness among the population, including persons aged 60 and over. One member of each sample household was asked to provide information on whether any household members had been ill during the two-week period prior to the interview. Except for an unusually high level of illness reported during the first survey, the surveys revealed little change in the proportions ill over time. Data from four of the surveys for which a comparison could be made, however, indicated that the elderly were not only twice as likely as the general population to have had a recent illness but also several times more likely than the general population to have been ill for

more than two weeks (Chayovan et al 1990: Table 6).

Recent surveys indicate that the elderly are not only twice as likely as the general population to have had a recent illness but also several times more likely to have had a prolonged illness.

Table 1, which is based on retabulations of data from the 1986 Health and Welfare Survey, shows that the percentage of household members experiencing an illness during the two weeks prior to the survey was

higher for each five-year age group within the 60+ age range than for any of the other age groups except children under age 5. Among the elderly themselves, however, the prevalence of illness, ranging between 11 and 14 percent, did not consistently increase with age. The overall age pattern of illness prevalence was similar for males and females. Seven percent of both males and females among the population at large and 12% of both sexes among the elderly had been ill during the two weeks preceding the survey.

The duration of illness among those reported as ill had a generally

Table 1. Morbidity rates, length of illness, and use of health sources, by age and by sex: Thailand, 1986

Age group	% ill during prior 2 weeks	Of those ill, % ill more than 2 weeks	% using any health source	Among those hospitalized		
				% hospitalized	% in hospital for more than 1 week	% using government facility
0-4	14	3	56	5	19	95
5-9	9	4	43	3	26	87
10-19	5	6	27	2	22	89
20-29	4	14	28	5	25	93
30-39	5	17	35	5	28	88
40-49	6	23	35	5	33	88
50-59	8	29	37	7	40	91
60-64	12	28	43	10	45	92
65-69	11	39	41	18	38	89
70-74	14	39	46	10	46	84
75 +	13	36	38	8	55	84
All ages	7	12	36	5	28	90
Males	7	12	33	4	32	90
Females	7	13	38	5	26	91
Ages 60 +	12	35	42	9	46	88
Males	12	36	40	10	44	90
Females	12	33	43	8	47	86

Source: Original tabulations from the 1986 Health, Welfare and Use of Traditional Medicine Survey.

positive association with age and was distinctly longer than average among the elderly. Children under age 5 were the least likely to have been ill for more than two weeks (3%) and those 65-74 most likely (39%). The prevalence of prolonged illness increased rather consistently with age until age 50 (29%); thereafter it continued to rise, but less consistently. Nevertheless, the higher percentages of persons reported to have had a prolonged illness were in the 65+ age range than in the 50-64 age range. Elderly men appeared more likely than women of the same ages to have had a prolonged illness.

The 1986 survey included several questions about the use of health services by household members during the prior 12 months. Respondents were asked whether an ill person had used any service during the reference period and whether he or she had been hospitalized (that is, treated as an in-patient regardless of the type of facility used) and if so, for how long.

Only one type of service was to be recorded for each ill person; if a household member had used more than one type of service, information was recorded about the facility where the person had received

most of the treatment. Tabulations of the types of services used during the reference period are thus likely to understate the percentages of Thais who actually used the health services.

In addition, household members who had used health services during the 12 months preceding the survey but had subsequently died were not recorded in the survey. If information about deceased persons had been included, the overall level of use and the percentages of patients using particular types of service might have been higher than those reported—especially for the elderly, given their greater than average risk of dying in any given year.

As Table 1 shows, a larger percentage of elderly persons than of the population in general was reported to have used a health service during the reference period. Among the elderly themselves, however, no clear age pattern of health-service use emerged; in fact, proportionately fewer of the oldest age group (persons 75+) than of the younger elderly had used a health source during the reference period. This finding may be due in part to less mobility among the oldest group, which might have deterred them from going to health service outlets for treatment (Pramualratana 1990). (The problem of limited mobility presumably increases with age.) It may also be due to greater mortality among persons in that age group who did use a health source but would not have been reported in the survey because they were deceased.

CHAPEN SAENGTEENCHA



Thailand's rapidly aging population is posing new challenges to the country's health services. Survey data indicate that the elderly, who experience longer periods of chronic illness and disability than other age groups, are twice as likely to be hospitalized as the general population.

Of all age groups, however, young children made the most frequent

(continued on page 21)

The Conflicting Effects of Delayed Marriage and Declining Divorce Rates on Cumulative Fertility in Indonesia

Although the age at first marriage for women has been rising and divorce rates have been falling in Indonesia, many Indonesian women still marry young and divorce and remarriage rates are higher than elsewhere in Asia. In 1987, the year in which the data for this study were collected, virtually all women over the age of 30 had married at least once. Among women of reproductive age (ages 15–49), close to 20% had married before age 15 and 45% had married before age 18. The prevalence of currently married women who had been married more than once was 7% for women aged 15–24, 15% for women 25–34, and 29% for women 35–49.

These nuptiality patterns affect fertility in several ways. Earlier marriage leads to higher fertility, but being married more than once leads to lower fertility. Among Indonesian women 35–49, for example, being married more than once lessened cumulative fertility by more than one child. In the same age group, those who had first married before age 15 had cumulative fertility almost three-fourths of a child higher than those married after age 18.

Using multivariate analysis and statistically controlling for eight socioeconomic variables related to nuptiality and fertility, we found a one-year delay in age at first marriage to be associated with having approximately .2 fewer children ever born. A five-year delay thus led to having approximately one less child, net of all the other variables. Being married more than once resulted in a woman's having about two fewer children—a strong negative effect on cumulative fertility.

Both marriage variables were found to be correlated with contraceptive use, contraceptive use apparently reinforcing lower fertility for those marrying later and low contraceptive use characterizing women married more than once.

If past trends continue, rising age at marriage will lower fertility rates but lower divorce rates will tend to increase fertility.

*by James A. Palmore
and Masri Singarimbun*

TWO FEATURES stand out when Indonesia's marriage patterns are compared with those elsewhere in Asia: Indonesian women generally have married young and have had high divorce rates (Smith 1980; Hull and Hull 1985; McDonald 1984, 1985; Palmore 1985; King et al. 1986). It has been argued that part of this pattern resulted from mate selection determined by parents rather than by the couples marrying (Geertz 1961; Cheung et al. 1985; NRC 1987). Recently, as the marriage partners themselves have had more influence in selecting their own mates, marriage ages have been rising and divorce has become somewhat less common (McNicoll and Singarimbun 1983; Hull and Hull

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1985, 1987; Keyfitz 1985; Hugo et al. 1987; NRC 1987; Taj 1989; Williams 1990). The increase in age at first marriage may also have been influenced by the 1974 Marriage Law, which established the minimum age at marriage as 16 for women and 18 for men, with parental permission required for anyone marrying under age 21 (CBS et al. 1989:14; McDonald and Kasto 1978). Nevertheless, substantial proportions of women are still marrying at young ages.

These trends in nuptiality are important in their own right because

of the lengthened period of adolescence before marriage and its implications for education, occupational experience, and the like. But their effects on fertility are of particular interest to those concerned about the size and rapid growth rate of Indonesia's population. Early first marriage is usually associated with high fertility. High divorce rates, on the other hand, are usually associated with lower fertility.

For both of these marriage variables, one explanation for the association with fertility is a standard demographic concept: length of ex-

posure to the risk of conception. Earlier marriage lengthens the period of exposure to the risk of conception. Divorce, because it is typically preceded by reduced sexual activity between the partners and because there is usually a delay between successive marriages, shortens exposure (Palmore and Ariffin bin Marzuki 1969; McDonald 1984).

Early marriage increases the exposure to the risk of conception, whereas divorce shortens that exposure even when it is followed by remarriage. But women who marry at younger ages are also more likely than other women to divorce and marry again.



ASCLEPIAS R. SOERHONO

A Javanese couple pose for their wedding portrait. In recent years, as Indonesian marriage partners have had more influence in selecting their mates, female age at marriage has been rising. Indonesia's 1974 Marriage Law establishing the minimum age at marriage for women at 16 and requiring parental permission for anyone marrying under age 21 has probably contributed to the trend.

A complicating factor is that women who marry at younger ages often have a greater likelihood than other women of being married more than once (see Palmore and Ariffin bin Marzuki 1969 for Malaysia; Mamas 1978 and 1989 for Indonesia; and Smith et al. 1984 for comparative information). The net effect of the two marriage variables on fertility can therefore be positive, negative, or neutral. The negative correlation between average age at first marriage and the prevalence of divorce may be due in part to the fact that many young people, and particularly young women, defer to their parents and marry a partner selected for them by their parents (Taj 1989). If the marriage is unsuccessful, they may then divorce and marry "someone more of their own choosing" (Williams 1990:57; Ihromi et al. 1973).

In this study we first review recent marriage patterns and trends in Indonesia and consider the effects of the marriage variables on fertility. Next, we look at the relationship between the marriage variables and a variety of socioeconomic factors that influence marriage behavior and also consider the net effects of the marriage variables on fertility, controlling for appropriate socioeconomic factors. Finally, we discuss the interrelationships between marriage patterns and contraceptive use.

Data

The data used in this study come from the 1987 National Indonesia Contraceptive Prevalence Survey (NICPS), conducted as part of the worldwide Demographic and Health Surveys (DHS) program. Because the survey design, questionnaire, field operations, and some results are described in the usual first country report issued for every country in the DHS program (CBS et al. 1989), we do not repeat that information here. What is important for this analysis is that the 1987 NICPS was conducted according to the highest international standards for such work and was based on a probability sample covering 20 of Indonesia's 27 provinces. The excluded areas contain less than 10% of the country's population; hence the survey was essentially national in coverage.

The NICPS gathered information on age, sex, and marital status for everyone in the households surveyed, and it involved intensive interviews with ever-married women between ages 15 and 49. These intensive interviews obtained addi-

Table 1. Percentage distribution of all women of reproductive age by current marital status and age: Indonesia, 1987

Age group	Current marital status				Total
	Never married	Currently married	Divorced	Widowed	
15-49	26	68	3	3	100
15-19	81	18	1	0	100
20-24	35	62	3	0	100
25-29	11	85	3	1	100
30-34	4	90	4	2	100
35-39	3	89	3	5	100
40-44	1	88	3	8	100
45-49	1	80	4	14	100

Source: CBS et al. (1989: Table 2.1, p. 13).

tional information on marital status and on fertility, contraceptive use, socioeconomic characteristics of the women, and related topics.

Indonesian Marriage Patterns in 1987

Age at first marriage for Indonesian women has been rising for at least two decades (King et al. 1986; Hugo et al. 1987; NRC 1987). Continuing this trend, the singulate mean age at marriage rose by more than one year between 1980 and 1985 (Mamas 1989:52; Xenos 1990), and between 1980 and 1987 the percentage of women 15-49 who had never married rose by almost 5%, from 21.5% to 26.4% (CBS et al. 1989: 14). Perhaps some of those women will never marry.

Reflecting past patterns, however, 96% of women between the ages of 30 and 34 in 1987 had married at least once, making marriage virtually universal by age 35, and more than 98% of those over age 40 had married. Furthermore, substantial

proportions of Indonesian women were still marrying at young ages (Table 1). Almost one-fifth of women 15-19 had married and almost two-thirds of those 20-24 had married. Among all women between ages 15 and 49 in 1987, close to one-fifth (19%) had married before age 15 and nearly half had married before age 18 (CBS et al. 1989:15).

Indonesian women have traditionally married young. Among all women between ages 15 and 49 in 1987, 19% had married before age 15 and nearly half had married before age 18. But age at marriage has been rising in recent years, and divorce rates have fallen.

The percentage of women married more than once has fallen dramatically in recent years but is still high. Among currently married women in 1976, the percentages

who had been married more than once were 15% for ages 15-24, 28% for ages 25-34, and 37% for ages 35-39 (Mamas 1989:82). Eleven years later, in 1987, the proportions of currently married women who had been married more than once were much lower but still high relative to most other countries in Asia: 7% for ages 15-24, 15% for ages 25-34, and 29% for ages 35-49 (Table 2).

Age at first marriage and the number of times married were strongly and negatively correlated in both 1976 (Mamas 1989) and 1987. Among currently married women aged 35-49 in 1987, for example, the percentage married more than once was more than twice as high for women who had first married before age 15 as it was for women who had married after age 18 (Table 2, panel 2). Comparing the mean ages at first marriage reveals that women who married more than once had married more than two years earlier, on the average, than those married only once (Table 2, panel 1).

Marriage Patterns and Fertility

Notable relationships are found in the NICPS data between cumulative fertility and both age at first marriage and number of times married. Among women 35-49, for instance, being married more than once lessened cumulative fertility by more than one child. In the same age group, those who had married before age 15 had cumulative fertility almost three-fourths of a child higher than those married after age 18 (Table 3). In the younger age groups the effect of early marriage

Table 2. Mean age at first marriage, by number of times married and current age, and percentage married more than once, by age at first marriage and current age: Ever-married women of reproductive age: Indonesia, 1987

Mean age at first marriage/percentage married more than once	Current age		
	35-49	25-34	15-24
Mean age at first marriage			
All women	16.6	17.4	16.7
Women married once	17.4	17.8	16.9
Women married more than once	14.8	14.6	14.5
Percentage married more than once			
All women	29	15	7
Women first married at ages			
Under 15	45	31	21
15-17	30	16	*
18-20	18	6	*
21 or more	—	1	*

Note: Percentages and means are based on 75 or more cases unless otherwise indicated. Those based on fewer than 25 cases (indicated by a dash) have been omitted.

* Percentage is heavily affected by censoring and hence not shown.

Table 3. Mean number of live births to ever-married women of reproductive age, by current age, number of times married, and age at first marriage: Indonesia, 1987

Times married and age at first marriage	Live births, by current age		
	35-49	25-34	15-24
All women	5.1	2.9	1.3
Married only once, first married at ages			
Under 15	5.9	3.7	1.7
15-17	5.9	3.4	1.4
18-20	5.2	2.8	1.0
21 or more	—	1.1	0.6
Married more than once, first married at ages			
Under 15	4.6	3.1	1.4
15-17	4.8	2.6	1.4 ^a
18-20	3.9	2.1 ^a	—
21 or more	—	—	—

Note: Means are based on 75 or more cases unless otherwise indicated. Those based on fewer than 25 cases (indicated by a dash) have been omitted.

a. Mean based on 50-74 cases.

Table 4. Percentage of ever-married women 35–49 years old who first married at specified ages, their mean age at first marriage, and percentage married more than once, by selected social and demographic characteristics: Indonesia, 1987

Social/demographic characteristic	Percentage first married at ages				Mean age at first marriage	Percentage married more than once
	Under 15	15–17	18–20	21 or more		
All women 35–49	37	40	23	0	16.6	29
Current residence						
Rural	40	40	21	0	16.1	32
Urban	29	41	30	0	17.9	22
Region†						
Java or Bali	41	39	10	0	16.2	35
Outer Islands I	29	42	30	0	17.5	19
Outer Islands II	21	50	30	0	18.0	21
Religion						
Muslim	38	40	21	0	16.3	31
Non-Muslim	12	34	54	0	20.5	10
Language of interview						
Bahasa Indonesia	27	44	29	0	18.0	20
Javanese	39	39	23	0	16.2	34
Sundanese	43	45	12	0	15.1	45
Madurese	70	22	8	0	13.3	47
Balinese	16	40	44	0	19.0	15
Education						
None	45	35	19	0	15.8	34
Some primary	39	42	18	0	15.9	32
Primary completed	24	48	28	0	17.0	27
Secondary or more	10	37	53	0	20.5	12
Whether worked for money before marriage						
Yes	34	39	27	0	17.4	29
No	39	41	20	0	16.0	30
Primary residence before age 12						
Village	39	39	22	0	16.3	31
Town or city	28	43	29	0	18.1	21

† The regional classification is based on the phased expansion of the national family planning program (CBS et al. 1989). Outer Islands I are the provinces of Daerah Istimewa Aceh, North Sumatra, West Sumatra, South Sumatra, Lampung, Nusa Tenggara Barat, West Kalimantan, South Kalimantan, North Sulawesi, and South Sulawesi. Outer Islands II include all the remaining provinces.

on fertility was even more pronounced.

These relationships, however, are confounded by the fact that early marriage and the number of times married are closely related to other variables that affect fertility. Therefore it is necessary to examine social and economic differentials in marriage patterns and then to assess the net effects of the marriage variables on fertility.

Socioeconomic Differentials in Marriage Patterns

In Indonesia, as elsewhere, age at first marriage is highly associated with many socioeconomic factors. The NICPS found that rural women married at younger ages than urban women, that women in Java and Bali married younger than women in other provinces, and that Muslim women, women with less education, women who did not work before marriage, women who had lived primarily in a village before age 12, and women whose language of interview¹ was Javanese, Sundanese, or Madurese all married at substantially younger ages than other Indonesian women (Tables 4 and 5).²

1. Language of interview is not a precise measure of ethnicity because many Indonesians speak Bahasa Indonesia, the official language of the country, in addition to their ethnic language. Nevertheless, because it is less common to speak Balinese, for example, if one is not Balinese, interview languages other than Bahasa Indonesia are likely to be reasonably accurate indicators of ethnicity.

2. We present separate tables for the two age groups because age is related to the marriage variables and also because the estimates for the younger age groups are influenced by a high probability that some women who would marry later had not yet married at the time of the survey. In view of this censoring problem, a table for the 15–24 age group is not presented.

The differences in social groups are often large. In the 35-49 age group (Table 4), the women of Java and Bali married roughly a year and a half earlier than women living on the outer islands, Muslim women

married more than four years earlier on average than women of other faiths, women who were interviewed in Madurese married at the very early mean age of 13.3 years, and those with a secondary or

higher education married nearly five years later than those with no formal schooling.

Even in a multivariate analysis, most of the variables just discussed prove to be significantly associated with age at first marriage (Table 6), and this small set of variables explains 27% of the variance in age at first marriage. Only the respondent's primary residence before age 12 (village or nonvillage) is not significant in the multiple regression analysis, undoubtedly because that variable is so strongly correlated with current residence and current residence is a significant independent variable.

The number of times married is also closely connected with many socioeconomic characteristics: the same groups that married at younger ages were also more likely to have higher proportions who had been married more than once. Here, again, the differences appear to be substantial, but in this case they are large only without multivariate controls. Two examples suffice, taken from the 35-49 age group: Muslim women were three times more likely to have been married more than once than were women of other faiths, and women with no education were almost three times as likely to have been married more than once than were women who had completed their secondary education or more.

These findings are altered, however, when one considers the results of a multivariate analysis that includes the variables of Table 4 and 5 along with age at first marriage in estimating the number of times married (Table 7).³ The independent variables used in this analysis explain only 13% of the

Table 5. Percentage of ever-married women 25-34 years old who first married at specified ages, their mean age at first marriage, and percentage married more than once, by selected social and demographic characteristics: Indonesia, 1987

Social/demographic characteristic	Percentage first married at ages				Mean age at first marriage	Percentage married more than once
	Under 15	15-17	18-20	21 or more		
All women 25-34	28	39	29	5	17.4	15
Current residence						
Rural	31	40	25	4	16.8	17
Urban	20	34	39	7	18.7	10
Region						
Java or Bali	32	38	26	4	16.9	18
Outer Islands I	19	41	34	5	18.2	8
Outer Islands II	18	34	41	7	18.4	10
Religion						
Muslim	29	39	28	4	17.1	16
Non-Muslim	10	31	47	12	20.4	4
Language of interview						
Bahasa Indonesia	19	38	36	8	18.5	11
Javanese	29	41	27	4	16.9	16
Sundanese	35	41	22	2	16.1	22
Madurese	67	26	6	2	13.8	31
Balinese	8	37	50	4	18.6	3
Education						
None	38	36	22	4	16.2	18
Some primary	33	41	23	2	16.4	18
Primary completed	20	42	33	5	17.5	14
Secondary or more	5	27	53	16	20.7	4
Whether worked for money before marriage						
Yes	22	39	32	8	18.3	12
No	32	39	26	2	16.6	17
Primary residence before age 12						
Village	30	39	27	4	16.9	17
Town or city	20	36	37	7	18.7	9

variance in the number of times married. With few exceptions, the independent variables are found to have had small net effects on the number of times married. Being Muslim had no statistically significant effect in the multivariate analysis. Being urban, living in Java or Bali, educational attainment, having lived primarily in a village before age 12, having worked before marriage, and language of interview (with one exception) had small net regression coefficients.

The important net effects were for women interviewed in Balinese (who were 11% less likely than other women to have been married more than once), age (each year of age adding 2% to the percentage married more than once), and age at first marriage (each year's delay in age at first marriage subtracting 2% from the percentage married more than once). In other words, the relationship between age, age at first marriage, and the remaining variables (with the exception of being interviewed in Balinese) accounted for the large percentage differences reported in Tables 4 and 5.

3. We used ordinary least squares regression to estimate the parameters presented in Table 7. Although logit regression is usually preferable when the dependent variable is an indicator random variable, as in this case, we had several reasons for not using logit regression here. First, the proportion of women who were married more than once was sufficiently large that a rare event was not being estimated (the dependent variable was well within the .10-.90 rule of thumb). Second, the results were more easily compared with the regression on age at marriage. Finally, we conducted a logit regression, and our interpretation of those results is fully consistent with the results reported here.

Table 6. Multiple regression parameter estimates and standard errors for estimating age at first marriage, using selected social and demographic characteristics: Ever-married women of ages 25-49, Indonesia, 1987

Variable	df	Parameter estimate	Standard error
Intercept	1	20.134002*	1.02963308
Urban	1	0.547796*	0.09450949
Java or Bali	1	-0.534038*	0.20280856
Outer Islands I	1	0.180466	0.18992927
Muslim	1	-2.025056*	0.14807627
Javanese	1	-0.393040*	0.11625608
Sundanese	1	-1.120690*	0.13832943
Madurese	1	-2.187902*	0.18596228
Balinese	1	-0.074610	0.31092573
Education	1	0.283881*	0.00885357
Whether worked for money before marriage	1	1.236424*	0.07350025
Primary residence before age 12	1	0.128216	0.10293039
Current age	1	-0.142120*	0.05682260
Current age squared	1	0.001805*	0.00077914
$R^2 = .27, p < .0001$			

* $p < .05$.

Marriage Patterns, Socio-economic Factors, and Cumulative Fertility

Given the extensive interrelationships found between the socio-economic variables, age at first marriage, and the number of times married, we next pose the question: How do these variables together affect cumulative fertility? A first attempt at an answer is found in Tables 8 and 9, which cross-tabulate the mean number of live births by age at first marriage, the number of times married, and each socio-economic variable separately.

The tables show a number of striking results. First is the consistency with which age at first marriage is related to cumulative

fertility in almost every socio-economic subgroup of the population when age and number of times married are controlled. Second is the same consistency in the number of times married: women married more than once are found to have had lower cumulative fertility in almost every socioeconomic subgroup when age and age at first marriage are controlled. Third, some of the differentials in socio-economic subgroups are small after age, age at first marriage, and number of times married have been controlled.

It is not surprising, then, that a multiple regression analysis incorporating all these variables (Table 10) shows strong net effects for the marriage variables and 36% of the

variance being explained. (The high figure for explained variance is of course partly due to the inclusion of age as one of the explanatory variables.) Net of all the other variables, a five-year delay in marriage leads a woman to have between .75 and 1.1 fewer children net of all the other variables. Being married more than once leads her to have 2.1 fewer children—a strong negative effect on cumulative fertility.

With social and economic differences statistically controlled, a five-year delay in marriage leads a woman to have between .75 and 1.1 fewer children than average. Being married more than once leads her to have 2.1 fewer children.

The other strong net effects are living in Java or Bali (which leads to having fewer children), being interviewed in Javanese or Madurese (fewer children), rural background (more children), and age (more children with increasing age). Interestingly, neither the wife's educational attainment nor her work experience before marriage has a statistically significant effect on the number of children ever born after the marriage when other variables have been controlled.

The regression analysis also tested for the interaction between number of times married and age at first marriage. Although statistically significant, the net regression coefficient for the interaction term is smaller than the main effects. Nevertheless, the term is not trivial and is a positive .07. This implies

Table 7. Multiple regression parameter estimates and standard errors for estimating number of times married using selected social or demographic characteristics and age at first marriage: Ever-married women of ages 25–49, Indonesia, 1987

Variable	df	Parameter estimate	Standard error
Intercept	1	0.003321	0.11726806
Urban	1	-0.025976*	0.01056762
Java or Bali	1	0.064667*	0.02263919
Outer Islands I	1	-0.033100	0.02119583
Muslim	1	0.020131	0.01668806
Javanese	1	-0.016863	0.01298093
Sundanese	1	0.060767*	0.01548994
Madurese	1	0.047103*	0.02090412
Balinese	1	-0.106163*	0.03469521
Education	1	-0.002334*	0.00104088
Whether worked for money before marriage	1	0.020282*	0.00832712
Primary residence before age 12	1	-0.032997*	0.01148838
Current age	1	0.023643*	0.00634581
Current age squared	1	-0.000197*	0.00008701
Age at first marriage	1	0.023596*	0.00115439

R² = .13, p < .0001

* p < .05.

that for women married more than once, the later their first marriage, the higher was their cumulative fertility net of all the other variables. This effect may be due to attempts to "catch up" in fertility in second and later marriages.

Marriage Patterns and Contraceptive Use

Clearly, both of the marriage variables have had strong effects on cumulative fertility in Indonesia. To what extent might those effects be due to differential contraceptive use? Unfortunately, this question cannot be addressed in a multivariate analysis because of confusion in arguments about causality. The relationship between number of children ever born and contraceptive

use is definitely one of both cause and effect. Some women use contraception because they have already had a large number of children. Other women have used contraception in the past and therefore have had fewer children. Without a complete history of pregnancy and contraceptive use, which is not available from the 1987 NICPS, it is difficult to unravel the causality issue.

It is possible, however, simply to look at the association between the marriage variables and contraceptive use. It is obvious from Table 11 that women who were married more than once used contraception and sterilization less than those married only once—both in the past and currently, in 1987. Women married

Table 8. Mean number of live births to ever-married women of ages 35–49, by age at first marriage, number of times married, and selected social and demographic characteristics: Indonesia, 1987

Social/demographic characteristic	Married only once, first married at ages			Married more than once, first married at ages			All women
	Under 15	15–17	18–20	Under 15	15–17	18–20	
All women 35–49	5.9	5.9	5.2	4.6	4.8	3.9	5.1
Current residence							
Rural	5.9	5.9	5.2	4.6	4.9	4.1	5.2
Urban	5.8	6.0	5.0	4.5	4.4	3.3 ^b	4.8
Region							
Java or Bali	5.4	5.4	4.6	4.4	4.5	3.5	4.6
Outer Islands I	7.1	6.7	5.8	5.7 ^a	5.5 ^a	4.9 ^b	5.9
Outer Islands II	7.5 ^b	7.0	6.0	—	6.0 ^b	—	6.1
Religion							
Muslim	5.9	5.9	5.2	4.6	4.8	3.8	5.1
Non-Muslim	7.4 ^b	5.6	5.2	—	4.4 ^b	—	4.7
Language of interview							
Bahasa Indonesia	6.7	6.5	5.5	5.0	5.5	5.3 ^b	5.4
Javanese	5.3	5.3	4.6	4.4	4.2	3.5 ^a	4.6
Sundanese	6.2	5.6	5.0 ^b	5.2	4.8	—	5.2
Madurese	4.1 ^a	—	—	3.2 ^a	—	—	3.5
Balinese	—	5.5	4.3	—	—	—	4.5
Education							
None	5.7	5.5	5.0	4.4	5.0	3.9 ^a	5.0
Some primary	6.3	6.4	5.3	4.8	4.4	3.6 ^b	5.4
Primary completed	5.4	5.8	5.2	4.6 ^a	5.0	4.1 ^b	5.1
Secondary or more	—	5.6	5.1	—	4.8 ^b	—	4.4
Whether worked for money before marriage							
Yes	5.8	6.0	5.0	4.4	4.9	4.0	4.9
No	6.0	5.9	5.3	4.7	4.6	3.9 ^a	5.2
Primary residence before age 12							
Village	5.8	5.8	5.2	4.6	4.8	3.9	5.1
Town or city	6.2	6.4	5.1	4.8	4.6	—	5.0

Note: Mean number of live births is based on 75 or more cases unless otherwise indicated. Means based on fewer than 25 cases have been omitted, including the means for all women who first married at age 21 or older. Omitted means are indicated by a dash.

a. Mean based on 50–74 cases.

b. Mean based on 25–49 cases.

more than once may have thought contraceptive use inappropriate because their cumulative fertility was substantially lower than that of women married only once. As mentioned previously, women married more than once may have been trying to catch up with the women married only once.

The relationship between age at first marriage and contraceptive use is less clear-cut. Among women of ages 35–49, those who had married later had higher contraceptive use rates. For women under age 25, however, the relationship was negative; that is, the higher their age at first marriage, the less contraception they had used. This finding undoubtedly reflects the shorter marriage durations for younger women at the time of the survey.

The relationship between age at first marriage and contraceptive use is less clear-cut, but contraceptive use may have contributed to the low-fertility effect of later marriage.

Overall, however, it seems safe to say that marriage patterns in Indonesia are related to contraceptive use, and it is reasonable to speculate that contraceptive use may have played a reinforcing role in producing the low-fertility effect of later marriage.

Discussion and Conclusions

Knowing about trends and differentials in women's age at first marriage and their divorce and remarriage rates is critical to understanding fer-

tility trends and differentials in Indonesia. After statistically controlling for eight socioeconomic variables related to both fertility and nuptiality, we found that a five-year delay in age at first marriage was associated with bearing between .75 and 1.1 fewer children than average. Being married more than once, in the same multivariate analysis, was associated with having 2.1 fewer children. Both marriage variables were also correlated with contraceptive use, contraceptive use probably reinforcing the effect of later marriage (lower fertility) and low rates of contraceptive prevalence characterizing women who had been married more than once.

Understanding the mechanisms leading to changes in the marriage variables is central to understanding how and why the socioeconomic changes and policy directives in Indonesia are changing the marriage patterns. We are interested in knowing, for example, to what extent shifts from arranged marriages to "love matches" are occurring and how these shifts vary by region, ethnic group, and educational attainment. To what extent, how, and where is the 1974 Marriage Law being enforced? Are government agencies, particularly through their change agents in the villages, actively promoting later marriage and attempting to influence marital dissolution? If so, how important are these governmental efforts relative to other social changes in affecting marriage patterns? Unfortunately, the NICPS data contain little information suitable for investigating these important issues.

If past trends continue, rising age at marriage in Indonesia will lead

(continued on page 25)

Table 9. Mean number of live births to ever-married women of ages 25-34, by age at first marriage, number of times married, and selected social and demographic characteristics: Indonesia, 1987

Social/demographic characteristic	Married only once, first married at ages				Married more than once, first married at ages			All women
	Under 15	15-17	18-20	21 or more	Under 15	15-17	18-20	
All women 25-34	3.7	3.4	2.8	1.1	3.1	2.6	2.1 ^a	2.9
Current residence								
Rural	3.6	3.4	2.8	1.0	3.1	2.5	2.1 ^b	3.0
Urban	4.0	3.5	2.9	1.1	3.0 ^a	3.0 ^a	—	2.8
Region								
Java or Bali	3.5	3.1	2.7	1.0	3.0	2.4	1.8 ^b	2.7
Outer Islands I	4.4	4.0	3.2	1.1 ^b	3.5 ^b	3.7 ^b	—	3.3
Outer Islands II	4.5 ^b	4.1	3.2	—	—	—	—	3.3
Religion								
Muslim	3.7	3.4	2.8	1.1	3.1	2.6	2.2 ^a	3.0
Non-Muslim	4.3 ^b	3.3	2.8	1.1 ^b	—	—	—	2.5
Language of interview								
Bahasa Indonesia	4.2	3.9	3.0	1.1	3.4	3.0	2.8 ^b	3.0
Javanese	3.5	3.0	2.6	1.0 ^a	3.0	2.1 ^a	—	2.7
Sundanese	3.7	3.2	2.9	—	3.6 ^b	2.6 ^b	—	3.1
Madurese	2.8 ^a	2.5 ^b	—	—	2.2 ^b	—	—	2.4
Balinese	—	2.9	2.5	—	—	—	—	2.6
Education								
None	3.8	3.3	2.9	1.2 ^b	2.8 ^a	2.6 ^b	—	3.0
Some primary	3.8	3.5	2.8	0.8 ^b	3.4	2.8	1.9 ^b	3.2
Primary completed	3.4	3.4	2.9	1.3 ^b	2.4 ^b	2.2 ^a	—	2.9
Secondary or more	—	3.3	2.8	1.0	—	—	—	2.4
Whether worked for money before marriage								
Yes	3.9	3.4	2.7	1.1	3.1	2.8	2.2 ^b	2.8
No	3.6	3.4	3.0	1.0 ^a	3.0	2.5	2.0 ^b	3.1
Primary residence before age 12								
Village	3.6	3.4	2.8	1.1	3.0	2.6	2.0 ^a	3.0
Town or city	4.2	3.6	2.9	1.0	3.6 ^b	2.8 ^b	—	2.9

Note: Mean number of live births is based on 75 or more cases unless otherwise indicated. Means based on fewer than 25 cases have been omitted, including, for women married more than once, the means for all women who first married at age 21 or older. Omitted means are indicated by a dash.

a. Mean based on 50-74 cases.

b. Mean based on 25-49 cases.

Reviews and Publication Notes

Births and Power: Social Change and the Politics of Reproduction edited by W. Penn Handwerker. Boulder, San Francisco, and London: Westview Press, 1990. vi, 227 pp. ISBN 0-8133-7787-0 (paper), US \$27.50. Available from Westview Press, 5500 Central Avenue, Boulder, CO 80301, U.S.A.

Births and Power: Social Change and the Politics of Reproduction is a collection of articles about the social and political aspects of events related to birth, from contraception to birth itself, to the value of children. Its thesis is that the birth of a child is a political event, and this thesis is underscored by the choice of articles included. It should be noted that politics in this context is used not in the narrow sense of the word but rather to signify the importance of power—the power of individuals, families, communities, and governments—to determine sequences of events surrounding birth.

The articles vary in quality. Unfortunately, the introductory article, "Politics and Reproduction: A Window on Social Change," by Handwerker, is weaker than many others in the collection. Its purpose seems to be to advance the main thesis, that birth is a political event, and to argue that fertility and fertility changes can generate social change. The latter argument, which Handwerker makes through a series of sections with cute subtitles (e.g., "A Leader Without Followers Has No Power," "Sweetness Can Be Calculated"), has been made before—and better—by other researchers, including John Caldwell and many eco-

nomics demographers.

The argument that birth and its associated behaviors is political is made effectively, however, by the cumulative evidence presented in the 11 articles that make up this collection. One of the strengths of the book is that it includes pieces about a wide variety of societies.

Caroline Bledsoe's chapter on child fosterage in Sierra Leone is particularly interesting; she argues cogently that in that society, at least, attempts to weigh the costs and benefits of biological fertility are not useful. Where fosterage occurs, children are viewed as potential sources of achievement and status improvement through their connections with foster parents. Fostering (both fostering in and fostering out) provides a way for parents in that society to lessen the costs of reproduction.

Carolyn Sargent's chapter on the politics of birth in Benin is important for its contribution to research on how Western practices influence cultural change in many unexpected ways. She studies the role and value of pain in Bariba society and argues that Western medicine, which attempts to control pain, including that involved in childbirth, may interrupt the cultural traditions of that society.

John O'Neil and Patricia A. Kaufert, writing on Inuit experience in northern Canada, add to our understanding of how foreign (in this case southern Canadian) practices impinge on traditional experience. Ostensibly in the interest of reducing maternal and infant mortality

(the authors argue that other factors were at play as well), obstetric practices have undergone great change. Whereas birth was once a community event, Inuit women in the communities studied are now evacuated to hospitals in the south and give birth away from their families and friends. This innovation causes disruption in the women's lives and in the community as a whole.

Other chapters deal more directly with the political nature of birth and contraception. Warren M. Hern writes about abortion in the United States, Martha C. Ward discusses the politics of adolescent pregnancy in one area of the United States (Louisiana), and Barbara Pillsbury advances arguments supporting the controversial family planning and sterilization program in Bangladesh. These articles, perhaps because of their polemical stance, are less successful in persuading the reader of the political nature of these behaviors than are those that argue through the presentation of data.

This book will be of interest to readers from many fields. For demographers interested in the social context of fertility, the articles lend support to previous studies focusing on the social, political, and economic context of fertility behavior. Public health researchers and practitioners will benefit from descriptions of how varying social and political influences can affect the distribution and use of family planning, abortion, obstetric, and maternal and child care services. There is much here to interest

policymakers as well, as most of the articles deal explicitly (as in the case of Jeanne M. Simonelli on Hungary and O'Neil and Kaufert on the Inuit experience) or implicitly (in almost all the articles) with the role of policy in creating, limiting, and shaping options.

After reading the varied and richly textured material in this volume, one comes away with a sense that birth and reproduction are indeed political events. For this reason the book makes an important contribution to all fields that deal with birth and reproduction.

—Nancy E. Riley
Project Fellow
Population Institute
East-West Center

Handbook on International Migration
edited by William Serow, Charles B. Nam, David F. Sly, and Robert H. Weller. New York: Greenwood Press, 1990. xi, 385 pp. ISBN 0-313-26117-2, US \$59.95. Available from Greenwood Press, 88 Post Road West, Westport, CT 06881, U.S.A.

This work, like its earlier counterpart—*International Handbook on Internal Migration* (New York: Greenwood Press, 1990), reviewed in the *Asian and Pacific Population Forum*, Vol. 4, No. 2—provides an overview of contemporary migration and case studies of migration in a variety of national settings. Here, however, the focus is on international population movements, who the movers are, what motivations impel them to move, and how their movements are documented.

Movement by individuals, families, or larger groups can be moti-

vated by economic opportunity, family reconstitution, political instability, natural disasters, or persecution. Some movement involves the illegal crossing of national borders or staying in a country when a visa expires.

Population movements directly affect the country of destination by increasing its numbers, changing its ethnic makeup, and requiring new jobs and public services for entrants. Countries of origin can be affected by the loss of professional or skilled labor.

Even in the most economically advanced nations, the quality and completeness of data on international migration are issues of concern. Comparisons between nations are difficult to achieve, not only because of inadequate data, but also because of differences in their immigration policies. For example, members of the European Community permit their citizens free access to all member nations. Other countries, such as the United States, have more restrictive immigration laws.

Individual chapters of this volume focus on such principal receiving nations as Australia, Canada, and the United States (Chapters 1, 3, and 19); countries whose recent experience with immigration has been primarily with the short-term importation of labor, e.g., the Federal Republic of Germany (Chapter 4); countries such as the Netherlands and the United Kingdom, whose history as colonial powers has led to an influx of migrants from former colonies (Chapters 13 and 18); and countries that receive immigrants mainly for noneconomic reasons such as religion, Israel being a prime example (Chapter 8), or that receive immigrants as refugees

(Nigeria, Chapter 14, and Pakistan, Chapter 15).

Other chapters deal with countries whose history as colonies has influenced their current immigration and emigration patterns—for example, Botswana, French West Indies, India, and Kenya (Chapters 2, 5, 6, 11); and countries where emigration has long been a way of life (Ireland and Italy, Chapters 7 and 9). Finally, several chapters deal with some of the principal sending nations of current international flows—Jordan, Mexico, the Philippines, and Turkey (Chapters 10, 12, 16, 17).

As they had done for the volume on internal migration, the editors provided the authors with an outline of topics to follow so that some transnational comparisons could be made. Missing, however, is a chapter summarizing general trends and patterns. The editors believe that both short-term and permanent migration is economically beneficial to the sending nations. For receiving nations also, the economic and social benefits appear to be favorable, except when countries are forced—as in the recent case of Pakistan—to accept large numbers of refugees without adequate resources to handle them.

The editors conclude that international migration will continue as long as economic disparities exist between nations. They recommend the coordination of immigration policies worldwide to balance the interests of receiving and sender nations.

Although this book makes no startling revelations, it does assemble information from a variety of countries, in a readable and orderly format. It should be of interest to

anyone doing comparative migration studies and a useful addition to collections serving readers interested in migration issues.

Alice D. Harris
former Resource Materials
Specialist for the
East-West Population Institute

ALSO NOTED

"The Demographic Situation in Cambodia" by Jerrold W. Huguet. Published in the *Asia-Pacific Population Journal*, Vol. 6, No. 4, December 1991, pp. 79-91. Available from the Population Division, Economic and Social Commission for Asia and the Pacific, United Nations Building, Rajadamnern Nok Avenue, Bangkok 10200, Thailand.

Piecing together Cambodian government and UN statistics based on various sources and assumptions, this report provides a demographic profile of one of the countries in the Asian-Pacific region about which little has been published in recent years. The Department of Statistics, Ministry of Planning, projects Cambodia's population to reach 9.0 million in 1992 and estimates it to be growing at a rate of 2.5% per year. The United Nations gives somewhat smaller estimates, 8.6 million in mid-1992 and a 2.2% growth rate. Mortality and fertility remain high; the crude death rate is about 15 per thousand population, the infant mortality rate "well over 100" per thousand live births, and the crude birth rate about 40 per thousand.

Huguet notes, however, (p. 79) that "all of these figures are actually only reasonable assumptions . . . and not based on any existing data. During the period 1970-1979,

statistical work came to a complete stop. Most, if not all, statistical documents were destroyed."

Owing to the Indochinese War and its aftermath, the Cambodian sex ratio exhibits a severe distortion, 80 males per 100 females, in the 18-64 age span, with the result that 20% of adult females are single, widowed, separated, or divorced.

The capital of Phnom Penh, the only large city, is 18 times as large as the second largest city of Battambang. Its population, estimated to be growing at about 5% a year, fluctuates between 800,000 during the rainy season and 1.0 million during the dry months, for an average of 900,000 (as of 1991).

A large number of Cambodians, both within and outside Cambodia, have been displaced from their homes. According to one estimate, nearly 170,000 persons were displaced in Cambodia's nine provinces in 1991. Some 350,000 more living in refugee camps in Thailand were expected to begin returning to Cambodia in early 1992.

Sociological Studies on the Vietnamese Family edited by Tuong Lai. Hanoi: Social Sciences Publishing House in association with the Institute of Sociology, National Center for Social Sciences, and the Department of Sociology, Gothenburg University, 1991. 193 pp. (paper). Available from: Khoa Hoc Xa Hoi (Social Sciences Publishing House), 61 Phan Chu Trinh, Hanoi, Vietnam.

This collection of 12 studies, all but one of which are by Vietnamese authors, examines Vietnamese family structure and functions in the context of the country's recent political, social, and economic

changes. The focus is on rural families, who constitute about 80% of Vietnam's population, and specifically on the Viet ethnic group, although ethnic minorities are also described.

Several papers consider cultural influences, such as Confucianism, on family institutions; others concentrate on women's roles and status, the rural family as a productive agricultural unit, or peasant families' adaptation to the country's new economic conditions. One paper, by Pham Bich San, assesses Vietnam's modern population trends and prospects, drawing upon a variety of sources including the 1989 census.

Population Statistics of China compiled by Yasuko Hayase and Seiko Kawamata. I.D.E. Statistical Data Series, No. 55. Tokyo: Institute of Developing Economies, 1990. (In English and Japanese.) xiv, 298 pp. (paper). Available from Asian Economic Press, Ltd., 42 Ichigaya-Hommura-cho, Shinjuku-ku, Tokyo 162, Japan.

During the 40 years since the founding of the People's Republic in 1949, the population of China doubled, growing from 540 million to 1.12 billion. This volume presents a series of statistical tables derived from China's population censuses of 1953, 1964, 1982, and 1987, by province and major demographic, social, and economic variables. Augmenting the tables are age pyramids of the Chinese population by province for the four census years, instructions for interpreting the tables and age pyramids, and four brief articles on China's population statistics, its educational system, minority nationalities, and population projections for 1987-2057. Ac-

ording to an East-West Population Institute researcher, this book is very useful.

Vasectomy: New Opportunities by Laurie Liskin, Ellen Benoit, and Richard Blackburn. Population Reports, Series D, No. 5. Baltimore: Population Information Program, Center for Communication Programs, The Johns Hopkins University, 1992. 23 pp. (paper). Available from Center for Communication Programs, The Johns Hopkins University, 527 St. Paul Place, Baltimore, MD 21202, U.S.A.

According to the authors, vasectomy—voluntary male sterilization—is a major family planning method in the United States and five other developed countries and in three developing countries (China, India, and South Korea). Worldwide, however, it is among the least known and least used methods. Only 42 million couples rely on vasectomy, compared with 140 million couples using female sterilization, 100 million using IUDs, 65 million using oral contraceptives, and 45 million using condoms. Yet for the couple who want no more children, vasectomy offers a simple procedure, effectiveness, permanent protection, convenience, little risk of complications, no long-term effect on the man's health or sexual performance, and no health risks for his wife.

The authors suggest that low levels of use may not lie, as is often supposed, in men's irresponsible attitudes toward the problem of unwanted pregnancy "but rather in policy-makers' and providers' lack of attention to vasectomy—and sometimes even prejudices against it" (p.2). Where high-quality vasectomy services are offered, they attract clients.

Conventional vasectomy requires one or two small incisions in the scrotum. A new no-scalpel technique substitutes a tiny puncture for the incisions and results in "little or no bleeding, fewer infections, fewer buildups of blood under the skin (hematomas), less postoperative pain, and contraception that is just as effective" (p. 2).

The report recommends that vasectomy services be made convenient for men by being offered where men are and when they can use the services; that they be offered in facilities where men feel comfortable; and that they be provided by well-trained staff and supported by good counseling to enable men to make an informed choice.

CENSUS REPORTS

The following census reports are available from countries in the region.

People's Republic of China:

10 Percent Sampling Tabulation on the 1990 Population Census of the People's Republic of China by China Statistical Publishing House. Beijing: China Statistical Publishing House, 1991. (In Chinese.) ii, 708 pp. (cloth). ISBN 7-5037-0630-9/C-377; 60 yuan in China, 350 yuan elsewhere. Available from China Statistical Publishing House, 38 Yuetan Nanjie, Sanlihe, Beijing, People's Republic of China. Also available on tape and diskette.

This first volume of tabulations from China's 1990 population census, summarizing data from a 10% sample, contains more than 100 tables providing basic descriptive statistics on population size by province, rural-urban distribution,

and population characteristics such as age, marital status, ethnicity, education level, and occupation. Additional tables present statistics on household composition, fertility, and migration. The census data on migration should be of special interest because new questions shedding light on intra- and inter-provincial migration and on reasons for migrating were included in the census during the 1990 round.

