Chapter 4

The Direct Determinants of Fertility Change

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Chapter 4

The Direct Determinants of Fertility Change

Abstract

Fertility, mortality, and migration determine population change: if births plus net immigration exceed deaths, populations grow. Because no government advocates raising mortality rates and few encourage emigration, fertility change is the most viable option for countries that wish to lower population growth rates. Among the many factors that influence fertility, such as education, desired family size, and value and cost of children, eight directly influence the number of live births that occur, and four of these—lactation, proportion married and age at marriage, induced abortion, and contraceptive use-are most likely to contribute to any significant reduction in birth rates in the next 20 years. The relative influences of the remaining direct factors—frequency of intercourse, natural sterility, spontaneous abortion and fetal mortality, and duration of the fertile period during a woman's menstrual cycle—are likely to change only slightly. Because lactation temporarily suppresses ovulation, breastfeeding can lower fertility rates, but is an unreliable contraceptive for individuals. Age at marriage and proportion married influence fertility because most births take place in stable unions and women who marry at later ages are exposed to the possibility of pregnancy for fewer years. In some countries, both rising age at marriage and contraceptive use have contributed to fertility declines. Age at marriage will continue to be an important factor in less developed countries (LDCs) for the next 20 years because there will be more young adults in their peak reproductive years than ever before in history. An estimated 55 million induced abortions are performed in the world each year; more than half occur in LDCs. changes in abortion laws have occurred in recent years for reasons of public health, social justice, women's rights, and government population policies. The incidence of induced abortion and maternal mortality from improperly performed procedures can be reduced by improving access to effective contraceptive services. Contraceptive prevalence rates, which are reliable predictors of crude birth rates, vary widely among countries, and more urban than rural women use contraception because many family planning programs are not yet effectively reaching rural areas. Con= traceptive use has been established as of central importance in achieving replacement fertility.

Introduction

The determinants of population change are fertility, mortality, and migration. If the number of births plus net immigrants exceeds the number of deaths, the population grows. No government advocates raising mortality rates, and few countries encourage emigration. Thus, fertility change is the most viable option for countries that wish to lower population growth rates.

The factors that influence fertility include the motivation to have children; decisions about family size; relationships between child mortality and desired family size; value and cost of children; a couple's level of education, income, and occupation; decisionmaking power within the family; influence of peer groups and family; availability of family planning services; and external factors related to the development level of the country in which a couple lives. (See ch. 7.) These factors influence fertility by mediating other direct factors (usually termed intermediate or proximate) that in turn directly influence fertility. For example, the level of education of women is frequently found to be inversely related to fertility—women with more education have fewer children than those with less education. But other factors emerge on detailed examination: women who are better educated are more likely to marry later and to practice contraception, thus reducing the number of children they bear. These latter two factors—age at marriage and contraceptive use—directly influence fertility, whereas education is an indirect influence.

Eight factors directly influence the number of live births that occur: 1) proportions married and age at marriage, 2) contraceptive use, 3) induced abortion, 4) lactation (breastfeeding), 5) frequency of intercourse, 6) natural sterility, 7) spontaneous abortion and fetal mortality, and 8) duration of the fertile period during a woman's menstrual cycle. The first four of these elements are the most likely contributors to any significant reduction in births in the next 20 years (2,3,6).

The latter four elements are likely to have little impact on birth rates during this period. Normal variations in the frequency of intercourse have relatively little impact on fertility rates except in cases of spousal separation due to migratory work patterns or war.

Natural sterility displays the same general pattern in all populations; it increases with age. Although at young ages sterility averages about 5 percent, by age 35 from 15 to 20 percent of all women are sterile. In a few geographic areas of sub-Saharan Africa, sterility is high at all ages. Venereal disease, a probable major cause of these high levels of sterility, could, if treated, affect fertility. For the most part, however, changes in sterility will not have a significant impact on fertility rates in the next 20 years.

Past trends in fetal death rates from natural causes in more developed countries (MDCs) and expected health improvements in LDCs suggest that these rates will continue to decrease slowly, causing only slight increases in LDC live birth rates.

The duration of women's fertile period—the interval in the middle of the menstrual cycle during which ovulation occurs—is unlikely to change.

Natural fertility

If women were to begin childbearing at the start of their reproductive years (menarche) and to continue without interruption until they were no longer fecund (menopause), then, in the absence of limiting factors such as variations in frequency of intercourse, natural sterility, fetal mortality, and lactation, they could potentially have 30 to 40 children over their reproductive lives. But no known population—even those that have maintained high fertility goals—has ever reached this average. The highest fertility rate (total marital fertility rate) ever confirmed was for the North American religious sect known as the Hutterites—nearly 13 (table 10). More recently, Guatemala (1970-74) and Syria (1973) have recorded marital fertility rates of nearly 10 (table 11).

As groups desiring large numbers of offspring have been able to achieve fewer than half of the possible total per woman, natural limiting factors are clearly at work. Frequency of intercourse, natural sterility, natural fetal mortality, and duration of the fertile period reduce fertili-

ty from the potential level of 30 to about 15. To reduce fertility rates further to those actually observed in most populations, the most important limiting direct factors are: 1) lactation, 2) proportion married and age at marriage, 3) induced abortion, and 4) contraception (3).

Table 10.–Total Fertility Rate and Total Marital Fertility Rate for Selected Populations'

Historical populations	Total fertility rate	Total marital fertility rate
Bavarian Villages, 1700-1850	4.5[b]	11.9
Crulai, 1674-1742	5.6	9.9
Grafenhausen, 1700-1850	4.7[b]	10.7
Hutterites, 1923-1930	9.5	13.0
Ile de France, 1740-1779	6.1	12.1
Oschelbron, 1700-1850	5.1[b]	10.6
Quebec, 1700-1730	8.0	12.7
Tourouvre au Perche, 1665-1714	6.0	10.2
Waldeck Villages, 1700-1850	4.4[b]	9.9
Werdum, 1700-1850	3.8[b]	9.4

[a]The total marital fertility rate is higher because it is the fertility rate for married women only and reflects the depressant effect of proportion married