According to these new figures, as of the census date (1 July 1990), China's total population was 1,131,876,050. The total fertility rate for the country as a whole was 2.253. The differential effects of the family planning policy are evident in a broad range of total fertility rates for the provinces, from a low of 1.332 in Beijing to a high of 4.222 in the province of Tibet.

Federated States of Micronesia:

Kosrae State 1986 Census Report by the Division of Statistics, Office of Planning and Statistics, Pohnpei. Kolonia, 1989. xvi, 110 pp. (paper). Available from Division of Statistics, Office of Planning and Statistics, Kolonia, Pohnpei, Eastern Caroline Islands 96941.

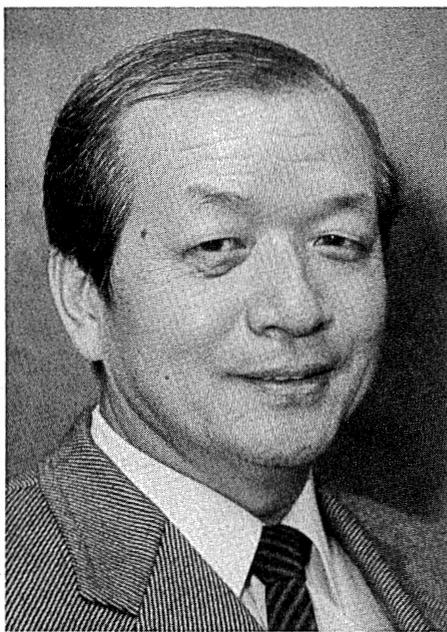
The report describes the population characteristics of Kosrae State, the second largest island in the Federated States of Micronesia. The census taken on 15 September 1986 was the first to deal exclusively with Kosrae since Kosrae separated from Pohnpei in 1977 and is the second in the round of censuses conducted throughout the Federated States of Micronesia (FSM). The FSM national government and the Kosrae State government worked together on the census.

(continued on page 27)

Activities and Announcements

Lee-Jay Cho to Leave Population Institute and Head Northeast Asia Program for East-West Center

Dr. Lee-Jay Cho, 56, vice president for academic affairs at the East-West Center since 1987 and director of the Center's Population Institute since 1974, assumed a new Center post as vice president for program development on 22 April 1992 and announced his intention to resign the institute directorship as of 1 July. During the next two years Cho will be free of administrative and research duties so that he can de-



DEBORAH BOOKER

Lee-Jay Cho, director of the Population Institute and former vice president for academic affairs of the East-West Center, has been named vice president for program development and will head a new program focusing on development in Northeast Asia.

vote his time to developing a new program focusing on economic development and cooperation in Northeast Asia, a topic on which he has already spent much effort.

The Center's new president, Dr. Michel Oksenberg, stated in a letter to Cho that he expected Cho to have successfully developed and launched the new program within two years, "having garnered external support to sustain the bulk of this program," after which Cho would remain as vice president for program development and become director of the new program. Oksenberg also stated that Cho will have the additional title of senior advisor to the president.

Oksenberg noted his own and Cho's common desire to make the world a safer place and pledged his best efforts to assist Cho. Acknowledging Cho's contributions to the Center over the past two decades, Oksenberg stated that "in many ways you are the Center."

Oksenberg appointed Dr. Bruce Koppel, interim director of the Institute of Economic Development and Policy, as interim vice president of academic affairs. A new director of the Population Institute has not yet been named.

Robert C. Schmitt, State Statistician for Hawaii, Retires

Robert C. Schmitt, 70, Hawaii's state statistician for more than 35 years and "a walking encyclopedia," according to a columnist for one of



CHARLES OKAMURA, HONOLULU ADVERTISER

Bob Schmitt, retiring state statistician, is a fount of information about Hawaii.

Honolulu's leading newspapers, retired from that post at the end of April 1992. Schmitt, who serves on the editorial board of the *Asian and Pacific Population Forum*, has been an invaluable resource to East-West Center researchers, the academic community at large, government officials, the business community, news media, and the public. Cheerfully and with amazing alacrity he has answered literally millions of questions about Hawaii. Schmitt's *Demographic Statistics of Hawaii, 1778-1965* and *Historical Statistics of Hawaii* (both published by the University of Hawaii Press) are widely cited.

When asked what he planned to do after retiring, he replied that he

was off to Europe for a few weeks and then would resume work on several writing projects, one of which is a kind of Guinness book of first accomplishments in Hawaii.

International Population Conference Planned by IUSSP for Summer 1993

The International Union for the Scientific Study of Population (IUSSP) will hold the XXIInd International Population Conference in Montreal, Canada, from 24 August to 1 September 1993. The conference will take place under the auspices of the governments and Canada and Quebec and at the invitation of the Federation of Canadian Demographers. The program will consist of three plenary sessions on broad themes and some 50 ordinary sessions on specialized topics. Poster sessions and related meetings will be held in conjunction with the general conference.

The conference will provide a forum for current thinking of the scientific community on population issues and for influencing future directions in the population field. The sessions will deal with such topics as population in the twenty-first century, the relationship between population and the environment, health and mortality, population aging, fertility and the status of women, international migration, population policies, labor markets, minorities, HIV transmission and AIDS, and data collection and methodology.

The conference will be open to all interested individuals. It is not necessary to be member of the IUSSP to participate or to submit a

paper for presentation at the conference. For authors wishing to have their papers considered for publication, the deadline for submission to the session organizers is 31 August 1992; and for authors wishing to contribute papers at a later stage, the deadline is 30 June 1993.

For more information, contact:

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IUSSP
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India's Population Likely to Reach One Billion by Century's End

The 1991 Indian census recorded a population of 844,324,222 and an average annual growth rate for the 1981-91 decade of 2.1%, according to Amulya Ratna Nanda, registrar-general and census commissioner of India, who presented a summary of the census results to staff of the East-West Center's Population Institute during a visit in January. India currently accounts for 16.0% of the world's population (as compared with China's 21.6% and Africa's 12.1%). By the year 2000, Nanda stated, India's population will pass the one billion level, and by 2041 it is projected to reach 1.5 billion. Between 2030 and 2040, India will overtake China as the world's most populous country.

The Indian government had hoped to bring down the country's net reproduction rate to 1, or replacement level, by the year 2001, but now expects a delay of another 10 to 15 years. High growth rates in eastern India are due in part to im-

migration from neighboring Bangladesh.

Urbanization has slowed somewhat since the 1981 census, from an annual rate of 4.6% to 3.6%. The urban population grew from 23.3% to 25.7% of the total population during the intercensal period. India now has 23 cities with populations of 1 million or more, their combined population totaling 73 million. Five megacities each have populations of 5 million or more. Despite the rapid growth of cities, more than 627 million Indians continue to live in rural areas.

The ratio of females to males, historically low in India, fell again between 1981 and 1991, from about 935 to 929 females per 1,000 males. The causes are not fully understood.

In past censuses women's economically productive work has not been adequately reported. During the 1991 census the Indian government made a special effort to publicize the importance of women's work, and this led to better figures on women's labor force participation, Nanda said. In response to a question about contraceptive prevalence, he stated that about 45% of married women of reproductive age now use some form of birth control.

Nanda spent January 18-20 as a visiting fellow at the East-West Center's Population Institute to confer with institute staff about collaborative research on India's population involving the Office of the Registrar General and the institute. The project is supported by a grant from the U.S. Agency for International Development. □

Population Aging . . .

(continued from page 4)

use of health services. A higher percentage of children under age 5 used the services did than any of the elderly age groups, and the percentage of children in the 5-9 age group who used a service slightly exceeded that of the elderly population overall during the reference period. Women, both in the population at large and in the elderly age groups, were somewhat more likely to have used a health service than were men.

Although proportionately more children than elderly had used health services during the reference period, the elderly were the most likely age group to have been hospitalized. They were almost twice as likely to have been inpatients than was the general population (9% versus 5%). Among the elderly themselves, however, no distinct age pattern of hospitalization is evident from the survey data. Of those hospitalized, 46% of persons 60+ years old had been hospitalized for more than one week, compared with only 55% of those aged 75+. Again, limited mobility and higher mortality among the oldest group may account for the lack of a clearer positive association between age and hospital admissions at the older ages.

Regardless of age group, the vast majority of Thais who were hospitalized depended on government facilities. Use of government hospitals was somewhat lower among the elderly, however, than among the population at large (88% and 90%, respectively). Gender differences in the use of health services were small.

Nine percent of the elderly had recently been hospitalized, compared with 5% of the general population, according to the 1986 Health and Welfare Survey. Regardless of age group, the vast majority of those hospitalized depended upon government facilities.

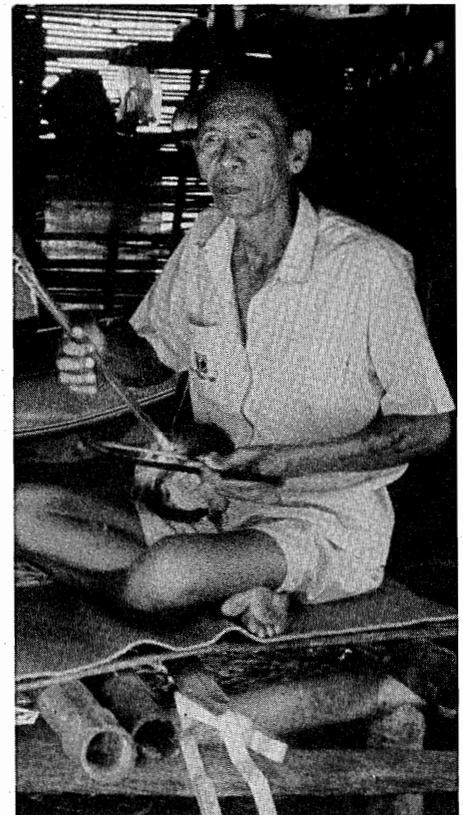
Projected population size and age structure

Although the absolute size of Thailand's elderly population has grown substantially over the recent past, the age structure has changed only modestly, with the proportion of elderly remaining low. According to United Nations estimates, the share of the total population in the 60+ age group increased from 4.8% to only 5.4% between 1950 and 1980 (UN 1991a). Given the rapid decline in fertility that has taken place over the past two and a half decades, however, the age structure will undergo major changes in the future. If fertility remains low, not only will the absolute numbers of elderly continue to rise but so will their relative share of the population.

As of 1980 Thailand's age structure resembled fairly closely that of the world's less developed regions, where only 6% of the total population was in the 60+ age group. But Thailand has been experiencing unusually rapid growth of its elderly population segment in comparison with other less developed countries. During the 1970s its elderly popula-

tion grew by 3.9% per year, while in the less developed regions as a whole the elderly population grew by 2.7% annually.

Assessing the population prospects for all countries in 1990, the United Nations produced alternative population projections to the year 2020 based on high, medium, and low assumptions about the course of fertility, a single set of mortality assumptions, and the as-



Thailand's elderly population segment is growing much more rapidly than that of most developing countries. Here a village elder practices a traditional Thai instrument in preparation for a festival in Chainat Province.

sumption of no international migration (United Nations 1991a, 1991b). The results of the projections for Thailand, incorporating the medium fertility variant, are summarized in Table 2 for selected years. The medium fertility variant assumes that fertility will level off at approximately the replacement level by the first half of the 1990s. Given that fertility in several other Asian countries has already fallen below the replacement level, the medium variant projection is probably conservative from the standpoint of anticipating population aging.

By the year 2010 Thailand's population is projected to increase by a little more than 50% over that of 1980, but during the same 30 years the elderly share of the population is projected to increase by 167%. By the year 2020 the growth in the 60+ population will exceed 300% whereas the total population will have increased by just two-thirds. Among the 75+ age group the proportionate increase will be even higher than among the 60+ population as a whole.

Between 1980 and 2020 Thailand's population is projected to increase by two-thirds, but the 60+ age groups will triple in number and their share of the total will rise from 5% to 13%.

The disproportionately large increases projected for the elderly mean that their share of the total population will grow—from 5% in 1980 to 9% by 2010 and to 13% by 2020 for the elderly age group at

Table 2. Projected trends in selected demographic measures of the elderly population in Thailand, based on United Nations projections, 1980–2020

	1980	1990	2000	2010	2020
Assumptions ^a					
TFR ^b		2.60	2.11	2.07	2.07
e ₀ , male		63.0	66.6	69.1	71.3
e ₀ , female		67.1	70.6	73.7	76.0
Population (thousands)					
Total	46,718	55,702	63,670	71,594	78,118
60+	2,527	3,453	4,928	6,737	10,258
65+	1,649	2,175	3,173	4,429	6,538
75+	484	671	925	1,427	2,020
% increase over 1980					
Total	19	36	53	67	
60+	37	95	167	306	
65+	32	92	169	296	
75+	39	91	195	317	
% of total population					
60+	5.4	6.2	7.7	9.4	13.1
65+	3.5	3.9	5.0	6.2	8.4
75+	1.0	1.2	1.4	2.0	2.6
Population 75+ as % of					
60+	19.2	19.4	18.8	21.2	19.7
65+	29.4	30.9	29.2	32.2	30.9
Men per 100 women					
60+	83	83	84	83	85
65+	78	78	80	80	80
75+	71	67	68	66	67

Source: Calculated from data provided in United Nations (1991a, 1991b).

a. Assumption refers to the five-year period prior to the date shown.

b. Medium variant of total fertility rate (TFR).

large. Thus the Thai population will become noticeably older in the next few decades if fertility remains low and mortality continues to improve. The elderly population itself will age somewhat, persons 75+ representing a slightly larger percentage of the 60+ age span in the future.

The sex ratio of the elderly (males per 100 females) is projected

to change little over the projection period, the deficit of men persisting at about the same level. The "feminization" of the elderly population that has been observed in many of the economically more developed countries does not appear to be an emerging phenomenon in Thailand, at least as implied by the UN projections.

Implications of an aging population for hospital demand

In view of the elderly population's disproportionate use of hospital services documented by the 1986 Health and Welfare Survey, the projected increase in the absolute and relative numbers of elderly persons in Thailand's population has important implications for the extent and pattern of demand for in-patient hospital care. A simple exercise illustrates just how profound these implications are.

From the survey data it is possible to estimate the number of days per person spent in a hospital during 1986 for each age group of the population.¹ If we assume that these

1. The numbers of in-patient days are coded on the data tape for the survey as intervals rather than as exact numbers of days. For the purpose of calculating the average number of days per person, we assigned the values shown in parentheses to the following intervals: 1-7 days (4); 8-14 days (10); 15-28 (21); 29-42 (35); 43-56 (49); 57+ (70); unknown (10). Persons who were not hospitalized were assigned a value of 0 days.

A comparison of the amount of time spent hospitalized in the prior year as reported in the 1986 survey agrees reasonably well with information provided by service statistics collected by the Ministry of Public Health (MOPH) and suggests that the survey provided generally accurate data on this matter. On the basis of the values assigned to the time intervals indicated above, the survey implies 22.7 million in-patient days for the Thai population as a whole during the year prior to the survey (1985-86).

Service statistics on in-patient days for health institutions outside Bangkok that operate under the MOPH are issued in the annual publication series *Public Health Statistics*. Those institutions represented exactly 50% of all health facility beds in Thailand in 1985-86, the other 50% being represented by Bangkok facilities and those provincial private and government facilities not under the jurisdiction of the MOPH. Thus an estimate of total in-patient days for the country as a whole can be derived roughly by doubling the number of in-

Table 3. Projected number of days spent in hospitals, by age, based on 1986 hospitalization rates and the 1990 United Nations medium-variant population projections

Age	Days in hospitals (10,000s)		% distribution of days in hospitals		% change, 1990-2020	% of total change accounted for by age group
	1990	2020	1990	2020		
0-14	457	438	18	10	-4	-1
15-39	1,039	1,209	41	27	+16	9
40-59	592	1,545	23	34	+161	48
60+	451	1,337	18	30	+196	45
Total	2,539	4,529	100	100	+78	100

age-specific levels of hospitalization will remain constant, the total number of days spent in hospitals can be estimated for future years by multiplying these rates by the projected number of persons in each age group. Table 3 presents the results of such an exercise, comparing the situation in 1990 with that estimated for 30 years later. (The calculations are based on the medium fertility variant of the latest UN projections for Thailand.) Although we made the calculations for each five-year age group, for ease of presentation we show only the broader age groups in Table 3.

Given the substantially greater proportionate increase anticipated in the number of elderly compared

patient days reported for MOPH institutions outside Bangkok. This calculation produces an annual estimate of 24.7 million in-patient days, or 9% more than implied by the 1986 survey.

We have already noted several reasons for suspecting that the survey data understate the extent of hospital use. The comparison with service statistics suggests that the amount of understatement is rather modest. In any case, it is the accuracy of the age pattern of hospital use rather than the amount of hospital use that is more important for the purpose of the present exercise. Unfortunately, the ages of patients are not available from the service statistics for comparison with the age-specific survey data.

with the rest of the population and the fact that the elderly tend to spend more days per person in hospitals, the number of days spent in hospitals will increase almost twice as much as the total population. Overall the population is projected to increase by 40% between 1990 and 2020 (see Table 2), but the number of days spent in hospitals is projected to increase by 78%. In addition, the relative share of hospital use by the various age groups will shift radically. Adults in the 40-59 age group and the elderly (60+) will account for far more of total in-patient care, whereas children of ages 0-14 and younger adults (15-39) will use far less.

Other things being equal, hospital in-patient days will increase by 78% over the projection period while total population grows by only 40%. Growth of the elderly population segment will account for 45% of the rise in in-patient days.

In the case of the 0-14 age group, the absolute number of days

spent in hospitals will actually decline according to these calculations, which reflect the low levels of fertility that are projected during the period under consideration. In contrast, the swelling of the population in the 60+ age group implies an almost 200% increase in the number of days spent in hospitals by the elderly. The growth in the number of the elderly accounts for 45% of the total increase in the number of days spent in hospitals by the entire population, even though that age group accounts for only 30% of the total population growth over the projection period.

Summary and conclusion

The results demonstrate that population aging will increase substantially the need for hospital services beyond the increase that can be expected simply from population growth. As we noted at the outset, the exercise reported here is intended only to illustrate the independent role that population aging will play in hospital-care demand rather than to represent a realistic projection of hospital use in the future. Our underlying assumption that the 1986 age-specific rates of days hospitalized will remain constant was made for heuristic purposes only and ignores other factors likely to affect hospital use.

Both supply and demand factors lead us to expect that age-specific use of health services, including hospitalization, will change in the next few decades. The current rapid spread of HIV infection will undoubtedly put severe new strains on the health care system and alter the age pattern of hospital use as more and more of those infected fall ill (Muecke 1990; Myers and Ashakul

1991). Whereas victims with active AIDS or ARC are likely to increase the rate of hospitalization mainly of younger and middle-aged adults, other factors may reinforce the preeminence of the elderly as hospital patients. For example, increased levels of smoking and alcohol consumption in recent years are likely to result in a rise in the prevalence of chronic illnesses, mainly among the elderly (Chayovan et al. 1990; Preston 1970). Social trends such as urbanization, declining family sizes, and changing proclivities of adult children to be caretakers for ill elderly parents can all influence the demand for in-patient hospital care.

In short, predicting actual demand for hospitalization is a complex task. It seems unlikely, however, that developments in the foreseeable future will alter the basic pattern in which the elderly make disproportionate use of in-patient hospital services and thus the conclusion that population aging itself will contribute in a major way to an increased demand for hospital services. Any planning for the future health care of the Thai population will need to take this reality into account.

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The Conflicting Effects of Delayed Marriage . . .

(continued from page 14)

to lower fertility and lower divorce rates will lead to higher fertility. The net influence of the two marriage variables is difficult to predict because it is impossible to know which trend (rising age at marriage or declining divorce rates) will predominate. Furthermore, until efforts are made to collect more detailed information on why Indonesia's marriage patterns are changing, our ability to make in-

formed comments on future trends will be limited.

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Table 10. Multiple regression parameter estimates and standard errors for estimating number of children ever born, using selected social or demographic characteristics, age at first marriage, number of times married, and the interaction between number of times married and age at first marriage: Ever-married women of ages 25-49, Indonesia, 1987

Variable	df	Parameter estimate	Standard error
Intercept	1	-1.580772*	0.62431370
Urban	1	0.021007	0.05620591
Java or Bali	1	-0.897630*	0.12041697
Outer Islands I	1	-0.173664	0.11269251
Muslim	1	0.090568	0.08890710
Javanese	1	-0.424697*	0.06902243
Sundanese	1	-0.003151	0.08242715
Madurese	1	-1.609693*	0.11138168
Balinese	1	-0.088558	0.18458295
Education	1	-0.008270	0.00554761
Whether worked for money before marriage	1	-0.004672	0.04428378
Primary residence before age 12	1	0.137672*	0.06110189
Current age	1	0.421057*	0.03376918
Current age squared	1	-0.003486*	0.00046287
Age at first marriage	1	-0.218423*	0.00676569
Number of times married	1	-2.084315*	0.24375950
Interaction‡	1	0.069250*	0.01568803

$R^2 = .36, p < .0001$

* $p < .05$.

‡ Interaction between age at first marriage and number of times married.

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Table 11. Percentage of ever-married women of reproductive age ever using contraception or sterilized, and percentage currently using contraception or sterilized, by age, number of times married, and age at first marriage: Indonesia, 1987

Characteristic of women	Percentage, by current age		
	35-49	25-34	15-24
Ever using contraception or sterilized			
All women	56	72	56
Married only once, first married at ages			
Under 15	47	72	66
15-17	61	76	56
18-20	63	79	54
21 or more	—	52	38
Married more than once, first married at ages			
Under 15	45	62	24
15-17	49	61	38 ^a
18-20	52	74 ^a	—
21 or more	—	—	—
Currently using contraception or sterilized			
All women	37	53	40
Married only once, first married at ages			
Under 15	28	56	51
15-17	41	56	38
18-20	46	60	41
21 or more	—	42	29
Married more than once, first married at ages			
Under 15	25	42	24
15-17	27	41	38 ^a
18-20	33	42 ^a	—
21 or more	—	—	—

Note: Percentages based on fewer than 25 cases (indicated by a dash) have been omitted.

a. Percentage based on 50-74 cases.

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Reviews and Publication Notes

(continued from page 18)

The report consists of nine chapters describing the census and the Kosrae's population, focusing on its composition, marital status, fertility, mortality, education, economic activity and socioeconomic status, and projected trends. Numerous tables and figures augment the text. The remainder of the report presents 15 basic tables, five technical appendixes, definitions and abbreviations, the census questionnaire, a census base map, and references.

A volcanic island with a total area of only 109.6 km² and 70% of that area unsuitable for development, Kosrae has experienced more rapid population growth in recent decades than the FSM as a whole. The 1986 de facto census recorded a total of 6,607 persons on Kosrae, representing an annual growth rate of 3% since the 1980 de jure census. Mean age of the population was 16.6 years in 1986, indicating a high level of fertility in recent years. But the percentage of the population in the youngest age group (0-4) declined between 1980 and 1986, from 18.5% to 16.8%, suggesting that fertility may be declining. Total fertility rates derived from census data also indicate that the mean number of children per women has fallen, the adjusted figure for 1986 being 5.46.

Pohnpei State 1985 Census Report by the Division of Statistics, Office of Planning and Statistics, Pohnpei State. Kolonia, 1988. xv, 132 pp. (paper). Available from Division of Statistics, Office of Planning and Statistics, Kolonia, Pohnpei State, Eastern Caroline Islands 96941.

The report documents what was in-

itially intended to be a pilot census of Pohnpei State, the first census undertaken by any government of the Federated States of Micronesia, on 15 September 1985. The planned follow-up census in 1986 did not take place, so that the 1985 census became the final census for the decade.

The census recorded a total population of 28,671, representing an exceptionally high 5.2% average annual growth rate over the previous five years. The mean age was 21.7 years. Average household size was 7.1 persons.

The report states that fertility declined in Pohnpei between 1973 and 1985, the total fertility rate dropping from 7.96 to 5.15 children per woman. The number of children born each year continues to rise, however, because the number of women of childbearing age is growing, owing to the high fertility rates that existed until recently.

Infant mortality has fallen only slightly since 1973, from 29.7 deaths per 1,000 infants, to 28.7. Life expectancy at age 1 was 61.9 for females and 58.3 for males.

Republic of Korea:

Preliminary Count of Population and Housing Census As of Nov. 1, 1990 by the National Statistical Office, Republic of Korea. Seoul, 1991. In Korean and English. 189 pp. (paper). Available from National Statistical Office, 90 Kyongundong, Chongno-gu, Seoul 110-310, Republic of Korea.

The first part of this report briefly traces the history of census taking in Korea and outlines the organization of the 1990 census. Subsequent sections present preliminary tabula-

tions for the whole country and its provinces, by administrative district.

The total population, according to the preliminary count, was 43,520,199, including 20,525 foreigners, as of midnight on 1 November 1990. Seoul, the capital, had a population of 10,627,790.

The census enumerated a total of 11,357,160 ordinary households and 19,239 institutional households. Ordinary households contained an average of 3.78 members.

Advance Report of 1990 Population and Housing Census Based on Two Percent Sample Tabulation by the National Statistical Office, Republic of Korea. Seoul, 1991. In Korean and English. 121 pp. (paper). Available from National Statistical Office, 90 Kyongundong, Chongno-gu, Seoul 110-310, Republic of Korea.

This report presents a description of the basic characteristics of the population, households, and housing units in the Republic of Korea, based on the results of a 2% sample tabulation of the 1990 census. The text contains an outline of the 1990 Population and Housing Census, explanations of terms used in the census, and an outline of the sample design. The remainder of the report consists of statistical tables and appendix tables.

According to the report, the total population at the time of the census was 43,499,674, the number of males exceeding the number of females by 100.77 to 100. One-fourth (25.4%) of the population belonged to the age group under 15; only 5.1% was in the age group of 65+.

Other population characteristics presented in the nine statistical ta-

bles on population include school attendance and educational attainment, marital status, migrants, number of own children by age of mother, and the ever-married population by age, sex, and age at first marriage. Six tables focus on household characteristics and four tables describe housing units.

Singapore:

Census of Population 1990: Advance Data Release by Census of Population Office, Department of Statistics, Singapore. Singapore: Department of Statistics, 1991. xviii, 71 pp. ISBN 9971-914-33-6 (paper). Price unknown. Available from SNP Publishers Pte Ltd, Ministry of Trade and Industry, Department of Statistics, 8 Shenton Way No. 10-01, Treasury Building, Singapore 0106, Rep. of Singapore.

This report on Singapore's third census since independence analyzes the main characteristics of the population in 1990 and changes during the last decade. It contains advance information on basic demographic characteristics such as age, sex, citizenship status, ethnic group, and marital status of Singapore citizens and permanent residents based on the complete enumeration. Information on economic and other characteristics of the population such as housing, education, transport, religion, and employment is based on data from a 10% sample of households.

Numerous tables and figures augment the text, which is followed by two appendixes, the first containing 22 statistical tables and the second presenting concepts and definitions.

A few statistics from the 1990 census: The population of Singapore as of 30 June 1990 totaled 3,002,800, of whom 90%, or

2,690,100, were citizens and permanent residents. The total population grew at an average annual growth rate over the previous decade of 2.2%, the resident population (consisting of citizens and permanent residents) grew at 1.7%, and the citizen population grew at 1.6%.

The city-state's ethnic composition remained stable over the decade. Chinese constituted 78% of the resident population, Malays 14%, and Indians 7%.

As a result of declining fertility and increased longevity, the median age of the resident population rose from 24 to 30 years between 1980 and 1990. The proportion of persons 60+ years grew from 8% to 9%. Among the three main ethnic groups, the Malays had the most youthful population (mean age of 26 years) because of their higher fertility; among the Chinese and Indians the mean ages were 31 and 30, respectively.

Average family size shrank from 3.4 children born to resident ever-married women to 2.9 children. Malays still had the largest number of children: 3.4 compared with 2.9 for Chinese and 2.8 for Indians.

The proportion of single persons grew among males and females of all age groups between 25 and 44. Among women, the proportion single rose in the 35-39 age group from 9% to 14% and in the 40-44 age group from 6% to 11%.

Tonga:

Kingdom of Tonga, Population Census 1986 by Statistics Department, Tonga. Nuku'alofa, June 1991. 231 pp. (paper). Available from Statistics Department, P.O. Box 149, Nuku'alofa, Tonga.

This first volume from Tonga's 1986

census presents the main findings, 151 pages of general statistical tables on the population's characteristics, and the household and personal schedules, with instructions to enumerators.

The 1986 census counted all persons who were actually in Tonga on the night of November 28, in contrast to the 1976 *de jure* census. Mapping of census blocks was greatly improved, and for the first time Tonga had its own computing facilities for processing census data.

The questionnaire included new questions and modified some concepts, in particular the measurement of migration, fertility, mortality, and the labor force. For example, a new question on place of usual residence helped to distinguish migrants who had actually changed their usual residence from short-term movers counted away from their usual residence. Although the census did not try to enumerate persons who had migrated overseas, it did ask about countries where respondents had lived for six months or longer to provide insights into return migration.

The census recorded a population of 94,649 and an intercensal growth rate 0.5% per year (indicating a high rate of overseas emigration). More than 67% of the population was enumerated on Tongatapu Island, one of five main islands. Using various demographic techniques to analyze the census data, the Statistics Department estimates the intercensal birth rate at 30.0 births per thousand population per year, the death rate at 6.5 deaths per thousand, the rate of natural increase at 23.5 per thousand, and the net migration rate at 18.5 per thousand. □

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Factors Associated with Child Mortality in Pakistan and Implications for the National Health Programs

by Tauseef Ahmed

Pakistan's infant and child mortality rates are high even by the standard of less developed countries. In the absence of a good vital registration system, surveys offer the best means of measuring child mortality as an indicator of social and economic development. This study attempts to establish the levels of infant and child mortality in Pakistan using an indirect estimation technique to analyze data from the 1984-85 Pakistan Contraceptive Prevalence Survey.

The levels of infant and child mortality derived from the analysis are similar to those produced by the Pakistan Demographic Survey of 1984, indicating that children's survival chances have hardly improved in recent years. Rural areas continue to have much higher child mortality than urban areas, despite recent efforts by the government to meet basic health needs in the countryside. As expected, parents with some education exhibited a greater tendency than those with no formal education to engage in modern child-care practices, but only in urban areas did the educational level of mothers have a statistically significant effect on children's survival chances. Suggestions are offered on ways to improve the effectiveness of rural health programs.

Tauseef Ahmed is Senior Fellow at the National Institute of Population Studies in Islamabad, Pakistan.

ASIAN AND PACIFIC POPULATION FORUM

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THE EAST-WEST CENTER is a public, nonprofit education and research institution with an international board of governors. The U.S. Congress established the Center in Hawaii in 1960 with a mandate "to promote better relations and understanding between the United States and the nations of Asia and the Pacific through cooperative study, training, and research."

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The PROGRAM ON POPULATION, formerly the Population Institute of the East-West Center, conducts research and training activities in the population field, with emphasis on social and economic aspects of population in the Asia-Pacific region.

THE HEALTH status of Pakistani children typifies that of a developing country. According to Grant (1992:74), more than a quarter of infants born in Pakistan during 1980-88 had low birth weights. At least one of every 10 Pakistani infants dies before reaching his or her first birthday (Rukanuddin and Farooqui 1988:69).

The government of Pakistan has made the reduction of infant mortality a prime public health goal in recent years. Policy documents and budget allocations for health programs emphasize preventive measures (Government of Pakistan 1982). Immunization coverage for children increased substantially over the period 1977-84 (Government of Pakistan, Federal Bureau of Statistics, 1986: table 5.3).

Nevertheless, government-supported health facilities are far from adequate. Although 50% of Pakistanis live within 2 miles (3.2 km) of a public or semipublic health facility, a serious shortage of health personnel limits the services that can be provided to those in need. The national expenditure on health increased 34 fold over the 1971-86 period, but because of population growth the annual per capita expenditure remained at only Rs. 20.49 (US \$0.80) at the end of the period (Rukanuddin and Farooqui 1988:159).

The concentration of health facilities in urban areas has contributed to the higher rate of infant and child mortality in rural than in urban areas. Other social and economic factors such as the family's economic status and the mother's education are also known to affect infant and child mortality.

The Pakistan Contraceptive Prevalence Survey, conducted between October 1984 and February 1985, collected information from a nationally representative sample of women of reproductive age about their fertility histories, survival of children born, maternal characteristics thought to be associated with children's survival, and the mothers' own health behavior during the three years preceding the survey. The data provide a unique opportunity to study national trends in child survival and the factors associated with it. The present study uses data from the survey to estimate the levels of Pakistani infant and child mortality and to examine its covariates.

Recent Trends in Pakistani Infant Mortality and Theoretical Assumptions

Estimates of infant mortality in Pakistan have varied, according to the data sources used (Rukanuddin and Farooqui 1988). Pakistan lacks a good vital registration system, and in its absence an elaborate dual record system known as Population Growth Estimation (PGE) was established in the early 1960s. Estimates of infant mortality based on PGE and data from several surveys have indicated a decline from approximately 150 deaths per 1,000 live births in the early 1960s to slightly more than 100 deaths per 1,000 live births in the mid-1980s (Table 1). In comparison, the average infant mortality rate for the less developed countries as a group in 1991 was 75 and for the more developed countries it was 14 (Population Reference Bureau 1991).

Infant mortality in Pakistan in the mid-1980s has been estimated at slightly above 100 deaths per 1,000 live births, compared with an average rate of 75 per 1,000 for the less developed countries as a group in 1991 and 14 per thousand in the developed countries.

In Pakistan the principal causes of infant death after the first month of life are acute respiratory infections, gastroenteritis, other communicable diseases, and malnutrition (Awan 1986:188). Results from the National Health Survey of 1982-83 have revealed that better facilities, such as

piped drinking water, flush toilets, and gas cooking stoves, tend to improve the health standard of the community (Government of Pakistan, Federal Bureau of Statistics, 1986:30).

Proximate determinants of child survival. Mosley and Chen (1984) have developed a theoretical framework in which they treat available health care and mothers' and children's nutritional status as proximate variables, through which social, economic, and demographic factors affect child survival. An infant's survival during the first month of life has been found to be closely associated with the mother's health and nutritional status during pregnancy. Malnourished mothers

tend to produce infants with low birth weights who have a higher than average risk of infant mortality (Lechtig et al. 1978; Galway et al. 1987). This risk may be aggravated by a poor feeding pattern and insufficient breast milk. Prenatal care and the presence of a medically qualified attendant at a child's delivery can prevent birth injuries and provide necessary medical care in case of an emergency (Meegama 1986).

Other, exogenous health-care variables, which Mosley and Chen (1984) characterize as environmental contamination, adversely affect child survival. They include mothers' exposure to postpartum infections and families' lack of access to safe drinking water, sanitary toilets, or disease-prevention measures such as inoculation programs. The introduction of sanitary toilet facilities has been found to reduce infant mortality in the Philippines (Martin et al. 1983) and in Malaysia (Peterson et al. 1986). Improved water supplies and sanitation proved to be significant factors in the decline of infant mortality in Malaysia among mothers who were not breast-feeding (DaVanzo and Habicht 1986).

Malnourished children are at a heightened risk of acquiring diseases for prolonged periods because their immune systems are weakened (Galway et al. 1987). Measles, malaria, diarrhea, and other communicable diseases are prominent killers of infants in developing countries where malnutrition is widespread (Hill and Kaufman 1987). The availability, accessibility, and appropriateness of health services are important determinants of child survival (Galway et al. 1987).

Table 1. Estimated infant mortality rates from various sources: Pakistan

Year	Rate per 1,000	Method	Data source
1962	152	Indirect	Population Growth Estimation
1963	137	Indirect	Population Growth Estimation
1964	136	Indirect	Population Growth Estimation
1965	118	Indirect	Population Growth Estimation
1968	124	Indirect	Population Growth Survey
1969	111	Indirect	Population Growth Survey
1970	109	Indirect	Population Growth Survey
1971	106	Indirect	Population Growth Survey
1970-74	145	Indirect	Population Growth Survey
1976	87	Indirect	Population Growth Survey
1977	100	Indirect	Population Growth Survey
1978	95	Indirect	Population Growth Survey
1979	95	Indirect	Population Growth Survey
1984	127	Direct	Pakistan Demographic Survey
1985	116	Direct	Pakistan Demographic Survey
1986	106	Direct	Pakistan Demographic Survey
1987	104	Direct	Pakistan Demographic Survey

Source: Rukanuddin and Farooqui (1988: table 6.2).

Demographic factors. Demographic factors such as a child's birth order and sex, the mother's age, the duration of the preceding and following birth intervals, and whether the mother has had a prior experience of child loss are known to affect child survival in many populations (see, for example, Hobcraft et al. 1983). Rapid, successive childbearing results in low birth-weight infants and increased risk of child mortality. Successive childbearing and short birth intervals may also result in greater competition between siblings for scarce resources, resulting in poor nutrition and high infant mortality (Hobcraft et al. 1983; Choe 1987; Winikoff 1983). A short birth interval implies early weaning of the older child, which may cause that child to be exposed to malnutrition or infectious agents in food. Having a large number of very young children may increase their exposure to communicable diseases that can lead to death.

Successive childbearing and short birth intervals lead to underweight infants, competition among children for scarce resources, and early weaning of older siblings—increasing the children's risk of malnutrition, infection, and exposure to communicable diseases.

In societies where early marriage is the norm, childbearing starts early in a woman's life, and for many women childbearing continues late in the reproductive age span. First-born children of very young wom-

en are at especial risk of infant mortality because of their mothers' physical immaturity (Gubhaju 1986; Rutstein 1983). A mother's experience of losing a child is strongly associated with her greater risk of subsequent infant mortality (Cleland and Van Ginneken 1988; Sathar 1987; Gubhaju et al 1987). Births to women at older ages, especially after age 35, also entail a higher risk of infant mortality (Galway et al. 1987).

Social and economic factors. Social and economic factors have been found to affect a child's chances of survival in many populations. These include ethnicity, the family's socioeconomic status, the mother's work pattern, her education, the parents' sex preference, and their place of residence. Peterson et al. (1986) and Choe et al. (1989) report ethnic differences in infant mortality in Malaysia and Nepal. Higher family income can generally be taken as an indicator of better nutrition and greater access to health facilities, which improve an infant's chances of survival. Preston (1974) suggests that certain diseases may be linked to a family's living standard.

Cultural values associated with gender make an infant's sex an important factor in survival. Excessive female mortality, especially in late infancy and early childhood, has been found in Bangladesh (Chen et al. 1981), Pakistan (Sathar 1987), and the Republic of Korea (Choe 1987). Chen et al. also report gender differences in nutritional levels and the amount of care provided to infants in Bangladesh.

A negative association is commonly found between a mother's

educational level and infant and child mortality (Cleland and van Ginneken 1988; Galway et al. 1987; DaVanzo and Habicht 1986; Visaria 1988). Higher female education leads to improved child-care skills and preventive care (Das Gupta 1989), better child-feeding patterns (Caldwell and McDonald 1981), women's ability to make their own decisions and understand the importance of hygiene and sanitation (Ware 1984), reduced fatalism and enhanced focus on child quality (Caldwell 1979), and the preference of modern health-care practices that improve children's survival (Mosley and Chen 1984).

Sathar (1987) argues that in Pakistan, maternal education improves infants' survival chances regardless of the availability of health services because it leads mothers to provide better nutrition and care for their children. Alam and Cleland (1984) suggest that mortality could be reduced more effectively by encouraging proper child-care practices than by increasing the general economic standard of poor parents. DaVanzo and Habicht (1986) have found evidence suggesting that the influence of maternal education on child mortality increases after mortality begins to decline. Typically, a mother's education has a stronger association with infant mortality than does the father's education (Caldwell and McDonald 1981; Alam and Cleland 1984).

Data and Method

To analyze the factors that affect infant mortality in a particular context, it is desirable to obtain direct

information on each birth, the nutrition and health care of each child, and the mother's health before, during, and after each pregnancy. The Pakistan Contraceptive Prevalence Survey of 1984-85 (hereafter referred to as the PCPS) used a structured questionnaire to collect information on fertility and infant mortality from a randomly selected sample of 7,405 currently married women between the ages of 15 and 49. Women who reported having given birth within three years of the interview were asked direct questions about their infant-mortality experience, breast-feeding patterns, infant food supplementation, and desired fertility. Upon examination, however, the partial birth histories obtained from the survey were found to be inadequate for purposes of analyzing child survival.

For this analysis, therefore, I have employed indirect estimation of infant and child mortality based upon the number of children ever born and of children surviving reported by respondents. Gubhaju et al. (1987) conclude from their analysis of infant mortality in Nepal that child-survivorship information yields better estimates of infant and child mortality than do partial birth histories because the latter tend to omit infant deaths.

The indirect estimation method, first developed by Brass (Brass 1964; United Nations 1983), uses information on the cumulative number of children ever born and surviving at the time of a survey, classified by respondents' duration of marriage or age. The proportion of deceased children is adjusted by a multiplier, appropriate for the given maternal age or marriage du-

ration, to yield estimates of cumulative probability of child mortality at selected ages. The multiplier depends upon the age (or marriage-duration) pattern of fertility and the age pattern of mortality.

I used the multipliers estimated by Trussell (1975). For the age pattern of mortality, I used the Coale-Demeny West model life table (Coale and Demeny 1983) because it closely models Pakistan's mortality pattern. The computation of indirect estimates of infant mortality was done with a computer program (MORTPAK: procedure CEBCS) developed by the United Nations (1988).

For the multivariate analysis of the factors associated with child survival, I used the Mortality Index (United Nations 1985). The index, which can be computed for each woman in the group under consideration (in this case those women in the PCPS who had given birth during the three-year period before the survey), is based on the proportion of children who have died among all children born. It is a ratio of the actual proportion of deceased children to the proportion expected for women having the same marital duration and is based on the estimated age distribution of children and an assumed standard age pattern of mortality.

The index is computed as follows:

$$MI = [G (D/B)] / q_s(a)$$

where B and D represent respectively the number of births a woman has had and the number of deaths among them, G is the appropriate multiplier, and $q_s(a)$ is the probability of dying before reaching exact age (a) in a standard population.



MARK EDWARDS/STILL PICTURES

Although the Pakistani government has attempted to improve children's survival by expanding medical facilities, launching a child immunization program, and communicating with the public about health issues, child mortality remains high. Poverty coupled with early and rapid childbearing are among the causes.

The multiplier and the value of (a) are determined by the duration of marriage and the associated age distribution of children according to the Coale-Trussell model fertility pattern (United Nations 1985). The standard age pattern of mortality, $q_s(a)$, is assumed to conform to the Coale-Demeny West model life table (Coale and Demeny 1983), with the infant mortality rate equaling 108 deaths per 1,000 live births. The in-

dex thus created is a standardized ratio of observed to expected deaths.

Several types of error may have been introduced into the data. Information on births and surviving children was obtained retrospectively, and it is possible that some women, misunderstanding the survey questions, neglected to report the births (and deaths) of children who died in infancy, grown children, and children who had moved away from the parents' home for a long period. Such omissions would have affected the accuracy of our mortality estimates. Age misreporting, which is common in Pakistan (Retherford and Mirza 1982) also would affect the estimates. Booth and Shah (1984) report that older and illiterate Pakistani women are more likely than others to underreport the births of deceased children who died in the distant past. To minimize the problem of underreporting of deceased children, I have based the analysis on women who had been married between five and 24 years at the time of the survey.

Results

Indirect estimation of infant mortality rates. Results from the indirect estimation (Table 2) indicate

much lower infant mortality over the period of 1975–81 than the estimates (145 deaths per 1,000 live births) obtained by the Pakistan Fertility Survey for the period 1970–74, but higher than the indirect estimates reported by the Population Growth Survey for the years 1976–79 (shown in Table 1). Given the disparate rates among the three sources, it is difficult to determine whether infant mortality has been falling in Pakistan. One can conclude from the present analysis that the infant mortality rate was quite high in the early 1980s, probably in the range of 110–120 infant deaths per 1,000 live births. But there is definitely a need to verify these estimates using other data sources.

My estimates of infant mortality are likely to be lower than the true rates because of underreporting of deceased infants. I conclude therefore that any decline in Pakistan's infant mortality between 1965 and 1980 was modest at best.¹ This result is contrary to expectation because Pakistan's child immunization program underwent a major expansion in the late 1970s and early 1980s, the government has attempted to make Pakistani women more aware of health issues through mass communication, and access to med-

ical facilities has improved in recent years, especially in urban areas.

The conclusion that Pakistan's infant mortality declined only modestly between 1965 and 1980 is surprising because the government has expanded its child immunization program, mass communication efforts, and access to medical facilities in rural areas.

Multivariate analysis. To assess various factors affecting infant and child mortality, I used the ordinary least squares (OLS) method, with the Mortality Index (MI) as our dependent variable. The independent variables were classified by category and coded as sets of dummy variables. Unfortunately, the PCPS collected information on only some of the variables assumed to affect infant and child mortality.

Background variables are wife's education, husband's education, wife's work status, province, and urban versus rural residence. Demographic variables include children's gender, mother's age at last birth, and whether she ever used any con-

(continued on page 53)

Table 2. Estimated infant and child mortality based on reported proportion of surviving children: Pakistan Contraceptive Prevalence Survey, 1984–85

Age (x)	Probability of dying before age x	Equivalent infant mortality	Estimated date
3	.181	130	February 1981
5	.165	109	December 1978
10	.188	112	April 1977
15	.195	109	August 1975

1. The Pakistan Demographic and Health Survey conducted in 1990–91 found an estimated infant mortality rate of 91 deaths per 1,000 live births for the period 1986–91. This estimate is based on birth-history information, whereas the current analysis focuses on living and ever-born children to Pakistani women. The difference in estimates is a question that requires detailed analysis of the new data. (See National Institute of Population Studies and IRD/Macro International 1992.)

Census-Based Approaches for Studying Aggregate Changes in Characteristics of the Elderly

Census data and methods of analysis associated with them are an underutilized resource for studying changes in the social and economic characteristics of the elderly in developing countries. The social and economic characteristics typically measured in a census can be divided into those that are relatively invariant for older individuals, such as educational attainment, and those that are subject to change, such as employment status. In the case of relatively invariant characteristics, cohort analysis can be applied to a single census, combined with a mortality schedule, to project changes in the composition of future elderly populations. In the case of characteristics that vary over the lifetime, the research focus is on the net movement of older cohorts between states of a social characteristic, such as movement out of the labor force. In the latter instance, cohort analysis is applied to a series of two or more censuses to describe the level of net transitions, which may then be compared for various groups. This article illustrates these techniques and discusses their limitations, which result from the underlying assumptions and from measurement error. The policy implications of the projections are also discussed.

*by Albert I. Hermalin
and Bruce A. Christenson*

NOW THAT fertility has declined in a number of developing countries, government and business leaders in those countries have started to be con-

cerned about both the relative and the absolute numbers of elderly in their aging populations. In most cases these countries are in the initial stages of experiencing an aging population structure; hence concern centers on longer-term development. One response to this concern has been to conduct surveys of the

elderly population, for three purposes: to describe, on a cross-sectional basis, some of the key characteristics of the elderly, such as their living arrangements, economic well-being, social support, and health status; to provide an opportunity for causal modeling and studies of association among those characteristics; and to permit comparative analyses when surveys from other countries with similar data are available (e.g., Martin 1989).

These surveys, however, do not provide much understanding about social change in the condition of the elderly over time. How do the social status and condition of a cohort change over the life course? How do cohorts differ in their levels and rates of change of key characteristics? How will a population change over time as a result of differences in the size and characteristics of successive cohorts? Although census data from a number of developing countries provide a partial answer to some of these questions, their potential has not been systematically explored in aging-related research. This article illustrates a few simple techniques and approaches for using census data on the elderly more completely.

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Elements in a Strategy to Analyze the Life Course

The foregoing observations suggest that three elements are involved in an analytic strategy to study macro-level changes in the status of the elderly. They are (1) the birth cohort as the unit of analysis, (2) a repeated cross-sectional design for tracing cohorts, and (3) a distinction between relatively fixed and variable status measures.

Relying on the birth cohort as a unit of analysis directs attention to distinctive types of change (Ryder 1965). Intracohort change, on the one hand, occurs throughout the life cycle as members of a single cohort experience various life-course transitions. Widowhood and labor force retirement are two examples of transitions that will change the composition of a given cohort, affecting marital status and labor force status, respectively.

Social change, on the other hand, is often reflected by the compositional differences between cohorts. When successive cohorts differ in

their educational or occupational composition, or in their probabilities of marriage or divorce at certain ages, we tend to refer to these as social-structural changes.

Effective use of cohort analysis requires that the research be designed with temporal depth. A repeated cross-sectional design is one means of meeting this requirement (e.g., Duncan 1968, 1975). Demographers have long considered the potential uses and practical problems of applying cohort analysis to a repeated cross-sectional design afforded by two or more censuses to measure such population processes as mortality and migration (Hamilton 1966; United States, Department of Commerce, 1972; Shryock and Siegel 1976; United Nations 1983:chap. IX).

The nature of the characteristic is the third element in this research strategy. Status measures may be conveniently divided into those that are, or at least tend to be, invariant for older individuals and those that are subject to change. Some obvious fixed characteristics include gender,

race, and national origin or place of birth. In the case of older adults it is also reasonable to assume that other characteristics, such as literacy, education, and number of children ever born to women will also be invariant. Variable characteristics, in contrast, can include economic activity and occupation, marital status, current residence (e.g., urban versus rural or region), and living arrangements.

Analytic Potential of Census Data

The implications of the distinction between fixed and variable characteristics for the substantive focus of research become clearer when they are considered in relation to the available time points of data. Table 1, which cross-classifies the number of time points, or censuses, by the type of measure, identifies the types of cohort change that might be studied with census data.

In this section we briefly describe the types of cohort analyses, focusing in particular on the projection of compositional change, net transi-

Table 1. Census data and their relationship to aging research

Number of time points or censuses	Age-gender classes only	Type of data	
		Fixed characteristics	Variable characteristics
1a. Single census	Age-sex structure of the population; relative cohort sizes	Differentials among age groups; age composition of subgroups	
1b. Single census plus projected mortality schedule	Future number of elderly	Projection of compositional change	
2. Two censuses	Census survival ratios	Relative survival among subgroups	Net transition rates (i.e., intracohort)
3. Three censuses	Cohort differences in census survival ratios	Intercohort stability or change in relative survival	Structural change in the aging process (i.e., intercohort differences in net transition rates)

tion rates within cohorts, and structural (intercohort) change in the aging process (the characteristics shown in boldface type in Table 1).

Single-census analysis. The data from a single census lend themselves to the study of population structure. Unless the census includes retrospective questions, however, a single census is not very useful for studying population change. Using the basic counts of persons by age and gender, one can create population pyramids or otherwise describe the population structure. Whether the characteristics are fixed or variable is of limited relevance as an analytic distinction. In either instance, one can examine differences among age groups with respect to a characteristics (e.g., educational level by age) or, alternatively, the age composition of those with a given characteristic (e.g., the age distribution of college graduates).

Single census combined with a projected mortality schedule.

The combination of a census and a projected mortality schedule introduces the possibility of projecting certain types of compositional change. Projections of the future number of elderly in a population demonstrate the implications of cohort succession for a changing population structure. Typically, the mortality schedules are provided separately for males and females, so that it is also possible to project changes in sex ratios of the elderly.

Other types of compositional change in fixed characteristics can also be examined if one is willing to assume that there are no, or only slight, differentials in survival across

statuses. We consider examples of this type of analysis later in the article. Extending such analysis to variable characteristics becomes, by the very nature of their variability, problematic and less informative.

Two-census analysis. Comparing two consecutive censuses introduces the possibility of studying intracohort change, since a given cohort can be traced from one census to another as it ages. Of interest in this case is the degree of change among cohort members in such characteristics as marital status and employment status, which tend to change with age. This involves a simple extension of techniques used to study internal migration, in which it is standardly assumed that mortality rates do not vary across the categories being analyzed. The expected mortality can come from a life table or from a census survival ratio (CSR).

For a closed population, the CSR is the ratio of the total number of people in an age group of the second census to the total number 10 years younger in the first census. (For further details see Shryock and Siegel 1976:379-384.) It should be noted that this technique produces a measure of change for each cohort over the same period, but these changes refer to different life-cycle stages for each cohort. We will discuss an example of this technique when we turn to the topic of measuring net transition rates.

Table 1 indicates that, in principle, one might calculate from two censuses the relative survival of subgroups having a fixed characteristic, such as the expected survival at a specific age of one educational group compared with another. In

reality, however, these estimates are highly sensitive to assumptions about the completeness of census coverage. Such comparisons may prove useful for assessing the relative coverage of consecutive censuses, but at present they are of limited use for more substantive analysis.

Three-census analysis. A sequence of three or more censuses will, in principle, permit an analysis of cohort differences in aging experiences. From a practical standpoint, the most promising area is in the study of variable characteristics. When considering variable statuses, one can examine intercohort stability or change in net transition rates. The latter provides the third example for our more extended discussion.

Cohort differences in mortality at similar ages might be evaluated using census survival ratios. Once again, however, the practical application is often more useful for clarifying the relative completeness of coverage among censuses than for reflecting real survival differences. Analyzing cohort differences in survival with respect to fixed characteristics, such as gender or literacy, also presents practical problems that are beyond the scope of this article.

The availability of three or more censuses introduces other obvious possibilities for describing changes in the makeup of an elderly population that are not included in Table 1. For instance, historical trends in the proportion of the population at older ages or the proportion of elderly who are literate, employed, or widowed, can be described with a series of three or more censuses.

The distinction between fixed and variable characteristics is not germane to these descriptions, and therefore such uses of census data will not require further comment here.

Projecting Compositional Change

Next, we illustrate the technique for developing projections of the elderly population by fixed characteristics, the first of the three topics highlighted in Table 1. The projection of fixed characteristics is demonstrated for both interval measures (e.g., mean number of children ever born) and categorical measures (e.g., proportion of a cohort completing a given level of schooling), and it is further extended to an analysis of future status differences between older and younger cohorts.

To carry out this projection requires data on the age structure of the population (preferably by sex) at a given time, which are most usually obtained from a census; a projection of survival rates for each age-sex group for some future period, which are usually derived from current and recent life tables and from assumptions of future trends; and, for each age and sex group (i.e., cohort), a measure of the fixed or relatively fixed status, such as the percentage literate among persons aged 25 and older or the number of children ever born to women above age 40 or 45. Large-scale, nationally representative household surveys may provide an alternate source of data for age-sex distributions or measures of fixed characteristics by age and sex groups.

With these ingredients in hand, it is a simple matter to project the ex-

isting population forward in time, to establish the age structure at each date, to assign each cohort its "fixed" characteristic at each time point, and to combine cohorts in order to measure the change in composition of all the cohorts under study. Often one can work with an existing population projection so that all that is required is to assign each cohort its status measure at each time point. Population projections are routinely made by government agencies within countries and by international organizations, such as the United Nations.¹ (The techniques of population projection are described in Shryock and Siegel 1976:443-453 and in Pollard et al. 1974:101-113.)

It will be seen from this description that the driving force behind change in a population's composition is the degree to which successive cohorts differ from one another in the characteristic in question and in their relative size. Projecting compositional change requires two important assumptions. The first is that the population is relatively closed to in- and out-migration. In the case of older adults, this is usually a reasonable assumption for a national popula-

tion. For smaller geographic entities such as provinces and local areas, however, it is typically an untenable assumption for projecting the status of the elderly. The second assumption is that within a cohort the differentials in survival probabilities by characteristic are slight or nonexistent, or that differentials in survival probabilities are much smaller than the effects of inter-cohort differentials in status and relative size. An evaluation of this assumption follows some examples of the technique for projecting compositional characteristics.

Projecting the number of children ever born among older cohorts of women. Tables 2 and 3 give two examples of the projection technique as applied to Taiwanese data. In the case of interval variables, a summary measure, such as the mean, is projected. Table 2, showing the projected average number of children ever born (CEB) to women in the age categories of 60 and over at five-year intervals from 1985 to 2020, is based on data from the 1980 census, which reported the CEB for each age group of ever-married women. Such women represent more than 98% of all women in the age groups of 35 and over. Assuming that for women in 1980 no significant number of births would occur after ages 35-39, and further assuming no differential mortality among women of different parities, one can project the average number of children ever born among each older age group for the years 1985 to 2005. With the addition of forecasts of the completed fertility of cohorts still in the reproductive age span, the projection can be extended to the

1. In the future, researchers will probably need to pay greater attention to the mortality assumptions that underlie a given set of population projections. Olshansky (1988), for example, notes that demographers have only recently begun to appreciate the extent to which mortality may decline at older ages. The traditional assumption has been that mortality declines for a short time for younger and middle-age groups but changes only minimally for older age groups. Decreases in mortality at older ages could, therefore, lead to a larger elderly population in both absolute and relative terms than is found in many projections.

year 2020. By combining these data with a recently calculated projection of the population by age and sex, one can estimate the average number of children ever born to various subgroups of the elderly, as shown in the last three rows of Table 2.

The top panel of Table 2 shows how the decline in CEB begins with the 60–64 age group and spreads to older five-year age groups as a consequence of the succession of cohorts. The number of children born to women of ages 60–64 begins declining with the cohort that reaches that age group in 1990 (the birth cohort of 1926–30). Women in this cohort were 40–44 years of age in 1970 and had spent a significant part of their reproductive span subject to the declining fertility that started in the late 1950s and continued with the rapid expansion of contraceptive availability in the 1960s.

In each of the five-year intervals from 1990 to 2010, the 60–64 age group of women will experience a

decline in the number of children ever born amounting to about one-half a child per woman. This decline occurs over successive cohorts, reflecting the increasing adoption of contraception and the decreasing desired family size that have characterized Taiwan's rapid demographic transition (Freedman et al. 1987). If the forecast data are correct, women 60–64 in 2015 will have had half the number of children of those 60–64 in 1990.

The bottom panel of Table 2 shows the implications for all the elderly and for the younger old (those 60–69) and the older old (70 and over), by combining the age groups weighted by cohort size. For all women 60 and over, there is a noticeable decline in the number of children ever born from 1990 on, which accelerates over time until about 2015. In 2015 this age group will have had two fewer children on average than the same age group had had in 1990. The average CEB for all the elderly masks two different trends, however. Women 60–69

will show an even steeper fertility decline, having two fewer children on average between 1990 and 2010; whereas the fertility of those 70 and over will decline much more slowly, decreasing by less than one child between 1990 and 2010 and remaining at an average of four children as late as 2015.

Projected declines in Taiwanese fertility signal the possible need for alternate forms of support for the elderly. Knowledge that the most vulnerable elderly age group (those 70 and over) will not experience a sharp drop in their total fertility until after 2010 or 2015 gives planners time to shape new policies.

The policy implications of these trends are obvious. The number of grown children available to older people reflects the potential for coresidence and other forms of support. Sharp reductions in fertility signal the possible need for alternate forms of financial, emotional, and physical support for which governments need to plan. The impact of the fertility decline may be moderated somewhat by the fact that secular declines in mortality will result in larger proportions of surviving offspring to elderly women. Knowledge that the most vulnerable of the elderly—those 70 and over—will not experience a sharp reduction in CEB until after 2010 or 2015 provides planners with a period of time within which to shape new policies.

Table 2 tells only part of the story, but together with the patterns of

Table 2. Projected number of children ever born among women 60+: Taiwan, 1985–2020

Age group	1980	1985	1990	1995	2000	2005	2010	2015	2020
5-year age groups									
60–64	5.5	5.4	5.1	4.6	4.1	3.6	2.9 ^a	2.6 ^a	2.4 ^a
65–69	5.4	5.5	5.4	5.1	4.6	4.1	3.6	2.9 ^a	2.6 ^a
70–74	5.3	5.4	5.5	5.4	5.1	4.6	4.1	3.6	2.9 ^a
75–79	5.3	5.3	5.4	5.5	5.4	5.1	4.6	4.1	3.6
80+	5.3	5.3	5.3	5.4	5.5	5.4	5.1	4.6	4.1
Broader age groups									
60–69	5.45	5.44	5.23	4.82	4.33	3.84	3.20	2.71	2.49
70+	5.35	5.35	5.42	5.41	5.28	4.96	4.53	4.07	3.48
60+	5.41	5.40	5.31	5.06	4.73	4.36	3.83	3.29	2.89

Sources: ROC (1982); ROC, Executive Yuan (n.d.).

a. Includes forecasts of completed fertility.

actual and desired support revealed by appropriate surveys, it can provide the groundwork for sound policy. In addition, it uses data that are readily available in many places.²

The use of CEB as a fixed characteristic throws into sharp relief the question of consistency of reporting by a cohort as it ages. It has been demonstrated that in some populations older women tend to under-report the number of children ever born, particularly omitting children who died shortly after birth. The expectation of this recall error was one impetus for the development of indirect methods of fertility estimation by Brass and others (Brass 1975; Brass et al. 1968; United Nations 1983:chap. I and II).

Whether the reporting of a "fixed" characteristic—be it educa-

2. Note should also be taken of several alternate approaches for estimating indicators of the potential support of the elderly in the future that differ in methodology, assumptions, inputs required, and output measures from the projection technique presented here. Tu et al. (1992), for example, use a micro-simulation (KINSIM) of Taiwan based on 1985 period rates of fertility and mortality to generate kin distributions that would eventuate from a stable population. For each age group of women in this hypothetical population one can obtain, among other outputs, the number of children and the number of siblings of each sex. Lee and Palloni (1992) make use of a family status life table model to estimate, for various cohorts of women, the prevalence of widowhood by age and the number of children by age and marital status, among other indicators.

For estimating the status of the elderly in the future, which requires demographic data beyond 1985, marriage and birth patterns of 1985 are assumed to remain in force, and certain patterns of improved mortality are adopted. Where the outputs from these alternative methods overlap, future research might be aimed at a comparative evaluation of the projections resulting from these techniques.

tion or childbearing—tends to change over time must be assessed with respect to both the characteristic and the setting before one can accept a projection at face value. In the case of Taiwan and the number of children ever born, analyses now under way (not reported here) demonstrate little tendency for older women to omit the reporting of children they have borne, and the magnitude of any change in the completeness of such reporting among cohorts of older women certainly does not mask the declines in actual fertility and their impact on the future elderly.

Projecting educational distributions characteristics of the elderly. As an example of categorical measures, Table 3 indicates that it is also easy to project forward the proportion of elderly with a given characteristic. The table projects the proportion of elderly Taiwanese males with less than a primary education and the proportion of elderly males with at least a senior high school education for the years 1985–2020. As demonstrated in these examples of educational attainment, one simply advances each cohort's proportion at each level of education and then combines these levels across cohorts, weighted by size, to obtain the distribution of all the elderly or particular subgroups. (The assumption that survival probabilities do not differ greatly across educational statuses is assessed in the shaded inset beginning on page 63.)

Most of the gain in educational levels of the elderly will initially reflect an improvement in minimum schooling as the proportion of elderly with less than a primary

education declines rapidly. Starting about 2010, however, there will also be rapid gains in the proportion of elderly who have completed senior high and higher levels of education. The last row in the left half of Table 3 shows that the proportion of males aged 60 and over with less than a primary education is expected to decline from about one in two in 1980 to about one in 20 by 2020. The last row of Table 3 shows that the proportion of the older male population with at least a high school education is expected to increase from less than 15% in 1980 to over 40% in 2020, with most of the gain occurring after the turn of the century.

Most of the projected gain in educational levels of Taiwan's elderly will initially reflect improvement in minimum schooling. Around 2010, however, the proportion of elderly who have completed senior high school and higher levels of education will begin to grow rapidly.

The pace of change in the educational composition of the elderly male population slows down in the last decade of the twentieth century but resumes in the first decade of the next century. This temporary slowdown reflects the interruption that the onset of World War II caused in the trend toward increased opportunity for formal education in Taiwan, an interruption that directly affected the schooling experiences of the Taiwanese birth cohorts of the 1930s.³ As these cohorts enter their 60s at the close of

the century, the proportion of males 60–69 years old with less than primary schooling and the proportion with a high school or greater level of education remain fairly constant.

The interruption caused by World War II also has implications for assessing trends in differentiation between the younger old and the older old. If one were to examine the projections only to the year 2000, it would appear that the differences between 60–69 year olds and those aged 70 and older with respect to attainment of a senior high or greater level of education had disappeared and that differentiation of the younger old and older old with respect to the attainment of less than a primary education was also on a continuous decline. Further inspection of the projection to the year 2020, however, indicates a re-emergence of age differentiation at both levels of schooling in the midst of a general trend toward increasing education for all age groups. Thus the imprint of historical events on the fixed characteristics of a birth cohort has implications for the pace of change in the composition of the elderly population as well as for the degree of heterogeneity or homogeneity of the elderly.

The trends toward increasing education have implications for policy because educational level is often associated with a population's health status, types of demands

Table 3. Projected educational distribution of adult males, 1985–2020, and comparisons with younger cohorts: Taiwan

Age group	1980	1985	1990	1995	2000	2005	2010	2015	2020
Proportion of males with less than a primary education									
5-year age groups									
20–24	0.018								
25–29	0.033	0.018							
30–34	0.049	0.033	0.018						
35–39	0.104	0.049	0.033	0.018					
40–44	0.231	0.104	0.049	0.033	0.018				
45–49	0.230	0.231	0.104	0.049	0.033	0.018			
50–54	0.209	0.230	0.231	0.104	0.049	0.033	0.018		
55–59	0.303	0.209	0.230	0.231	0.104	0.049	0.033	0.018	
60–64	0.419	0.303	0.209	0.230	0.231	0.104	0.049	0.033	0.018
65–69	0.515	0.419	0.303	0.209	0.230	0.231	0.104	0.049	0.033
70–74	0.618	0.515	0.419	0.303	0.209	0.230	0.231	0.104	0.049
75–79	0.726	0.618	0.515	0.419	0.303	0.209	0.230	0.231	0.104
80+	0.827	0.762	0.671	0.576	0.479	0.371	0.279	0.254	0.243
Broader age groups									
60–69	0.460	0.349	0.250	0.220	0.231	0.163	0.072	0.039	0.025
70+	0.681	0.584	0.493	0.386	0.292	0.258	0.245	0.189	0.122
60+	0.525	0.425	0.331	0.286	0.259	0.210	0.152	0.100	0.062
Proportion of males with a senior high school education or more									
5-year age groups									
20–24	0.511								
25–29	0.452	0.511							
30–34	0.372	0.452	0.511						
35–39	0.273	0.372	0.452	0.511					
40–44	0.195	0.273	0.372	0.452	0.511				
45–49	0.173	0.195	0.273	0.372	0.452	0.511			
50–54	0.210	0.173	0.195	0.273	0.372	0.452	0.511		
55–59	0.203	0.210	0.173	0.195	0.273	0.372	0.452	0.511	
60–64	0.173	0.203	0.210	0.173	0.195	0.273	0.372	0.452	0.511
65–69	0.128	0.173	0.203	0.210	0.173	0.195	0.273	0.372	0.452
70–74	0.097	0.128	0.173	0.203	0.210	0.173	0.195	0.273	0.372
75–79	0.084	0.097	0.128	0.173	0.203	0.210	0.173	0.195	0.273
80+	0.060	0.076	0.089	0.113	0.151	0.183	0.199	0.186	0.190
Broader age groups									
60–69	0.154	0.192	0.207	0.191	0.185	0.237	0.331	0.421	0.485
70+	0.088	0.111	0.145	0.179	0.196	0.188	0.189	0.222	0.291
60+	0.135	0.166	0.186	0.186	0.190	0.213	0.265	0.341	0.410

Sources: Same as in Table 2.

3. Another event that ultimately increased the observed level of education among older male cohorts in 1980 was the migration of male refugees from mainland China to Taiwan after the revolution in 1949 because mainland refugees had more formal education than the islanders.

made on health and pension systems, modes of communication, and quality of life in general. In addition, the particular pace of changes in education may have implications for the timing of policy changes or initiatives.

The educational status of elderly persons relative to that of the younger persons with whom they interact also has potential social implications for family relationships and labor force behavior. Projecting educational levels of the adult population for various age groups introduces the possibility of simulating age differences in specific levels of educational attainment.

One simple method, for example, is to use the data from Table 3 on the projected proportion of males in each five-year age group with a senior high or higher level of education to calculate the probability of a difference in schooling in an encounter between an older and a younger individual drawn randomly

from their respective cohorts. Such an encounter would include four alternatives: only the older person has a senior high school education, only the younger person has a senior high school education, neither individual has a senior high school education, or both of them have attained this level of schooling.

Table 4 shows, to the extent possible, trends in the probability of these alternative outcomes when persons in the 65–69 year age group are compared with those at younger ages. The 40–44 age group was selected to simulate roughly the educational level of the sons of the older males, whereas the 50–54 age group might be taken to represent the educational level of the senior work force. The characteristics of 50–54 year olds relative to 65–69 year olds are relevant from an employment perspective because the younger group will likely be competing for the jobs of the older group. Large discrepancies in educa-

tion may serve to push the older cohorts out of the labor market more rapidly.⁴

Throughout the final decades of the twentieth century, the most likely alternative in a random encounter between a 65–69 year old man and one 40–44 years old is that neither will have a senior high school education. The probability of this alternative, however, is diminishing, while the probability that only the younger male will have this much education is on the increase and becomes the most likely alternative by the year 2000. The probability that only the older male has such an education remains small but fairly stable until the end of the century, when a decline in this outcome becomes evident. The probability that both men have at least a senior high school education tends to increase gradually during this period but is still less than 10% by the end of the century.

Although family interactions are far from random encounters, this simple simulation does suggest that intergenerational tension created by educational status differences between elderly and younger males can be expected to increase over the next several decades. The final outcomes will depend, of course, on the degree to which the educational system has expanded higher levels of schooling to social classes or groups that previously had limited access to advanced education. It
(continued on page 58)

Table 4. Projected outcomes in the likelihood of completing senior high school in randomly selected pairs of older and younger Taiwanese males

Completed senior high school	1980	1985	1990	1995	2000	2005	2010
65–69 versus 40–44 year olds, 1980–2000							
Older male only	0.103	0.126	0.128	0.115	0.085		
Younger male only	0.170	0.226	0.296	0.357	0.423		
Neither	0.702	0.601	0.501	0.433	0.404		
Both	0.025	0.047	0.076	0.095	0.089		
Total	1.000	1.000	1.000	1.000	1.000		
65–69 versus 50–54 year olds, 1980–2010							
Older male only	0.101	0.143	0.164	0.153	0.109	0.107	0.133
Younger male only	0.183	0.143	0.155	0.216	0.307	0.364	0.372
Neither	0.688	0.683	0.642	0.574	0.519	0.441	0.355
Both	0.027	0.030	0.040	0.057	0.064	0.088	0.140
Total	1.000	1.000	1.000	1.000	1.000	1.000	1.000

4. Since this analysis focuses on variation between close-ended age groups as presented in the published data, this projection of age differences can be done without a population projection. The assumptions of a population closed to migration and of little or no survival differential relative to the fixed characteristic still apply.

Reviews and Publication Notes

Immigration, Trade, and the Labor Market edited by John M. Abowd and Richard B. Freeman. Chicago and London: The University of Chicago Press, 1991. x, 432 pp. ISBN 0-226-00095-8 (cloth), US \$49.95. Available from The University of Chicago Press, 5801 South Ellis Avenue, Chicago, IL 60637, U.S.A.

This volume arose from a research program of the U.S.-based National Bureau of Economic Research (NBER) on immigration, trade, foreign investment, and the labor market. It includes 15 papers selected from those presented to a conference held in Cambridge, Massachusetts, in September 1987.

The book is organized into three parts. The first looks at the characteristics of the flows of people, goods, and capital to the United States. The second examines the effects of these flows on the U.S. labor market. The third reviews the comparative experience of Canada and Australia.

The project is distinctive in its approach of combining the study of migration with that of trade and investment, particularly at a detailed empirical level. Such an attempt at integrating factor flows is only to be lauded. A glance at any standard textbook on international economics shows how mainstream economists, in their modeling, neglect the movement of people and even investment, relying overwhelmingly instead on a traded-goods interpretation of the world economy. This book focuses on immigration, but as conditioned by complementary investment and trade perspectives.

The project is also provocative in

its conclusions since, contrary to common presumption, it finds that "immigrants have been absorbed into the American labor market with little adverse effect on natives" (p. 22).

It also finds that "notwithstanding all the attention given to Japanese firms, the bulk of direct foreign-owned enterprises in the United States are European" (p. 23). At the same time foreign firms are at least as favorable to U.S. workers in employment conditions as are domestically owned companies. The volume concludes, however, that in contrast to people and capital flows, trade flows have harmed American labor. The impact of import increases on wages and employment has been severe.

Why should this be so? The answer is actually straightforward. People and capital flows have been smaller and induce offsetting consequences, in ways that trade in goods does not. For example, migrants spend on jobs as well as take them, and foreign equity leads to U.S. resource claims only when that foreign investment is profitable. Imports have no such significant direct counter-balancing benefits.

The benign result for immigration may explain why U.S. politicians have been emboldened to expand U.S. immigration under the congressional immigration-law reform package of late 1990.

The comparisons in the book with Canada and Australia, which show the higher levels of skilled international migration tapped by those countries, may also explain

why the recent U.S. initiatives have sought a much sharper economic focus. Less clearcut is why such results have not muted concern over foreign investment, at least as opposed to foreign imports.

The volume, then, is interesting, productive, and pertinent. But it is also narrow, superficial, and outdated.

Its narrowness derives from a strongly short-term focus on economic impacts. Even in strictly economic terms the decision of the project organizers to look only at first-round impacts, rather than full equilibrium adjustments, and to put aside questions of how things may work out for the economy as a whole in the long run, seems limited. Much of the subtlety in economics lies in the indirect effects. Much of the interest in the economic role of immigration and investment lies in their historical contribution to the growth process. But that contribution is ignored in this volume.

The book is superficial in its treatment of policy, particularly immigration policy. The authors are mostly labor and trade economists with no particular specialty in immigration issues. This has the advantage of bringing bright, well-trained minds to bear on pertinent issues from a fresh perspective. The disadvantage is a limited basis from which to address policy development and its associated political and institutional processes. It may have been too much to expect economists to deal creatively with those social and cultural issues

where much of the real action on immigration lies. But a greater leavening of policy experience in the field could have helped.

Finally, the book is outdated both literally and figuratively. For papers from a conference that was held in 1987 to appear in print only in late 1991 seems a rather unfortunate delay in a rapidly evolving policy area. Indeed, the impact of the book may have come and gone. The earlier informal circulation of its ideas may well have been part of the climate of opinion leading to the now-achieved reform of U.S. immigration law.

But it is also outdated in a broader sense, that is, in its focus on settler migration. Certainly it grapples with the issue of illegal migration and certainly it talks of the internationalization of the U.S. economy. But it slights other people flows that are of equal importance to settler movements.

Other, far greater dimensions of modern globalization include business, tourist, and student movements of very large magnitudes, as well as the complex refugee and humanitarian movements. The latter pose problems for economic interpretations of causes and the former pose problems for economic interpretations of impact that seek to distinguish people flows from trade. In a world where international tourist expenditures often exceed the value of manufactured exports and where the export of educational services is expanding in leaps and bounds, flows of trade and people are as much joint as separate.

Even in its own economic terms the NBER volume needs to be supplemented by longer-run analyses,

policy analyses, and examination of broader international population flows. For a fully comprehensive view of immigration, more focus is needed on impacts on source countries and on social and cultural dimensions.

We are still awaiting the project that can provide that blend. And we are still awaiting studies for countries other than those of North America and Australasia. In the meantime the Abowd and Freeman book makes a helpful contribution upon which others can build, and it certainly innovates in centrally linking people flows to investment and trade.

—Glenn Withers
Professor of Economics
La Trobe University
Victoria, Australia

Migration: The Demographic Aspects by the Organisation for Economic Co-operation and Development (OECD). Paris: OECD, 1991. 77 pp. ISBN 92-64-13439-5 (paper), FF 125 (US \$26.00). Available from Publications Service, OECD, 2 rue André-Pascal, 75775 PARIS CEDEX 16, France.

This is the second monograph in a new series entitled *Demographic Change and Public Policy* published by the OECD. The first monograph, *Ageing Populations: The Social Policy Implications*, addressed the issue of growing numbers of the elderly in populations that have experienced fertility declines. The current publication is concerned with declining population size as the longer-term outcome of fertility decline and with the implications of using migration policy to achieve demographic goals.

Although controlling the movement of people across borders is one way for governments to influence population size (the other acceptable way being to adopt pronatalist or antinatalist policies), demographic concerns have not, as a rule, been central to national migration policies. Insufficient knowledge about the complex links between migration and demographic growth has hampered the consideration of policy choices.

In November 1988 a Working Party on Migration brought together OECD member country experts on migration to address this research issue. The current monograph contains their contributions to the meeting, together with an OECD Secretariat paper synthesizing the main conclusions of the workshop participants. The chief message from the discussions is that unless countries are willing to admit substantially larger numbers of migrants each year than they have during recent decades, migration "cannot be expected . . . to compensate for the slowing down of demographic growth and the ageing of populations of OECD countries" (p. 3). Future migration policies are expected to have a more pronounced demographic dimension to offset the negative economic effects of ageing in those nations.

The introductory chapter sets forth the demographic challenges that declining populations present to European countries, describes the contributions of the succeeding chapters, and summarizes the conclusions drawn from the papers and the workshop discussions. A main conclusion is that "the seemingly simple proposition of increasing the intake of young migrants to com-

pensate for the slowdown of population growth and . . . aging" faces formidable technical and political obstacles. "In fact, many countries clearly reject the migration option as a means of counteracting unfavourable demographic shifts" (p. 13).

In chapter II Hervé La Bras estimates the effect of post-World War II migration on the population growth of seven OECD countries (Australia, Belgium, Canada, France, Germany, Italy, and Sweden), and finds that whereas its effect on total population growth has been substantial (accounting, for example, for 38% of Australia's growth since 1945), its effect on the age structure has been modest. "Le Bras argues that migration waves are triggered by economic upswings but then persist as a result of their own inherent dynamics, such as family reunion," with the result that over several decades structure of the population with migrant origins begins to resemble that of the host population.

Using data for 11 OECD countries since 1965, the OECD Secretariat analyzes the fertility of nationals and foreigners over time (Chapter III). The findings indicate, on one hand, that the fertility of immigrants is usually higher than that of the native population and the effect of foreign births on family size is considerable; on the other hand, the higher foreign fertility affects total fertility only modestly because it represents a generally small share of total fertility.

In Chapter IV, Hania Zlotnik discusses the methods used to make official population projections for nine OECD countries, finding much variation, particularly in data avail-

ability, among them. Although the projections make similar assumptions of a small decline in mortality, a modest increase in life expectancy, and narrow fluctuations in fertility, the assumptions about future migration tend to reflect current migration policies rather than statistical analysis of past migration trends. Zlotnik concludes that "The tendency to develop assumptions about future migration without taking account of undocumented movements—both existing or potential—or those of asylum-seekers and refugees is detrimental for the realistic assessment of future prospects" (p. 54).

One way to approach the relationship between population size and migration is to ask what migration flows would be required to achieve certain demographic objectives, for example, to have a steady flow of workers. In Chapter V Christine Wattelar and Guido Roumans present various simulations of fertility, mortality, and migration to the year 2050 for four countries with different age structures and migration histories (Austria, Belgium, Canada, and Spain).

Their results: (1) In the absence of migration, at current fertility levels the populations of all four countries would begin to shrink by 2025; even if total fertility were to rise to 2.1 children per woman, deaths would outnumber births in all those countries by 2040. (2) If migration is to be used to prevent population declines, this will have to start as early as 1990 in Belgium and Austria, by 2000 in Spain, and by 2010 in Canada. The volume of immigration into Belgium and Canada would have to double. (3) The ratio of the economically active

population (ages 20–64) to the retired population (ages 65 and over) in the absence of immigration would fall to below 3 by 2020 except in Spain.

Wattelar and Roumans next consider three possible scenarios for migration. First, immigration is used to maintain an active/retired ratio of 3. In this scenario, migration would occur in great and fluctuating numbers, eventually creating a "population explosion." Second, the size of the active population is held constant, while the active/retired ratio is allowed to fluctuate. This scenario results in fewer migrants being needed and smaller fluctuations in their numbers. In the last scenario, immigration would be constant to assure an active/retired ratio equal to 3 in the year 2050. This would result in more immigration than in the second scenario. If life expectancy rises, retirement age would also have to rise to maintain an active/retired ratio of 3.

Canada and Australia have gone further than the other OECD countries in considering migration as a means to achieve demographic goals. Discussing Canada's population structure (Chapter VI), David Foot argues that, as that country has already created a points system for immigration criteria, a mechanism is in place to smooth out Canada's demographic profile over time—a profile currently bulging in the 34–53 age group consisting of postwar baby boomers. New immigrants could be selected on the basis of age and admissible ages adjusted over time, depending upon demographic and labor market conditions.

(continued on page 68)

Activities and Announcements

Both Continuity and Change Are Goals of East-West Center's President

In a mid-July speech to Friends of the East-West Center (EWC), President Michel Oksenberg described his vision of the Center's future and outlined organizational changes he has begun making to realize that vision. Among those changes are the replacement of the Center's institutes with research programs; a Center-wide system of student recruitment and education; the development of a core curriculum for all EWC graduate students that will lead to an EWC certificate; and the establishment of a conference program on issues of contemporary regional significance that will be overseen by an international committee of scholars and policy analysts. Central elements of Oksenberg's vision are strengthening the Center's ties to the U.S. mainland and the Hawaiian community and diversifying the Center's funding.

The East-West Center, officially known as the Center for Cultural and Technical Interchange Between East and West, Inc., is a public, nonprofit, education and research institution established by the U.S. Congress in 1960 to promote better relations and understanding between the United States and the nations of Asia and the Pacific through cooperative study, training, and research. Oksenberg, who became its fourth president in January 1992 (see *APPF*, Vol. 5, No. 4, p. 107), believes that the Center's mission is as relevant as ever and that

many of its valuable traditions must be preserved. He hopes, however, to make the Center more responsive to changes that are occurring throughout the Asia-Pacific region, and in particular to Asia and the Pacific's changing relationship to the United States. The United States, having ceased to be an overwhelmingly dominant economic power in the region, "can no longer be the benevolent patron of Asia-Pacific countries," he told the Friends organization. "Instead, it must learn to act as a mature partner, an equal."

Flexible agenda needed

The Center's intellectual agenda must be able to respond flexibly and swiftly to new issues as they arise in the region, stated Oksenberg. "We must not be forever identified with issues of the 1970s and 1980s, some of which are no longer of pressing concern." The Center, he noted, is well positioned to study interface issues, such as "how changing demographic profiles affect economic growth, how growth affects energy consumption, how energy consumption affects the environment, how environmental degradation affects security, how environmental change affects health, or how telecommunications change culture."

Creating a single intellectual community, particularly among the Center's researchers, is one of the president's first objectives. That is why research programs have replaced the operationally more autonomous institutes. Another priority is to

diversify the student program by increasing the proportion of EWC scholarships to students from the Pacific islands and the least developed countries of Asia, by enrolling students from the former Soviet Union for the first time, and by developing curricula specifically for Pacific islanders and Indochinese students. The Asian Studies Development Program, established several years ago to make Americans more aware of the Asia-Pacific region by bringing faculty from U.S. mainland colleges and universities to the Center for short periods of study, will place new emphasis on reaching institutions with substantial numbers of minority-group students.

Oksenberg plans to improve the Center's outreach through the creation of a speaker's bureau and the development of a more visible publication program, and by offering special seminars about the region to rising leaders in government, business, the military, communications, and the humanities. A Humanities Forum will enable artists and scholars to spend six to 12 months at the Center pursuing their work and interacting with one another.

New Research and Education Division

As part of the Center's reorganization, a Research and Education Division has been created that incorporates the former institutes, now called programs. The division is headed by Vice President Bruce Koppel, former interim director of the Institute for Economic Develop-

ment and Policy. Besides population, the research-oriented programs focus on cultural studies, communications and journalism, international economics and politics, the environment, resources (energy and minerals), and Pacific islands development. The division also oversees the Center's students, teacher training, short-term training programs, and conferences.

Another new division, Program Development, has the goal of launching a new program focusing on economic development and cooperation in Northeast Asia with support from governments and private organizations in that region. Lee-Jay Cho, former director of the Population Institute, is the division's vice president (see *APPF*, Vol. 6, No. 1, p. 19).

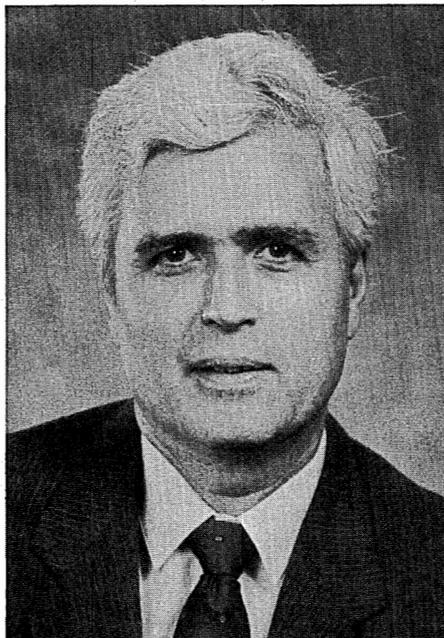
The Center's public affairs and public education activities have been merged into a single office, called Public Programs. Headed by Webster Nolan, it has responsibility for publications, news and information, alumni activities, community relations, the new speakers' bureau, and exhibitions and films.

Andrew Mason Is Named Director of the East-West Center's Program on Population

Andrew Mason has been appointed director of the East-West Center's Program on Population (formerly called the Population Institute), replacing Lee-Jay Cho, who recently assumed the post of vice president for program development.

Mason, 44, joined the Center in 1975 after earning his Ph.D. from the University of Michigan. An

economist by training, he also holds a joint appointment as professor of economics at the University of Hawaii. Between 1984 and 1989 he served as the institute's assistant director for professional education. During 1983-84, while on leave from the Center, he was a visiting scholar at the Sloan School of Management Science, Massachusetts Institute of Technology.



Andrew Mason has been appointed director of the Program on Population, East-West Center.

In collaboration with other economists and demographers from the region, Mason has developed a model for projecting the number and demographic characteristics of households and assessing the likely impact on important social and economic features of the household and its members. The model, known as the HOMES model, is being used by a number of Asian governments in their economic

planning efforts and has also attracted the attention of the popular press. A coauthored monograph that includes a detailed analysis of household changes in Japan during the last two decades has just been published by the Japan Statistical Association in cooperation with Nihon University, and a coedited volume describing the application of HOMES to Thailand is due to be published in early 1993 by the East-West Center.

Japan's Statistics Bureau Pulls Out All Stops for the Fourteenth Population Census Conference

Representatives of census organizations in 23 Asian and Pacific countries, including for the first time Brunei and Mongolia, and from several international agencies gathered in Tokyo during May 26-28 for the Fourteenth Population Census Conference, hosted by the Statistics Bureau of Japan and cosponsored by the East-West Center's Population Institute (now the Program on Population). The meeting was the latest in a series begun by the Population Institute in 1971 to facilitate the comparable collection, tabulation, and analysis of census data in the region and to encourage cooperation between statistical agencies and researchers who rely upon census data. Hosting the event were Mitsuru Ide, director-general of the Statistics Bureau, and Lee-Jay Cho, director of the Population Institute and vice president for development of the East-West Center. Griffith Feeney, East-West Center research associate, and Takanobu Negi, director of the

General Affairs Division, Statistics Bureau of Japan, were the conference coordinators.

Conference participants, many of whom head the bureaus they represented, spent the three days exchanging information about their countries' census operations during the 1990 round of censuses, summarizing the census results, and describing their plans for future population surveys and censuses. The meeting had special significance because the 1990 census round was the last decennial round of the twentieth century.

The conference also provided an opportunity for founding directors of the Association of National Census and Statistics Directors of Asia and the Pacific (ANCSDAP) to approve a document formally establishing the association, which is an outgrowth of the cooperation that has existed among the census organizations of the region for many years. The nonprofit association, which has been incorporated in the state of Hawaii, will support future conferences and networking activities of the region's census bureaus, including publication support for selected issues of the Asian and Pacific Population Forum.

Founding association directors are Barbara Everitt Bryant, director of the U.S. Bureau of the Census; Mitsuru Ide; Teik Huat Khoo, chief statistician of the Department of Statistics, Indonesia; Tai-Hyung Min, administrator of the National Statistical Office, Republic of Korea; Amulya Ratna Nanda, registrar-general and census commissioner of India; and Azwar Rasjid, director-general of the Central Bureau of Statistics, Indonesia. Other census organizations are expected to join

the association in the near future.

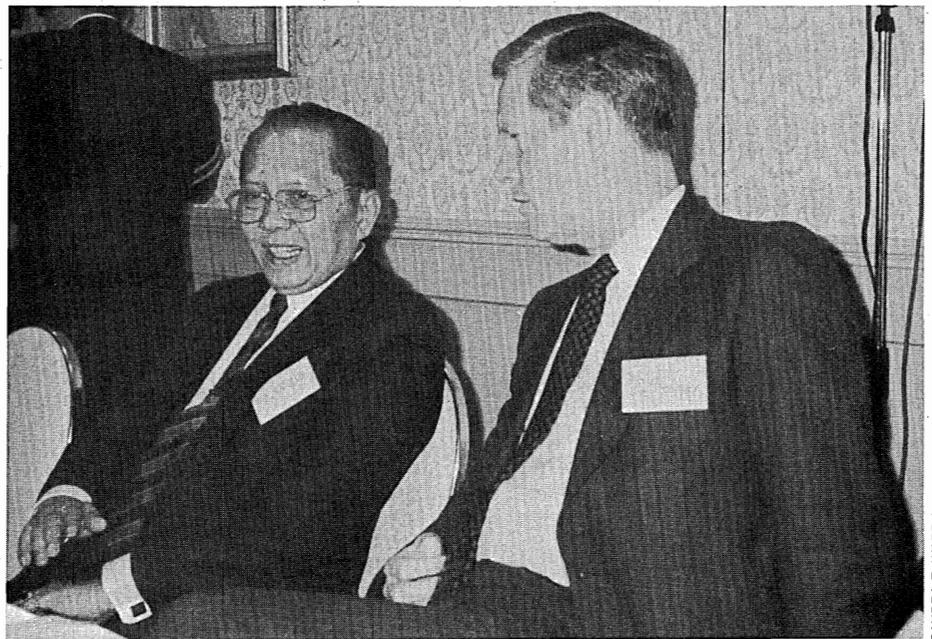
On the last day of the conference, participants were invited to visit the Statistics Bureau and observe a demonstration of its census mapping system (CMS) and its on-line statistical data-base system called SISMAC (statistical information system of management and coordination). CMS uses high-powered computers to map characteristics of Japan's census enumeration districts. It has greatly improved the mapping that must be done before a census is conducted, and it can be used to display census results, such as population density, by geographic area with a high degree of sophistication. SISMAC links 19 user ministries to the Statistics Bureau's data base, giving them direct access to census and survey

data. The two systems have enabled the bureau to expedite the release of census results and to make the data easier for other agencies to use.

Census conferees enjoyed the exceptional hospitality of their hosts, who held several receptions in their honor and, on the day after the conference ended, arranged for them to tour the Fanuc robotics factory in Fuji prefecture and afterward to visit Mt. Fuji. To members of the conference secretariat, who worked tirelessly to ensure that conference ran smoothly, the participants were especially appreciative.

A list of conference presentations and participants appears in the shaded box beginning on page 49.

(continued on page 51)



Azwar Rasjid, director-general of the Central Bureau of Statistics, Indonesia, and Griffith Feeney, research associate at the East-West Center and co-coordinator of the Fourteenth Population Census Conference, confer during a recess in the proceedings.

Presentations and Participants at Fourteenth Population Census Conference

Readers wishing to obtain copies of the conference papers, which are designated with an asterisk (*) in the list of presentations below, should direct requests to the authors, whose addresses are included in the list of participants.

PAPERS AND PRESENTATIONS

Opening Ceremony

Opening Remarks, by *Mitsuru Ide and Lee-Jay Cho*

Status Reports on Recent Censuses

Lee-Jay Cho, Barbara Everitt Bryant, and Teik Huat Khoo, Chairs

*The 1990 Population Census of China and the Utilization of Census Data, by *Zheng Jiabeng and Zhang Weimin*

*A Brief Note on Preliminary Results of the 1990 Population Census of Indonesia, by *Azwar Rasjid*

*Current Status of Census Operations and Processing of the 1991 Population and Housing Censuses of Malaysia, by *Teik Huat Khoo*

*The Status of Operations of the 1991 Census of Population in Nepal, by *Bisnu Dass Singh Dangol*

*Some Topics Concerning the Accuracy of the 1990 Population Census of Japan, by *Nobuyuki Urata*

*Status Paper on the 1991/1992 Population and Housing Census of Pakistan and Relevant Issues, by *Javid Akram*

*Co-ordination of 1990 Census Activities and Problems Encountered in the Census from Provincial Perspectives in Papua New Guinea, by *Kit Ronga*

*The Use of a Population Census in a Changing Society: The Case of Mongolia, by *B. Tsend-Ajush*

*The Mexican Population and Housing Census of 1990 and Other National Demographic Surveys During this Decade, by *Francisco Javier Gutierrez and Eduardo Rios Mingramm*

*Measuring and Correcting for Census Coverage Errors, by *Howard R. Hogan and J. Gregory Robinson*

Census Data Processing

Maree Curran, Chair

*Developments in Data Processing and Utilization of the 1990 Population and Housing Census in the Republic of Korea, by *Min-Kyung Kim*

*The Philippine Experience with Decentralized Processing During the 1990 Census of Population and Housing, by *Nelia R. Marquez*

Sample Surveys and Censuses

Azwar Rasjid, Chair

*How Surveys are Changing at the U.S. Bureau of the Census, by *Barbara Everitt Bryant, Sherry L. Courtland, and Preston Jay Waite*

*Survey Design for the Bangladesh Sample Census, 1991, by *Mohammad Hamidul Hoque Bhuiyan*

*Monitoring Emerging Trends through Intercensal Surveys - Singapore's Plans and Experience, by *Paul Cbeung*

Planning for Future Operations

Phensri Suwansingha, Chair

*Planning for the Post 1991 Intercensal Surveys and Studies in India, by *Amulya Ratna Nanda*

*Planning for the 1996 Fiji Census of Population, by *Sakiusa Balekiwai*

*Emerging Needs in the Population and Housing Censuses: 1990 Round and Beyond, by *Yuen-chung Yu*

Analysis of Census Results

Nelia R. Marquez, Chair

*Applications of Census Data in Projections of Demographic and Socio-economic Aggregates and Implication of these Projections for Planning, by *Chi Ming Luk*

*Small Area Statistics of the Population Census of Japan, by *Takinosuke Dateki*

Dissemination and Utilization

Zhang Weimin, Chair

*Dissemination and Utilization of Vietnam's 1989 Census Data, by *Le Van Toan*

*Promoting the 1991 Australian Census and Marketing Its Products and Services, by *Maree Curran*

*The Utilization of the 1990 Census Data of Thailand, by *Chintana Pejarononda*

Future Plans and Activities

Lee-Jay Cho and Mitsuru Ide, Chairs

Report on the first meeting of the Directors of the Association of National Census and Statistics Directors of America, Asia and the Pacific; *Asian and Pacific Population Forum*; plans for next conference; general discussion.

Closing Ceremony

CONFERENCE COORDINATORS

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Activities and Announcements

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The next item in this section presents highlights from the report on the 1990 census of China presented by Zhang Weimin. The fall issue of the *Forum* will contain an article by Barbara Bryant on how surveys at the changing at the U.S. Census Bureau, based on her

conference paper, and highlights of several other presentations. Readers interested in obtaining copies of any of the conference papers should request them directly from the participants.

More Results from China's 1990 Census Are Being Released

The Chinese government has significantly improved the design and formats of its computerized cross-tabulations of data from the 1990

census, according to Zheng Jiaheng and Zhang Weimin of the State Statistical Bureau, who reported on the status of China's census operations at the Fourteenth Population Census Conference held in Tokyo in May. Because all of the cross-tabulations for national, provincial, prefectural, and county levels, if printed, would fill 9.85 million pages, the government is selecting only the most commonly used ones for publication. The State Statistical Bureau will begin releasing the cross-tabulations at the beginning of 1993.

In addition to the published tabulations, data from the census will be made available to users for detailed analysis in a series of computerized data bases. These will be:

- A micro data base of sample households, called the 1% household data base, containing national and provincial-level data. It will allow statisticians to tabulate the data in any format they wish.

- A subject-specific data base that includes data on the industrial and occupational structure of the employed population, on nationality characteristics of the minority population, on the fertility of women of childbearing ages, and on mortality.

- A macro data base (also called the aggregation data base), with each county as a recording unit, that will include such aggregated data as the total population, population by sex, population by large age groups (children, persons of labor-force age, the elderly), birth rate, death rate, number of women of childbearing ages, total fertility rate, general fertility rate, infant mortality rate, average life expectancy, and population by industry, occupation,

and educational attainment. Offering easy retrieval, this data base should be particularly useful for government leaders and other decision makers who need timely information about the Chinese population.

Experiments with the data bases have been under way since last spring, and work on building them will begin in 1993.

By July 1992 the bureau planned to issue population census maps illustrating China's population growth, population density, and the urban-rural distribution of the population for 2,852 counties. A year before it released a volume containing 124 tables based on the 10% advance sample tabulations from the census.

Additional information about the Chinese census is reported in "The 1990 Population Census of China and the Utilization of the Census Data," by Zheng Jiaheng and Zhang Weimin, State Statistical Bureau, People's Republic of China, 38 Yuetan Nanjie, Sanlihe, Beijing 1000826, People's Republic of China.

United Nations Forms Inter-Agency Technical Support Team for Region's Population Programs

The United Nations announced in mid-August the formation in Bangkok of an Inter-Agency Country Programme Technical Support Team (CPTST) for East and Southeast Asia, under the aegis of the United Nations Population Fund (UNFPA). The team, headed by Dr. Ghazi Farooq, will include 13 population advisers from the Economic and So-

cial Commission for Asia and the Pacific (ESCAP), the Food and Agriculture Organization (FAO), the International Labour Organisation (ILO), the UN Educational, Scientific, and Cultural Organization (UNESCO), and the World Health Organization (WHO). Their task will be to provide high-level technical support to national population programs in such areas as basic data collection; population policy formulation, implementation, and evaluation; maternal and child health and family planning; population education; and rural development planning.

According to the UN, "the new arrangements will ensure a unified and multi-disciplinary team approach that will promote better coordination and cross fertilization of ideas among the advisers." With backing from specialized services at the UN agencies' headquarters, the team is expected to bring "both greater expertise and increased flexibility to ensure more rapid response to country needs."

The advisers will share technical knowledge and skills developed within the UN system. They will also organize and conduct training activities at the regional and country level to upgrade competencies of project personnel. Their expertise ranges from social science research and management information systems to nonformal population education.

Before assuming his new post as team leader for CPTST, Farooq served as senior population economist and head of the Population and Human Resource Planning Unit of the ILO in Geneva and more recently as coordinator of the ILO's population activities. □

Factors Associated with Child Mortality . . .

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trapection. Proximate variables related to the health of the mother and the child are available only for the last child born during the three years preceding the survey. They include prenatal care, place of delivery, type of attendant at the delivery, whether the child was immunized, whether the child had visited a physician or clinic when ill, and the mother's knowledge and experience of using an oral rehydration solution.

Several of the variables are indicators of other factors that may directly affect child survival. For instance, only a small proportion of women in Pakistan use contraception, and for a majority of those who do so the purpose is to limit family size rather than to space births. Evidence from prior research indicates that some women who use contraception may prolong their birth intervals (Ahmed 1989), but because they use contraception inefficiently, they end up having more births than planned. Nevertheless, women who report that they have used contraceptives probably wish to control their reproduction. I assume that for that reason they are likely to be less fatalistic than other women and to be more likely to make conscious efforts to improve their children's survival chances.

For the multivariate regression analysis I selected the maternal age group below 20 to determine whether younger women had experienced higher than average mortality, which might be assumed from their physical immaturity and inexperience in providing child care. For the family-composition

variable, I chose a dummy variable reflecting whether a woman had borne more daughters or sons to assess sex differentials in infant and child mortality. Son preference is known to be strong in Pakistan, which has a patriarchal lineage system. I expected to find that women who had borne more daughters had experienced a higher incidence of infant mortality than other women.

I estimated the effects of these variables for rural and urban women separately because the availability of, access to, and use of health services are generally assumed to be much greater in urban than in rural areas of Pakistan. By analyzing urban and rural residents separately I hoped to identify the population most in need of health services.

Table 3 presents the estimated regression coefficients for urban and rural women, with statistical significance indicated by asterisks. In urban areas, children born to mothers with some formal education were found to have experienced less mortality than those whose mothers had no formal education. However, the estimated coefficients for children whose mothers had six years or more of formal education was not statistically significant. This finding is possibly due to the fact that only a tiny proportion of Pakistani women have six years or more of education. (Among currently married women between ages 15 and 19 in the PCPS, fewer than 8% had completed six or more years of schooling.)



Environmental contamination, such as this open latrine next to a river used for bathing and drinking water, poses a special threat to children's survival.

In rural areas the relationship between a mother's education and child mortality was not statistically significant, probably because of the negligible proportion of women with formal education in rural Pakistan. It is also possible that in rural areas the mortality transition has not progressed to the stage where significant socioeconomic differentials in child mortality can

be observed. A study in Malaysia found that the effect of parental education on child mortality increases after mortality has begun to decline (DaVanzo and Habicht 1986).

Among urban fathers, a high level of education (11 years or more) was associated with lower child mortality, but an intermediate educational level was associated with higher

child mortality, compared with the level of mortality among children whose fathers had no formal education. This finding is surprising but not totally implausible.

It is possible that lower middle-class families in urban areas are exposed to unfavorable conditions for child survival, such as crowded and unsanitary housing and a low prevalence of breast-feeding, whereas families in which fathers have little or no formal education may practice traditional customs that include extensive breast-feeding and limited exposure to some environmental health risks associated with initial stages of development.

Exposure to child mortality is likely to be lowest in families headed by fathers with a high level of education because such families tend to have better nutrition, living conditions, and medical care than those in which the father has no formal education.

Both urban and rural women in Balochistan reported significantly higher infant mortality than those in the Northwest Frontier Provinces. Among rural women, those from Punjab also experienced higher child mortality. These results are consistent with findings from prior surveys, and their causes need more study.

Contrary to expectation, in rural areas children of mothers under age 20 seem to have lower mortality than those of older mothers. Part (possibly a large part) of this relationship, however, may be due to the way the dependent variable was defined. Although I adjusted the dependent variable (the Mortality Index) for marriage duration by grouping marriage duration into five-year intervals, some variation in

Table 3. Estimated regression coefficients of child mortality in Pakistan: Pakistan Contraceptive Prevalence Survey, 1984-85

Variable	Coefficient	
	Urban	Rural
Mother's education (none is reference)		
1-5 years	-0.204*	-0.183
6+ years	-0.163	-0.195
Father's education (≤ 5 years is reference)		
6-10 years	0.172*	-0.038
11+ years	-0.289*	-0.070
Mother's work status (not working is reference)		
Currently working	-0.139	-0.014
Residence (Northwest Frontier Provinces are reference)		
Punjab	0.062	0.171*
Sind	-0.089	0.045
Balochistan	0.258*	0.335*
Mother's age at last birth < 20	-0.058	-0.563*
Sex composition (reference is M = F)		
F > M	-0.164*	-0.128
F < M	-0.190*	-0.128
Used contraception	-0.005	-0.046
Received prenatal care	0.066	0.238*
Delivered at hospital/clinic	0.045	0.041
Doctor or nurse attended	-0.012	0.053
Child received immunizations	-0.070	-0.085
Child visited doctor	-0.018	-0.114*
Mother knows or used oral rehydration solution	-0.017	0.043
R ²	0.036	0.036
Number of mothers	1,672	2,748

* $p < .05$.

child mortality remains in the number and age distributions of deceased children among women with similar marriage durations. This variation may be associated with the characteristics of mothers. For instance, children born to mothers who had delayed marriage were more likely to be younger and therefore to have had shorter periods of exposure to death than children of young mothers. In other words, mother's age provided a partial control for the number of child deaths and their age distributions. The results for the sex combination of children indicate that children from urban families in which either boys or girls outnumbered children of the opposite sex experienced lower mortality than did children from families with balanced sex ratios. Why this should be so is not clear.

Among the variables representing maternal health, only prenatal care proved to be a significant—and surprisingly, positive—factor. Contrary to results from earlier studies, children born to rural women who had received prenatal care experienced higher rather than lower mortality. I interpret this result as due to the likelihood that only women who had had pregnancy complications or who had previously suffered the loss of a child sought prenatal care in rural areas.

Among the child-care variables, only visiting a doctor when a child was ill proved to be significant, and it was so only in rural areas. Because of the government's recent efforts to provide health services in remote areas, I had expected that immunization would show a significantly positive effect on child survival. The result does not support

this hypothesis, however. The immunization program may be inadequate, perhaps because it does not reach children at appropriate ages or because the vaccines are ineffective.

It is noteworthy that none of the variables related to mothers' or children's health care appeared to affect child mortality significantly in urban areas. However, when a reduced model with only variables related to health care was estimated (result not shown here), immunization was found to be a statistically significant factor. Further examination revealed a strong positive correlation between mothers' education and child immunization. Thus one of the reasons why immunization was found not to be a significant factor in urban areas is that the model included a variable that is highly correlated with immunization.

This was not the case for rural areas. There, immunization proved not to be a significant factor whether education was included in the model or not. This result suggests that prenatal care and immunization programs in rural Pakistan have not achieved their full potential in improving child survival. As for curative health care, the visits to clinics or hospitals were significant factors in reducing mortality in rural areas.

In summary, the multivariate analysis indicates that the factors affecting infant mortality are different in urban and rural areas. In urban areas socioeconomic conditions seem to affect child mortality more than other factors, whereas in rural areas child mortality seems to be influenced more by curative health care.

In urban areas social and economic conditions seem to have the greatest effect on child mortality, whereas in rural areas curative health care seems to be more influential.

Discussion

Other studies (e.g., Mosley and Chen 1984) have found that major improvement in child survival is achieved through women's use of both preventive and curative health services. Education provides women with decision-making power, reducing their fatalism, making them more aware of children's welfare, and increasing their knowledge about childhood diseases and their scientific understanding of illness (Cleland and van Ginneken 1988). More-educated women tend to seek medical services for their children even if they have to travel long distances and make unexpected expenditures.

The need for medical services starts at pregnancy. Prenatal care, the conditions surrounding delivery, and the competence of the person attending a delivery are all associated with risks to maternal and child health and survival. Medically unqualified birth attendants and unsanitary deliveries can result in injuries to the newborn that are commonly reported reasons for high infant mortality at the neonatal stage.

This study has found that in urban areas, the better were parents educated, the more likely were their children to have been immunized against childhood diseases. Table 4 shows strong positive associations

in both urban and rural areas between women's educational level and three health variables—whether they had received prenatal care, whether their children were immunized, and whether they had taken ill children to see a doctor. The small difference in the prevalence of child immunization between urban and rural areas may be associated with the provision of outreach services in rural areas of Pakistan in recent years. Immunization, however, proved not to be a significant factor in the survival of rural children, a finding that suggests that the immunization program may not have been effective in rural areas in the early 1980s.

Pakistan's health facilities need to be modified to match the needs of local people. The provision of mobile health units, training for traditional midwives in modern medical practices, and supplies needed by midwives for safe deliveries would improve child survival.

This study has found a clear negative association between infant

mortality and maternal educational level, one that becomes stronger as mothers' educational levels rise. But a general rise in the average level of female education, especially in rural areas, does not seem to have greatly improved children's survival chances in Pakistan. The reason, as DaVanzo and Habicht (1986) argue, is probably that not enough health facilities and resources exist to be available to the public at large.

Summary and Conclusion

Infant mortality is still quite high in Pakistan, more than 100 deaths per 1,000 live births. It is higher in rural areas and in the provinces of Punjab and especially Balochistan. Higher levels of maternal education are associated with improved child survival in urban areas. High levels of education among fathers is also a significant factor in reducing infant mortality.

Recent efforts to provide basic health care to rural Pakistanis seem to have had limited success in im-

proving children's survival chances. Although immunization against childhood diseases is widespread in rural areas, its impact on child mortality is not statistically significant; and in urban areas it is not a significant factor when mothers' educational level is taken into account.

The immunization program could have a much greater impact on child survival if it were administered more effectively and reached groups most in need, such as the poor and less educated. Prenatal care seems to be sought mainly by high-risk women. In rural areas more emphasis is needed on preventive services such as prenatal care for all pregnant women and immunizing children at optimal ages (0–9 months). In addition, programs to reduce leading causes of infant and child mortality, such as acute respiratory disease and gastroenteritis, need to be improved. The availability of primary health care programs, combined with public health education for rural residents, would in all likelihood lead to major improvements in child survival.

This study has been limited to indirectly estimating child mortality and its covariates because data on the survival of individual children in respondents' birth histories were inadequate. For more detailed analyses of child mortality, better survey data are required. An effort should be made to improve the design of future surveys.

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Table 4. Percentage of currently married women using various health services in Pakistan, by urban-rural residence and women's educational level: Pakistan Contraceptive Prevalence Survey, 1984–85

Residence and education	Services		
	Prenatal	Child immunization	Examination by doctor
Urban areas			
No formal education	31.6	43.6	47.0
1–5 years	45.4	67.3	54.2
6+ years	67.0	77.9	56.9
Rural areas			
No formal education	18.6	37.3	43.3
1–5 years	36.0	62.6	59.1
6+ years	48.4	56.5	65.3

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Census-Based Approaches . . .

(continued from page 42)

is within these social classes or groups where intergenerational tension would be the greatest.

This simple simulation suggests that intergenerational tension created by differences in educational status between elderly and younger males will increase over the next several decades.

Somewhat similar outcomes are found in a random encounter between a 65-69 year old man and one 50-54 years old, as projected to 2010. Although the greatest likelihood is that neither has a senior high school education, the probability of this alternative starts to decline in 1990. The probability that only the younger male has a senior high school education begins to increase rapidly during the last decade of the twentieth century. By the year 2010 this type of random encounter is just as probable as one in which neither man has a senior high school education. The likeli-

hood that only the older male has this level of schooling fluctuates, rather than declines, during the period from 1980 to 2010.

To the extent that educational credentials are a determinant of career outcomes, the growing tendency for only the younger males to have a senior high school education may create increased pressure on older men to step aside or withdraw from the labor force altogether. This tendency may be ameliorated somewhat by a small but growing probability over the projection period that both the younger and the older male have at least a senior high school education.

Net Transition Rates within Cohorts

When one examines characteristics, such as marital status or labor force participation, that can change with age over the life span, interest shifts to ascertaining the rate of change for a cohort as it advances from one age group to another. Ideally one would like to know the gross as well as the net shifts—for exam-

ple, how many in a given cohort married and how many dissolved a marriage in a given period. Census data are rarely detailed enough to provide this information, but they can be used to estimate the net rate of change in a cohort's status.

This application is well recognized in the development of age-specific migration rates from two censuses through the use of census survival ratios. The logic of the technique can be extended directly to other characteristics relevant to studies of the elderly.

The technique consists of applying the census survival ratios to the members of a cohort having a specific status in one census to estimate the expected number in the next census and then comparing this expected number with the actual number in the second census. The difference provides an estimate of the net change in number and allows the calculation of net rates of change (Shryock and Siegel 1976). Life table survival rates may also be used to calculate the number expected to have a particular status at the second census. In general,

however, estimates of intracohort change based on the census survival ratio will have the advantage over those based on life table survival of taking into account errors in population statistics related to census coverage (Shryock and Siegel 1976:360).

This procedure is illustrated in panels A and B of Table 5 for the economically active male population of Thailand in 1960 and 1970. As expected, the results in the last column of panel B show net movement over the decade into the economically active status among the

two youngest cohorts but net movement out of economic activity thereafter, with a net "out-migration" of 260 per 1,000 for those 50 and over in 1960. One can further compare the net transition rates for the same cohort and time period among subgroups of a population

Table 5. Use of census survival ratios to assess the mobility of economic activity: Male population of Thailand

PANEL A							
Age group	Males			Age group	Economically active males		
	1960	1970	1980		1960	1970	1980
10+	9,004,412	11,581,756	16,577,343	11 + ^a	7,144,796	8,910,760	11,814,637
10-19	2,825,515	4,141,726	5,702,918	11-19	1,456,795	2,209,547	2,387,725
20-29	2,236,636	2,419,724	3,983,160	20-29	2,053,210	2,226,077	3,497,444
30-39	1,576,046	2,000,282	494,651	30-39	1,538,639	1,930,346	2,364,172
40-49	1,062,362	1,373,446	1,991,768	40-49	1,036,754	1,322,364	1,876,018
50-59	723,268	860,513	1,288,331	50-59	683,710	788,260	1,133,512
60-69	377,571	513,758	708,034	60+	357,198	431,262	555,766
70+	177,338	250,656	408,481	Unknown	18,490	2,904	0
Unknown	25,676	21,651	0				

PANEL B							
Age group		Survival ratio	Economically active			Difference, actual-exp.	Transition Rate ^b
1960	1970		1960 actual	1970 expected	1970 actual		
10-19	20-29	0.8564	1,456,795	1,247,575	2,226,077	978,502	531.4
20-29	30-39	0.8943	2,053,210	1,836,239	1,930,346	94,107	47.2
30-39	40-49	0.8715	1,538,639	1,340,848	1,322,364	-18,484	-12.9
40-49	50-59	0.8100	1,036,754	839,771	788,260	-51,511	-56.4
50+	60+	0.5981	1,040,908	622,515	431,262	-191,253	-259.8

PANEL C							
Age group		Survival ratio	Economically active			Difference, actual-exp.	Transition rate ^b
1970	1980		1970 actual	1980 expected	1980 actual		
10-19	20-29	0.9617	2,209,547	2,124,954	3,497,444	1,372,490	481.0
20-29	30-39	1.0310	2,226,077	2,295,008	2,364,172	69,164	30.1
30-39	40-49	0.9957	1,930,346	1,922,130	1,876,018	-46,112	-24.2
40-49	50-59	0.9380	1,322,364	1,240,415	1,133,512	-106,903	-87.1
50+	60+	0.6871	1,219,522	837,954	555,766	-282,188	-317.9

a. It is assumed that no one of age 10 is in the labor force because government figures report only workers of ages 11 and older.

b. Transition rate per 1,000 equals the difference between actual and expected divided by the average population of the two censuses.

defined by fixed characteristics, such as gender. The comparable data for females are shown in panels A and B of Table 6 and indicate earlier and larger net movement out of the economically active class for females.

If the data permit, the same

strategy can be used to compare labor force movement among educational or literacy groups. Again, such data have direct policy relevance. Although the economic interrelationships may be complex, knowing the direction and rate of labor force change for key groups

may assist governments and the private sector in planning for pension programs, labor force supply, and productivity.

The application of this "migration strategy" to examining cohort change in economic activity has a counterpart in the literature on

Table 6. Use of census survival ratios to assess the mobility of economic activity: Female population of Thailand

PANEL A							
Age group	Females			Age group	Economically active females		
	1960	1970	1980		1960	1970	1980
10+	9,021,992	11,871,557	16,985,973	11+ ^a	6,692,188	7,939,376	9,976,287
10-19	2,761,664	4,138,021	5,609,840	11-19	1,639,844	2,353,009	2,388,011
20-29	2,250,617	2,505,094	4,092,296	20-29	1,932,365	1,972,270	2,927,843
30-39	1,549,816	2,034,695	2,548,817	30-39	1,330,217	1,614,488	1,899,676
40-49	1,046,778	1,363,786	2,069,722	40-49	916,766	1,091,137	1,538,938
50-59	739,395	891,525	1,336,533	50-59	598,538	626,566	862,545
60-69	408,589	563,124	775,908	60+	261,358	279,539	359,274
70+	244,717	353,486	552,857	Unknown	13,100	2,367	0
Unknown	20,416	21,826	0				

PANEL B							
Age group		Survival ratio	Economically active			Difference, actual-exp.	Transition rate ^b
1960	1970		1960 actual	1970 expected	1970 actual		
10-19	20-29	0.9071	1,639,844	1,487,496	1,972,270	484,774	268.4
20-29	30-39	0.9041	1,932,365	1,746,976	1,614,488	-132,488	-74.7
30-39	40-49	0.8800	1,330,217	1,170,546	1,091,137	-79,409	-65.6
40-49	50-59	0.8517	916,766	780,796	626,566	-154,230	-199.9
50+	60+	0.6582	859,896	565,943	279,539	-286,404	-502.7

PANEL C							
Age group		Survival ratio	Economically active			Difference, actual-exp.	Transition rate ^b
1970	1980		1970 actual	1980 expected	1980 actual		
10-19	20-29	0.9890	2,353,009	2,327,008	2,927,843	600,835	227.6
20-29	30-39	1.0175	1,972,270	2,006,693	1,899,676	-107,017	-55.3
30-39	40-49	1.0172	1,614,488	1,642,281	1,538,938	-103,343	-65.5
40-49	50-59	0.9800	1,091,137	1,069,332	862,545	-206,787	-211.7
50+	60+	0.7349	906,105	665,880	359,274	-306,606	-484.6

a. It is assumed that no one of age 10 is in the labor force because government figures report only workers of ages 11 and older.

b. Transition rate per 1,000 equals the difference between actual and expected divided by the average population of the two censuses.

projecting labor force entries and separations (see United Nations 1971:36–38). The emphasis in the UN's *Manual V*, however, is on the net increase or decrease in the size of the labor force over the decade rather than in measuring cohort movement into or out of statuses reflecting economic activity. Moreover, the migration approach is not the only method for measuring net transition rates into and out of a status. One can, for example, calculate the percentage of change in the proportion of a cohort occupying a given status in consecutive censuses. The percentage of change, however, may produce inflated estimates of change when a large proportion of the elderly moves between categories. (The formal relationship between the two approaches is described in Hermalin 1989.⁵)

Net Transition Rates between Cohorts

The last example we will pursue in any detail is the additional insight

5. The model used in Hermalin (1989) assumes that a cohort occupies one of two statuses (e.g., economically active or inactive) and traces movement (i.e., migration) across these statuses over a period of time, for example between censuses. It is further assumed that there is no differential mortality by status. In the case where the population is closed to immigration and emigration and there is no error in reporting status over time, the relative change in the proportion in either status is equal to the number of in- or out-“migrants” alive at the initial date divided by the initial number in that status.

If immigration or emigration and reporting errors are introduced, however, then the relative change in the proportion in either status is not equivalent to the migration rates derived by using census survival rates and tends to exaggerate the degree of movement if large numbers migrate from one status to another. The difference arises from the differential impact of immigration and reporting errors in the two measures.

possible from three or more censuses. In the discussion of Table 1 we suggested that using at least three censuses makes it possible to analyze structural change in the aging process—that is, differences among cohorts in the net transition rates occurring at the same age. Compare, for example, panels B and C of Table 5. They show that between 1970 and 1980 the net transition rates for males were less positive at the younger ages and more negative at the older ages than between 1960 and 1970. The younger cohorts were behaving differently either because they were also different in such relevant characteristics as education and occupation or because of period differences in socioeconomic conditions.

Differentials among censuses in completeness of coverage and enumeration can heighten or dampen the apparent degree of change over a period to the extent that a correlation exists between the enumeration error and the characteristic in question. For example, a comparison of the census survival ratios in Table 5 between 1960 and 1970 versus 1970 and 1980 shows that the latter were substantially higher, indicating the possibility of poorer coverage in 1970 than in the other censuses. This should not affect the observed pattern of transition rates across the two periods, though, unless the level of coverage is associated with economic activity.

In this connection, Table 6 reveals that females have the same pattern of change in the census survival ratios as males, whereas the pattern of transition rates for females across the two periods is quite different

from that for males. This result suggests that the sex difference in the trend of net transitions is real and not simply an artifact of changes in the completeness of coverage. To the extent that policymakers can examine trends in cohort behavior over time, they will have a better idea of developments that can affect the well-being of the elderly and other groups within their societies.

To the extent that policymakers can examine trends in cohort behavior over time, they will have a better idea of developments that can affect the well-being of the elderly and other groups within their societies.

As is evident from the two examples shown in Tables 5 and 6, the availability of three censuses also shows the change in the net transition rates over two decades in the lifetime of each cohort. As data from the 1990 census round become available, the transition experiences of these cohorts may be traced over an even longer portion of their lives.

Conclusion

The major objective of this article has been not to introduce a new technique but rather to show how techniques familiar to demographers can be used to study issues in aging in ways not previously considered. By fully exploiting census and similar data, it is possible for analysts to gain insights about the future composition of the elderly, the changing status of the elderly in relation to younger groups, and the rate at

which key cohorts are changing in various characteristics. These approaches serve to give temporal depth to the type of data typically collected in censuses and cross-sectional surveys and provide insights often of direct relevance to policymakers. They are not meant to supplant other types of information, but they represent an important adjunct that is all too often overlooked. Given the widespread availability of the basic data and the low costs of the analysis, the techniques deserve more attention as a useful tool for setting the stage for more refined analyses.

Several steps can be taken to make this kind of analysis even more useful. Key assumptions, such as the existence of no differential mortality or no difference in coverage by level within a characteristic, need further examination. Although these assumptions represent a reasonable starting point, research to assess the extent of differential mortality and coverage and to evaluate the sensitivity of the results to these assumptions needs to be promoted. Attention also needs to be given to assessing the varying accuracy of reporting over time. At a minimum the census survival ratios for each category of fixed characteristics should be calculated for each cohort to see to what degree they are similar.⁶

The range of analyses can be greatly strengthened when one can move beyond published census ta-

bles to sample files of individual-level census data (i.e., micro-level data). With such data, one is not constrained by the levels of aggregation and types of cross-classifications published. It is common, for example, to find in the published data 10-year age groups for certain characteristics and open-ended classifications starting at fairly young ages (e.g., 50 and over). Such tabulations greatly limit the range of analysis that can be undertaken. Similarly, it is rare to find age cross-classified by more than two other characteristics (e.g., gender and economic activity), which precludes examining more subtle relationships such as net rates of change in economic activity by gender and education. In other words, increasing the availability of micro-level data has the potential of advancing research on aggregate-level issues by freeing the analyst from data restrictions created by relying on someone else's decision about which census variables are to be cross-classified.

Another attractive feature of the types of analysis proposed here is that it is possible to combine survey data with census data in order to extend projections or obtain information not available from the census. In Table 2, for example, the furthest date for which we can project the number of children ever born from the 1980 census question, without forecasting the fertility of incomplete cohorts, is 2005 (assuming that no significant numbers of births occur after age 39). But a mid-decade survey of fertility, such as Taiwan's 1986 KAP (family planning knowledge, attitudes, and practice) survey, could be used to provide data on the completed fer-

tility of one additional cohort. This information could be incorporated into the projection to extend the range to the year 2010. Similarly, it is possible to combine data on the size of each cohort with survey data that might not be available in the census, such as information on the country of birth or educational level of a parent.

Many of the countries that have experienced a decline in fertility and are now facing the prospect of an older age structure have a good tradition of census-taking. Important new data will be forthcoming from the 1990 round. It is to be hoped that growing awareness of the potential of these data to address policy-relevant issues in the field of aging will spur research into the associated issues of differential mortality, coverage, and registry, lead to greater levels of detail in published data, and encourage greater provision of micro-level data so that more refined analyses can be conducted.

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(continued on page 67)

6. Given the current state of knowledge, if the census survival ratio varies across levels of a characteristic for a single cohort, it may not be possible to determine whether this results from differences in mortality, from differences in coverage, or from reporting errors between the two censuses.

Assessing the Assumption of Similar Survival Probabilities across Educational Statuses

In projecting the educational composition of the elderly, it is customary to use age-by-period-specific probabilities of surviving to advance cohorts to older ages. The assumption that these probabilities are similar across educational statuses deserves further consideration along two lines of inquiry. First, how valid is the assumption of no differences in survival probabilities by educational status? Second, does the violation of this assumption significantly alter the projected trends in educational composition of the elderly population?

Validity of the assumption. On the surface, the validity of the assumption can be questioned on the general grounds that in most societies an individual's life chances are affected by his or her social status. Empirical evidence of such a relationship as it pertains to educational status has been suggested by studies of adult mortality from the United States and developed countries in Europe (Kitagawa and Hauser 1973; Valkonen 1989). These studies demonstrate that adult mortality ratios at lower levels of education are large in relation to mortality at higher levels of education.

Since mortality is the obverse of survival, one might be tempted to infer that such a demonstration of educational differentials in mortality implies similar differences in survival chances. Although such a conclusion is appropriate where absolute differences in mortality probabilities or proportions are concerned, it is not necessarily a valid conclusion with respect to relative measures. Specifically, under conditions where mortality is generally low, relative mortality differentials appear larger than corresponding differentials in survival probabilities. Consider a hypothetical population of 30-year-old individuals evenly distributed between low- and high-status categories with annual survival probabilities of .990 and .998, respectively. The average survival probability is .994, and the survival of the high-status group relative to the low-status group is 1.008. The probability of dying, however, is five times greater for the lower-status group than for the higher-status group (.010 versus .002), even though the overall probability is low in either case.

In other words, the different impression one obtains from simple measures of relative mortality and survival in a low-mortality setting is a reflection of floor effects in the first instance and ceiling effects in the latter. In brief, if educational projections are made in settings where levels of mortality are already low, then an assumption of comparable survival probabilities across educational levels is likely to be reasonable.

The empirical validity of our assumption depends on the cumulative effect of differential survival as a cohort ages. Thus age-specific

Table A. Proportion of adult males with at least a primary education, by age group and place of residence: Taiwan 1980 census

Age group	Five major cities	Other townships
20-24	0.997	0.994
25-29	0.995	0.991
30-34	0.991	0.983
35-39	0.972	0.948
40-44	0.923	0.869
45-49	0.919	0.863
50-54	0.903	0.831
55-59	0.847	0.724
60-64	0.765	0.606
65-69	0.681	0.503
70-74	0.587	0.386
75-79	0.475	0.261
80+	0.359	0.150
Total	0.928	0.873

Table B. Proportion of adult males with at least an upper secondary education, by age group and place of residence: Taiwan 1980 census

Age group	Five major cities	Other townships
20-24	0.689	0.511
25-29	0.602	0.428
30-34	0.524	0.332
35-39	0.420	0.232
40-44	0.333	0.155
45-49	0.306	0.139
50-54	0.341	0.177
55-59	0.337	0.126
60-64	0.324	0.119
65-69	0.268	0.081
70-74	0.239	0.058
75-79	0.218	0.050
80+	0.181	0.031
Total	0.469	0.285

data on mortality rates by level of education are needed for a full evaluation. Unfortunately, such data are not currently available for Taiwan, nor for most other countries. For the moment, we might indirectly assess the extent of survival differences in education by comparing geographic subpopulations that differ in average educational characteristics and for which we have information on mortality.

A comparison of the five major cities of Taiwan with the other townships provides such an opportunity. (The five major cities include the Taipei and Koahsiung metropolitan areas and Keelung, Taichung, and Tainan City.) Among the adult male population of ages 20 and older in those cities, 93% have completed at least a primary education and 47% have at least an upper secondary education. (See Tables A

and B). The comparable proportions for the remaining townships are 87% and 29%, respectively. Geographic differences in educational attainment also vary by age, with larger differences appearing at older ages. At older ages the proportion of large-city, male residents with a primary education is substantially greater than at comparable ages in other townships (Table A). The differences disappear, however, for younger cohorts, reflecting the establishment of compulsory primary education. A substantial difference in proportions with an upper secondary education exists by place of residence at all ages, although the difference is more dramatic among the older cohorts (Table B).

The 1980 Taiwan-Fukien Demographic Fact Book (ROC, Ministry of the Interior, 1981) provides life ta-

Table C. Age-specific and cumulative survival probabilities for males in large cities and townships: Taiwan, 1980

Age at <i>N</i>	<i>N</i> +5	Age-specific survival ^a		Cumulative survival		Difference	Hypothetical townships		Difference
		Cities (1)	Townships (2)	Cities (3)	Townships (4)	(3)-(4) (5)	Survival ^b (6)	Cumulative (7)	(3)-(7) (8)
	20-24			1.0000	1.0000	0.0000		1.0000	0.0000
20-24	25-29	0.9934	0.9908	0.9934	0.9908	0.0026	0.9746	0.9746	0.0188
25-29	30-34	0.9929	0.9887	0.9863	0.9795	0.0068	0.9741	0.9493	0.0371
30-34	35-39	0.9898	0.9852	0.9763	0.9651	0.0112	0.9710	0.9218	0.0545
35-39	40-44	0.9841	0.9798	0.9608	0.9456	0.0152	0.9654	0.8899	0.0709
40-44	45-49	0.9769	0.9720	0.9386	0.9191	0.0195	0.9584	0.8529	0.0857
45-49	50-54	0.9680	0.9608	0.9086	0.8830	0.0255	0.9496	0.8099	0.0986
50-54	55-59	0.9529	0.9421	0.8658	0.8320	0.0338	0.9348	0.7571	0.1086
55-59	60-64	0.9250	0.9107	0.8008	0.7577	0.0431	0.9074	0.6870	0.1138
60-64	65-69	0.8814	0.8647	0.7058	0.6551	0.0507	0.8647	0.5941	0.1117
65-69	70-74	0.8160	0.8026	0.5760	0.5258	0.0502	0.8006	0.4756	0.1004
70-74	75-79	0.7236	0.7153	0.4168	0.3761	0.0407	0.7099	0.3376	0.0792
75-79	80+	0.5140	0.4888	0.2142	0.1839	0.0304	0.5043	0.1702	0.0440

Source: Taiwan, Ministry of the Interior (1981:table 87, Abridged Life Table for Taiwan Area, 1980 (p. 3): Five Big Cities; table 87: Abridged Life Table for Taiwan Area, 1980 (p. 5): All Chen).

a. The source for this table presents separate life tables for *chen*, or urban townships, and *bsiang*, or rural townships. Only marginal differences exist between them for adult males aged 20 and older, and we used the life table for *chen* to calculate the age-specific survival probabilities. Although the differences are miniscule, the direction of the differences is in favor of higher adult survival in the rural rather than the urban townships.

b. The hypothetical age-specific survival proportions for townships in column 6 are calculated by multiplying the age-specific survival proportions of cities by 0.9810 to reflect a constant differential.

bles for the five largest cities combined and for the other townships. Five-year age-specific survival probabilities calculated from the life tables of both types of communities are presented in columns 1 and 2 of Table C. Differences in survival are indeed small at each age, even when cumulative survival levels are compared (columns 3 and 4). Column 5 shows that for any age group during the adult life span, the cumulative proportions of men surviving in the two settings differ by no more than about 5 percentage points. Thus the indirect evidence would seem to support the validity of the assumption that there is little difference in survival probabilities among educational categories. The evidence would be somewhat stronger if the amount of difference in educational characteristics of large-city and township residence found at older ages were to apply to all age groups.

In short, although the information to directly assess the validity of the assumption of little or no difference in survival probabilities by level of education is not available, consideration of the evidence from the mortality literature and the indirect evidence from the Taiwan life tables suggests that this assumption is more tenable than it first appears. In the end, the validity of the assumption is likely to depend upon the time and place and to be a matter of degree.

Thus, it is useful to consider the second question. Would projections based on moderate educational differences in survival probabilities greatly alter our initial projections?

Effect of violating the assumption. Since we have concluded above that the comparison of life tables for large cities and other townships provides indirect support for our assumption that little or no educational differences exist in survival probabilities, it is obvious that a simulation based on survival differences for these two settings would result in projected educational levels quite close to our original projections.

To test the robustness of the projection technique for moderate violations of the assumption, we devised a simulation based on somewhat larger differentials in survival probabilities. The largest

differentials in survival probabilities between men from cities and townships occur at older ages. To arrive at a hypothetical difference in survival that is noticeable, we assume that a cohort of men from the townships experiences survival rates that differ from those of its counterpart in the cities by a constant relative proportion.

We use the ratio of township to city survival found among men of ages 60–64 in 1980, which has a value of 0.981, to represent the relative survival of less and more educated groups of men at all ages. The new hypothetical-township survival probability for each age group is represented in column 6 of Table C, and the hypothetical situation creates noticeably greater cumulative differences in the survival probabilities between city and township males than indicated by the previous comparison. By age 60, fully 11% more of the city cohort survive than the township cohort. The difference then declines at older ages.

We applied this differential to the age-specific survival probabilities to simulate the effect that differences in survival by educational status would have on the projection of elderly educational characteristics. The same educational differential was used in projecting the proportion of the elderly male population with at least a primary education and the proportion of the population with at least an upper secondary level of education.

(To maintain comparability with our initial projections, we treated the survival ratio calculated from the original Taiwan population projections as the average survival level and used the constant relative survival differential of .9810 between low and high education for all age groups to calculate the deviations of each educational group from age-specific averages. The amount of deviation at each age depends on this constant differential and on the proportion of persons in each educational group at the start of the time interval.)

Tables D and E provide a comparison of these projections for the elderly aged 60 and over with the earlier projections, which assumed no educational differences in survival rates. The results indicate that similar projection results are obtained even when one allows for moderate differentials in sur-

vival probabilities by level of education. The maximum difference in the two projection procedures is less than 2 percentage points for primary education and less than 4 percentage points in the case of upper secondary education. Similar results are found when the elderly are divided into younger old (60–69) and older old (70 and over) age groups, as can be seen by comparing the age group summaries in Table 3 of the main text with Tables F and G.

In summary, the limited available evidence indicates that the assumption of similar survival probabilities across educational levels is reasonable at least for a low-mortality country such as Taiwan. We recognize, however, that the extent to which our assumption holds will likely vary among settings. Where moderate differences in cumulative survival probabilities exist by population characteristics, it appears that one can still make fairly accurate projections even if those differences are not taken into account. This preliminary result is encouraging

because researchers typically lack direct data on educational differences in survival probabilities.

Further simulation efforts may help to establish some principles and parameters for determining how much survival probabilities can differ by educational attainment before projections become misleading. The amount of tolerance for variation in survival probabilities is likely to depend on the degree to which cohorts differ in a given characteristic. When sharp cohort differences are observed in a characteristic such as education, modest variation in survival probabilities is much less likely to result in misleading projections than in cases where observed cohort differences are small. Although efforts to achieve greater precision are desirable, the preceding simulations suggest that the current method is useful for identifying major trends and that in most cases modifying the assumptions will represent minor refinements.

Table D. Projected proportions of elderly males at ages 60 and over with less than a primary education, based on alternative assumptions about differential survival by level of education

Projection	1980	1985	1990	1995	2000	2005	2010	2015	2020
Original	0.525	0.425	0.331	0.286	0.259	0.210	0.152	0.100	0.062
Differential survival ^a	0.525	0.420	0.323	0.275	0.245	0.195	0.140	0.089	0.054

a. Calculations in this table and Table E assume a constant relative survival probability of .9810 between low and high education from ages 20–24 onward. In Table D this refers to persons with less than a primary education versus those with at least a primary education. In Table E the hypothetical differential applies to those with less than an upper secondary education versus those with at least an upper secondary education.

Table E. Projected proportions of elderly males at ages 60 and over with at least an upper secondary education, based on alternative assumptions about differential survival by level of education

Projection	1980	1985	1990	1995	2000	2005	2010	2015	2020
Original	0.135	0.166	0.186	0.186	0.190	0.213	0.265	0.341	0.410
Differential survival ^a	0.135	0.168	0.192	0.195	0.202	0.229	0.287	0.371	0.446

a. See note in Table D.

Table F. Projected proportion of elderly males with less than a primary education, by age group, based on simulation of differential survival by level of education

Age group	1980	1985	1990	1995	2000	2005	2010	2015	2020
60-69	0.460	0.344	0.242	0.210	0.217	0.151	0.065	0.034	0.021
70+	0.681	0.579	0.486	0.374	0.276	0.241	0.225	0.171	0.107
60+	0.525	0.420	0.323	0.275	0.245	0.195	0.140	0.089	0.054

Note: Calculations in this table and Table G assume a constant relative survival probability of .9810 between low and high education from ages 20-24 onward. In Table F this refers to persons with less than a primary education versus those with at least a primary education. In Table G the hypothetical differential applies to those with less than an upper secondary education versus those with at least an upper secondary education.

Table G. Projected proportion of elderly males with at least an upper secondary education, by age group, based on simulation of differential survival by level of education

Age group	1980	1985	1990	1995	2000	2005	2010	2015	2020
60-69	0.154	0.195	0.214	0.201	0.197	0.254	0.357	0.454	0.523
70+	0.088	0.113	0.149	0.186	0.209	0.203	0.208	0.246	0.323
60+	0.135	0.168	0.192	0.195	0.202	0.229	0.287	0.371	0.446

Census-Based Approaches . . .

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1990 meeting of the Population Association of America in Toronto, Canada.

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Reviews and Publication Notes

(continued from page 45)

Australia's large post-World War II influx of immigrants has retarded population aging in that country. As Reginald Appleyard points out in the last chapter, however, Australia now has a total fertility rate below replacement (at 1.87). Its population is projected to peak at 18 million in 40 years and then begin to decline unless immigration is used to offset the aging process. Even with substantial immigration, population aging and declining growth will not be reversed, only slowed. If Australia cannot get skilled laborers from Europe it will have to turn to developing countries. Then the question will be how willing are Australians to allow their European ethnic base to erode.

This issue is one facing European OECD members as well. There are already signs of a backlash toward guest workers and their families in several nations. Planners and researchers who regard demographically oriented migration policies as a way to prevent population aging and decline are aware of strong political opposition to such policies. In-depth studies are needed of the economic, social, cultural, and psychological implications of using migration to offset declining population growth and aging.

Migration: The Demographic Aspects suggests solutions to the problem of declining population growth and aging, but these solu-

tions may not be greeted with enthusiasm by the citizens of OECD member countries. This work is recommended for large academic libraries and special population collections.

Alice D. Harris
former Resource Materials
Specialist for the
East-West Population Institute

ALSO NOTED

Microcomputer software packages for population analysis, developed by the United Nations Department of Economic and Social Development. Available from UN Department of Economic and Social Development, United Nations Plaza, New York, NY 10017, U.S.A.

The UN Department of Economic and Social Development (DESD) maintains a policy of generating computer software that requires little or no programming knowledge, allows users to use the software with minimal training, and runs on lower-end computers. Two of its demographic software packages are described here.

Abacus is a projection program for personal computers that uses the cohort component method for projecting population by sex and five-year age groups at five-year intervals up to 100 years for each run and allows the projection to con-

tinue for an unlimited number of years. It offers forward and backward projections with an option to shift the initial year, annual interpolation, single-year age group interpolation for ages 0-24, selection of survival ratios from nine families of model life tables, construction of new life tables by combining empirical and model life tables, three families of model fertility schedules, and a parametric system of model migration schedules. Users can choose from many options when they formulate assumptions for their projections. Output results and projected demographic indicators are formatted in a table presentation. Required: microcomputer with 256 K of random-access memory (RAM). Price: US \$100.

QFIVE has been prepared to accompany DESD's *Step-by-Step Guide to the Estimation of Child Mortality*. It produces estimates of infant mortality, child mortality (probability of dying between exact ages 1 and 4, ${}_4q_1$), and mortality under exact age 5 by applying the two versions of the Brass method presented in the *Guide*: the Trussell version, which is based on the Coale-Demeny model life tables, and the Palloni-Heligman version, based on the UN model life tables for developing countries. Available on a 5.25-inch diskette with the *Step-by-Step Guide*. Required: 300 K of RAM. Price: US \$50. □

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How Surveys Are Changing at the U.S. Bureau of the Census

by Barbara Everitt Bryant

This article describes the survey activities of the U.S. Census Bureau and recent efforts by the bureau to move toward a more fully automated environment. Census Bureau surveys are the source of more than two-thirds of the data for U.S. national accounts and the source of the intercensal updates on how people and households in the United States are changing. An example of the bureau's new approaches to survey methodology is the Current Population Survey, which measures the nation's labor force activities and is the bureau's oldest and largest survey (71,000 households). The questionnaire for this survey has been redesigned to reflect changes that have occurred in the labor force itself over the past generation. It has also been redesigned to permit computer-assisted interviewing by telephone and in personal interviews conducted by interviewers using laptop computers. The Census Bureau is testing the new questionnaire now and plans to switch to it and computer-assisted interviewing early in 1994. Another major project is the redesign of samples used in all the Census Bureau's household surveys so that they reflect information obtained from the latest census. Eventually data obtained from all of the Census Bureau's surveys will be gathered and transmitted electronically as part of an envisioned computer-assisted information collection system.

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ASIAN AND PACIFIC POPULATION FORUM

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The *Asian and Pacific Population Forum*, published quarterly by the Program on Population of the East-West Center, contains articles on population issues affecting the Asia-Pacific region, book reviews, and news about population activities in the region. Single copies are free to individuals and organizations engaged in population-related work. All manuscripts are peer-reviewed. Readers are invited to submit articles, news items, reviews, and letters to: Editor, Asian and Pacific Population Forum, East-West Center, 1777 East-West Road, Honolulu, Hawaii 96848, U.S.A.

The Association of National Census and Statistics Directors of Asia and the Pacific provided support for this issue.

THE EAST-WEST CENTER is a public, nonprofit education and research institution with an international board of governors. The U.S. Congress established the Center in Hawaii in 1960 with a mandate "to promote better relations and understanding between the United States and the nations of Asia and the Pacific through cooperative study, training, and research."

Some 2,000 scholars, government and business leaders, educators, journalists and other professionals annually work with the Center's staff on major Asia-Pacific issues. Current programs focus on environment, economic development, population, international relations, resources, and culture and communications. The Center provides scholarships to about 300 graduate students from the Asia-Pacific-U.S. region to study at the University of Hawaii and conducts faculty and curriculum development programs focusing on Asia and the Pacific for teachers from kindergarten through undergraduate levels. Since 1960 some 28,000 men and women from the region have participated in the Center's programs.

Officially known as the Center for Cultural and Technical Interchange Between East and West, Inc., the Center receives its principal funding from the U.S. Congress. Support also comes from more than 20 Asian and Pacific governments, private agencies and corporations and through the East-West Center Foundation.

The PROGRAM ON POPULATION conducts research and training activities in the population field, with emphasis on social and economic aspects of population in the Asia-Pacific region.

AS THE MAJOR survey research agency of the United States' decentralized federal statistical system, the Bureau of the Census conducts an extensive program of sample surveys, which is active in both the decennial census year and the nine years between censuses. The surveys are of two basic types, demographic surveys of households and economic surveys of business establishments. Household surveys are conducted by means of face-to-face interviews in the home, augmented by telephone interviews. Establishment surveys are done primarily by mail, often using telephone follow-up to non-respondents. Occasionally, special personal interview surveys are conducted at business establishments.

These surveys provide the major economic indicators released by the U.S. Department of Commerce, of which the Census Bureau is a part. They also provide the unemployment and employment data that are released by the Bureau of Labor Statistics and supply data on the incidence of crime, housing conditions, the health of the nation's people, and the country's economic well-being. Census Bureau surveys are the source of more than two-thirds of the data input for U.S. national accounts and the source of the intercensal updates on how people and households in the United States are changing.

The surveys are funded primarily by two sources. The first is appropriations to the Census Bureau by the U.S. Congress, which also funds the decennial census of population and housing and the censuses of manufacturing, retail trade, wholesale trade, service businesses, transportation, construction industries,

mineral industries, governments, and agriculture that are conducted every five years. The second source is other agencies and departments of the federal government.

The Census Bureau does research under contract for such other units of the federal government as the Bureau of Labor Statistics in the Department of Labor, the Department of Housing and Urban Development, the Department of Justice, the Department of Health and Human Services, the Department of Education, and the Department of Transportation. These agencies and departments reimburse the bureau for the costs of their surveys out of funds appropriated to them by Congress.

In 1991 the Census Bureau conducted 182 separate surveys. Interviewing waves—that is, the number of times that the bureau sent interviewers to a sample of households, interviewed a sample of households or businesses by telephone, or mailed out a questionnaire to a sample of business establishments—totaled 682.

In 1991 the Census Bureau conducted 182 separate surveys, of which 147 were paid for out of its congressional appropriation and 35 were reimbursed by other units of the federal government. Because some of these surveys were done on an annual basis, others quarterly, and still others monthly, the total number of waves of interviewing came to 682—which is the number of times that the bureau either sent interviewers to a sample of house-

holds, interviewed by telephone a sample of households or business establishments, or mailed out a questionnaire to a sample of establishments.

This article focuses on four areas in which the Census Bureau is changing its approach to surveys: (1) redesigning the questionnaire for the Current Population Survey to better reflect current labor force conditions; (2) redesigning the same questionnaire to gain advantages from computer-assisted interviewing; (3) redesigning the samples for household surveys to be used during the next decade, a task undertaken after every decennial census; and (4) progress in changing to a computer-assisted survey information collection (CASIC) system and developing a data management network for all Census Bureau surveys.

Redesigning the Current Population Survey Questionnaire to Reflect Labor Force Conditions Better

The Current Population Survey, or CPS, which is equivalent to the labor force survey in many other countries, is the principal intercensal household survey and the largest and oldest of the approximately 50 ongoing demographic surveys that the Census Bureau conducts each year. Begun 52 years ago to make monthly estimates of employment, unemployment, and characteristics of the labor force, it is cosponsored by the Census Bureau and the Bureau of Labor Statistics.

With a sample size of 71,000 households, the survey is large enough for making employment

and unemployment estimates for the nation, the 11 largest states, and New York City and Los Angeles, the two largest cities. Each month's sample has eight parts that rotate on a schedule of four months in, eight months out, four months in, so that only 25% of households differ between consecutive months.

In addition to providing data for the Bureau of Labor Statistics' monthly report on employment and unemployment, the survey includes questions added in different months that provide the Census Bureau and other government agencies with quarterly updates on housing vacancies, biennial data on displaced workers who lost jobs during the past five years, and the annual demographic update for the nation, which includes such characteristics as income and poverty, work experience, migration, household composition, health insurance, alimony, child support of divorced and never-married mothers, fertility, school enrollment, tobacco use, voting, and voter registration. Although the supplementary questions change from time to time, the labor force questions have remained relatively unchanged for 25 years to maintain consistency and comparability in the unemployment rate, a major economic indicator.

Several years ago, however, the Census Bureau and the Department of Labor Statistics recognized that the questionnaire developed for the technology and labor conditions of a generation ago were no longer suitable. They embarked on a redesign effort to improve the measurement of labor force characteristics by reducing errors in the interaction between interviewers and respondents, by developing better defini-

tions of the characteristics being measured, and by depending less on answers volunteered by respondents. They also wanted to expand the labor force data available without burdening respondents with additional questionnaire length. Finally, since respondents are interviewed over a period of 16 months, they wanted to take advantage of this period to improve longitudinal measures (Rothgeb et al. 1992).

The questionnaire redesign had two objectives. The first was to make the questions measure contemporary labor force conditions more accurately. The second was to restructure the questionnaire to capitalize on the availability of computer-assisted interview technology, which allows for dependent interviewing—that is, using data collected in prior months' interviews as part of a current interview. Computer-assisted interviewing also allows for more complex questionnaire designs, with different sets of questions for different types of respondents.

The starting point for redesigning the questions was to learn more about the meanings that questions and their response categories had for respondents. These meanings could then be compared with the concept that researchers intended to measure and to what respondents were actually doing inside or outside the labor force. When the meaning that a question elicited from respondents did not match the concept that the Census Bureau and the Bureau of Labor Statistics intended to measure, this was evidence that alternative question wordings needed to be developed and tested.

The research on meanings, called cognitive research, was done using interviewer focus groups and respondent focus groups. Focus groups are small discussion groups of 10–12 persons. Other techniques included respondent debriefings, in-depth laboratory interviews, and a test of interviewers' knowledge of the concepts that the researchers intended to measure.

This cognitive research led to the development of alternative questions to be tested. The testing was done in two phases by means of computer-assisted telephone interviews of a representative national sample of households. In the first phase, two new versions of the questionnaire were tested over a four-month interviewing period, along with the existing questionnaire, which was used as a control. Afterward the interviews were evaluated. In the second phase a third version of the questionnaire, which combined the best of the first two alternatives, was tested against the existing questionnaire. Modifications of this third version then became the new questionnaire.

What are the new questions and how do they differ from the old? There have been many changes, but several examples will illustrate the kinds of changes that have been introduced.

Actual hours of work last week. The original questionnaire asks for this information in a single question. When respondents were probed extensively about their actual work patterns, it was found that the question did not fully capture the hours of those who worked at more than one job or the variations from week to week in the hours of

those who worked part time. The new questionnaire asks the respondent a series of short questions on the number of jobs held and whether the individual worked overtime or less than the usual time last week. Only after the series of questions has forced the respondent to make a mental review of the actual work that he or she has done over the past seven days is the question asked: "How many actual hours did you work last week?"

Working without pay in a family business. The research on focus groups and respondent interviews showed that persons who work in a family business without pay often do not report that they work because they receive no wages. Their contribution to the business is not directly reflected in income to themselves. New questions identify family businesses and capture the work hours of all members of the family who worked in the business within the past seven days.

Redesigning the CPS Questionnaire for Computer-Assisted Interviewing

When the Current Population Survey questionnaire was last redesigned 25 years ago, computer-assisted interviewing did not exist. Thus the questionnaire's design was limited to the degree of complexity that an interviewer could handle using a printed questionnaire form and recording responses on it. The Census Bureau has used computer-assisted telephone interviewing, called CATI, for many CPS interviews conducted after the initial in-

household interview, but the same questionnaire that had been used for paper and pencil interviewing was simply programmed for CATI.

Redesigning the questionnaire for computer-assisted technology can take advantage of that technology in two ways. First, as already mentioned, information obtained in prior interviews can be referred to and used in subsequent ones (dependent interviewing). Second, it is possible to design much more complex questionnaires, with branching to various sets of questions according to the answer to a prior question.

For example, in the redesigned version of the CPS the interviewer confirms whether a respondent identified as a retiree during a previous interview continues to be retired. If so, that respondent is skipped over the questions on labor force participation to questions appropriate for retirees. The interview is shorter for the respondent and easier to manage for the interviewer.

Another example of the advantages of CATI concerns job classification. The Census Bureau and the Bureau of Labor Statistics suspected that the old questionnaire was showing more changes of occupation and industry for respondents from month to month than was probably occurring. The in-depth cognitive interviewing and focus groups confirmed this suspicion. The respondent—or another member of the household reporting for the respondent—often describes the same job in different ways at different times. Coders were coding these responses as different industries and occupations when, in fact, the subject person remained in the same job.

The Census Bureau and the Bureau of Labor Statistics suspected that the questionnaire used for the Current Population Survey was showing more changes of occupation and industry for respondents than was probably occurring. In-depth cognitive interviews and focus groups confirmed this suspicion. Now interviewers call up on a computer screen the respondents' previous answers to employment questions and ask whether there have been changes.

Now the interviewer calls up on the computer screen the employer and job reported in the previous interview, then asks whether the respondent is still working at that job for the same employer. According to whether the answer is yes or no, the computerized questionnaire branches to one or another set of follow-up questions.

Redesigning Household Samples

After each decennial census the Census Bureau redesigns the samples to be used for all its household surveys so that they reflect the updated population and household distribution. The frame from which these samples are selected is currently the 1990 census address file. This address file is a computerized list of 102 million household addresses, each coded geographically to its census block, tract, community, voting district, county, and state. Sample selection is done in two

stages. The first is the selection of primary sampling units for all household surveys. These primary sampling units are composed of counties or groups of contiguous counties selected from the 3,141 counties throughout the country. The second stage is the selection of clusters of addresses within the sample counties. These addresses become the interview sites for the various demographic surveys.

Redesigning the samples is a complex undertaking that requires extensive coordination. Several factors complicate this effort, including requirements imposed on the process from outside. Four requirements are especially important.

The first requirement is that a sufficient number of sample housing units be selected to last the entire decade for each of the approximately 50 demographic surveys that the Census Bureau conducts. The CPS, the largest demographic survey, requires 18 panels of approximately 70,000 housing units each to provide data for the entire decade. Each sample housing unit in this survey will have an interview conducted eight times over a 16-month period. The National Crime Survey requires six panels of 10,000 households each, which are interviewed every six months for three years. As each panel rotates out of the sample, it is replaced by new households. The Survey of Income and Program Participation, a longitudinal survey, uses a continuous series of national panels of 12,000–20,000 housing units that require an interview every four months for two and one-half years. This survey also uses some oversampling of low-income households.

Another requirement involves personnel management. The Census Bureau has a field force of approximately 3,500 interviewers, one or more of whom must be assigned to each primary sampling unit. It is desirable to retain as many as possible of the experienced interviewers who worked in the primary sampling units of the prior decade's samples. Samples need to be planned to be geographically efficient to minimize interviewer travel and give each interviewer a sufficiently steady flow of work to make employment with the Census Bureau attractive.

A third requirement is that sample redesign have sufficient flexibility to permit changes in the size of particular surveys during the decade and to allow for the addition of new surveys not included in the original redesign.

Finally, the Census Bureau tries to assure that no housing unit is selected for more than one survey during the decade.

Although redesign involves selection of housing units for all surveys for the entire decade, each sample is updated continuously with data on new construction and demolitions. For this purpose the Census Bureau relies in part on data collected as part of its Survey of Construction.

Moving Labor Force Data Electronically

The Census Bureau has begun an 18-month program in which half of the sample selected for the Current Population Survey will be interviewed with the new questionnaire and the other half with the old one. The purpose is to measure the

effects that the new questionnaire, combined with the shift to 100% computer-assisted interviewing, will have on the key economic indicator, the unemployment rate. From January 1994 onward, the CPS will be switched completely to the new questionnaire and computer-assisted interviewing.

Interviewers all over the nation will receive their assigned cases and the questionnaire transmitted from headquarters via computer modem, whether they are working with laptop computers from respondents' homes for computer-assisted personal interviewing or working at one of the Census Bureau's two computer-assisted telephone interviewing facilities. At the end of each day's work, they will transmit their completed interviews, their hours of work, and their travel expenses via modem. Interview assignments can be transferred electronically from the CATI facilities to an individual interviewer for personal interview follow-up if an interview cannot be completed by telephone. After data gathered in the interviews are processed at the Census Bureau, the data base for each month's survey will be shared for use and further analysis by the Census Bureau and the Bureau of Labor Statistics.

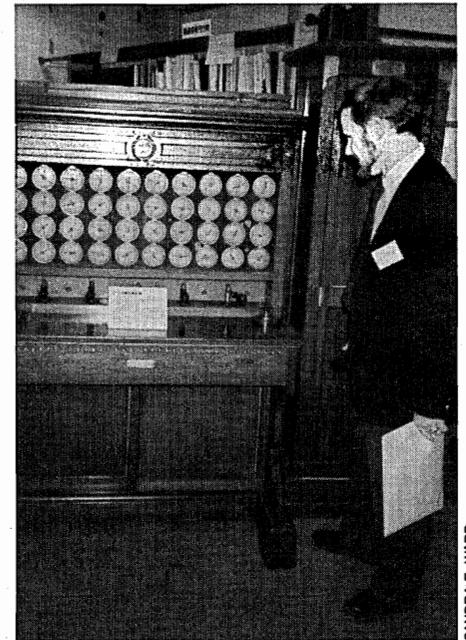
Progress in Changing to Computer-Assisted Survey Information Collection

The U.S. Census Bureau has historically been in the forefront of automation in its survey activities. Herman Hollerith was a Census Bureau employee before he designed the electric tabulating machines that used his specially

designed punch cards for tabulating the 1890 census. The company he founded to produce the cards and tabulating machinery became part of IBM. The Census Bureau had the first nonmilitary computer, UNIVAC I, delivered in time to finish the tabulation of the 1950 census. For the 1960 census the Census Bureau pioneered the design of optical readers that enter data directly from microfilmed questionnaires to computer tape. For the 1990 census it developed, in cooperation with the U.S. Geological Survey, a digital data-base mapping system called TIGER, which contains information about every block, street, river, and railroad in the nation. This system produced 9 million maps used in conducting the 1990 census.

Nevertheless, the Census Bureau has been slow in moving to computer-assisted interviewing. CATI technology was developed in the private sector in the early 1970s by Chilton Research, a large market and survey research firm. The technology's use expanded rapidly in the private sector, and by the mid-1980s CATI, combined with random-digit-dial selection of probability samples of telephone numbers, was the dominant methodology used for market research surveys and political polling. During the latter half of the 1970s, the major U.S. academic survey research organizations shifted to CATI for many of their surveys.

The entry of the academic survey centers spawned a great deal of research on the differences between in-person and telephone interviews, the adaptation of questioning techniques for telephone use, the development of new software, and the methodology of CATI. Software for



SANDRA E. WARD

THEN: Howard Hogan, chief of the Undercount Research Staff, U.S. Bureau of the Census, examines a Hollerith Tabulating Machine at the museum of the Statistics Bureau of Japan during the Fourteenth Population Census Conference in Tokyo, May 1992. The machine, a precursor of the electronic computer, was first used to tabulate the U.S. census of 1890. Its inventor was Herman Hollerith, a U.S. Census Bureau employee who founded a company that eventually became the International Business Machines Corporation (IBM).

CATI proliferated as interviewing facilities shifted from large mainframe computers driving terminals to minicomputer hosts and to networked microcomputers.

Although the Census Bureau first tested CATI in 1977, it did not open a telephone interviewing center to conduct CATI interviews for its household surveys until 1985. By 1986 the bureau's business division also had developed its own CATI system for following up non-

responses to mailed business surveys. The same business CATI system included related functions for mail preparation, data entry, analyst review, and tabulation of business survey data. The household CATI system and the business CATI system were developed independently. Neither their software nor their hardware was compatible.

In 1986 the Census Bureau began its first tests of computer-assisted personal interviewing, or CAPI, using laptop computers. Although the bureau had actively explored computer-assisted data collection, developed and tested software, and used it in a limited way, by 1991 it was apparent that the organization had fallen behind not only the private and academic sectors in the United States, but the statistical agencies of other nations as well. Furthermore, the Census Bureau was not exploring such newer computer-assisted technologies as touchtone data entry, voice recognition entry, or computerized self-administered questionnaires. In short, the bureau was behind the curve in computer automation and in need of a coordinated effort to address these problems (Nicholls 1992).

The situation changed in December 1990 with the appointment of a CASIC (computer-assisted survey information collection) manager and the appointment by that manager of three groups of advisors. The first group, the Policy Advisory Group, comprised division chiefs from each of the Census Bureau's departments, or directorates. The second, called the CASIC Software Panel, included experts temporarily recruited as consultants from academic survey organizations, private-sector survey



U.S. BUREAU OF THE CENSUS

NOW: Staff at the U.S. Census Bureau watch a demonstration of a questionnaire on the laptop computers currently in use for the Current Population Survey of the U.S. labor force.

organizations, other federal agencies, and the statistical bureaus of Canada, Great Britain, and the Netherlands. All of these experts were from organizations that were either using CASIC technology for household or business-establishment surveys or were planning to do so. The third group was the CASIC Methodology Panel, which included experts temporarily recruited from the same types of organizations as the Software Panel.

Each panel member spent two one-week periods listening to presentations on the Census Bureau's operations, interviewing individuals in the demographic and economic programs, and taking part in field interviews. Each prepared a report answering key questions and presenting his or her findings, conclusions, and recommendations.

Each gave an oral report at a meeting of the Census Bureau's executive staff and afterward submitted the written report.

Two panels of outside experts have provided the Census Bureau with a critical benchmark review of its current status and made recommendations for moving toward a totally automated environment. To a person they supported the development of computer-assisted survey information collection.

Convening the panels of outside experts was an outstanding success. They provided benchmarking for the Census Bureau, giving it a criti-

cal review of its current status, what others were doing and what it should do, broadening the bureau's perspective of what was happening in other agencies and the state of computer technology. To a person they supported CASIC for its qual-

ity, timeliness, cost containment, and management efficiency. The experts' recommendations evidenced large areas of agreement among panel members on how the Census Bureau should move toward a totally automated environment.

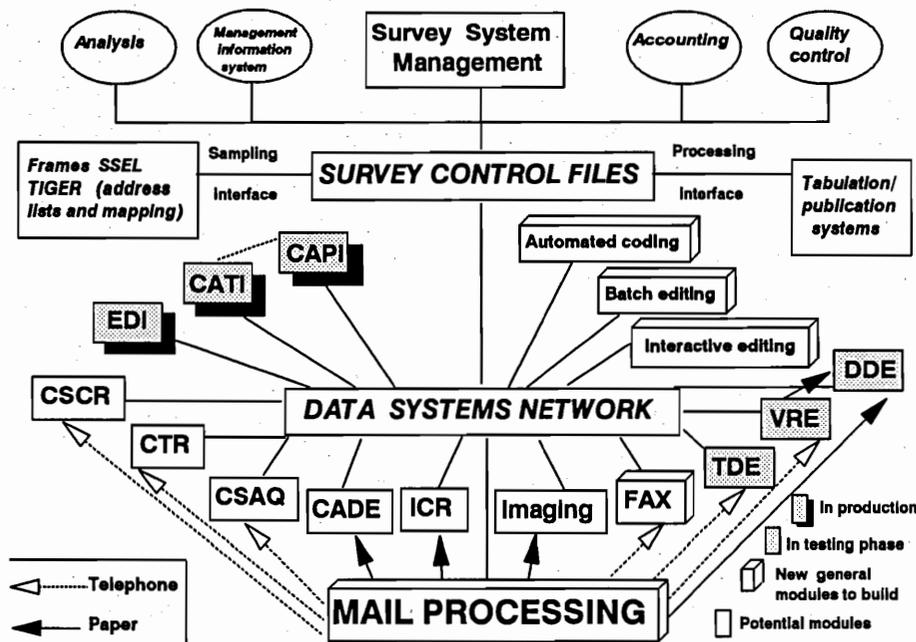
In discussions with the executive staff and the CASIC Policy Advisory Group, the CASIC staff used these recommendations to develop the vision for a CASIC environment, modeled in Figure 1. The vision is far broader than a system for data collection. It represents a total data management system and a network for all Census Bureau surveys.

It incorporates direct data entry and automated coding. Although these activities are already computerized at the Census Bureau, plans call for a more general module for automated coding to be developed.

Computer-assisted telephone and personal interviewing will be part of the system. The National Health Interview Survey is scheduled to move to CATI in January 1993, using software provided by its sponsor, the National Center for Health Statistics. By 1994, data collection for the Census Bureau's largest survey, the Current Population Survey, will be totally automated, using software developed by the bureau.

Meanwhile the Census Bureau is working with a provider of software to examine how well this software meets Census Bureau needs and assessing a second system. Both the Software Panel and the Methodology Panel advised the bureau against continuing to put its resources into developing its own software. Instead, the bureau will adapt an off-the-shelf modular system to its needs, focusing its resources on developing modules for which the bureau has unique requirements. The Census Bureau plans to adopt a system within the next several months, in time for the redesign of the Survey of Income and Program Participation, a

Figure 1. The Census Bureau's envisioned computer-assisted survey information collection (CASIC) system



- SSEL — Standard Statistical Establishment List
- TIGER — Topologically Integrated Geographic Encoding and Reference System
- CAPI — Computer-Assisted Personal Interviewing
- CATI — Computer-Assisted Telephone Interviewing
- EDI — Electronic Data Interchange
- CSCR — Computer Service Company Reporting
- CTR — Cable Television Reporting
- CSAQ — Computer Self-Administered Questionnaire
- CADE — Computer-Assisted Data Entry
- ICR — Image Character Recognition
- TDE — Touchtone Data Entry
- VRE — Voice Recognition Entry
- DDE — Direct Data Entry

bureau-sponsored survey on sources of income and utilization of federal income-support programs. All household surveys will be moved successively to the same system so that the Census Bureau need support only one system.

The software system will have both form-based displays, in which the forms seen on computer screens match those mailed to enterprises for business surveys, and sequential question formats like those used for household surveys. Respondents will be able to return their survey forms by mail or fax, or telephone their responses to an operator who will be looking at the same form on a terminal screen.

The Census Bureau is now testing touchtone data entry (TDE) for such economic surveys as Advance Retail Sales and New Construction, for which respondents need report only a few numbers each month.

Electronic data interchange (EDI), the direct transfer of information from the respondent's computer to the Census Bureau computer via tape or modem, began in January 1991 for import and export data to Canada. Beginning in 1993 the largest U.S. retailers, those with hundreds of stores, will respond to the economic census of retail trade by EDI.

The Census Bureau has a long way to go to fulfill its vision of computer-assisted survey information collection. We plan to reach it step by step, one module at a time. It will take most of the next decade to achieve. In some sense it is a goal whose completion will always lie ahead because technology will always be moving on.

The Census Bureau's Envisioned CASIC System

The Census Bureau's envisioned computer-assisted survey information collection (CASIC) system, diagrammed in Figure 1, comprises an integrated set of modular technologies and procedures to support the collection, capture, and cleaning of data for most bureau surveys and censuses. Figure 1 shows the relationship among the various modules.

The survey control files contain information from the sampling frame and provide the data needed to manage data-collection operations: survey system management, analyses, management information, accounting, and quality control. The survey control files also provide the interface between data collection and the tabulation and publication systems.

The data systems network includes modules for CASIC technologies for data collection, capture, and cleaning. Modules such as computer-assisted telephone interviewing, computer-assisted personal interviewing, and electronic data interchange are in production for several major surveys. Touchtone (telephone) data entry and voice recognition entry modules are being tested, while other modules, such as computer self-administered questionnaires and imaging, are being assessed as potential CASIC tools. Both administrative data and survey data flow to and from these modules and to the survey control files as needed to support all survey operations.

The mail-processing technologies will standardize one integral part of the total system, which accommodates a wide variety of response and processing options.

ACKNOWLEDGMENTS

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Activities

More Experiences from the 1990 Census Round: Indonesia and Mongolia

The last issue of the Asian and Pacific Population Forum (Vol. 6, No. 2: 47-52) contained a report on the Fourteenth Population Census Conference, a meeting of census officials from 23 Asian and Pacific countries that took place in Tokyo last May. The following two items are based on papers presented at that conference by representatives from the statistics bureaus of Indonesia and Mongolia.

1990 Census Registers Drop in Indonesia's Population Growth Rate

Between 1980 and 1990, Indonesia's population, the fifth largest in the world, grew by 31.9 million to 179.4 million, reflecting the difficulty of putting brakes on a large and young population. Nevertheless, Indonesia has made progress in slowing its average annual growth rate, which fell from 2.32% to 1.98% over the decade. The decline is attributed to two factors, according to Azwar Rasjid, director-general of the Central Bureau of Statistics: rising age at marriage among women, and increasing use of contraception by women of reproductive age.

The Indonesian census was conducted in two stages between 15 September and 31 October 1990. The first stage consisted of a complete enumeration of all buildings and persons. The second, using a more detailed questionnaire, collected information on a variety of topics from a 5% sample of the population. Rasjid's report to the Fourteenth Census Conference was based on a 10% subsample of the 5% sample.

The 1980-90 intercensal growth

rate fell in every region of the country except Kalimantan, where in-migration from Java caused population growth to rise. The island of Java had the smallest population growth over the decade, 1.66% per year, owing to its comparatively low total fertility rate of 2.68 children per woman and net out-migration to other regions. But a disproportionate share of the population, 60%, continues to live on Java. Within Java, the capital province of Jakarta had a growth rate averaging 2.47% per year. Jakarta's growth rate has declined over the past 20 years as a result of outward settlement of the population to West Java and regencies around the capital.

Indonesia continues to have a young population, with the proportion of children under age 15 at 36.5% (down from 40.9% at the 1980 census). A hopeful sign is that fertility declined more rapidly in the five years preceding the 1990 census than earlier, as is evidenced by a smaller proportion of children in the 0-4 age group than in the 5-9 age group. This trend is documented by the 1985 Population Intercensal Survey and the 1990 census.

The proportion of young, single women has risen rapidly during the past two decades. The percentage single in the 25-29 age group rose from 10.7% to 19.5% in urban areas between 1971 and 1990 and from 3.8% to 7.1% in rural areas over the same period. During the most recent intercensal period alone, the singulate mean age at marriage increased from 21.8 to 23.5 among urban women and from 19.4 to 20.5 among rural women. As many studies have shown, delayed marriage plays an important role in bringing down fertility. (See, for example, "The Conflicting Effects of Delayed Marriage and Declining Divorce Rates on Cumulative Fertility in Indonesia" by James A. Palmore and Masri Singarimbun in *APPE*, Vol. 6, No. 1.)

Indonesia's population growth rate fell from an annual average of 2.32% to 1.98% during the 1980s, and over the past two decades the total fertility rate fell from 5.6 to 3.3 children per woman. The decline is attributed to delayed marriage by increasing proportions of women and to an increasing proportion of women (50% by 1991) who use contraception.

Comparison of the 1971 and 1990 censuses reveals that Indonesia's total fertility rate has been falling steadily during the past two decades, from 5.6 children per wom-

an in the period 1967-70 to 3.3 children in 1986-89. (The total fertility rate required for population replacement without growth is approximately 2.1 children.) Even more important than delayed marriage in causing the fertility decline, according to Rasjid, has been the increased percentage of women using family planning methods—48% in 1987, according to the National Indonesian Contraceptive Prevalence Survey, and 50% in 1991, according to the Indonesian Demographic and Health Survey. Fertility continues to be highest in the 20-24 age group.

Education, especially female education, is also known to be associated lower fertility levels. Indonesian educational attainment showed improvement as measured by three indicators over the intercensal period—literacy, school attendance, and completed level of education. The literacy rate at ages 10 and above rose from 71.1% in 1980 to 84.1% in 1990, and for the first time the female rate equaled that of males. The gap in school attendance between males and females narrowed in every age group, the percentage of females even exceeding that of males in the 7-12 age group (91.7% and 91.4%, respectively). But males were still more likely than females to be attending school beyond the primary level. The third indicator, the percentage of the population that has completed each level of education, also showed improvement, rising from 29.2% to 35.9% for primary school completion and from 5.9% to 11.8% for senior high school completion. Separate figures for each sex were not reported.

The Indonesian census gathered

information on economic activity that took place during the week before the enumeration. It showed that the population contained 135.3 million persons of ages 10 and over (30.9 million more than counted by the 1980 census), of whom 74.4 million were in the labor force, 72.0 million were employed, and 2.4 million were looking for work. The proportion of the population in the labor force rose during the intercensal period, from 50.2% to 55%.

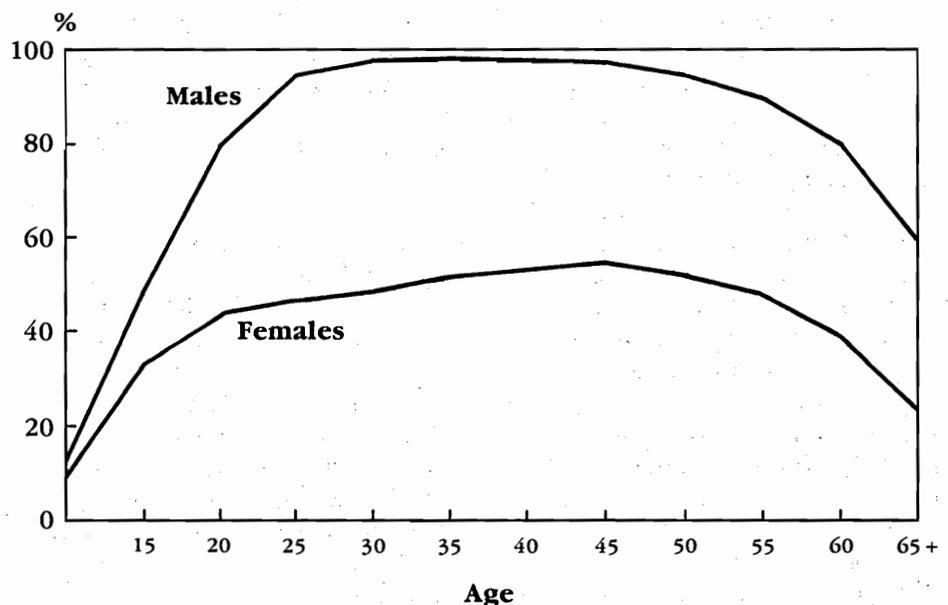
The age pattern of labor force participation was similar for both sexes: low at younger ages and increasing with age, reaching a peak in the 40s (see Figure 1). Among the youngest (10-14) age group, female labor force participation was lower in 1990 than in 1980, reflecting the greater proportion of girls in school. But the census recorded a general rise in female labor force

participation during the 1980s, which Rasjid characterized as "encouraging because it shows an increased participation of women in the economic development process."

Although agriculture is still Indonesia's major occupational sector, the proportion of the labor force working as farmers has been steadily declining in recent years, from 60.9% in 1971 to 49.5% in 1990. The next two largest occupational groups in 1990 were production and transport equipment operators, representing 22.2% of the 1990 work force, and sales personnel, at 14.6%.

Readers interested in obtaining more information about Indonesia's 1990 population census results may write to: Central Bureau of Statistics, Jalan Dr. Sutomo 8, Jakarta, Indonesia.

Figure 1. Male and female labor force participation rates (%), by age: Indonesia, 1990



Planners Are Using Results from the 1989 Mongolian Census to Address the Nation's Economic Problems

In 1990 Mongolia changed its political leadership and began a drastic revision of its political, economic, and social ideology. Transforming its economy from a closed, centrally controlled system to one that is market-oriented and integrated into the world economy has not been easy, according to Badamcedengiin Tsend-Ayush, chairman of the State Statistical Office of Mongolia, and Ricardo F. Neupert, chief technical adviser to Mongolia from the United Nations Population Fund (UNFPA) and the United Nations Department of Economic and Social Development, in a report to the Fourteenth Population Census Conference. Mongolians have been suffering from an economic crisis characterized by high unemployment, inflation, shortages of food and consumer goods, and a drastic decline in their living standard.

Having reliable statistical information is essential for overcoming the crisis and continuing Mongolia's economic and social transformation, stated Tsend-Ayush and Neupert. "The design of a realistic, efficient, and just price policy, the adoption of measures toward an equilibrium between demand and supply of goods and services, and, in general, government and private decision-making processes require a substantial amount of information not only on the economic situation . . . but also on population trends."

Mongolia has a fairly well-developed system of population

data collection, the authors reported. Seven population censuses have been conducted between 1935 and 1989, and a civil registration and vital statistics system has been in existence since 1951. The State Statistical Office (SSO), an autonomous government agency responsible for the collection and analysis of economic and social statistics, has developed an efficient population data network.

In response to Mongolia's economic problems, the SSO has begun giving increased attention to three activities: the production of accurate post-census population estimates, studies of past demographic trends and current demographic indicators, and the dissemination of demographic information to other agencies. For these purposes the 1989 census is one of the most important sources of data and is likely to remain so for several years.

Post-census population estimates. Accurate post-census population estimates are needed for the equitable distribution of scarce resources, such as food, among Mongolia's 18 *aimaks* (provinces) and four major cities. Population figures collected at the end of 1991 by the SSO from the *aimaks'* civil registration system were higher than expected—2.26 million, as compared with the figure of 2.15 million obtained by calculating the number of deaths and births since the January 1989 census. Two explanations for the difference suggested themselves: either the registration in the *aimaks* was more complete in 1991 than in previous years, or the *aimaks* were inflating their totals to qualify for more resources.

In an effort to determine the cause of the discrepancy, with help from the UNFPA the SSO in early 1992 evaluated the completeness of the 1989 census enumeration so as to establish a base population. It used the consistent correction method developed by staff of the Program on Population, East-West Center, combined with indirect techniques of fertility and mortality estimation. The SSO found the census to have undercounted the population by approximately 6.5%, a higher percentage than earlier estimates had indicated. When the adjusted census figure was used to estimate the size of the 1991 population, the result suggested that *aimaks* were not inflating their populations; rather, some under-registration of *aimak* residents was still occurring.

Mongolia's State Statistical Office was directing its efforts in early 1992 toward obtaining accurate estimates of the population by age and sex at the aimak (provincial) level. These estimates were needed to evaluate registration figures used for the allocation of food, improve the vital statistics system, and draw electoral districts for the July 1992 elections, which would determine the political future of the country.

The SSO has been directing its efforts toward obtaining accurate estimates of the 1991 population by age and sex at the *aimak* level. "These estimates are essential to evaluate the figures obtained by

registration and to improve our vital statistics system," stated the authors of the report, who emphasized the estimates' practical importance in determining the allocation of food.

A second reason why accurate estimates have been so important is that general elections were planned for July 1992 that would determine the political future of Mongolia. The electoral districts were to be defined on the basis of the population 18 years of age and older living in given areas.

Demographic studies. The new government is revising the former administration's pronatalist policies. Although a new policy has not yet been formally adopted, couples are being encouraged to delay child-bearing until age 20, to space their births, and not to have more than three or four children. Barriers to the importation and distribution of contraceptives have been removed, and abortion was legalized in 1990.

The SSO has used vital registration and census data to establish reliable mortality and fertility trends for the past 20 years. Mongolian mortality, especially infant mortality, has declined substantially during this century; but the decline slowed during the 1980s despite the expansion of health facilities to remote regions of the country, and it is feared that the current economic crisis may impede further improvement in mortality rates over the short term. Fertility began a significant and sustained decline in the mid-1980s. Total fertility is now about 4.5 children, whereas the desired number of children is three.

Net rural-to-urban migration has existed for several decades, but without the urban explosion ex-

perienced by many developing countries. The government's policy of regulating the spatial distribution of population to coincide with its development objectives has apparently succeeded. The new administration has relaxed the restrictions on foreign travel for Mongolian citizens, and since 1991 workers have been able to work abroad for specified periods under collective labor contracts; most have gone to republics of the former Soviet Union.

"The future population profile of Mongolia will certainly be different from that which one may have foreseen a couple of years ago," stated Tsend-Ayush and Neupert. The adoption of a market economy, they added, is likely to have major demographic consequences for fertility, migration, and population distribution. The SSO plans therefore to update its population projections at frequent intervals and to devote a large effort to analyzing regional trends.

"The future population profile of Mongolia will certainly be different from that which one may have foreseen a couple of years ago." The adoption of a market economy is likely to have major demographic consequences for fertility, migration, and population distribution.

The 1989 census included a special survey on fertility, which was directed to 60,000 women of reproductive age. The questionnaire included questions about desired family size, attitudes toward child-

bearing, and social and economic characteristics of respondents. Unfortunately, this survey did not include items on birth histories. However, analysis of the survey data has provided useful information about the fertility decline that is under way in Mongolia.

One obstacle to demographic analysis in Mongolia has been the inability to download mainframe computer data to microcomputers. The SSO expected to acquire data-processing equipment by the middle of 1992 that would permit access to the census data base by microcomputers.

Dissemination and technical support. In the past the SSO has concentrated on producing descriptive statistics and has neglected the analysis and dissemination of census data. Mongolia's recent political and economic changes have created an unprecedented demand for demographic and socioeconomic data. In response to the demand, the SSO is establishing a service unit for data users that will create microcomputer-readable census files and make them available to government agencies and organizations, produce special tabulations at users' request, and provide technical support to users of census data both on an individual basis and through short seminars. The unit will also make information from vital registration available to its users. One objective of the unit is to prevent the needless duplication of data-collection efforts.

For more information about Mongolia's 1989 census and the activities of the SSO, readers may write to: State Statistical Office, Ulan Bator, Mongolia. □

Population Research and Education in Vietnam

The following overview was provided by Pham Bich San, head of the Social Demography Section, Institute of Sociology, Vietnam. Readers interested in knowing more about the organizations and studies discussed here may contact Dr. San at the Institute of Sociology, 27 Tran Xuan Soan, Hanoi.

Few population studies were conducted in Vietnam prior to the 1980s, for two main reasons: the nation's population problems were underestimated, and the level of demographic knowledge was poor. Demographic research was therefore confined to determining the crude birth rate, crude death rate, rate of population growth, and population density. The rates were estimated with a low degree of accuracy.

Major changes have taken place since the early 1980s, when for the first time Vietnamese cadres and researchers had the opportunity to participate in population training courses funded by the United Nations and other international organizations. Population studies have since become more common, attracting widespread attention, and have helped fill the demographic information gap in publications about Vietnam.

Five main groups are engaged in population research and education in Vietnam. The General Statistics Office and the Institute of Sociology conduct quantitative and qualitative demographic studies, respectively. The National Committee for Population and Family Planning, within the Ministry of Health, carries out studies of contraceptive methods, population policies, and the national family planning system. The Ministry of Education and the Institute of Pedagogical Sciences have responsibility for population education. Finally, various entities,

such as the Ministry of Labor Force, the Vietnam Women's Union, and the Youth Union, examine specific population issues relevant to their own functions.

This overview attempts to assess the data sources, data quality, and analysis underlying the studies issued by each of the five groups.

General Statistics Office

As the governmental institution responsible for collecting and disseminating national statistics, the General Statistics Office (GSO) issues statistics on Vietnam's population derived each year from administrative sources, the decennial census conducted in the northern half of the country before 1975, and the two national censuses of 1979 and 1989. The GSO's statistical publications provide information on the population's size, distribution, crude birth and death rates, and, more recently, the total fertility rate. Except for the 1979 and 1989 censuses, which were more complete and accurate than previous enumerations, the main value of these publications lies in their description of changing demographic trends. In general, the vital rates reported by the GSO are thought to be lower than the actual rates.

Institute of Sociology

Having identified population as one of its main research interests, the Institute of Sociology applies modern sociological techniques, in

particular the sample survey and the focus group for in-depth studies, to investigate demographic and social changes in Vietnam. Its general approach has been to analyze how social and economic conditions affect the norms and values that regulate reproductive behavior.

The role of government in population regulation is one subject of institute study. For decades the Vietnamese government's emphasis on centralized development has contributed to a decline in the crude death rate and to major changes in the social environment in which population processes have been regulated. Institute studies have focused on the health care service and family planning programs at the commune level. As Vietnam moves toward adopting a market economy, significant changes in the government's population and health-care policies are likely to occur that should have long-term demographic effects.

In March 1984 the Institute of Sociology fielded its first survey of family planning knowledge, attitudes, and practice (KAP) in a commune in Thai Binh Province, a locality with the highest population density in the Red River delta. Subsequent studies also concentrated on the commune level, the commune being the basic administrative unit for population management in rural areas. Variables studied included age-sex distributions, social norms and the value of children to parents, contraceptive knowledge and practice, attitudes toward children's education, and respondents' prospects for migration to urban areas. The most important conclusion drawn from these studies was that, without major social and eco-

conomic change, the government's family-size goal of two children per couple could not be achieved, despite an active family planning campaign.

Studies conducted in rural communes by the Institute of Sociology have examined social norms and the value of children to parents, contraceptive knowledge and practice, and prospects for migration to urban areas. The most important conclusion was that, without major social and economic changes, the government's goal of two children per couple could not be achieved, despite an active family planning campaign.

The Institute of Sociology and the Ministry of Labor have jointly conducted studies on migration aimed at assessing the government's resettlement strategies, in particular the effect of government-directed population movements to the New Economic Zones (NEZs) in the Central Highland. These studies indicate that although the age structures of the NEZs are more balanced than those of other rural areas, fertility and mortality levels are much higher. Insufficient investment in the NEZs has resulted in poor living conditions for the settlers, environmental degradation, and serious social conflicts. Not surprisingly, family planning campaigns in these zones have been ineffective. Rural-to-rural migration can therefore be considered only a temporary solution to the problem of rapid population growth.

To study changes in the Vietnamese family under the new conditions of a market economy, the Institute of Sociology recently conducted a national Family and Fertility Survey focusing on family characteristics, fertility, and socioeconomic conditions in rural areas. The survey was funded by the United Nations Population Fund (UNFPA). A sample of 1,195 households was drawn from the three main regions of the country, and from those households 820 ever-married women of reproductive age were selected for in-depth interviews. The study found that, despite a sizable proportion of nuclear families in rural areas, rural families remain overwhelmingly traditional.

Among younger women, fertility has declined, partly as a result of the low land-to-people ratio and also in response to the government's efforts to encourage social changes such as smaller families. Nevertheless, the government's role in reducing fertility levels has been less active than in many other developing countries, and a rapid fertility decline is unlikely.

The survey and focus-group data used by the Institute of Sociology are especially useful when combined with census data provided by the GSO. The main shortcoming of the institute's data is that they do not represent all localities of the country.

Ministry of Health and National Committee for Population and Family Planning

The Ministry of Health and the National Committee for Population and Family Planning have traditionally been responsible for population

and family planning programs in Vietnam. Their early studies focused on the biotechnology of contraceptive methods and abortion. As an agency concentrating on population issues, the National Committee has developed and expanded population studies throughout the country, especially since 1990, often working with other agencies such as the Ministry of Labor and the Institute for Protection of Mothers and the Newborn. These collaborative studies have focused on the use of the intrauterine device T-Cu 380A, on family planning information, education, and communication, and on family planning activities in the Red River delta.

In 1987 the National Committee conducted a sample survey of family health workers to measure their knowledge of and attitudes toward various contraceptive methods. The result was disappointing; except for IUDs, this group had little knowledge of contraceptive methods because of poor, and possibly biased, training. The study highlighted the importance of training at the grass-roots level, and the government has accordingly made changes in its training operations.

A 1987 survey by the National Committee for Population and Family Planning found that family health workers had little knowledge of contraceptive methods. The study highlighted the importance of training at the grass-roots level, and the government has accordingly made changes in its training operations.

Perhaps the National Committee's most important study was the 1988 Vietnamese Demographic and Health Survey (DHS), which was funded by the UNFPA and used the DHS methodology that has been applied in other countries, thus making its findings internationally comparable. With a sample size of 4,172 ever-married women, ages 15-49, the study found a high female singulate mean age at marriage (22.4 years in the North and 24.6 years in the South); a very low ratio of males to females, especially in the reproductive ages; a preference for moderately large families (the mean number of children preferred by currently married women was 2.64); and major differences between rural and urban areas in family-size preference.

A third set of studies, undertaken by the National Committee in 1990, was aimed at gathering data needed for the government's population and family planning programs during the planning periods of 1991-95 and 1996-2000 by forecasting future demographic changes. On the basis of its findings, the National Committee has set the following targets for the 1991-2000 decade: an annual decline of 0.6% in the crude birth rate and an annual decline of 0.1 child in the total fertility rate. The studies also revealed the need for greater integration of population concerns into the country's education, health care, and social security systems.

The National Committee's studies, which represent the first coordinated effort between that agency and other scientific institutions inside and outside Vietnam, have provided timely and scientific assistance to Vietnamese decision makers. Except

for a few published findings, however, most of the studies have resulted only in internal reports. Wider dissemination of the findings would benefit the demographic research community.

Ministry of Education and Institute of Pedagogical Sciences

Population education in Vietnam has two targeted groups, the general public and students. Materials developed for the first group are abundant and range from cursory discussions of population issues to studies that provide a deeper understanding of population problems. These materials, which are prepared by the Institute for Pedagogical Sciences, emphasize the negative effects of rapid population growth on social and economic development, outline the government's population policies, and inform readers about family planning. Most are based on international studies and do not focus specifically on Vietnam. School texts and other materials developed by the Ministry of Education to teach population education in the schools have succeeded in creating favorable attitudes toward the government's family planning program among students. Further improvement of these materials is desirable, however.

Specialized institutions

A variety of other institutions conduct studies in the population field, among them universities, colleges, and nonacademic organizations. Their activities include data analysis and sample surveys.

The Vietnam Women's Union has conducted KAP studies in many lo-

calities, using large sample sizes. Its studies have found women's knowledge of contraceptive methods to be very limited and often erroneous, and the proportion of users to be small. Studies on women's status, done as part of a 1988 UNFPA project, have provided important information about rural women's lives and suggested that, without fundamental improvements in their status, family planning campaigns aimed at women in rural areas are unlikely to have much effect.

The Center for Women's Studies at the National Center for Social Sciences has concentrated on the problems facing women in the course of the country's development. Its studies indicate a need for greater concern for women and increased efforts to reduce fertility.

The Center of Population and Labor Force studies rural migration and labor force issues. It has also investigated fertility levels and made population forecasts. Its summary reports are useful to those interested in Vietnam's population.

In conclusion, although a welter of demographic studies has proliferated in Vietnam during the past decade, it is often difficult to discover them and to identify those of greatest value. In designing new studies, researchers need to choose their methodologies carefully, and their findings must be given wide dissemination. Closer cooperation is needed among institutions and organizations working in the population field. One possibility is to have all population studies, except for research done by academic institutions, coordinated by the National Committee for Population and Family Planning. □

Reviews and Publications Noted

Beyond the Limits: Confronting Global Collapse, Envisioning a Sustainable Future by Donella H. Meadows, Dennis L. Meadows, and Jørgen Randers. Post Mills, Vt.: Chelsea Green Publishing Company, 1992. xx, 300 pp., US \$19.95. ISBN 0-930031-55-5 (hardcover). Available from Chelsea Green Publishing Company, P.O. Box 130, Post Mills, VT 05058-0130.

Twenty years ago *The Limits to Growth* (Donella H. Meadows et al., New York: Universe Books, 1972) warned of a sudden and uncontrollable collapse of the world's industry and population within the next 100 years. This crash would occur because of continued growth in the number of human beings and in human material well-being, which would exhaust resources and poison nature's life-support systems.

Reanalysis by three of the same authors, using essentially the same computer "systems model" for projections, confirms their initial warning in this sequel, *Beyond the Limits*. Whereas the first book provoked vigorous and often bitter attacks by establishment technocrats, there will probably be few tenable arguments raised against this reconfirmation. Gross, obvious, and persuasive evidence continues to accumulate that the world has too many people too aggressively exploiting its resources.

Beyond the Limits carefully documents and explains the consequences of exponential growth as "overshoot" (Chapter 2). The mathematics of a positive feedback in the world population-economic system, wherein growth begets

growth, leads not only to exorbitant consumption but also to terminal increments of growth so large that finite limits of resources are far exceeded before corrective actions can hope to have effect. This time, however, the authors serve up the gloom and doom sauced generously with a brave hope that a "sustainable" society can be found plausible and made possible through "visioning, networking, truth-telling, learning, and loving" (pp. 224-236).

Their computer scenarios show "... a great variety of future paths. They include various kinds of collapse, and also smooth transitions to more or less sustainable states. They do not include continuous growth. The choices are to bring the burden of human activities upon the earth down to a sustainable level through human choice, human technology, and human organization, or to let nature force the reduction through lack of food, energy, or materials, or an increasingly unsound environment" (p. 12). The smart money will be on nature if the requirements for sustainability are actually those postulated about human nature in this book. The most striking feature of the authors' desired sustainable world is essentially total equity, voluntarily provided by the affluent.

Their recommended scenario calls for the world "to aim for an average industrial output per capita of \$350 per person per year" (p. 194). But this \$350 will be enough because by the year 2050 society will have greatly reduced the industrial output that must now

be devoted to war, corruption, growth of industrial capital, pollution, and resource extraction. Through "perfect birth control effectiveness" (p. 198) starting in 1995, the world's population will have leveled off at just under 8 billion.

Since the authors' term "industrial output per capita" represents an undetailed mixture of consumer goods, capital equipment, and investment (p. 34), it is difficult to compare it with other measures of economic well-being. The *World Development Report 1992* (World Bank), in its table on basic indicators, gives a world average gross national product per capita of \$4,200, about 40% of which is industrial (\$1,700). The comparable industrial product figure for a U.S. citizen is about \$8,700, all in 1990 US dollars. Thus, world average persons in the sustainable future will have only about one-fifth the material well-being of their grandparents, and Americans, only one-twenty-fifth, if universal equity is achieved.

The prescribed rapidity and magnitude of such a revolution in lifestyle suggest, to this reviewer, its inevitable failure. Other scenarios offered by the authors show that neither delaying the transition nor aiming for a higher material standard of living will prevent collapse. Narrow is the gate for any possible transition to sustainability.

Another problem that I have with the authors' guidelines is that the information required about natural systems is far beyond the current capabilities of ecological under-

standing and monitoring. We are admonished to learn more about local and planetary sources and sinks, inform others promptly about environmental conditions, forecast stress of the environment, harvest renewable resources only at their regeneration rates, and use all resources with maximum efficiency (p. 214).

As evidence of the difficulty of that challenge, a June 1992 conference at the World Bank, arranged by the United Nations University and others, addressed the "Definition and Measurement of Sustainability: The Biophysical Foundation." The conclusion reached by conference participants was that for various reasons—the nonlinearity of ecosystem response to stress, natural variability (low signal-to-noise ratio), ignorance of important cause-effect relationships in the environment, and sampling and analytical errors under field conditions—it will be extremely difficult to make the concept of sustainability operational. If the world opts to move toward sustainability, it will be without adequate scientific information or predictive power.

As for the likelihood that the more affluent will voluntarily equalize the distribution of material well-being, Lynton Keith Caldwell reminds us (in his latest book, *Between Two Worlds*, Cambridge University Press, 1992) that the famous 1987 Brundtland Commission report opened with the phrase "The Earth is one but the world is not" (p. 55). Caldwell goes on to state: "Relatively few people yet see the earth as an object of concern, respect and responsibility. . . . Many contemporary values, attitudes, and institutions militate against interna-

tional altruism. As widely interpreted today, human rights, economic interests, and national sovereignty would be factors in opposition. The cooperative task would require behavior that humans find most difficult: collective self-discipline in a common effort" (pp. 55, 173).

These reality checks—implausibility of equity, inertia in human affairs, lack of understanding of ecosystems, and deep-rooted materialism—must be combined with the quite believable warning scenarios of *Beyond the Limits*. Then, unfortunately, the alternative of collapse seems much surer than the hope of starting, in 1995, the multiple revolutions in science, technology, fertility control, and human behavior needed for sustainability. A prudent and urgent next task for serious futurologists would be to help plan how best to cope with widespread suffering on an impoverished earth and in an inequitable world. That grim scenario is shown by this book to be probable but is not addressed.

—Richard A. Carpenter
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ALSO NOTED

The Environment and Population Growth: Decade for Action by Cynthia P. Green. Baltimore: Population Information Program, The Johns Hopkins University, May 1992. Population Reports, Series M, No. 10. 31 pp. (paper). Free to developing countries; in developed countries, US \$2 each for multiple copies. Available from Population Information Program, The Johns Hopkins University, 527 St. Paul Place, Baltimore, MD 21202, U.S.A.; fax (410) 659-6266.

This report argues that the combination of rapid population growth and increasing consumption threatens the world's environment in the following ways: Each additional person places an incremental demand on the earth's resources. That demand is multiplied to varying degrees by the person's affluence and by the environmental impact of technologies involved in producing what that person consumes. The current rapid pace of population growth leaves little time to promote environmental safeguards and introduce new technologies that would permit sustainable economic growth. The steadily increasing burden of population growth can eventually overload natural systems, causing their collapse.

According to author Cynthia Green (p. 6), the developed countries, containing less than one-fourth of the world's population, are consuming roughly three-fourths of its raw materials and energy, producing three-fourths of its solid waste, and generating about 55% of the atmospheric gases blamed for global warming. The rising aspirations of poorer countries are threatened by growing resource scarcity and increasingly serious environmental damage.

Actions taken during the next decade to curb population growth and address such pressing environmental problems as water and air pollution, mounting solid wastes, soil degradation, loss of nonrenewable mineral resources, deforestation, and ozone depletion will determine the quality of life on the planet for generations, Green asserts. "Adopting the principle of sustainable development requires a fundamental change in thinking. The data used for

decision-making must reflect the true costs of resource depletion and pollution as they affect future generations rather than just the short-term costs and profits of depleting income-producing resources." (p. 4)

The report urges that environmental and population issues be given top priority and sustained political commitment by policymakers. Other recommended initiatives include increasing policymakers' knowledge about environmental problems, building public support for population and environmental programs, and undertaking a wide range of urgently needed programs to address the problems described in the report.

The text is augmented by tables, graphs, illustrations and examples, and an extensive bibliography. Supplementing the report is a poster-size wall chart that lists population and environmental indicators for 130 countries by region.

Family Planning and Child Survival Programs as Assessed in 1991 by John A. Ross, W. Parker Mauldin, Steven R. Green, and E. Romana Cooke. New York: The Population Council, 1992. vi, 182 pp. (paper). ISBN 0-87834-066-1. Available from The Population Council, One Dag Hammarskjold Plaza, New York, NY 10017, U.S.A. Requests for single complimentary copies should be addressed to Ms. Peggy Knoll.

Continuing the tradition of the Population Council's periodic factbook, *Population and Family Planning Programs*, this volume presents comparative statistical information dating from the mid-1980s on the demographic and social settings, eligible populations and prevalence of contraceptive use,

family planning programs, and maternal care and child survival programs of all countries having more than 1 million inhabitants. The data, which come from responses to a Population Council questionnaire and from the work of other agencies, are presented in table format.

The authors report (p. 1), that "between the mid-1960s and the present, 17 countries have had fertility declines of more than 50 percent, and an additional 31 countries have had declines exceeding 25 percent. Declines are widespread in East Asia and Latin America, are moderately widespread in South and Southeast Asia and in North Africa and the Middle East, and have barely begun in sub-Saharan Africa." They note that whereas the total fertility rate (TFR) in the developing world averaged about 6.1 children per women in the mid-1960s, by the late 1980s it had fallen to 3.9. With an additional decline of 1.8 children per woman, the TFR would reach replacement level.

The number of contraceptive users among married women of reproductive age in developing countries has grown from 220 million in 1980 to 380 million in 1990, with sterilization (170 million) being the most prevalent method. The regions with the greatest contraceptive prevalence (East Asia and Latin America) are those in which fertility is now lowest.

Infant mortality has declined nearly everywhere, overall by 43% between the late 1960s and the late 1980s. But regional declines vary widely, from 73% in East Asia (mainly China) to 34% in sub-Saharan Africa. Within Asia, the

sharpest declines occurred in Singapore (72%), Thailand (71%), and Malaysia (62%). Current levels of infant mortality also show considerable diversity.

Between 1983 and 1988, overall maternity mortality in the developing world declined by 7%, from 450 to 420 maternal deaths per year per 100,000 births, and in Asia it fell by 10%. A sharp disparity is still found between the maternal mortality rates of the more developed countries (26 pregnancy-related deaths per year per 100,000 births) and the less developed countries (320 deaths). Maternal mortality ranges from a high of 570 in South Asia to a low of 120 in East Asia.

Mathematical Population Studies: An International Journal of Mathematical Demography. Published quarterly by Gordon and Breach Science Publishers. Coordinating Editor: Marc Artzrouni, Department of Mathematical Sciences, Loyola University, New Orleans, LA 70118, U.S.A. ECU 132.00 (US \$126.00) per year. Available from Gordon and Breach Science Publishers S.A., c/o STBS Ltd., P.O. Box 90, Reading, Berkshire RG1 8JL, U.K., or P.O. Box 786, Cooper Station, New York, NY 10276, U.S.A.

According to the publisher, *Mathematical Population Studies* serves as a forum for the exchange of views between researchers in academia, international organizations, research institutes, and statistical offices throughout the world. Contributors include mathematicians, demographers, (bio)statisticians, sociologists, economists, biologists, actuaries, geographers, and others who are interested from their particular vantage point in the mathe-

mathematical formulation of population-related questions. Each issue contains abstracts of related articles, abstracts in French, software announcements, and book reviews.

CENSUS REPORTS

Census of India 1991. Series-1 India. Paper 3 of 1991, Provisional Population Totals: Workers and Their Distribution by Amulya Ratna Nanda. New Delhi: Registrar General and Census Commissioner, India. viii, 590 pp. Paper. Available from Registrar General and Census Commissioner, India, Ministry of Home Affairs, Government of India, 2/A Mansingh Road, New Delhi-110011, India.

This is the third and last volume in the series of provisional 1991 census totals for India as a whole. (Papers 1 and 2 were annotated in *APPE*, Vol. 4, No. 4, and Vol. 5, Nos. 2-3, respectively.) It focuses on workers—both those defined as main workers, who are classified by four broad types of economic activity (cultivators, agricultural laborers, household industry workers, and other workers), and marginal workers. Main workers are those who worked in some economic activity for the major part of the year preceding the census, whereas marginal workers are those who worked for less than six months during the year.

The volume presents 10 provisional tables and an analysis of the composition of the Indian work force. Maps and charts illustrate the analysis.

To be sure that the economic activity of unpaid workers, particularly of women and children, was counted in the census, the 1991 census questionnaire specifically

mentioned "unpaid work on farm or in family enterprise" when asking respondents if they had worked. Census enumerators were instructed to ask probing questions about work done at any time during the previous year, especially in the case of women, and posters supplied by the United Nations Development Fund for Women, emphasizing the importance of recording women's work, were widely distributed prior to the census.

The 1991 census also attempted to gauge the number of new entrants to the labor force by including in the questionnaire a question for nonworkers about whether they were seeking work and, if so, whether they had ever worked before.

The provisional number of workers in India's population of 836.6 million was 314.9 million, or 37.6% of the total, of whom 71% were male and 29% female, 79% rural and 21% urban. The work participation rate was 51.5% for males and 22.7% for females. It was higher in rural areas (40.1%) than in urban areas (30.4%), especially among females.

The total work participation rate has been rising since 1971, but the rise has not been uniform. Among males there has been a slight decline, whereas the rate for women has risen by more than 3 percentage points over the last decade alone. (Part of the increase among females may be due to the greater effort to count female workers.) Most of the increase has also occurred in rural areas. Tamil Nadu registered the highest rate of work participation (57.0%) and Sikkim the highest female participation rate (52.7%) in 1991.

Among the working population, 9.4% were marginal workers. About 85% of the marginal workers were female.

India's work force is still predominantly agricultural. Of the 285.4 million main workers in 1991, 38.7% were cultivators and 26.1% were agricultural laborers. Another 3.6% worked in household industries. All other job categories combined accounted for only one-third of main workers.

Final work force tabulations from the 1991 census will include distributions of workers by age, educational level, migration, and other variables.

SUPERMAP 2. Issued by the Department of Statistics, New Zealand, 1992. Available from Information Consultancy Group, Department of Statistics, 70 Symonds Street, Private Bag 92003, Auckland, New Zealand (Fax: 0-9-379 0859).

SUPERMAP 2 is a data base containing summary data from the 1991 Census of Population and Dwellings and some variables from the 1981 and 1986 censuses, available on a CD-ROM disk that can be used on a personal computer having the WINDOWS environment. It can be used to create tables, maps, and graphs of population characteristics for any area of the country, including areas as small as a small city block. Among its features are map overlays showing major topographical features such as rivers and lakes, roads, and railways, and detailed street maps for Auckland, Wellington, and Christchurch.

The census data include age, ethnic origin, education, marital status, industry, occupation, income, work status, unemployed, hours worked,

household size, household income, tenure, rent paid, and families.

SUPERMAP 2 is available on a regional basis and for an annual fee, the amount ranging from NZ \$2,200 for Lower North Island to \$4,000 for all of New Zealand. Hardware requirements for the IBM environment are 286 or more megabytes of core memory, 2 megabytes of random-access memory (RAM), 3 megabytes of disk space, a color monitor, WINDOWS 3 software, a mouse, and a CD-ROM reader. For the Macintosh environment they are at least a Mac Plus computer, 2 megabytes of RAM, 3 megabytes of disk space, a color monitor, a mouse, and a CD-ROM reader.

FOREIGN-LANGUAGE MATERIALS

The Forum welcomes information about and review copies and English-language summaries of population materials in local languages of the Asian and Pacific region.

Exploration of Opportunities to Promote Condom Use in Brothels to Prevent the Spread of AIDS by Yothin Sawaengdee and Pimonpan Isarabhakdi. In Thai with an English-language summary. Bangkok: Institute for Population and Social Research, Mahidol University, 1990. viii, 104 pp. (paper). ISBN 974-586-870-1, IPSR Publication No. 144. Available from Institute for Population and Social Research, Mahidol University, 25/25 Phuthamonthon 4 Road, Salaya, Nakornchaisri, Nakhon Pathom 73170, Thailand.

This monograph reports on a 1990 focus-group study of 61 low-income prostitutes, their clients, and the proprietors of the brothels where the prostitutes worked. The human im-

munodeficiency virus (HIV), which causes the fatal acquired immune deficiency syndrome (AIDS), is known to be spreading rapidly among low-income prostitutes in Thailand, particularly in Chiang Mai, the capital of the Northern Region, where 40% of such commercial sex workers were reported to be infected with the virus as of June 1989. Regular condom use by persons who have multiple sex partners can prevent the spread of HIV. The study, which was conducted over a three-month period in a district town in Chiang Mai Province and a seaside district in Choburi Province, was designed to identify the obstacles to condom use in brothels and to suggest strategies for overcoming those obstacles.

The study found that many of the low-income prostitutes and their clients did not regard unprotected sex as particularly hazardous. Some prostitutes thought that HIV could be prevented by personal cleanliness or cured with antibiotics; others who wished to protect themselves from sexually transmitted diseases had little power to insist on condom use if their clients were opposed to it. Some brothel proprietors discouraged condom use because it prolonged each sexual encounter, thus reducing client turnover and income.

The researchers concluded that a broad-based educational approach that targeted prostitutes, their clients, and brothel managers and proprietors was needed to establish a policy of regular condom use in Thai brothels. For prostitutes, the educational message should encourage hope for a desirable future and hence a reason to stay healthy; for clients, the message should

stress facts about HIV transmission and advice on preventing it.

"Mama-sans," older women who work, often as managers, in the brothels and are respected by the younger prostitutes, should be targeted for a leadership role in promoting a policy of regular condom use. Brothel proprietors should be encouraged to band together in requiring condom use by all their clientele.

Finally, although prostitution is illegal in Thailand, the researchers concluded that "educational strategies that are pursued in the brothel setting are not likely to succeed unless the government removes barriers to trust and collaboration. [We] were favorably impressed by the number of brothels that were operated by educated married couples. These establishments can easily be recruited into the anti-AIDS campaign through an approach of mutual trust and understanding." (p. xxiv)

Newsletter of Social Sciences Research on AIDS. Published quarterly by the Institute for Population and Social Research, Mahidol University. In Thai. Available for the cost of postage from Institute for Population and Social Research, Mahidol University, 25/25 Phuthamonthon 4 Road, Salaya, Nakornchaisri, Nakhon Pathom 73170, Thailand.

This four-page quarterly newsletter reports on AIDS-related research both in Thailand and abroad. Issues include useful tips on funding sources and grant application procedures. The newsletter is intended for Thai researchers, academicians, policymakers, and interested persons in both government and non-governmental organizations. □

Announcements

Twenty-Fourth Summer Seminar on Population Is Planned for 1993

The Program on Population is accepting applications for the Twenty-Fourth Summer Seminar on Population, to be held in Honolulu and in Japan from 1 June to 6 July 1993. The Summer Seminar, held annually since 1970, provides an opportunity for professionals in population-related fields to share and expand their knowledge of population and its relation to social and economic change.

The 1993 program begins at the East-West Center with four weeks of intensive workshops, each focusing on a current research topic. After the Honolulu portion of the program, the group will travel to Japan for a fifth week of lectures, discussions, and field trips under the cosponsorship of the Nihon University Population Research Institute of Tokyo, Japan.

Four workshops will be offered that will focus, respectively, on health care financing, geographic analysis of demographic change, secondary analysis of demographic and health survey data, and analytical tools for family planning. Ten to 15 participants will be selected for each workshop.

Health Care Financing

The objectives of this workshop are to introduce the participants to the fundamental principles of insurance theory, health economics, and health finance; to apply those principles to public policy issues affect-

ing health finance in developed and developing countries; to prepare country-specific background papers on health care systems and health finance in the Asia-Pacific region; to identify primary and secondary source data to support health finance research; and to prepare future collaborative research agendas on health finance involving workshop participants and East-West Center researchers. Coordinators: Gerard Russo, research associate, Program on Population, and Alejandro Herrin, professor of economics, University of the Philippines.

Geographic Analysis of Demographic Change

This workshop will focus on the use of geographically disaggregated data to examine policy issues and theoretical concerns about the spatial development of nations and the impacts of program effort on that spatial development. The goals of the workshop are to encourage clear documentation of national data files and the wide circulation of these files for analysis; to encourage comparability of data collection, coding, and even analysis; to link the producers and custodians of such data files with scholars within and outside the region interested in using them; to link all of these groups with the theoretical literature from human ecology and qualitative geography; and to train participants in the use of relevant computer technology, including PopMap and other software. Coordinators: Peter Xenos, research associate, Program on Population, and

Dudley Poston, professor and head of the Department of Sociology, Texas A&M University.

Secondary Analysis of Demographic and Health Survey Data

In this workshop, participants will work on in-depth analyses of data from Demographic and Health Surveys (DHS). Illustrative topics include marriage patterns and fertility; determinants of unmet need for contraception; projections of method mix for future family planning programs; determinants of infant mortality; correlates of childhood morbidity; health service utilization in relation to child morbidity and family planning use; and identifying which subgroups in a population are most affected by problems in health and family planning service delivery. Government, university, and other researchers who are responsible for analyzing DHS data are encouraged to apply. Coordinators: James A. Palmore, research associate, Program on Population, and John W. Molyneaux, consultant and post-doctoral fellow at the RAND Corporation.

Analytical Tools for Family Planning: Policy Promotion, Program Implementation, and Financial Analysis

The objective of this workshop is to familiarize participants with a variety of microcomputer-based models and presentations that are useful for family planning policy promotion, program implementation, and financial analysis. These tools can help program managers

project their future resource needs accurately and design strategies for using available resources efficiently; they can also help policymakers justify growing family planning budgets, mobilize sufficient resources to conduct their programs, and evaluate program performance. The workshop will consist mainly of laboratory sessions in which participants will gain hands-on experience in applying selected models to data from their own countries. The laboratory sessions will be augmented by formal presentations and discussions of the theoretical foundations of the models, data selection and preparation, and interpretation of the results. Priority will be given to applicants who are affiliated with government agencies, are familiar with basic microcomputer operations, have access to microcomputers in their workplace, and can assemble data needed for country-specific applications prior to their arrival. Coordinator: Dennis Chao, senior economist, Research Triangle Institute.

Eligibility, Costs, and Application Procedures

Applicants should be university graduates proficient in the English language and have had some training in the population field. Preference will be given to applicants holding appointments at universities or at other organizations or government agencies involved in research or planning, and to doctoral candidates whose dissertation research is directly related to one of the workshop topics.

The cost of the seminar, excluding airfare, is US \$2,654. This amount covers tuition, a mandatory

registration fee, dormitory housing, and a living allowance of US \$30 per day in Honolulu and an adjusted amount in Japan. Some full and partial scholarships will be awarded to applicants who are citizens or permanent residents of Asian and Pacific countries or the United States. Scholarships may also cover round-trip airfare by the most economical means. Because scholarship funds are limited, all applicants are encouraged to seek funding from their home organizations or governments or from outside funding agencies, or to provide for all or part of their costs by continuing current fellowships, grants, and contracts.

Detailed information about the seminar and application forms are available from:

Twenty-Fourth Summer Seminar
on Population
Program on Population
EAST-WEST CENTER
1777 East-West Road
Honolulu, Hawaii 96848, U.S.A.
Telephone: (808) 944-7444
Fax: (808) 944-7490
Cable: EASWECEN HI VIA WUW
Telex: (230) 989171 EWC UD
Easylink: 62932956
Bitnet: PI@EWC

In addition to completing an application form, applicants must submit a workshop statement that describes their relevant education, research, and work experience, and that indicates how participation in this seminar will benefit future work. Citizens and permanent residents of Bangladesh, Burma, India, Singapore, Tonga, and Western Samoa may not apply directly to the Program on Population but must apply through their respective

East-West Center country representatives.

The deadline for receipt of applications is 12 February 1993. Successful applicants will be announced by 15 March 1993.

U.S. Census Bureau's International Statistical Programs Center Announces Workshop Training Program for 1993

The International Statistical Programs Center of the U.S. Bureau of the Census will hold 10 workshops in Washington, D.C., between May and December 1993. The workshops are open to personnel of any organization involved in planning and conducting statistical programs. Two workshop series will be offered, one in computer technology and the other in management. A new workshop, Training for the 21st Century, has been designed for persons responsible for developing and implementing training, and another, Integrated Microcomputer Processing System (IMPS), will be offered in both French and Spanish, as well as in English.

The workshop titles, starting and ending dates, deadlines for nominations, and program fees are listed below. Except as noted, all workshops will be presented in English, and participants attending more than one workshop will receive a \$200 discount toward each workshop fee.

Computer Technology Series

Integrated Microcomputer Processing System (IMPS), in Spanish: 10 May to 18 June 1993, 1 April 1993 deadline for nominations, \$4,750 fee.

IMPS, in French: 13 September to 22 October 1993, 1 August 1993 deadline for nominations, \$4,750 fee.

IMPS, in English: 8 November to 17 December 1993, 15 October 1993 deadline for nominations, \$4,750 fee.

Local Area Networks: 12 to 23 July 1993, 1 June 1993 deadline for nominations, \$1,950 fee.

Advanced IMPS: 26 July to 6 August 1993, 1 June 1993 deadline for nominations, \$2,750 fee.

Software Tools for Data Dissemination: 9 to 20 August, 15 June 1993 deadline for nominations, \$1,950 fee.

Management Series

Training for the 21st Century: 14 June to 2 July 1993, 1 May 1993 deadline for nominations, \$2,800 fee.

Human Resources Management in Statistical Organizations: 12 to 23 July 1993, 1 June 1993 deadline for nominations, \$1,950 fee.

Improving Organizational Effectiveness: 26 July to 13 August 1993, 1 June 1993 deadline for nominations, \$2,800 fee.

Managing Statistical Organizations for Total Quality: 16 to 27 August 1993, 1 July 1993 deadline for nominations, \$1,950 fee.

For more information contact:
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Hong Kong and New Zealand Have New Government Statisticians

From the Census and Statistics Department of Hong Kong comes word that Frederick Wing Huen Ho has succeeded retiring Benjamin Mok as commissioner for census and statistics. Mr. Ho joined the department in 1972 and held the position of deputy commissioner between 1988 and January 1992, when he assumed the commissioner post. Mr. Mok was commissioner between 1988 and December 1991.

In the New Zealand Department of Statistics, Len Cook has become the new government statistician, replacing Steven Kuzmicich, whose contract ended in late 1991. Reporting to Cook are three group managers: Ronald Welply, heading the Survey Management Group; Denis Trewin, in charge of the National and Regional Statistics Group, which is responsible for data analysis; and Geoffrey Smith, managing the Information Services Group, which disseminates and markets the department's statistical products and services.

Association for Voluntary Surgical Contraception Revises Mission, Programs, and Organization

Looking toward the year 2000, the 50-year-old Association for Voluntary Surgical Contraception (AVSC), has expanded its mission and begun developing a strategic plan for making its programs, designed to help improve reproductive health in the United States and elsewhere in the world, more effective. The organiza-

tion, which is based in New York, will continue to work to make safe and voluntary sterilization services more available and more accessible to men and women. At the same time, it plans to apply its experience with voluntary sterilization to other methods of contraception that require medical procedures, such as Norplant, intrauterine devices, and injectables. In addition, it will increase its activities in training, family planning counseling, quality assurance, information and education, public affairs, and professional communication.

AVSC's governing board has appointed Hugo Hoogenboom, former executive director of AVSC, to the position of president. Two new vice presidential positions have been filled by Terrence W. Jezowski, formerly director of the International Programs Division and the recently appointed director of planning, and Amy Pollack, AVSC's medical director. The new Planning Division, headed by Jezowski, is expected to enable AVSC to move more rapidly into new programmatic areas and to improve the management of the organization's financial and human resources.

A new Field Operations Division is designed to provide support to the more than 40 country programs that AVSC manages through its field offices. Headed by Lynn Bakamjian, the division will implement AVSC's plan for greater decentralization of its operations to the field and will forge closer relationships between the organization's international and U.S. programs. AVSC's Asia Regional Office, located in Dhaka, Bangladesh, is directed by Nancy Piet-Pelon. □

LAST ISSUE

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How Female Education Affects Reproductive Behavior in Urban Pakistan

by Zeba A. Sathar and Karen Oppenheim Mason

This article explores the routes through which female education affects fertility in urban Pakistan. It first considers whether the inverse association between female education and cumulative fertility can be explained entirely by such variables as marriage duration and the extent of breast-feeding, known as child-supply variables. Then, having found that supply factors do not explain the relationship completely, it considers demand factors and fertility-regulation costs as possible explanations. The results suggest that a combination of supply, demand, and fertility-regulation factors explains the negative relationship between education and fertility, implying that increased investment in education for females could encourage significant fertility decline in urban Pakistan.

DESPITE HAVING a national family planning program of almost three decades' standing and government policies intended to reduce the country's birth rate, Pakistan has yet to experience significant long-term declines in fertility. In what remains essentially a pretransitional reproductive setting, contraceptive prevalence rates are

remarkably low. In 1991, only 11.9% of married women were using contraception, up from 9% in 1985 (NIPS, 1992:62; Pakistan, Population Welfare Division, 1986:88).

As in many other pretransitional settings, however, the population of Pakistan has several groups of "fore-runners" who are leading the way

ASIAN AND PACIFIC POPULATION FORUM

Editor Sandra E. Ward
Editorial Board Fred Arnold, Minja Kim Choe, Griffith Feeney, Robert C. Schmitt, Kirk Smith
Production Clifford Takara, Lois M. Bender

The *Asian and Pacific Population Forum*, published by the Program on Population of the East-West Center, contains articles on population issues affecting the Asia-Pacific region, book reviews, and news about population activities in the region. Single copies are free to individuals and organizations engaged in population-related work. All manuscripts are peer-reviewed. Requests for copies should be directed to: Distribution Office, East-West Center, 1777 East-West Road, Honolulu, Hawaii 96848, U.S.A.

The Office of Population, U.S. Agency for International Development, provided support for this issue.

The U.S. Congress established the East-West Center in 1960 to foster mutual understanding and cooperation among the governments and peoples of the Asia-Pacific region, including the United States. Officially known as the Center for Cultural and Technical Interchange Between East and West, it is a public, non-profit institution with an international board of governors. Principal funding for the Center comes from the U.S. government, with additional support provided by private agencies, individuals and corporations and more than 20 Asian and Pacific governments.

The Center promotes responsible development, long-term stability and human dignity for all people in the region and helps prepare the United States for constructive involvement in Asia and the Pacific through research, education and dialogue. It provides a neutral meeting ground at which people with a wide range of perspectives exchange views on topics of regional concern. Some 2,000 scholars, government and business leaders, educators, journalists and other professionals from throughout the region annually work with the Center's staff to address topics of contemporary significance in such areas as international economics and politics, the environment, population, energy and mineral resources, cultural studies, communications and journalism and Pacific Islands development.

The PROGRAM ON POPULATION conducts research and training activities in the population field, with emphasis on social and economic aspects of population in the Asia-Pacific region.

toward fertility transition, most notably urban women with post-primary levels of education. Educated urban women tend to have higher levels of contraceptive use and lower desired and achieved fertility than their less educated rural counterparts (Casterline 1984; Sathar et al. 1988). Pakistan's recent rise in contraceptive use from 9% to 11.9% has occurred almost entirely in urban areas, where better-educated women are concentrated and where contraceptive prevalence rates are now around 26%.

This study investigates the reasons why education has been leading to a reduction in marital fertility among urban Pakistani women. We are particularly interested in whether the negative impact of education on fertility results entirely from the effects of schooling on delayed marriage that reduce women's exposure to the risk of conception, or instead results from educational outcomes that lead to the deliberate limitation of fertility within marriage.

This issue is important because fertility normally attains low levels only when the deliberate limitation of marital fertility becomes widespread in a population. A better understanding of the impact of education on women's reproductive goals and behavior is also important because it can provide clues about the reasons for sustained high fertility throughout most of Pakistan and in certain other South and West Asian settings. It may also suggest potential demographic effects of particular educational interventions.

A better understanding of education's impact on women's reproductive goals and behavior can provide clues about the reasons for sustained high fertility in Pakistan and certain other Asian settings.

Theoretical Background

Fertility is frequently conceptualized as resulting from the interaction of three factors—the "supply" of children, the "demand" for children, and the "costs" of fertility regulation (Easterlin 1975; Lee and Bulatao 1983). In this scheme, the "supply" of children refers to the number of children who would be born in the absence of deliberate attempts to limit their numbers.

Empirical studies have shown that the supply of children is most strongly affected by two factors: (1) the amount of time that women are exposed to the possibility of child-bearing, or the average duration of marriage in the female population, which in Asia is determined primarily by the age at which females first marry; and (2) the extent of postpartum amenorrhea, which is determined primarily by the average duration and intensity of breastfeeding (Bongaarts 1982). Education may influence fertility by affecting both factors, although in most developing countries it is mostly via exposure time that it is likely to decrease fertility. This is because

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better-educated women in such countries typically breast-feed less than their less-educated counterparts; hence they have a shorter period of postpartum amenorrhea and, other things being equal, higher fecundability (i.e., monthly probability of conception). The low contraceptive prevalence rate in Pakistan suggests that education may lower fertility entirely through child-supply processes, in particular through a higher than average age at marriage among well-educated women. If this is the case, then further investments in female education, although likely to lower fertility somewhat, will alone be unlikely to bring down fertility to the levels desired by the government (Ministry of Population Welfare 1991).

In addition to influencing the supply of children, female education is frequently hypothesized to affect both the demand for children and the costs of fertility regulation—not only its monetary costs, but also the social and psychological costs of birth control. (See Cochrane 1979 for details about the linkages between education and fertility determinants.) Three hypotheses about the consequences of education for child demand and fertility-regulation costs seem especially pertinent to urban Pakistan.

First, economists have suggested that education helps to reduce fertility by improving women's labor market opportunities and wage levels, thereby elevating the opportunity costs of children (Michael 1973). Especially in urban areas, where formal-sector jobs are likely to be more available than in rural areas, literacy and the other skills acquired through formal education are

likely to improve women's employment opportunities and rewards. The jobs available to better-educated women in urban areas are also likely to conflict with childrearing and other domestic responsibilities. In such a situation, if a woman is able to contribute significantly to her family's income, she and her family are more likely to be motivated to limit her fertility so that she can continue to make an economic contribution.¹

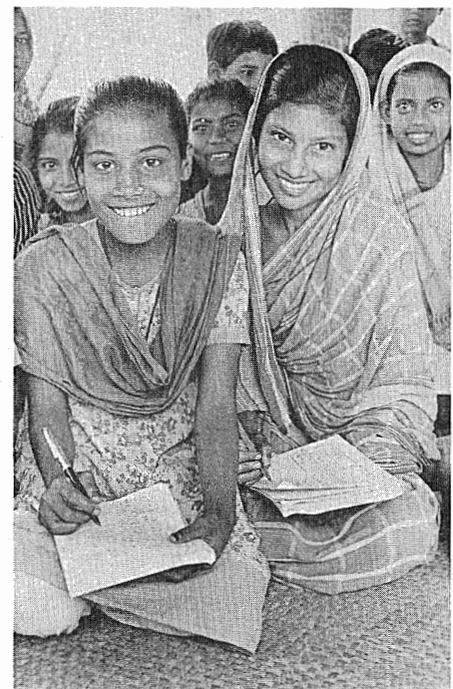
The second hypothesis is that education reduces marital fertility by improving women's status, in particular their authority in family decisions. This in turn is hypothesized to affect both the demand for children and the costs of fertility regulation. Illiterate women, especially those married in childhood, are unlikely to have the resources that would allow them to go against their husband's or mother-in-law's wishes in the matter of contraception or abortion (Mason 1988). Given their economic insecurity, they may also look to sons for support should they become divorced or widowed and for that reason may want to have a large number of children (Cain 1988).

To the extent that education gives women greater knowledge and resources, thereby improving their power within the household, it may increase their ability to practice fertility control. If it also increases their options for old-age support, it may weaken their need to rely on sons for security and status. Thus, better-educated women are

1. In many developing countries, female education is inversely related to employment, but it is usually positively related to employment in the formal sector. (See, e.g., Choi and Brinton 1993.)

hypothesized to have weaker son preferences and a stronger voice in domestic decisions than less-educated women have.

The third hypothesis argues that education leads to a reduction in marital fertility primarily by giving women improved knowledge and access to the means of fertility limitation or by increasing the legitimacy of using those means within marriage. This can occur if better-educated women marry men with higher incomes and are thereby able to purchase birth control methods or obtain information about such methods more easily than are less-educated women. It may also occur



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Female education appears to be a potentially powerful force for reducing fertility in urban Pakistan and for bringing rural Pakistani women up to what is fast becoming a world standard of minimal literacy.

because of the greater knowledge, better skills in learning, and a lesser degree of fatalism that education promotes (Cochrane 1979: chap. 5). We therefore expect better-educated women to have higher family incomes and more favorable attitudes toward the use of contraception than will less-educated women.

In the analysis that follows, we explore the extent to which education affects the marital fertility of urban Pakistan women through supply, demand, and fertility-regulation cost factors.

Data and Methods

The data we analyze were collected in the city of Karachi, Pakistan, during March, April, and May of 1987. Karachi is an appropriate locale in which to conduct a study of Pakistani women's education and fertility because it contains 10% of Pakistan's total population and most of its metropolitan population. Fifty-one percent of Pakistani women with postprimary education live in major cities and another 25% live in other urban areas (NIPS 1992:25). As a consequence, in comparison with rural areas Karachi has a high concentration of women with secondary education, a large number of women who are gainfully employed in professional and clerical occupations, and a high contraceptive prevalence rate—31% as compared with 19% in smaller urban centers and 6% in rural areas (Pakistan, NIPS, 1992:63). It therefore offers much less restricted variance in the variables that are central to our analysis than a national sample would.

The 1987 sample comprised ever-married women between the ages of 15 and 52. One thousand wom-

en, 680 of whom were currently in paid or family employment and 320 of whom were not currently employed, were selected from most major areas of the city by means of a complex nonprobability sampling scheme.² As part of the scheme, an effort was made to select women from high-, middle-, and low-income groups and from squatter settlements, which at the time were estimated to contain about 40% of the city's population.³ Although

2. Employed women were deliberately oversampled. At the time the sample was drawn, the ratio of employed to nonemployed married women in Karachi was estimated to be approximately 7:100, a ratio that made simple or even systematic random sampling unacceptable. The investigators consequently used a 1986 pilot survey as the basis for sampling employed women, and then sampled the nonemployed separately.

3. The sample of employed women was drawn primarily from work sites. In 1986 a pilot survey had identified heavy concentrations of women working both outside the home and within it in all geographic subareas of Karachi. For the 1987 study, widely dispersed factories, offices, banks, schools, government offices, health centers, and residential neighborhoods (including *katchi abadis*, or squatter settlements) having a high concentration of employed women were chosen purposively, and all working women employed at those sites were interviewed for the study. Additional sites containing home workers were added, based on information obtained by field supervisors during the field work.

To obtain a control sample of nonemployed women, the researchers stratified all major geographic subdivisions of Karachi (including many of the *katchi abadis* ignored in government surveys) according to income into three groups, using statistics supplied by the Federal Bureau of Statistics of Pakistan plus personal knowledge about the *katchi abadis*, virtually all of which are poor. Geographic areas within each of the three strata were then chosen purposively and ever-married women were selected through household screening until an areal quota was met. For a more detailed description of the sampling procedures, including identification of the specific sites included in the sample, see Sathar and Kazi (1988).

they did not constitute a probability sample, the households included in the sample were remarkably consistent in their age and sex distributions with the corresponding 1981 census distributions for Karachi (data not shown).

In addition to providing a sizable variance on women's education and employment status, the Karachi survey is desirable for our analysis because it gathered information on a number of variables that are likely to intervene between women's education and fertility, including their employment experience, attitudinal measures related to women's authority in household decisions, and the major child-supply variables. The data are thus better suited to disaggregating the education-fertility relationship into its component parts than are data from most previous fertility and contraceptive-prevalence surveys in Pakistan.

In the analysis that follows, we use two fertility measures: (1) the number of children born alive to each woman in the sample, and (2) the number of children born alive to her during the five years prior to the survey interview. The first measure accords more closely with the hypotheses, but the second may be more suitable to causal interpretation because it refers to approximately the same time period as that to which many of the independent variables pertain.

Our analysis strategy is as follows. First, we ask how education is related to fertility *and* to each of the variables that are thought to intervene between education and fertility. We do this to make certain that the intervening variables have the expected relationships with education. We then examine the relation-

ship of each intervening variable to fertility, again to be certain that the relationships have the expected form.

Next, we explore multivariate models in which education and some or all of the intervening variables are used to predict fertility. In this portion of the analysis, we first ask how the education-fertility relationship is affected when we control for the child-supply variables alone, and then we introduce the remaining intervening variables. This two-step approach is used to ascertain whether the child-supply variables are capable of explaining the entire education-fertility relationship.

We use two child-supply indicators, the duration of a woman's current marriage and the length of breast-feeding in her last closed birth interval.⁴ Marriage duration is expected to have a positive relationship to the number of children ever born, and length of breast-feeding, a negative relationship.

Also included in the model is the woman's age at first marriage. Although that is usually treated as an exposure, or supply, measure, it seems likely to tap differences in women's attitudes toward marriage, fertility, and the use of contraception when used in conjunction with marriage duration. Past studies have suggested that women who marry at older ages are less traditional in their outlook than are women who marry young (Mason 1988). Moreover, in a cross-sectional analysis in

which marriage duration is held constant, age at marriage becomes a measure of the birth cohort. (That is because a woman's current age is equal to her age at first marriage plus her marriage duration—at least among currently married women who have married only once.) If attitudes have changed over time, women in the more recent birth cohorts are likely to have less traditional outlooks than women in the older cohorts.

Besides age at first marriage, we use six additional indicators of the demand for children: (1) whether a woman has a favorable attitude toward the use of contraception; (2) family income minus the woman's own contribution, which is also a potential measure of social status, of the costs of fertility regulation, of the parents' aspirations for their children's education, and of other unmeasured aspects of child demand; (3) whether the woman works in the formal sector of the economy—which is a rough indicator of the opportunity costs of children, given that wages are generally higher, job security greater, and conflicts between work and child-care more severe in the formal sector than in the informal sector; (4) the ratio of the number of girls to the number of boys that the respondent says is ideal to have, which is a measure of her preference for sons; (5) two attitude questions about whether the respondent should have a voice in family decisions about fertility and finances;⁵

and (6) a question about whether the respondent expects to support herself in old age, rather than rely on her children.⁶

The entire analysis is performed using ordinary least squares (OLS) regression estimates. Throughout the analysis we not only examine all women together but also distinguish between those married less than 20 years and those married 20 years or longer. This distinction is important when analyzing recent fertility because little childbearing takes place during the later years of marriage. The effect of education on recent fertility is therefore likely to be greater in the earlier than in the later years of marriage.

Results

Women in the Karachi sample have more education and fewer children than Pakistani women in general. Table 1 shows the means of the variables used in the analysis, both for the total sample and according to marriage duration. Most of the differences between marriage-duration groups are as one would expect. Women married for longer periods have more children, but fewer born in the past five years, than other women. They also breast-fed their second-to-last child longer than did women married for shorter durations—a difference that probably reflects a secular decline in breast-feeding among Pakistani women rather than a change over the life course.

4. More than 98% of women in the sample were in their first marriage; hence the restriction of marriage duration to the current marriage does not seriously bias the measurement of total exposure to the risk of childbearing.

5. The questions were: "Who do you think should decide on how many children to have?" ("wife" and "couple" were coded as 1; all other responses were coded as 0); and "Who do you think should decide family expenditure?" (same coding).

6. The question was: "What means of financial support do you think you might have when you get old?" ("pension" and "rents" were coded as 1; "children," "God knows," and "other" were coded as 0).

Longer-married women have had considerably less education than the other women in the sample, but have slightly higher incomes. They are less likely to work in the formal sector and, perhaps because of that, are less likely to expect to support themselves in old age. Their attitudes about having sons versus daughters, family planning, and family decisions differ little, however, from those of younger women.

Table 2, which presents a series of zero-order OLS regression coefficients relating education to fertility

and to each of the intervening variables, indicates (in row 1) that better-educated women have fewer children than do less-educated women, an effect that is slightly stronger among women married for less than 20 years than for those married longer. According to the regression for the total sample, women who have completed 10 years of education have, on average, between one and two fewer children than do their counterparts who have had no formal education.⁷

Education also has an inverse

relationship with recent fertility, although only among women married for fewer than 20 years. In this group, a 10-year increment in education predicts that a woman will have had, on average, approximately two-fifths of a child less than other women during the previous five years. Although this difference is not large in absolute terms, it is sizable in relation to the average number of children born in this group (.81). For the Karachi sample, then, education has a strong, inverse effect on the number of children born, both during the previous five years and cumulatively since marriage.

Table 2 shows that education is related to each of the proximate determinants of completed fertility in the manner one would expect. Better-educated women marry considerably later than their less-educated counterparts and, in consequence, have been married for fewer years at the time of the survey interview. The better-educated also breast-feed their children for a shorter interval than do less-educated women. The direction of this latter relationship means that educational differentials in breast-feeding patterns cannot explain why better-educated women have fewer children than do less-educated women. Because of this finding, we drop breast-feeding du-

Table 1. Means of variables used in the analysis of female education and fertility: Karachi sample

Variable	All women	Women married < 20 years	Women married 20+ years
No. of children ever born	3.79	3.02	5.16
No. of children born in the last five years	.60	.81	.21
No. of children born previously ^a	2.98	2.12	4.53
Age at first marriage	19.16	20.51	16.72
Duration of current marriage (years)	15.81	10.09	26.10
Duration of breast-feeding (months) ^b	10.07	8.41	13.05
Whether favors family planning	.76	.78	.71
Education (years)	5.50	6.94	2.91
Net family income (1,000 Rs) ^c	4.85	4.78	4.98
Whether works in the formal sector	.36	.41	.27
Ratio of ideal number of girls to boys	.85	.85	.86
Whether wife should decide about family size	.52	.54	.48
Whether wife should decide about family finances	.52	.52	.54
Whether expects to support self in old age	.16	.21	.06
Number of cases	977	628	349

a. Number of children born prior to five years before the survey.

b. Months of breast-feeding in the last closed birth interval. Those with no closed birth interval are scored zero.

c. Amount of family income (in rupees) minus the wife's contribution.

7. Metric OLS regression coefficients show the change in the dependent variable per unit of change in the independent variable. Hence, according to the coefficients shown in the first row of Table 2, a 10-year increment in education produces an estimated change in fertility ranging between -1.62 and -1.03 children. An analysis using a dummy-variable classification of education has shown that the relationship is basically linear in form.

ration from the remainder of the analysis.

Table 2 also shows that better-educated women have a more favorable attitude toward family planning than do less-educated women. They have higher family incomes, are more likely to work in the formal sector, have somewhat weaker son preferences, and are more likely to feel that they should have a voice in family decisions. Moreover, better-educated women are more likely than less-educated women to plan on supporting themselves in old age. Thus, with the exception of the breast-feeding variable, all the intervening variables have a positive or negative relationship with education that is consistent with the hypotheses reviewed earlier.

We now consider the relationship of each intermediate variable to fertility. Zero-order regression coefficients for these relationships are shown in Table 3, in the left-hand panel for cumulative fertility and in the right-hand panel for recent fertility. Generally, these relationships have the form that one would expect from the hypotheses reviewed earlier. Longer-married women have higher than average fertility, those married later have lower fertility, and those favoring family planning also have lower fertility—although the effects of this last variable are significant only for cumulative fertility among the more recently married women. Family income is negatively related to fertility, although again primarily among younger women. Formal-sector employment has a strong negative relationship to fertility, as does a respondent's belief that the wife should have a voice in family deci-

Table 2. Zero-order relationships of education to fertility and to the intervening variables

Dependent variable	All women	Women	Women
		married	married
		< 20 years	20+ years
No. of children ever born	-.162**	-.132**	-.103**
No. of children born in the last five years	-.001	-.019**	-.010
No. of children born previously	-.135**	-.098**	-.063**
Age at first marriage	.433**	.438**	.211**
Marriage duration	-.554**	-.243**	-.125*
Breast-feeding duration	-.554**	-.540**	-.354**
Whether favors family planning	.020**	.019**	.022**
Net family income	.467**	.486**	.619**
Whether works in the formal sector	.039**	.044**	.026**
Ratio of ideal number of girls to boys	.004**	.006**	-.000
Whether wife should decide about family size	.019**	.024**	.005
Whether wife should decide about family finances	.009**	.014**	-.001
Whether expects to support self in old age	.030**	.031**	.022**
Number of cases	977	628	349

Note: Each number shown in the table is a metric regression coefficient estimated from a separate OLS simple regression equation in which education is the independent variable.

*Significant at .05 level.

**Significant at .01 level.

sions and her expectation that she will support herself in old age.

The only unexpected relationship shown in Table 3 is between the ideal sex ratio and fertility; although the relationship is statistically insignificant, it is positive instead of negative, meaning that those with weaker son preferences have more rather than fewer children than those with strong son preferences. The positive form of the relationship means that the ideal sex ratio cannot explain the education-fertility relationship. We therefore drop it from further analysis.

Next, we consider whether child-supply variables are able to explain

the relationship between education and fertility in the Karachi sample. Table 4 shows the education coefficients from a series of OLS regression equations. The top row displays the original, zero-order relationships already examined, whereas subsequent rows show these relationships after control variables have been introduced.

As was noted earlier, marriage duration is clearly a child-supply or exposure variable. Less clear is whether age at marriage is also a measure of exposure, once marriage duration has been controlled. We are inclined to argue that it is not. Because of this ambiguity, we first

control for marriage duration, then add age at marriage to each equation as a further control. The effect that this procedure has on the

education-fertility coefficients is shown in the third and fourth rows of Table 4.

Even if age at marriage is treated

as a measure of exposure to child-bearing, the results in Table 4 suggest that child-supply factors, although important, are unable to

Table 3. Zero-order relationships of education and the intervening variables to fertility

Independent variable	Children ever born			Children born in the last 5 years		
	All women	Women married <20 years	Women married 20+ years	All women	Women married <20 years	Women married 20+ years
Education	-.162**	-.132**	-.103**	-.008	-.021**	-.006
Previous fertility ^a	—	—	—	-.054**	-.029	.050**
Marriage duration	.144**	.260**	-.013	-.039**	-.026**	-.029**
Age at marriage	-.221**	-.173**	-.132**	-.009	-.031**	-.012
Favors family planning	-.682**	-.479*	-.514	.004	-.054	.023
Net family income	-.002**	-.002*	-.002	-.000*	-.001	-.000
Formal-sector work	-1.685**	-1.658**	-.893**	-.310**	-.443**	-.106
Ideal sex ratio (f/m)	.290	.134	.371	.110	.160	.080
Family-size decisions	-.758**	-.928**	-.179	-.175**	-.263**	-.026
Family-finances decisions	-.317	-.381*	-.345	-.133**	-.115	-.077
Self-support in old age	-2.030**	-1.595**	-1.187	-.171*	-.299**	-.126
Number of cases	977	628	349	977	628	349

Note: Each number in the table is a metric OLS regression coefficient from a separate equation in which fertility is the dependent variable and the variable shown in the table is the independent variable. The equations predicting the number of children born in the last five years also control for previous fertility.

*Significant at .05 level.

**Significant at .01 level.

a. These coefficients are estimated net of a control for education.

Table 4. Effects on the education-fertility relationship of controlling for intervening variables

Control variable	Children ever born			Children born in the past 5 years		
	All women	Women married <20 years	Women married 20+ years	All women	Women married <20 years	Women married 20+ years
None	-.162**	-.132**	-.103**	-.001	-.019**	-.010
Previous fertility ^a	—	—	—	-.008	-.021**	-.006
Marriage duration	-.096**	-.076**	-.106**	-.021**	-.025**	-.010
+ Age at marriage	-.061**	-.060**	-.084**	-.010*	-.013*	-.011*
Number of cases	977	628	349	977	628	349

*Significant at .05 level.

**Significant at .01 level.

a. All equations predicting children born in the last 5 years shown lower in the table also control for previous fertility.

explain the entire education-fertility relationship. Where the zero-order education coefficient is significant, it remains significant and strong after marriage duration and age at marriage have been controlled. Thus, it is evident that better-educated Karachi women have fewer children than their less-educated counterparts not only because they marry at a later age, but also because they prefer to have fewer children or find it easier to control their fertility effectively. Investments in female education in urban Pakistan therefore offer the promise of helping to achieve low levels of fertility.

To understand more fully the paths through which education affects fertility in urban Pakistan, we turn to a final set of regression

equations in which we predict fertility from education and from all the variables that might explain why education is negatively related to recent and cumulative fertility. These equations are shown in Table 5.

Better-educated Karachi women have fewer children than their less-educated counterparts not only because they marry later, but also because they prefer to have fewer children and can more easily control their fertility.

As the top row of this table makes clear, in most instances controlling for all the intervening varia-

bles is able to explain away the original education-fertility relationship. This does not mean that education is unimportant for fertility. Rather, it indicates that education operates through the measured intervening variables to influence fertility.

Which are the important intervening variables through which education operates? For the more recently married women, regardless of whether we consider cumulative or recent fertility, four significant intervening variables emerge: marriage duration, net family income, formal-sector employment, and age at first marriage. These findings suggest that education affects fertility for four reasons: (1) because it promotes a later age at marriage and hence reduces life-time exposure to

Table 5. Net relationships of education and the intervening variables to fertility

Independent variable	Children ever born			Children born in the last 5 years		
	All women	Women married <20 years	Women married 20+ years	All women	Women married <20 years	Women married 20+ years
Education	-.033*	-.012	-.060	.001	.005	-.003
Previous fertility	—	—	—	.024*	.007	.041**
Marriage duration	.113**	.225**	-.052	-.047**	-.037**	-.038**
Age at marriage	-.052**	-.035*	-.122*	-.029**	-.027**	-.033**
Favors family planning	.041	-.113	-.285	.055	.116	-.021
Net family income	-.002**	-.002**	-.001	-.000	-.001*	-.000
Formal-sector work	-.819**	-.793**	-.631	-.277**	-.435**	-.072
Family-size decisions	.050	-.080	.341	-.088	-.147	.044
Family-finances decisions	.006	.101	-.430	.064	.157	-.104
Self-support in old age	-.169	-.128	.172	-.002	.023	.037
Intercept	3.519**	2.064**	9.212**	1.907**	1.797**	1.639**
R ²	.338**	.477**	.073**	.222**	.115**	.175**
Number of cases	977	628	349	977	628	349

Note: Each column of the table shows a separate OLS regression equation.

*Significant at .05 level.

**Significant at .01 level.

the risk of childbearing; (2) because it leads women to marry men with higher incomes, which in turn may reduce fertility either because it lowers the cost of fertility regulation or because it reduces the demand for children; (3) because it leads women to take up formal-sector employment, something that is argued to reduce the demand for children; and (4) because it has other unspecified effects on women's values or opportunities, effects that are captured through their birth cohort (as represented by age at first marriage).

It is noteworthy that the only direct measure of the costs of fertility regulation in Table 5, namely whether women favor family planning, no longer has a significant relationship to fertility once the other intermediate variables are held constant. Apparently, merely favoring family planning does not lead directly to a fertility reduction once a woman's exposure time, resources, and demand for children have been held constant.

The measures of women's domestic autonomy and of their expectations of self-support in old age also fail to predict their fertility once other variables have been held constant. Although better-educated women are less likely than other women to expect their sons to support them in old age and are more likely to think they should have a say in domestic decisions, these findings do not explain their relatively low fertility. Rather, it is their greater wealth, involvement in formal-sector employment, and general values or opportunities that explain why they have fewer children once their more advanced age at marriage is taken into account.

Involvement in formal-sector employment, greater wealth, and general values or opportunities explain why better-educated women have fewer children once their older age at marriage is taken into account. Thus, educational differentials in fertility in urban Pakistan are not simply a product of reduced exposure to the possibility of conception.

In sum, then, this analysis has shown that better-educated women in urban Pakistan have fewer children than less-educated women for several reasons: because on average they are married for shorter periods (having delayed marriage), because they face greater opportunity costs associated with childbearing, because they marry relatively well-off men, and because they have more

"modern" attitudes or opportunities than their less-educated counterparts. Although exposure time plays an important role in explaining why education leads to lower fertility, especially among younger women, educational differentials in fertility in urban Pakistan are not simply a product of exposure time. It appears that education also diminishes the demand for children and the costs of fertility regulation, thereby influencing cumulative fertility.

Conclusions

The most important lesson to be drawn from this analysis is that the education of women appears to be a potentially powerful force for reducing fertility in urban Pakistan. Even when differences in exposure time are taken into account, better-educated urban women bear markedly fewer children than do less-educated urban women. For example, at a given marriage duration,

Pakistan's recent rise in contraceptive use from 9% to 11.9% has occurred almost entirely in urban areas, where better-educated women are concentrated and where contraceptive prevalence rates are now around 26%.



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urban women with 10 years of schooling have had on average almost one child fewer than women with no formal education. Greater investments in female education in urban Pakistan therefore seem likely to encourage a fertility decline, not only because they will lead to an older average age at first marriage, but also because they will eventually encourage the limitation of child-bearing within marriage.

Increased investments in female education in urban Pakistan seem likely to encourage a fertility decline, in part because they will encourage married women to limit their child-bearing.

What is less clear from our analysis is whether greater investments in female education might have similar, if somewhat muted, effects in rural Pakistan, where the total fertility rate is still 5.6 children per woman as compared with 4.9 in major cities (NIPS 1992:41). Data from the 1990-91 Pakistan Demographic and Health Survey (NIPS, 1992) show large fertility differentials by education for the population as a whole. This finding suggests that educational differentials in fertility are probably to be found outside as well as inside metropolitan areas such as Karachi. Whether they are caused by anything more than differences in age at marriage, however, is questionable, given the very low contraceptive prevalence rates in rural Pakistan. Moreover, the sequelae of education found to be important in

our analysis, such as formal-sector employment, seem less likely to be relevant in rural Pakistan than in urban centers.

Therefore, in the short run at least, investments in female education in rural Pakistan might have fewer effects on fertility than similar investments made in urban areas. From the viewpoint of human and economic development, however, investment in female schooling in rural Pakistan is clearly important, if only to bring Pakistani women up to what is fast becoming a world standard of minimal literacy. Investments in rural women's schooling should help to reduce the very high level of fertility in rural Pakistan, if only because of education's tendency to delay age at marriage.

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Partner Patterns in the Sexual Behavior of Unmarried, Rural Thai Men

by Peter Xenos, Phichit Pitaktepsombati,
and Werasit Sittitrai

This article explores two interrelated topics in a national sample of young, rural Thai youth. The first is the onset of active sexuality among males as a marker of the progression toward full adulthood. The other is age patterns of what in the literature has become known as "sexual networking"—that is, patterns of sexual activity with two or more partners, whether concurrently or serially. Such networking is a critical issue in efforts to model and predict the spread of acquired immune deficiency syndrome (AIDS), a disease that depends almost completely on sexual networking for its spread outside relatively isolated social groups. After a brief discussion of related studies of Thai youths' attitudes toward sexual activity, data from a 1988 national survey of young males (ages 15–24) about their family planning knowledge, attitudes, and practices are used to document the age pattern of sexual initiation, the prevalence of youths' encounters with commercial sex workers, the prevalence of their experience with non-commercial partners such as friends and casual acquaintances, and the degree to which the two patterns—commercial and noncommercial—are "networked" because young men engage in both types of sexual activity. Finally, background characteristics of male youths that are associated with these patterns of sexual activity are examined.

Overview of Related Studies

A NUMBER of surveys of Thai youths have been conducted in recent years that have shed light on adolescent attitudes and behavior, particularly sexual behavior. The surveys have employed

various designs, sampled different groups within the Thai population, and had a variety of purposes (Table 1). Respondents have included mostly students and young workers. Many of the surveys have focused

on urban areas, and most have drawn samples from only one or at most a few provinces.

It is likely that in any survey of youthful age groups, certain categories of young people are not fully represented. For example, youths who do not live at home with their parents are likely to be more difficult to find and interview than are those who have not left home.

Studies of youth sexuality in Thailand have disproportionately examined the urban stratum, sometimes the urban population as a whole, and sometimes the behavior of youths in particular urban areas. The population of Thailand continues to be primarily rural, however, and important behavioral patterns exist among rural young men that have great significance for policy relating to sexually transmitted diseases, including AIDS.

Only one of those surveys reviewed by us (Debhanom II) was based in principle on a national sample of adolescents (ages 13–20). But because the survey's designers made an effort to sample similar numbers of in-school and out-of-school youth and factory workers, the sample was not representative of the age group; for example, 42.2% of the sample was enrolled in school, a proportion far below the national level of enrollment for

that age group.

The surveys' methodologies have also varied. Some involved face-to-face interviews, whereas others—the Pramote et al., Santhat, Chutamas, Ministry of Public Health (MOPH), and Chuanchem studies—used self-administered questionnaires. Some studies were aimed at producing descriptive data, whereas others (e.g., the Pramote et al. and Chuanchem studies) had more narrowly focused goals and involved experimental and control groups.

Given the studies' limitations and all the differences among them, they offer little basis for generalization, either about the samples themselves or about the national population. For example, the range of results on two important indicators—the percentage of respondents having a favorable attitude toward sexual activity under specified conditions, and the percentage claiming personal experience of sexual intercourse either with any type of partner or with nonprostitutes—is considerable (Table 2). It is impossible to separate the effects of sample design, survey methodology, and the population subgroups described. The following summary of the studies' findings

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Table 1. Summary of survey characteristics: Thailand, various studies of adolescent sexuality

Study	Year of survey	Sample size	Age range	Other features of coverage
Debhanom I (Muangman 1979)	1978	1,598	15–20	Student and factory-worker strata in Bangkok and Nakornrachasima Province
Muangtong (Khemmani 1982)	1980	1,793		Students at Chulalongkorn University
Debhanom II (Muangman 1983)	1982	4,146	13–20	In-school compared with out-of-school and factory-worker strata in 16 provinces of 4 regions
DEEMAR I (DEEMAR 1986)	1986	500	15–22	Single females in Bangkok
DEEMAR II	1990	u	u	u
Pramote et al. (Prasartkul et al. 1987)	1986	361	15–24	Rural and urban areas in Khon Kaen, Kalasin, and Prae provinces
Santhat (Sermisri and Chaiyapak 1987)	1987	510	17–19	Urban vocational students in Khon Kaen Province
Chutamas (Nuchanart et al. 1988)	1987	836		High school students (apparently grades 10–12) in urban Supanburi Province
Ministry of Public Health 1988	1987	7,177		Single students in teachers' and vocational colleges
Wanpen (Uetrakul et al. 1989)	1988	1,195	15–24	Unmarried out-of-school males and females in urban and rural areas of Ubon, Pitsanulok, Chonburi, and Songkla provinces
Chuanchom (Sakondhavat et al. 1987)	1985–86	502	15+	Vocational students in Khon Kaen Province
Sumana et al. (Chompootaweep et al. 1988)	1986–87	4,377	10–20	Teachers and students, grades 7–12, in Bangkok
Chiang Mai University	1991	1,472		Single males, including university undergraduates, military recruits, semi- and unskilled workers

u—data unavailable.

must therefore be regarded as tentative.

Attitudes toward marriage. The majority of respondents in the surveys indicated that they wanted to choose their own mates. Only small proportions of most samples approved of cohabitation outside marriage.

Attitudes toward premarital sex. Substantial percentages of single respondents said they currently had or had ever had a boyfriend or

girlfriend. High percentages of male students considered virginity to be an important attribute of a prospective bride, but substantial percentages also approved of university students having lovers.

Despite important differences among the samples and among social groups within the samples, the studies found that males overall had widespread acceptance of premarital sexual intercourse, provided that sexually active couples planned to marry. The responses of females indicated far less acceptance of pre-

marital sex; and both sexes expressed generally low acceptance when conditions, such as a couple's intention to marry, were not specified.

Premarital sexual practices. Most of the surveys distinguished between two types of premarital sex among Thai adolescents: sex with prostitutes, or commercial sex; and sex with lovers, friends, or acquaintances. Sexual experience with a prostitute was common among males, whereas premarital sexual experience of any kind was considered improper for females.

In the Debbhanom I sample, about 70% of the urban, male factory workers reported having ever gone to a massage parlor or brothel. Approximately one-fourth of male adolescents who were still in school, in both rural and urban areas, had done so. In the Muangtong study, 54% of male students had ever gone to a brothel and 19% had ever engaged in physically intimate behavior short of sexual intercourse with a partner other than a prostitute. Only 6% had had sexual intercourse with a partner other than a prostitute. The DEEMAR I study further reveals that more than one-third of the male respondents thought that they would have premarital sex in the future, compared with only 9% among urban females and 2% among rural females. Several of the other studies report similar results.

Reproductive physiology. Ages 13–15 were the modal ages of menarche among female respondents in these surveys. Knowledge of reproductive physiology seems to have been fairly low. For example,

Table 2. Summary of main results on adolescent sexuality drawn from other studies

Study	% with favorable attitude toward sex			% with sexual experience	
	If engaged	After engagement; plan to marry	Under any circumstances	Overall (any partner)	Excluding with prostitute
Debbhanom I	59–63 (M) <20 (F)			70 (M)	
Muangtong	28 (B)	46 (B)	27 (B)	53 (M)	10 (M) 3 (F)
Debbhanom II	43 (B)	55 (B)		31 (M)	5 (B)
DEEMAR I		22 (F)	1 (F)		
Pramote et al.			82 (M,U) 70 (M,R) 28 (F,U) 20 (F,R)	70 (M,U&R)	5–13 (F)
Santhat				62 (M)	12 (F)
Chutamas				41 (M)	7 (F)
Ministry of Public Health			25 (M) 6 (F)	58 (M)	6 (F)
Wanpen			11 (M) 8 (F)		
Chuanchom				74 (M)	31 (F)

Sources: See Table 1.

Notes: Percentages not available for the studies by DEEMAR II, Sumana et al., or Chiang Mai University. F = females; M = males; B = both sexes; R = rural areas; U = urban areas.



JOHN KNODEL

Recent surveys of mostly urban Thai youth have revealed that premarital sexual experience with both prostitutes and friends is common among adolescent men whereas premarital sexual experience of any kind is considered improper for adolescent women.

49% of the respondents of both sexes in Debhanom I did not know the meaning of "fertile period." No more than one-third of any group in the Pramote et al. study—male, female, rural, or urban—knew when fertilization was most likely to occur during the menstrual cycle, and half of the adolescents placed false confidence in withdrawal as an effective means of contraception.

Knowledge, attitudes, and practices related to contraceptive methods and family planning.

In general, respondents agreed that single people should know about family planning. Almost all of the high school students in the Chutamas study indicated that they intended to use some type of contra-

ception if they ever engaged in premarital sex. A very high percentage (99%) of respondents in the DEEMAR study approved of birth control use by unmarried individuals.

The level of contraceptive knowledge was impressive. Only small proportions of respondents in the Debhanom I study had never heard of or seen modern contraceptive methods. More than 90% of the Chulalongkorn University students in the Muangtong study knew of or had heard about modern methods. In Debhanom II, 91% knew of at least one modern method.

Condoms and oral contraceptives ("the pill") were the best-known methods. In the DEEMAR I study,

89% of the female respondents were aware of family planning methods, particularly the pill. The majority of respondents in the MOPH study also had heard of or seen a modern contraceptive method, again mainly the pill.

Among sexually active respondents, however, the level of contraceptive practice seems to have been low. Only 12% of sexually active males and 3% of sexually active females in the MOPH study had ever used birth control. The majority of those in the Chutamas study who had ever had sex, however, had used some form of contraception, condoms being the most frequently mentioned method. The proportion of respondents who mentioned having knowledge of unmarried friends who were practicing contraception was less than 10%, except among urban factory workers, 19% of whom knew of such couples. In the Muangtong study only 10% of sexually active respondents were using some form of contraceptive.

Condoms were the method most frequently used by males. Among female contraceptors, condoms and withdrawal were most frequently used.

The 1988 National Survey of Adolescent Sexuality

In 1988 the Institute of Population Studies (IPS), Chulalongkorn University, with support from the United Nations Population Fund (UNFPA), conducted a national survey of Thai youth, ages 15–24, about their sexual knowledge, attitudes, and practices. The survey was called the National Survey of Adolescent Sexuality. Initial results

are reported in a collection of research papers prepared for an 1989 seminar on the survey (Pitak-*tepsombati* 1989).

The IPS survey had two design limitations of its own: the sample deliberately omitted respondents from the Bangkok Metropolitan Area (Bangkok-Thonburi), and it was limited to unmarried youth. The issues raised by confining the interviews to the single population are serious ones that bear on the data analysis offered subsequently. Nevertheless, the IPS study improved on most of the previous studies in representativeness and methodology.

Sample design. Except for Bangkok-Thonburi, all of Thailand's five regions were represented. In 1980, 11.1% of the Thai population was living in Bangkok-Thonburi, and that share had increased somewhat by 1988. Bangkok-Thonburi is recognized to be distinct from the rest of the country in the attitudes and behaviors of relevance to the study, and therefore the survey fell short of being a national sample in that important respect. The strength of the sample lies in providing, for the first time, solid data that are broadly representative of the large youth population of middle-sized and smaller cities and towns throughout Thailand, and of the population of rural youth.

In each region, a more modern and a less modern *changwat* (province) were selected. From each *changwat*, two districts (*amphoe*) were selected randomly. From each *amphoe*, one *tambon* (commune) was selected randomly. From each *tambon*, two villages were selected on the advice of the *amphoe* com-

munity development officer. One of these villages was known for its youth activities, whereas the other did not have this positive reputation.

From each village, 25 households were identified with the help of the village headman (*phu yai baan*). These were households containing unmarried adolescents in the age range of 15–24. Difficulties were experienced in locating young people, particularly those who returned to their homes late at night. The youths interviewed excluded those who were away from the village at the time, whether for short or extended periods.

Urban (*tesaban*) samples were obtained from the same *changwat* by taking two enumeration districts from each, one from the center of the town and the other from the periphery. From each, 25 households with unmarried youths (ages 15–24) were identified. Few households contained more than one adolescent. The final sample, which was reduced by only a small number of refusals, comprised 1,018 youths, 529 males and 489 females.

The sampling design produced essentially equal numbers of youths from each of the four regions repre-

sented, thus facilitating regional comparisons. In combining these regional data into estimates for the four regions together, we applied weights to the cases from each region, derived so as to reflect the regions' respective populations of single youths. The weights were based on the 1980 census, the most recently available national data source providing numbers of single persons in the 15–24 age range (Table 3). The sample contained a disproportionate number of respondents from the South and relatively few from the Northeast, but the weights adjust for this discrepancy.

Sample characteristics. We believe that the 1988 IPS study sample offers a broad representation of Thailand's youth population outside the Bangkok-Thonburi area. Although it is difficult to confirm this claim with available data, comparisons with other evidence offer some indication of the survey's coverage.

We are unable to compare the single-year age distribution in our sample with the age distribution of the unmarried population from any other source; single-year data for the unmarried population do not

Table 3. Percentage distributions of Thai youths in survey, by region, weighted and unweighted by census distribution

Region	Survey-unweighted	Census	Survey-weighted
Central	25.1	26.8	26.8
North	24.6	23.7	23.7
Northeast	25.0	35.8	35.9
South	25.3	13.6	13.5
Total	100.0	100.0	100.0

Note: Percentages may not sum exactly to 100.0 because of rounding.

exist for Thailand. Using the available 1980 census data on the single population for five-year age groups, however, we can consider the relative sizes of the 15-19 and 20-24 age groups. We can also compare our data with the age distribution for 1988 in the National Economic and Social Development Board's projections of the population (though that distribution is not available by marital status) and thereby obtain the following percentages for the population in the 15-19 age group:

Sex	1980 census (single)	1988 projec- tion (total)	1988 survey (single)
Males	63.7	60.8	66.0
Females	69.4	66.9	73.6

The 1980 census figures were obtained directly from the census without adjustment, but they reflect conditions eight years before the survey date. Considering the sharp fertility decline that began in Thailand during the 1970s and the fact that the "youth" in our survey were born between 1963 and 1972, we would expect the 1980 levels of fertility to be somewhat higher than in 1988. The projection to 1988 indicates a decline in the share of youths in the 15-19 age group, though it reflects the total and not the single youth population.

In light of these comparisons, we conclude that the survey somewhat overrepresented the age group of 15-19 and somewhat underrepresented the age group of 20-24. This result is as one might expect, since members of the older group were less likely to be living at home with their parents and less likely to be

living in the villages where they were born. Moreover, this was the age group with the highest rates of migration to Bangkok-Thonburi and thus out of the sample areas.

Examination of sex ratios among the single population in the 1980 census and in our survey suggests that much of this omission was of men.

Age group	Males per 1,000 females	
	1980 census	1988 survey
15-19	1,120	917
20-24	1,447	1,389

If we assume that the 1980 census-based sex ratios among the single are correct and applicable to 1988, and if we assume further that the number of single females was correct in the survey, then the implication of the survey sex ratios is that about 22% of single males aged 15-19 were missed from the sample, and about 4% of single males aged 20-24. These estimated percentages would of course be higher if we considered the possibility of female underrepresentation as well.

Another useful comparison is of rates of labor force participation. Participation rates are available from the Labor Force Survey of 1987 (National Statistical Office 1988), but they include all marital statuses. The survey participation rates are lower than in the national data, though the differences are smaller for the older age group than for the younger. The greatest difference is among younger females; those in the labor force were especially underrepresented in the survey. Disproportionate numbers of these young women may have been migrants to Bangkok-Thonburi, or

they may have been working away from their parental homes in circumstances that reduced their chances of being interviewed.

The survey's school enrollment rates were somewhat higher than in the census, but this difference may be due to the census's having been conducted eight years earlier than the survey and to the fact that the census figures included married as well as single students.

Many other characteristics of the sample can be evaluated only informally but, insofar as conclusions can be drawn from them, give no great cause for concern. For example, mean age at menarche in the survey was the mean age found in numerous other studies. Many surveys have systematic biases in their representation of the universes they are designed to represent. We have already noted that the IPS survey deliberately omitted Bangkok-Thonburi. This in itself is not a problem, but many young people from areas that were meant to be represented in the sample are likely to have left those areas for towns and cities, where they were much more difficult to locate for interviews, or for Bangkok-Thonburi.

Asking about unmarried sexuality in Thailand. The ethnographic and sociological literature on Thai society indicates a socio-historical background that permits a wider range of behavior during adolescence than one finds in many traditional social and cultural settings (Yoddumnern 1981; Keyes 1984; Ford and Koetsawang 1991; Havanon et al. 1992). Nevertheless, questions about sexuality intrude into a sensitive area of life. To avoid at least the social aspects of this

AIDS Will Claim Thousands of Thai Children's Lives and Cause Thousands More to Be Orphaned, According to Recent Study

If Thais do not change their sexual behavior related to fertility and the spread of HIV, the number of child and infant deaths is projected to increase from several hundred in 1990 to more than 20,000 in the year 2000. This projection comes from a new study entitled *AIDS and Children: Prospects for the Year 2000*, by Wathinee Boonchalaksi and Philip Guest and published by the Institute for Population and Social Research, Mahidol University (IPSR Publication No. 168, July 1993). The study was supported by UNICEF.

The authors used standard cohort component methods of demographic projection, published projections of new adult HIV infections, and standard parameters for pediatric HIV transmission, the transition from HIV to AIDS, and the transition from AIDS to death to make their projections. Their results can be summarized as follows:

- The effects of HIV on mortality rates will be significant. In the absence of AIDS, infant mortality is projected to decline by almost 30% over the decade. If the AIDS epidemic proceeds as projected, however, there will be a reversal of the decline in mortality of infants and children under age 5 sometime around the middle of this decade and an increase in mortality rates thereafter. For infant mortality, rates in the year 2000 will be at 1991 levels, while under-5 mortality rates will be higher than 1990 levels.
- Changes in behavior can have large effects on the number of children dying from AIDS. If HIV infection of women ceased at the end of 1994, the number of children projected to die from AIDS between 1990 and 2000 would be less than half the number who would die if infection continued unabated. Lower levels of fertility for women infected by the HIV virus would also have an obvious dampening effect on the numbers of children dying from AIDS.
- By the year 2000 approximately 86,000 Thai children of ages 12 and under and 30,000 children under age 5 are projected to lose their mothers to the AIDS epidemic. Most of those children will be between ages 5 and 12 when their mothers die.
- The number of children exposed to the risk of being orphaned will grow rapidly over the current decade. By the year 2000 more than 350,000 living children will have been born to mothers infected with the AIDS virus, compared with only 5,000 such children in 1990. Most of those children will be under age 5.
- Rapid and fundamental changes in sexual behavior causing a cessation of HIV infection by the end of 1994 would reduce the number of children under age 5 whose mothers had died from AIDS by approximately 40%. But even under this unlikely scenario, the number of AIDS orphans will continue to rise throughout the decade and in the year 2000 are projected to total more than 53,000 children 12 years old and younger.

AIDS and Children: Prospects for the Year 2000 is available for US \$10.00 per copy from the Institute for Population and Social Research, Mahidol University, 25/25 Phutthamonthon 4 Road, Salaya, Nakornpathom 43170, Thailand (fax: 66-02-441-9333; telex 84770 UNIMAHI TH). Thanks are due to the authors for providing this summary.

sensitivity, all the studies reviewed above used some form of self-administered questionnaire, which was either completed in the classroom or returned through the mail.

In an early pretest for the IPS survey, we attempted to interview directly 50 respondents in the South Region. The discouraging result was that not a single respondent reported having engaged in premarital intercourse, an implausible outcome. In the survey proper, the questions on sexuality were self-administered, but we improved on the earlier surveys by conducting the interviews in the natural surroundings of the respondents' homes rather than in classrooms or meeting rooms. We employed both male and female interviewers, most of them Ramkaengheng University graduates of the same age group. Only in rare cases did male interviewers interview female respondents.

Our questionnaire began with questions about the respondent's personal background (age, education, place of birth, etc.). After all nonsensitive questions had been asked and answered, the interviewer gave the respondent the last page, containing questions about his or her sexuality, and asked the respondent to complete it privately and return it in an envelope provided for that purpose. The physical arrangements virtually ensured anonymity. The interviewer also gave the respondent a ballpoint pen as a gesture of appreciation for the respondent's participation in the survey. We believe that this procedure created less psychological stress than earlier procedures and for that reason produced more accurate responses.

The interviewers' field experience was positive, and they reported no notable instances of refusal or verbalized suspicion on the part of respondents. Some respondents (mostly males) did not even bother to seal their envelopes, and a few female respondents indicated informally to their female interviewers that they had had sexual relations. Among the returned and processed questionnaires there were no blank or "don't know" entries.

The data set is examined here in part for its yield of new information—particularly on male youths, who have received limited research attention—and also as a vantage point for reexamining other recent Thai studies of sexuality among youths.

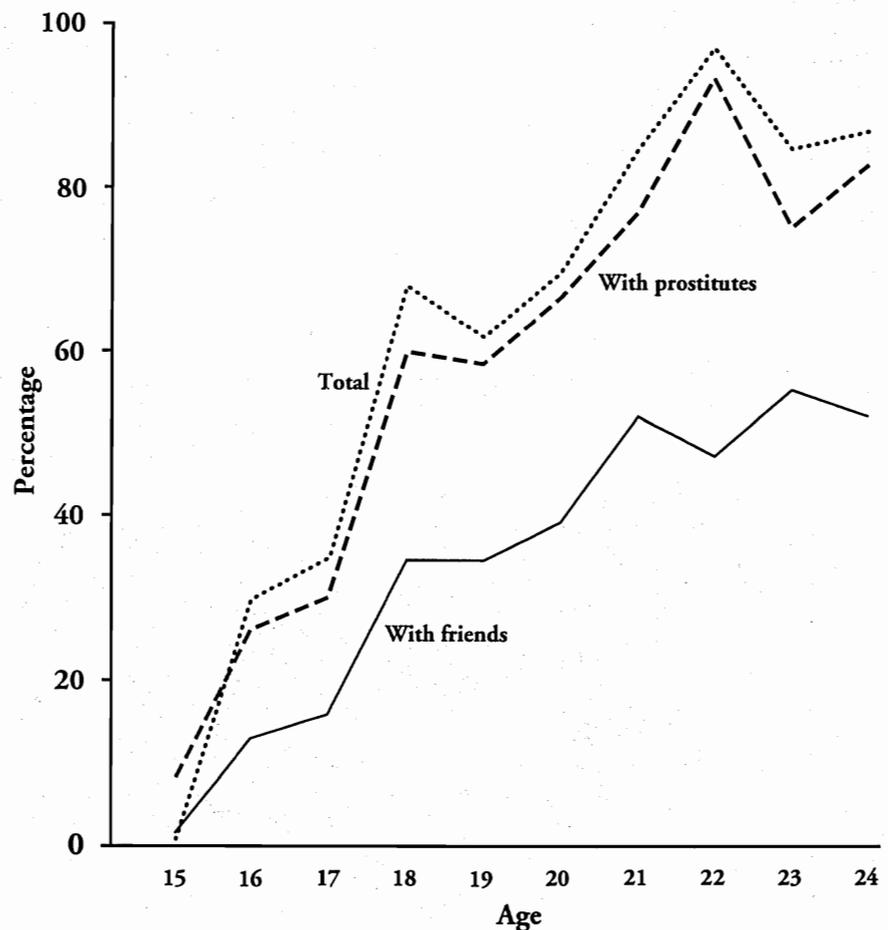
Results

Partner patterns by age. Figure 1 depicts the rapid disappearance of sexual inexperience with age among young, unmarried Thai males. Among the 16-year-olds surveyed, about 30% had already had sexual intercourse. The proportion was more than 60% among 18-year-olds, and among 24-year-olds it was nearly 90%.

The sexual partners of these young men included prostitutes and a variety of other women who did not receive payment for their sexual favors. The latter category included casual acquaintances, friends, and even intended spouses.

The questionnaire first asked whether the respondents had ever had sexual relations (*paed samphan*) or slept with (*larbnom*) a prostitute. Prostitutes are identified in a commonly employed, somewhat circuitous expression as "spe-

Figure 1. Percentage of young, rural males with sexual experience, by age and type of partner: 1988 IPS Survey



cial services girls" (*ying borigarn pisaed*).

A subsequent question asked whether the respondent had ever had sexual relations with a member of the opposite sex other than a prostitute. Four choices were given, a negative response and three explicit affirmative responses: with a girlfriend (*khonrak* or *fan*); with a friend (*puan*); and with other per-

sons (*khon un un*). Throughout the remainder of this article the term "friend" refers to all three categories. We retain only the distinction between commercial sexual encounters and others, although we recognize that even this distinction may sometimes be ambiguous.

As Figure 1 indicates, the proportion of young men reporting sexual activity with prostitutes rose

abruptly, to 60%, by age 18 and seems to have peaked at nearly 80% among the oldest males in the sample. Sexual experience with friends (i.e., other types of partner) was less common, peaking at around 50%.

Most remarkable—and worrisome for public health officials—is the sizable proportion of young men reporting having sexual relations with *both* prostitutes and friends.

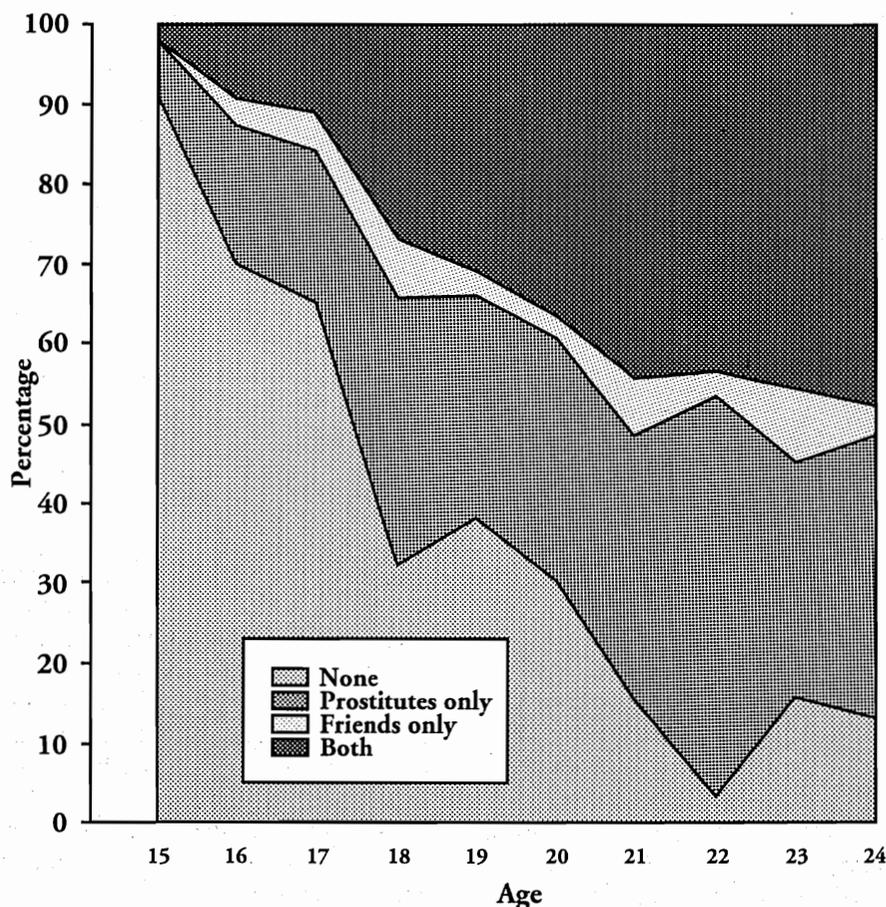
Shown in Figure 2, this reached about 30% by age 20 or so.

Nearly all those who reported having premarital sex with friends also reported having sex with prostitutes—a pattern highly conducive to the rapid spread of the AIDS virus to the general population.

Even more disturbing is that nearly all those who reported having premarital sex with friends also reported having sex with prostitutes. This pattern is shown in Figure 3, which presents the distribution of partner types among males aged 18 and 24 in the survey. At age 18 only about one-third of the age group had had no sexual experience. Most of those with experience had obtained it by visiting prostitutes; about one-fourth had had sexual relations with both prostitutes and friends, and only about one-tenth had obtained their sexual experience with friends only. By age 24, nearly half the age group had had sexual relations with both prostitutes and friends, and very few had limited their sexual relations to friends.

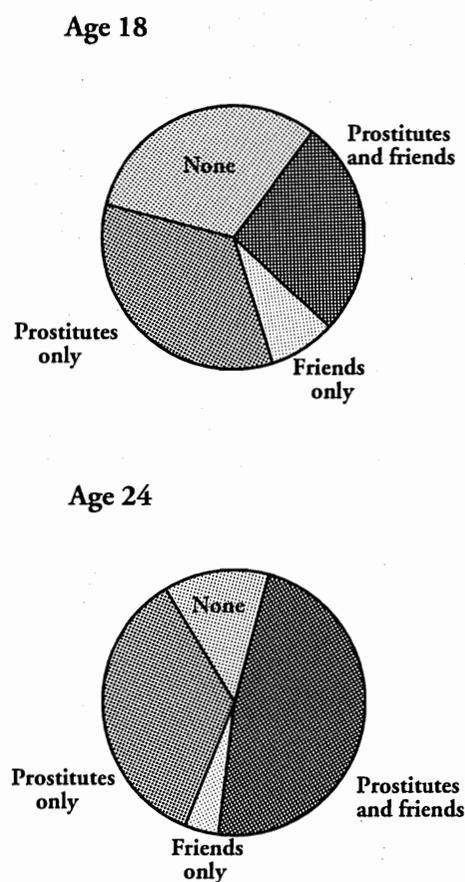
Unfortunately, the survey data provide no information on the sequence or frequency of these multiple-partner cases—the pathways that such respondents took that produced the cross-section presented for age 24 in Figure 3. Other recent surveys, such as the 1990 Partner Relations Survey supported by the World Health Organization (Sittitrai et al. 1992), have collected more fine-grained and temporally sensitive information, and health planners are exploring those results with great interest. Nevertheless, it is clear from the results presented here that the behavior of young men in Thailand provides substantial opportunity for the transmission of communicable diseases from prostitutes to their male clients, and from them to the female friends of those clients.

Figure 2. Partner patterns of young, rural Thai males, by age: 1988 IPS Survey



Background differences in sexual experience. We found impor-

Figure 3. Distribution of partner types at ages 18 and 24: 1988 IPS Survey



tant socioeconomic differentials across the total sample in the prevalence of sexual experience and in partner patterns. Table 4 presents, first, the percentage distribution of partner patterns for the entire sample, then each respondent characteristic as a dichotomy. For example, expectation about the timing of marriage is dichotomized as early or late. About one-fourth of the young men interviewed said

they expected to marry late (at age 26 or later), and fairly high percentages of that subgroup reported sexual experience with prostitutes and with a combination of partner types; only 3.5% reported sexual experience with friends but not with prostitutes.

The percentage of young men (ages 15–24) with no sexual experience was 48 overall but varied widely by social and economic characteristic. On the one hand, it was relatively low among those who did not provide their own resources for leisure and other discretionary expenditures (38%), those who had visited an urban area in the past year (42%), and those who had discussed AIDS with friends (39%). On the other hand, it was relatively high among young men who lived in somewhat controlled environments—for example, those who expected others to share their decision about a marriage partner (66%), had not visited an urban area within the past year (65%), did not know that AIDS was fatal (68%), had never looked at pornographic material (70%), or did not think that young people should know about contraceptives (61%).

Several observations can be drawn from these data. The prevalence of sexual experience with friends only was uniformly low. Most of the variation in overall sexual experience across groups was in the prevalence of the use of prostitutes, either alone or in combination with sexual relations with friends. Experience with prostitutes was relatively uncommon among young men who expected to have others share in their marriage decisions, had not visited a town in the past year, had never discussed AIDS with friends,

and had not looked at pornographic material.

We were particularly interested in the proportion of young men who reported sexual experience with both friends and prostitutes (21% overall). This varied mostly with variations in the use of prostitutes, from a low of 7–10% among men who had never looked at pornographic material or who had not visited a town in the past year to much higher levels among men who knew of friends who had had sex or were pregnant before marriage, or who agreed with the idea of premarital sex.

Some of the characteristics shown in Table 4 may be considered background or causal variables, whereas others—level of information about AIDS, for example—are better construed as correlates or even sequelae of sexual experience. Some, but not all, of the differentials reflect age-combination differences. It is older males, after all, who have had the most time to engage in premarital sexual activity and who are most likely to live in less controlled circumstances. And many of the background characteristics are likely to be related to the indicators of sexual activity.

Model of prostitute use versus other sexual relations. We have therefore constructed a preliminary multivariate model for assessing each of these relationships, controlling for differences in age and the other background factors. The results of the model are summarized for three dichotomous dependent variables: prostitute use, sexual experience with women other than prostitutes, and sexual experience with both categories of women

Table 4. Partner patterns, by background characteristics of respondents: 1988 IPS survey, rural males, ages 15-24

Characteristic	Reported partner pattern (%)						All patterns
	No experience	Prostitutes		Friends		Combination of partners	
		Only	Total	Only	Total		
Total	48.0	26.0	47.4	4.6	26.0	21.4	100.0
Expectation regarding marriage timing							100.0
Early ^a	50.2	25.4	44.8	5.0	24.4	19.4	73.8
Late	41.6	27.6	54.8	3.5	30.7	27.2	26.2
Expectation regarding choice of mate							100.0
Self and others	65.5	17.8	32.1	2.3	16.6	14.3	14.4
Self alone	45.0	27.4	50.0	5.0	27.6	22.6	85.6
Desired family size							100.0
Large ^b	42.1	25.8	51.6	6.4	32.2	25.8	25.1
Small	49.9	26.1	46.1	4.0	24.0	20.0	74.9
Parents are still together ^c							100.0
Yes	49.5	24.6	45.7	4.8	25.9	21.1	79.4
No	42.1	31.2	53.9	4.0	26.7	22.7	20.6
Provides own resources for leisure, etc.							100.0
No	38.2	27.4	55.6	6.2	34.4	28.2	47.2
Yes	56.7	24.7	40.1	3.2	18.6	15.4	52.8
Visited a town in last year							100.0
No	65.3	18.6	29.1	5.5	16.0	10.5	25.2
Yes	42.1	28.5	53.6	4.3	29.4	25.1	74.8
Prefers to live in an urban setting							100.0
No	48.6	26.8	47.5	4.0	24.7	20.7	85.6
Yes	44.4	21.1	47.1	8.5	34.5	26.0	14.4
In touch with an urban friend							100.0
No	55.2	28.4	41.7	3.1	16.4	13.3	52.5
Yes	40.0	23.3	53.7	6.3	36.7	30.4	47.5
Has heard about AIDS							100.0
No [*]	69.8	11.4	17.7	12.6	18.9	6.3	2.0
Yes	47.5	26.3	48.0	4.5	26.2	21.7	98.0
Knows symptoms of AIDS							100.0
No ^d	47.6	26.2	47.7	4.6	26.1	21.5	94.7
Yes	54.4	21.4	41.4	4.2	24.2	20.0	5.3
Knows AIDS is fatal							100.00
No ^d	67.7	18.7	22.1	10.2	13.6	3.4	3.6
Yes	47.2	26.3	48.4	4.4	26.5	22.1	96.4
Knows how to prevent AIDS							100.0
No ^d	50.1	25.0	45.4	4.5	24.9	20.4	57.5
Yes	45.1	27.3	50.1	4.8	27.6	22.8	42.5
Has discussed AIDS with friends							100.0
No ^d	58.5	22.0	35.9	5.7	19.6	13.9	45.7
Yes	39.1	29.4	57.2	3.7	31.5	27.8	54.3

Table 4. (continued)

Characteristic	Reported partner pattern (%)						All patterns
	No experience	Prostitutes		Friends		Combination of partners	
		Only	Total	Only	Total		
Has viewed pornographic materials							100.0
No	69.8	18.6	25.2	5.0	11.6	6.6	19.2
Yes	42.8	27.7	52.7	4.5	29.5	25.0	80.8
Knows of friends who had sex before marriage							100.0
No	51.6	32.4	41.1	7.2	15.9	8.7	25.1
Yes	46.7	23.8	49.5	3.7	29.4	25.7	74.9
Knows of friends who were pregnant before marriage							100.0
No	49.5	30.2	45.5	5.0	20.3	15.3	46.1
Yes	46.6	22.3	49.0	4.3	31.0	26.7	53.9
Agrees that youth should know about contraceptives							100.0
No	61.2	23.8	38.0	.7	14.9	14.2	16.6
Yes	45.3	26.4	49.3	5.4	28.3	22.9	83.4
Agrees with idea of premarital sex							100.0
No	49.8	24.8	44.9	5.3	25.4	20.1	87.9
Yes	34.2	34.4	65.8	.0	31.4	31.4	12.1

Notes: Number of respondents answering each question was 431. Percentages may not sum exactly to 100.0 because of rounding.

* Distribution based on fewer than 30 cases.

a. Early = before age 26.

c. Not separated, divorced, or widowed.

b. Large family = 3 or more children.

d. Includes respondents who had not heard about AIDS.

(Table 5). Because the dependent variables are dichotomies, we employ logistic regression with maximum likelihood estimation.

The males who exhibited the three types of sexual behavior shared a general profile. They were more likely to expect autonomy in mate selection, to be economically independent, to have an urban orientation or contact with urban friends, and to be well informed about AIDS and its consequences than were males who had had no sexual experience. They were also more likely to be part of what they seemed to perceive as a permissive sexual culture: they favored the idea

of premarital sex, they had looked at pornographic materials, and they had friends who had had sex before marriage.

Sexually active males tend to be more independent than others and to be part of a permissive sexual culture. Among those who patronize prostitutes, these attributes are even more pronounced.

What distinguishes the users of prostitutes only from respondents

who had had sex with friends only or with both friends and prostitutes is that they exhibited these attributes in a much more pronounced way. Many of the coefficients for this group are larger and statistically more significant than for the other two groups. For example, we find a strong association between agreement with the idea of premarital sex and having looked at pornographic materials and with having visited a town or city in the past year.

Discussion

Several inherent problems of all studies of adolescent sexuality need

Table 5. Logistic regression results predicting the likelihood of premarital sexual activity with prostitutes only, with friends only, and with both prostitutes and friends: 1988 IPS survey, rural males, ages 15-24

Variable	Prostitutes only	Friends only	Prostitutes + friends
Marriage and family attitudes			
Expects to marry late	.62	.76	.76
Expects to choose own mate	2.01*	1.77	1.76
Desires few children	.76	.68	.77
Urban exposure or orientation			
Visited a town in last year	2.45**	1.39	1.78
Prefers to live in urban area	1.22	2.27*	1.80
In touch with an urban friend	1.36	2.92***	2.41**
Family or economic background			
Parents still living	.95	1.39	1.23
Provides own support for leisure	1.18	1.81*	1.54
Information about AIDS			
Has heard about AIDS	2.36	.29	.02
Knows the AIDS symptoms	.82	1.42	1.51
Knows AIDS is fatal	1.14	1.77	1.37
Knows AIDS is incurable	1.27	.66	.76
Discussion of AIDS			
Discusses AIDS with friends	2.49***	1.29	1.72*
Knows of adult discussions of AIDS	.83	.88	.73
Exposure to pornography			
	3.29***	2.20*	3.05*
Perceived culture surrounding sexuality			
Knows of friends sexually active before marriage	1.16	1.42	2.70*
Knows of friends pregnant before marriage	.55*	1.05	1.07
Believes youth should know about contraception	.62	1.68	.88
Agrees with idea of premarital sex	2.70**	1.40	2.12*
Age			
	1.61***	1.40***	1.45***
Educational level			
	.76	.77	.74
<i>N</i>	431	431	431
Log-likelihood	-191.66	-191.60	-168.35
Chi-square (df)	111.11 (409)	111.11 (409)	111.22 (409)

* Significant at .05 level.

** Significant at .01 level.

*** Significant at .001 level.

to be stressed. One is the difficulty of obtaining truly representative samples of households on a national scale. The usual problems of survey sampling are exacerbated by the high rates of movement of young people among the usual sample strata, often into areas in which identification of dwelling units is extremely difficult. Another set of problems relates to finding and interviewing youth, even when their regular residences have been selected for interviewing. These problems can be minimized in various ways but not avoided.

Analytical problems are caused by decisions to focus on particular characteristics of a sample. The greatest difficulty arises when that characteristic is marital status. It is natural, but a major mistake, to focus a study of premarital sexuality on the unmarried. The problems that arise reflect the fact that sexual histories are often tied closely to subsequent marriage patterns, including the timing of marriage. This means that much of the premarital sexual experience of a society can be reported upon only by married people. A true picture of the society requires information on both the married and the unmarried.

Conclusion

The IPS survey data provide little evidence that patronage of prostitutes is confined to a special type of Thai male who is deviant in some way, perhaps because of precipitating background experiences. Instead, the evidence supports the view common in the social science literature on Thailand today, that commercial and social sexual encounters prior to marriage

are aspects of the same popular culture of sexuality (Ford and Koetsawang 1991; Havanon et al. 1992; Keyes 1984). It is possible to suggest, though at this point only as a speculation, that similar data from married men would show an analogous link between commercial and marital sexuality.

There is a stark warning in these results, that the sexual culture of young Thai males throughout the country is highly conducive to the spread of sexually transmitted diseases, including the fatal HIV virus. And that is exactly what is occurring, according to the latest evidence (Sittitrai et al. 1992).

We must emphasize that the 1988 IPS study presents data problems, both in its inefficient sampling design and in its measurement of sexual activity. Nevertheless, we believe that the survey's results are important and useful as interim estimates—better than mere orders of magnitude—although they are less precise than we would like.

Considering how urgent it is to have accurate estimates of sexual behavior patterns in Thailand, we conclude with a plea for better and more frequent national surveys of this topic. Thailand has an advantage over most countries in having numerous specialized studies of human sexuality focusing on well-defined subpopulations, including high-risk groups, and often reflecting great methodological imagination and skill; this genre of research must continue, despite inherent problems of comparison and generalization. But those studies should be complemented by periodic national sample surveys.

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Editorial

Aloha to Our Readers

We regret to announce that this is the last issue of the *Asian and Pacific Population Forum*, which began publication nearly 20 years ago, in August 1974. Originally named the *Asian and Pacific Census Newsletter*, it was launched with the financial support of the Office of Population, U.S. Agency for International Development (USAID), to serve as a vehicle for the exchange of ideas and information about population census, survey, and vital registration activities in the Asia-Pacific region. USAID has continued to support the publication throughout its evolution from a newsletter intended primarily for census planners and statisticians to a quasi-journal with a broader editorial scope.

As your many thoughtful and gratifying comments about the *Forum* in response to our reader survey mailed in December 1992 indicate (see article on page 127), the publication has served a useful purpose, reaching a broad spectrum of the professional community concerned with population issues in Asia and the Pacific. When it began, it was practically the only periodical devoted to the exchange of information about demographic measurement and population developments in Asia and the Pacific. Now a number of reputable journals and newsletters focus on the region's demographic situation.

Our decision to discontinue the *Forum* is in part a response to that evolution and in part due to

changes within the Program on Population. The *Forum* is costly to produce, both in monetary terms and in staff time. When we sent out our reader survey to *Forum* subscribers early this year, therefore, we realized the time had come to take stock of our resources and reassess our priorities. Although many of the responses to the survey indicated strong interest in having the *Forum* continue and despite the fact that the recently formed Association of National Census and Statistics Directors of America, Asia, and the Pacific pledged financial support for the *Forum*, it has not proved possible to put the *Forum* on a self-supporting footing.

We are instead redirecting our communication effort as part of a four-year cooperative agreement between with the East-West Center and USAID that began in September. The agreement enables the Program on Population to expand the scope of our research activities and undertake several new publication initiatives. The principal research goals funded by the agreement are three-fold: understanding the nature and determinants of fertility and mortality decline, assessing the benefits of family planning programs and lowered population growth for national objectives, and improving family planning and maternal and child health programs.

Although most of the research effort under the agreement will focus on Bangladesh, India, Indonesia, and the Philippines, we plan to

continue our work in other countries of the Asia-Pacific region, using other resources. We will also continue our work on topics not supported by USAID, such as aging, population movement, and urbanization.

Our publications will place more emphasis on communicating the results of our research to population program managers and policymakers, and on elucidating the practical and policy implications of the findings. We are planning to issue a new series of research reports that will provide a comprehensive discussion of findings and be accessible to a broad readership while being written to a high scholarly standard. Our intention is to make the reports inviting to readers, producing them in an attractive format that includes photographs as well as tables and graphs.

Produced with each report will be a summary sheet that succinctly describes the subject, background, objectives, approach, results, and implications. These summaries, which will also contain bibliographic and ordering information for people who wish to obtain complimentary copies of the full reports, will be sent to you each time a report is issued.

The quarterly series *Population & Policy* will be continued and the range of topics expanded to reflect the broadened scope of research supported by the new agreement with USAID. Our scholarly Paper Series (renamed Occasional Paper

Series), Reprint Series, and Working Paper Series are also continuing and are now part of a newly redesigned Centerwide publishing program.

Our communication strategy includes increased use of computer technology, particularly in the preparation of graphic materials for presentations. We are exploring the possibility of sending our research summaries by electronic mail to at least some of our constituents.

Finally, in cooperation with counterpart organizations in the region, we are increasing our efforts to publish the results of collaborative research through host-country outlets such as locally published journals and newsletters.

In saying farewell to the *Forum* I want to acknowledge those who contributed to its success. Appreciation is due to its previous editors, who maintained a high editorial

standard for the publication and struggled to bring it out on schedule. *Forum* readers are indebted in particular to Betsy Gould, its first editor, who gave the publication a distinct personality, infusing even the most technical articles with a lively, readable style and revealing her wit in the pieces she wrote herself. (At one point she considered listing a technical note by William Brass as "Solid Brass" in the table of contents.)

Subsequent *Forum* editors Griffith Feeney, Bob Retherford, and Linda Martin, and managing editors Milann Gannaway, Rob Hearn, and David Ellis added, each in his or her own way, to the value of the *Forum*.

Thanks are due, too, to the editorial board members and outside reviewers who helped us evaluate manuscripts submitted to the

Forum and to those who contributed manuscripts, news items, and book reviews—most especially to Alice Harris, former head of our Resource Materials Collection, who despite her early retirement to Florida three years ago has continued to provide us with reviews.

Special thanks go to Lee-Jay Cho, our former director, who conceived of the *Forum* and gave it his wholehearted support during the past 19 years; to Andy Mason, the Program's current director; and to USAID for its generous financial support.

Finally, our warm thanks to you, our readers, who have made the whole enterprise worthwhile.

"Aloha" means hello as well as good-bye. Though we feel some sadness in saying good-bye to the *Forum*, we are looking forward to a continuing relationship with you.

—Sandra E. Ward

Reviews and Publications Noted

Society and Population by David M. Heer and Jill Grigsby. Englewood Cliffs: Prentice Hall, 1992. xii, 127 pp. (paper), US \$18. ISBN 0-13-819707-5 (paper). Available from Prentice Hall, Inc., Englewood Cliffs, NJ 07632, USA.

This is the third edition of a short, classic book on social demography. (The first edition was published in 1968 and the second in 1975.) The latest edition contains not only new facts updated to the 1980s, but also new subjects of great importance. In just 127 pages, the authors introduce clearly the three basic demographic components of population

change—mortality, fertility, and migration—and discuss succinctly the relationships between population and economic development, and between population and political power. The book presents the concepts and terms commonly used in the literature of social demography, and it cites many facts and provides a highly useful list of key references. It is an excellent book for students interested in population and a valuable book for scholars who want to learn the fundamental research findings in sociological studies of population.

The book is divided into three parts comprising 10 chapters. Part One is filled with interesting facts describing the world population picture. Chapters 1 and 2 review the growth of the world's population and describe the current geographic distribution of human populations, including urban populations. Chapter 3, on human societies and their environmental constraints, addresses a number of contemporary issues, such as the relationships between population and pollution, deforestation, water quality, global warming, and the

extinction of plant and animal species.

Part Two, on population processes, introduces the basic concepts and analytic frameworks for the three fundamental demographic processes that determine a population's composition: mortality, fertility, and migration. A chapter is devoted to each of the three. Each chapter covers measurement of the process, basic facts about it, its causes, and its consequences. Readers learn not only the basic demographic terms and facts, but also the most important research findings.

Part Three, on population and social structure, places population and population change within the context of the broad society. Among many interactions between demographic and broader social processes, the authors concentrate on four—age and sex composition, population and economic development, population and political power, and population legislation and policy. Each of these topics forms a chapter.

In the chapter on age-sex composition, the authors examine the determinants of a population's age and sex structure and the implications of various age-sex compositions. These implications include the size of dependent populations (that is, of age groups too young or too old to be in the labor force), labor force formation and composition, and marriage markets.

In the chapter on population and economic development, the authors summarize a wide variety of key research findings: economies of scale, marginal returns, changes in the dependency ratio, savings and capital formation, per capita investment in education and health, and

per capita income and income inequality. Much of the discussion is based on the 1986 U.S. National Academy of Sciences report entitled *Population Growth and Economic Development: Policy Questions*.

The last two chapters are devoted to the relationships between population and political power and to the role of modern governments in affecting population change. The authors demonstrate that, at the international level, population size is not highly correlated with political power. Within countries, however, the population size of various groups often plays an important political role. Examples cited are the U.S. political process and the case of the former Soviet Union, where ethnic conflict played a key role in political development.

Because governments are increasingly involved in influencing population change, the last chapter reviews various governmental policies that affect mortality, fertility, and migration and addresses the limits to population policy.

Throughout the book, the authors present their subject clearly and succinctly. They document the many facts they present with citations of original research. Their style makes this short book resemble a highly condensed encyclopedia of sociological studies of population. A great deal of knowledge can be gained by reading this excellent introduction to social demography.

—Wang Feng
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and Fellow,
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East-West Center

Statistical Handbook on the American Family edited by Bruce A. Chadwick and Tim B. Heaton. Statistical Handbook Series 1. Phoenix, Ariz.: Oryx Press, 1992. xiv, 295 pp., ISBN 0-89774-687-2, US \$59.50. Available from Oryx Press, 4041 North Central at Indian School Road, Phoenix, AZ 85012-3397.

One of the major issues appearing in both scholarly and popular media in recent years has been the crisis of the American family. It was a topic of heated discussion by both major U.S. political parties during the recent presidential elections and has been the subject of White House conferences, television documentaries, and numerous books and journal articles.

Many educators, sociologists, government officials, and religious leaders have deplored the breakdown of the family and the decline of "family values." They view the higher incidence of teenage births, women-headed households, cohabitation, divorce, and even voluntary childlessness as evidence that the entire family is at risk.

On the other side are those who perceive a "strong vibrant family in American society" (preface). They cite not only the high rate of marriage (90% of Americans marry by their 45th birthday) and the tendency of divorced individuals to remarry, but also the high level of marital satisfaction expressed in national surveys taken over the last 20 years.

Is the American family an endangered species? The *Statistical Handbook* allows readers to draw their own conclusions from the 400-odd tables and charts contained in its pages. While these illustrate substantial changes in many aspects of family life, they also indicate areas

of surprising stability in others.

For example, according to the National Opinion Research Center, the level of marital happiness varied little over the period between 1973 and 1989; on average, 65% of married respondents said they were "very happy" and an additional 32% reported being "pretty happy." Editors Bruce A. Chadwick and Tim B. Heaton point out, however, that "one obvious reason that the number of unhappy marriages is low is that many have ended by divorce" (p. 53).

Chadwick and Heaton are both sociology professors and director and associate, respectively, of the Center for Studies of the Family at Brigham Young University in Salt Lake City. They have written extensively on the family, marital dissolution, and the relation between religion and the family.

They have organized their material into nine broad topics: marriage; the quality of marriage and family life; divorce; children; sexual attitudes and contraceptive use; living arrangements and kinship ties; working women, wives, and mothers; family violence; and elderly families.

The nine topics are divided into several subcategories. For example, the topic of marriage includes marriage rates and marital status; age, race, and prior marital status of those of who marry; attitudes toward marriage; factors to consider in the decision to marry; and remarriage. The section of elderly families includes living arrangements, contact with relatives, and care given by family members.

In the section on children, age structure, and household composition, the editors note that declining

fertility in the 1960s and 1970s altered the age structure of the population and will continue to do so. "The percentage of the population under age 18 is projected to drop below 20 percent by the year 2000, down from a value of about 36 percent in 1960" (p. 105).

In the section of living arrangements and kinship ties the authors make a related point that debunks the stereotype of the American family: "Decreased fertility, more childlessness, fewer children, and living longer have produced a typical American family with *no* children under age 18. Today, the average family includes no minor children, and almost two-thirds of all households have no children present" (p. 169).

Here are a couple more examples of the *Handbook's* statistics that took me by surprise, given the extremely vocal opposition to legalized abortion. As of 1988 (the latest year for which the authors had statistics on this topic), the proportions of Americans approving of abortion if a woman's life was in danger, if the woman might suffer severe physical health damage, if the pregnancy was the result of rape or incest, or if there was any chance that the baby would be born deformed remained consistently high—regardless of respondents' age, race, region, education, politics, income, or religion. Proportions approving if the woman's life was in danger ranged from 88% to 97% (mean, 94%); in the case of severe physical health damage, from 72% to 90% (mean, 84%); in the case of rape or incest, from 77% to 92% (mean, 85%); and in the case of possible deformity, from 53% to 68% (mean, 60%). Moreover,

regardless of their background, a solid majority of Americans surveyed disapproved of the Reagan Administration's decision to withhold federal financing from family planning clinics that provided counseling about abortion. Even Catholics and Evangelicals disapproved, by 64% and 57%, respectively.

Although a textual summary of each main topic prefaces the relevant tables and charts, it is important to note that this is primarily a statistical factbook. The reader should not expect the fine-grained analysis of topics better left to monographs.

Chadwick and Heaton have used both published and previously unpublished sources to compile their statistics. They have circumvented the problem of not having the 1990 census data available for analysis by using a variety of sources in addition to more traditional government series. *The National Survey of Families and Households*, a public-use national sample of 13,000 households conducted in 1987–88, provides a wealth of information about the American family at that time. *The General Social Survey*, conducted by the National Opinion Research Center over a 20-year span (1972–91) was invaluable for recording longitudinal changes. Demographic information on family formation was taken from the 1982 and 1988 *National Surveys of Family Growth*.

Some demographers may take issue with the more popular sources of information on the family, such as a *Better Homes and Gardens* survey. The use of information from a wide array of material, however, presents a broader picture of contemporary family life than that

found in traditional sources. A complete list of sources appears at the end of the *Handbook*, along with an index to topics covered.

The *Handbook* is well organized and attractively presented. It should be a valuable reference resource for social scientists, statisticians, students, and interested citizens. As such, it belongs in specialized, academic collections as well as in larger public libraries.

—Alice D. Harris
Reference Librarian
Martin County (Florida) Library
and former East-West Center
Resource Materials Specialist

ALSO NOTED

Controlling Sexually Transmitted Diseases by Robert Lande. *Population Reports*, Series L, No. 9. Baltimore: Population Information Program, Johns Hopkins School of Public Health, June 1993. 31 pp. (paper). Free to developing countries; in developed countries, US \$2 each for multiple copies. Available from *Population Reports*, Population Information Program, The Johns Hopkins School of Public Health, 527 St. Paul Place, Baltimore, MD 21202, U.S.A.

This report provides an overview of the incidence of sexually transmitted diseases (STDs) worldwide, their complications and sequelae, their economic costs, the relationship between AIDS and other STDs, and what can be done to manage these diseases and reduce the alarming rate at which they are spreading.

According to the report, more than 250 million new cases of STDs occur each year, and in some developing countries as many as 1 or 2 women in every 10 are infected with an STD. Many STDs can be cured, but left untreated they can

be life-threatening. They also increase susceptibility to HIV, the deadly AIDS virus.

STDs are found to be common among women visiting prenatal, family planning, and gynecological clinics. In some countries up to 18% of women attending clinics have gonorrhea, up to 17% have syphilis, and as many as 30% have trichomoniasis. Chlamydia is spreading in North America and some European countries. In the United States chancroid and primary syphilis are becoming more common. Youth and women are among the most likely victims of STDs, according to the report. In the United States 15–19-year-olds have the highest rate of gonorrhea among women and the second highest rate among men.

The diseases can cause blinding eye infections and pneumonia in infants infected at birth; chronic abdominal pain, ectopic pregnancy, spontaneous abortion, cervical cancer, and infecundity in women; and sterility in men. Death can result from neglected syphilis; and chancroid, chlamydia, gonorrhea, herpes, syphilis, trichomoniasis, and several less common STDs weaken their victims' resistance to the sexual transmission of HIV, making them two to nine times more susceptible.

The report projects that by the year 2000, HIV will have infected 30–40 million people, three times the number having the virus today. By then, 10 million infected people will have developed AIDS, 90 percent of them in developing countries.

STDs are costly to those with the diseases and to health care systems. Treatment from private providers

can cost up to one-third of monthly earnings in some countries. STDs also reduce the productivity of their victims, causing debilitation and absenteeism.

An approach to the management and treatment of STDs, called the syndromic approach, bases diagnosis on a syndrome, or group of symptoms, rather than on specific STD symptoms and treats for all the diseases that could cause the syndrome. It improves clinical diagnosis, can be learned by primary health care workers, and allows treatment of symptomatic patients in one visit. Working with STD experts, the World Health Organization has developed procedures to help providers use the syndromic approach. A wall chart published with this report offers guidelines for syndromic case management, with or without a microscope and other laboratory tests.

The report also advocates the involvement of primary health centers in STD prevention and treatment. "Effective programs . . . need to make diagnosis and treatment readily available," states Lande, "and they must have a steady supply of the appropriate drugs for treatment." Counseling those with STDs to take prescribed medication, avoid sexual intercourse until they are cured, and help their partners get treatment is an important ingredient of such programs.

Family planning providers can help prevent the spread of STDs by educating their clients on how to avoid STDs, in particular by promoting the use of condoms and spermicides, and by referring suspected cases for treatment.

Population Reports is an international review journal of important

issues in population, family planning, and related health matters. It is published four times a year in three languages for health care and family planning professionals worldwide.

Gender and Political Economy: Explorations of South Asian Systems edited by Alice W. Clark. Delhi: Oxford University Press, 1993. viii, 375 pp. (hardcover), 500 rupees. Available from Oxford University Press, YMCA Library Building, Jai Singh Road, New Delhi 110001, India.

"In the last decade, feminist scholarship on the international plane has both taken a quantum leap, and undergone a paradigm shift. Only a decade ago, caution about feminism as a Western intrusion, an anxiety about ethnocentrism, and a self-conscious sensitivity to cultural differences shrouded the most earnest efforts of 'Women in Development' specialists. Now, even with cultural sensitivity, it has become impossible to see the feminist movement in politics and scholarship as a purely Western intrusion. Women from many walks of life, in all corners of the globe—not a majority, but an historic few—are now consciously struggling with the inequitable burdens they and other women bear in relation to their livelihood, their political voice, their autonomy within their bodies and their very lives. These burdens are increasingly understood as being continually imposed on them by systems that support the subordination of women, both to men and in a larger sense."

So states historian Alice W. Clark in her introduction to this volume of 11 essays by social scientists from

East and West, all of whom specialize in the study of South Asian societies. The volume is intended to form a bridge between those engaged in gender studies on a world scale and those engaged in studies of Asian societies and cultures, its approach is both empirical and theoretical, and the perspective is cross-disciplinary.

Focusing on historical and contemporary issues in South Asian women's lives and presenting data either newly collected or freshly analyzed, the chapters are grouped into three topic areas: (1) relations between production and reproduction; (2) class, gender, and the intensification of economic forces; and (3) gender in itself and for itself: issues of solidarity and political action. Finally, the volume identifies issues related to gender in the region that require further study.

The other contributors to the volume are economist Kalpana Bardhan; political scientists Jana Everett and Amita Shastri; sociologists Shelley Feldman, Patricia Jeffery, Roger Jeffery, and Mira Savara; anthropologists Priti Ramamurthy and Miriam Sharma; and philosophy and social sciences professor Florence E. McCarthy.

AsiaPacific Issues edited by Elisa W. Johnston and published by the Office of Public Programs, East-West Center, 1992-. Available from Office of Public Programs, East-West Center, 1777 East-West Road, Honolulu, HI 96848; telephone (808) 944-7197; facsimile (808) 944-7376.

This series, written by scholars, commentators, and journalists, reports on topics of regional con-

cern for a nonspecialist audience. Issues published in the series to date are the following:

No. 1, "Japanese Emperor's Visit to China Sends Important Signals to the United States" by Charles E. Morrison and Michel Oksenberg, October 1992.

No. 2, "Japan and the United States: Helping Each Other Cope with Change" by Ambassador Michael H. Armacost, November 1992.

No. 3, "Legislative Election in Taiwan May Pose Problems for United States and China" by Ralph N. Clough, December 1992.

No. 4, "South Korea's New President Faces Hard Times at Home and New International Demands" by Wonmo Dong and Charles E. Morrison, February 1993.

No. 5, "The Challenges of Vietnam's Reconstruction" by A. Terry Rambo, Nguyen Manh Hung and Neil L. Jamieson, April 1993.

No. 6, "Dear President Clinton: Voices from Asia and the Pacific" by Richard Halloran and John Schidlovsky, June 1993.

No. 7, "The High Costs of Environmental Loans" by Frances F. Korten, September 1993.

No. 8, "America's Trade: Markets Count More Than Deficits" by Bernard K. Gordon, October 1993.

No. 9, "Pacific Summit in Seattle: Testing Clinton's Asia-Pacific Policy" by Richard W. Baker, November 1993.

Vietnam Population Dynamics and Prospects by Judith Banister. Indochina Research Monograph. Berkeley: Institute of East Asian Studies, University of California, 1993. ISBN 1-55729-038-5 (softcover), xiv, 105 pp. US \$10.00 plus \$2.50 for shipping and handling. Avail-

able from Institute of East Asian Studies, University of California, Berkeley, CA 94720, U.S.A.

This brief volume provides a succinct overview of Vietnam's demographic situation, drawing upon information from a variety of sources, particularly the General Statistical Office of Vietnam, the Economic and Social Commission for Asia and the Pacific (ESCAP), the United Nations Population Fund (UNFPA), and the U.S. Department of State Office of Refugee Affairs. Topics include politics and the economy since 1975, a population overview, comparison of the 1979 and 1989 census coverage, population age-sex structures, mortality, marriage, family planning, fertility, international migration, urbanization and internal migration, ethnic groups, education and literacy, labor force and occupation, the 1992 population, and projected population trends. The text is supplemented by several appendixes, tables and figures, and a bibliography. Here are a few of the author's findings:

With a population of 70 million in 1992, Vietnam is the world's thirteenth most populous country, and its population is growing at about 1.9% per year. Fertility has declined from 5.3 births per woman early in the 1980s to 4.0 in 1987-88. Although the government has a family planning program and more than half of reproductive-age women practice birth control (IUDs, withdrawal, and periodic abstinence), survey data indicate the existence of a considerable unmet demand for effective birth control techniques.

The Vietnamese War and emigration have left Vietnam with a short-

age of adult men, but the sex imbalance is gradually improving. The disabled constitute 13% of the population, and in 1989 the census recorded 1.14 million invalids between ages 13 and 64 who were outside the labor force. These circumstances have undoubtedly created a drag on the country's economy. Banister asserts (p. 1), moreover, that "Vietnam's socialist economy continues to be in serious trouble, providing a per capita income of only US \$200 per year."

Emigration from Vietnam by legal emigrants and refugees nets more than 100,000 persons per year. Unlike other Asian countries, Vietnam did not experience an increase of its urban population during the 1980s; in fact, larger urban centers had population losses, in part because the government engineered emigration from them to the countryside between the late 1970s and 1982. But small towns grew rapidly during the decade.

Vietnam's population is projected to grow from about 70 million in 1992 to about 122 million in the year 2050. The age structure will shift gradually, the number of children remaining nearly constant but the number of people in the working ages rising sharply until about 2020, after which the size of elderly population will grow rapidly.

The text of this monograph is augmented by tables and figures. Several appendixes evaluate census coverage in the 1979 and 1989 censuses, discuss special enumeration groups in the 1989 census, and present a translation of a Council of Ministers decision in late 1988 affirming the importance of family planning to Vietnam's socioeconomic development.

FOREIGN-LANGUAGE MATERIALS

Les populations océaniques aux XIX^e et XX^e siècles by Jean-Louis Rallu. Paris: Institut National des Etudes Démographiques and Presses Universitaires de France, 1990. Cahier no. 128, 348 pp. Available from 27 rue du Commandeur, 75675 Paris, Cedex 14, France.

The following translation was provided by Gerard Baudchon, United Nations High Commissioner for Regional Cooperation, Noumea, New Caledonia.

Historical demography of the Marquesas Islands (French Polynesia) using family reconstitution and genealogies is the core of this book. It describes the methodology used to reconstitute genealogies in non-Western populations.

Population decrease in the Pacific has often been noted but rarely studied demographically. Historical demography provides information on birth and death rates, life expectancy, nuptiality, fertility, sterility, and birth intervals. The effect on population growth of high mortality due to new diseases against which Oceanians had no immunity, and of low fertility due to widespread venereal diseases are examined in detail. Permanently high mortality was the main cause of population decline, even before the introduction of epidemics. Regional differences were important and migrations were frequent. The book examines genetic factors, mixed marriages, mixed parentage, and kinship, using genealogical data.

The situation of other islands is discussed, mainly that of Tahiti and the Society Islands. A new estimate of the population of Tahiti at the time of contact is provided. Age-

specific death rates during the 1918 influenza epidemic indicate the effect of new diseases in non-immune populations.

Three chapters deal with Melanesia, specifically New Caledonia and

Vanuatu. They include a study using oral genealogies of the population of North Malekula. The results are compared with those of other Polynesian populations, mainly the New Zealand Maori.

Population decline following colonization occurred in the South Pacific, America, and some parts of Africa as well. It can be seen as a pretransitional phase of demographic transition. □

Activities and Announcements

1994 Summer Seminar Set for June 6–July 8

Applications are being accepted for the East-West Center's Twenty-Fifth Summer Seminar on Population, to be held in Honolulu and Taiwan.

Four intensive workshops are planned for the first four weeks at the Center, to be followed by a fifth week of lectures, discussions, and field trips sponsored by the Taiwan Health Department. The workshops, which will each have 12 to 18 participants, will focus on aging, AIDS, and the analysis of family planning programs. A brief description of each follows. For more details, contact the Program on Population of the East-West Center.

Advanced Methods for Family Planning Program Impact Evaluation. This workshop will familiarize participants with the structural concepts for evaluating family planning programs and several high-end research designs for estimating program effects. Most of the research designs use advanced statistical techniques. Topics to be covered are (1) evaluation concepts, data, and measurement; (2) establishing causality and evaluation design; (3) experimental design; (4) multilevel models; (5) panel analysis; and (6) multilevel panel analysis.

Selection priority will be given to applicants with advanced statistical backgrounds, familiarity with microcomputer operations, and major evaluation research responsibilities in family planning.

Evaluating Policy Implications of the HIV/AIDS Epidemic in Asia. This workshop will provide participants with knowledge of the key inputs and tools required to make informed and rational policies for addressing the HIV/AIDS epidemic in their countries. Topics to be explored are (1) the epidemiology of HIV and assessment of the levels of risk behavior in Asia; (2) data requirements and techniques for modeling HIV spread and its demographic impacts; (3) economic effects of the AIDS epidemic; (4) the design and implementation of HIV/AIDS policy; and (5) the evaluation of policies using such techniques as cost-benefit and cost-effectiveness analysis. A variety of possible policies will be examined.

Priority will be given to applicants doing AIDS-related work and those with a strong interest in developing expertise in the field. Previous academic training in demography, economics, epidemiology, medicine, nursing, public health, public policy, sociology, or statistics is desirable, as is some bas-

ic knowledge of personal computer applications such as spreadsheets and statistical software. Priority will also be given to applicants from countries having the most immediate HIV/AIDS problems and to those wishing to pursue work in those countries.

Family Planning Program Accomplishments and Challenges: Analytical and Presentation Tools. This workshop will familiarize participants with microcomputer-based tools developed by the RAPID IV Project for analyzing the achievements of and projecting future challenges to family planning programs. Among the models to be covered are (1) using family planning service statistics and contraceptive surveys to estimate and project the impact of family planning on fertility decline and births averted; (2) estimating the effects of fertility decline on population size and composition; (3) estimating the effects of fertility and population change on sectoral development goals and expenditures; (4) program implementation strategy design; and (5) costing, cost-effectiveness analysis, budget analysis, and cost-benefit analysis of family planning programs. Two graphics software packages will be introduced for preparing computer-assisted presentations.

Selection priority will be given to applicants who are affiliated with government agencies, are in a position to disseminate results and to arrange presentations to policymakers, are familiar with microcomputer operations, have access to microcomputers in their workplace, and can, prior to the seminar, assemble data needed for country-specific applications.

Population Aging and Intergenerational Transfers. This workshop has three objectives. First, participants will examine the determinants of population aging, its demographic effects, and projections of future trends. Second, they will investigate various systems of intergenerational transfers (e.g., familial support, pensions, social security, public education, public medical care) and their relative importance at different phases of national economic development. The focus will be on how rapid economic growth and population aging affect the relationships among these systems. Third, attention will focus on transfers within the family, currently the dominant institution in providing support for the elderly. Determinants of familial transfers to the elderly will be examined and prospects for the future role of the family will be discussed.

Participants are sought who have an interest in population aging and intergenerational transfers and who have completed work in one of these areas.

Qualifications and Selection Procedures. Applicants should be university graduates proficient in the English language and have had some training in the population field. Preference will be given to those holding appointments at

universities, government, or private organizations involved in research or planning, and to doctoral candidates whose dissertation research is directly related to one of the workshop topics.

Seminar Costs and Awards.

The cost of the seminar, excluding airfare, is US \$2,750 and covers tuition, a \$60 mandatory registration fee, dormitory housing, and a living allowance of \$30 per day in Honolulu and field costs in Taiwan.

A limited number of full and partial scholarships are available to citizens or permanent residents of Asian and Pacific countries or the United States. Scholarships may also cover round-trip airfare by the most economical means.

Applicants are encouraged to seek funding from their home organizations or governments or from outside funding agencies. They are also encouraged to provide for all or part of their costs by continuing current fellowships, grants, and contracts.

The field trip in the fifth week will be an integral part of the seminar, and all participants residing in Asia and the Pacific are expected to attend. Because of air travel costs, however, only a few awards for travel to Taiwan are available to persons residing outside Asia and the Pacific.

Additional information and application forms are available from:

Twenty-Fifth Summer Seminar
in Population
Program on Population
East-West Center
1777 East-West Road
Honolulu, HI 96848
Telephone: (808) 944-7444
Fax: (808) 944-7490
Cable: EASWESCEN HI VIA WUW
Telex: (230) 989171 EWC UD

EASYLINK: 62932956

EMAIL: PI@EWC

The deadline for the receipt of applications is **18 February 1994**. Selection of participants will be announced around 18 March 1994.

U.S. Census Bureau's International Statistical Programs Center Offers 1994 Training Courses in Population Data Analysis, Dissemination, and Utilization

The International Statistical Program Center, U.S. Bureau of the Census, is offering an intensive training program for mid-career demographers, planners, and statisticians who produce, repackage, or use population data. Called Population Data Analysis, Dissemination and Utilization (PDADU), the program is designed to strengthen developing countries' institutional capabilities in demographic data analysis, statistical data presentation and dissemination, and the use of population data for national planning.

Sixty-five courses are offered throughout 1994, ranging in duration from 1 to 8 weeks. They include three new topic areas: geographic information systems (GIS), data dissemination, and management. The program will place greater emphasis than in the past on applications, with at least 50% of each course consisting of laboratories and practical exercises.

Detailed information about the program is available from:

Chief, International Statistical
Programs Center
U.S. Bureau of the Census
Washington Plaza

Washington, DC 20233-0001
U.S.A.
Telephone: (301) 763-28860
Telex 9102509167
Fax 301 763-7589.

The Pacific Basin Research Center Announces Its 1994-95 Post-doctoral Fellowships at Harvard University

The Pacific Basin Research Center of Soka University of America is offering post-doctoral grants for research on policies in support of major national goals. These grants will provide up to US \$27,500 per fellow, plus essential research costs. The research may be conducted at the Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University, or elsewhere depending upon the nature of the problem. The theme for the present cycle of research is policies in support of human dignity, including such population-related national goals as

- community and family values
- integrated economic and social development
- public health
- applying science and technology to enrich human understanding or improve standards of living

Applications and requests for information, including research guidelines, may be obtained by writing to Professor John D. Montgomery, Director, Pacific Basin Research Center, Center for Science and International Affairs, Harvard University, John F. Kennedy School of Government, 79 John F. Kennedy Street, Cambridge, MA 02138, U.S.A. Or contact Virginia Kosmo, Tele-

phone (617) 495-1170; Fax (617) 495-8963.

The deadline for proposals for academic year 1994-95 is **15 February 1994**. Awards will be announced by 30 April 1994.

Results of the *Forum* Reader Survey

The reader survey mailed last December with Volume 6, No. 3 of the *Forum* yielded precisely 500 responses, or a response rate of 20.2%. Nearly half of the respondents (47%) were residents of the United States. The remainder were from 50 other countries, the largest number of responses coming from India (6.4%), China (4.8%), Australia (3.6%), and Thailand (3.2%).

Responses to our questions about readers' reactions to the *Forum* are summarized below. The category of response labeled "Not applicable" was included primarily for librarians, who would not be expected to read the *Forum* themselves, and in some cases for nonacademics.

Q2 About how long have you been receiving the *Forum*?

0-2 years	19.8%
3-5 years	28.6
6-10 years	24.8
11+ years	14.2
Don't know	9.0
No response	3.6

Q3 In the past two years, how frequently have you done the following?

(a) Read an article in the <i>Forum</i>?	
Never	0.2%
Once	6.8
More than once	86.6
Cannot recall	3.6
Not applicable	0.4
No response	2.4
(b) Cited a <i>Forum</i> article in one of your own research papers?	

Never	32.0%
Once	17.8
More than once	26.8
Cannot recall	8.8
Not applicable	10.2
No response	4.4

(c) Used a *Forum* article in some other way in writing a paper?

Never	15.8%
Once	17.2
More than once	49.8
Cannot recall	7.8
Not applicable	5.2
No response	4.2

(d) Used information from the *Forum* for writing lectures or speeches?

Never	20.4%
Once	12.2
More than once	48.6
Cannot recall	5.0
Not applicable	9.4
No response	4.4

(e) Assigned a *Forum* article to students in a course?

Never	34.0%
Once	11.4
More than once	22.0
Cannot recall	3.6
Not applicable	24.2
No response	4.8

(f) Learned about a new subject from the *Forum*?

Never	3.4%
Once	8.4
More than once	75.8
Cannot recall	8.2
Not applicable	0.4
No response	3.8

(g) Brought your knowledge up to date by reading a *Forum* article?

Never	0.6%
Once	4.4
More than once	86.6
Cannot recall	3.8
Not applicable	1.2
No response	3.4

(h) Had a policy decision of your own affected by a *Forum* article?

Never	0.6%
Once	4.4
More than once	86.6

Cannot recall	3.8	11-20	6.6
Not applicable	1.2	21-30	2.0
No response	3.4	31-40	1.0
		41+	2.2
		No response	85.6

(i) Thought that a *Forum* article was misleading, incomplete, or otherwise of poor quality?

Never	71.2%
Once	3.4
More than once	2.0
Cannot recall	16.0
Not applicable	3.4
No response	4.0

Q4 How do you rate the overall quality of the *Forum*?

Very high	30.6%
High	52.2
Medium	13.0
Low	0.2
Variable	1.2
No response	2.8

Q5(a) If subscribing individually, would you be willing to pay for a subscription to the *Forum*?

Yes	26.8%
No	34.8
Don't know/no response	38.4

If yes, about how much would you be willing to pay for a year's subscription (four issues)?

\$1-5 (US)	3.8%
6-10	10.4
11-15	4.8
16-20	4.2
21-25	0.6
26-30	0.8
31+	0.6
No response	74.8

Q5(b) If subscribing as an institution (such as a library), would your institution be willing to pay for a subscription to the *Forum*?

Yes	23.2%
No	15.4
Don't know/no response	61.4

If yes, about how much would your institution be willing to pay for a year's subscription?

\$1-10 (US)	2.6%
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Many respondents added comments to their questionnaires, most of which were complimentary about the *Forum*. Unfortunately, space does not permit us to reproduce all of the comments here, but a sampling is offered.

"The quality of articles and information is mixed—some quite good, others less so. Nevertheless, overall a valuable publication for those gems it contains." (United States)

"While undoubtedly useful, the *Forum* lacks a clear purpose. I would value a journal which (a) gave occasional updates/reviews of academic subject areas, e.g., childhood mortality estimation principles for non- or semi-specialists and (b) gave accounts of problems and ways forward for population programs with an increased emphasis on experiences of a qualitative nature." (Wales)

"I would like to see more articles on immigration history in Asia, especially China, Taiwan, and Burma. I feel that this is a great publication. I hope you will continue it as long as you can." (Japan)

"The *Forum* is one of the most useful publications I receive. I strongly urge that it be continued." (Thailand)

"I have found the methodological articles particularly valuable." (United Kingdom)

"I hope the *Forum* will introduce more data on China's population aging. Aging in developed countries should also be considered, especially their countermeasures on aging." (China)

"It would be greatly missed in the Asian-Pacific region. I bring each issue to the attention of Ph.D. students here, as there is always something of relevance." (Australia)

"The *Forum* has been very useful for keeping researchers (especially in LDCs) abreast of developments in population research and studies." (Philippines)

"I am now retired, but as an old 'census man' in the Pacific Islands I am still interested in the contents of the *Forum*, but probably not to the extent that I would consider paying a commercial subscription. I regret that the *Forum* no longer provides many papers on analytical demographic techniques." (New Zealand)

"My copy is used by many of my colleagues in developing countries. [The *Forum*] should not be stopped." (India)

"This journal has a very low profile. Even though it's 'about' my area of interest (Asia) I hardly ever look at it—and I haven't been motivated by what I've seen. Also, the title is terrible. Makes it sound like a narrow, dull, technical newsletter of uneven quality." (United States.)

"We're a department library with a limited (and declining) budget, and journal prices keep rising. If you charged too much relative to other newsletters we would have to cancel." (United States)

"The *Forum* has been a very useful publication and it is a source of articles which have a wide applicability in my research and teaching. However, departments are under severe financial pressure when it comes to journal subscriptions. A reasonably high subscription would inevitably mean limited response from New Zealand." (New Zealand)

"I am willing to pay for a subscription, but the system for paying in hard currency is laborious and difficult." (Myanmar)

"We hope the *Forum* will continue being provided free to LDCs." (Uganda)

"We are a nonprofit voluntary research organization. It is simply impossible for us to subscribe to the *Forum*. We shall therefore be grateful if we are placed on the complimentary mailing list." (India)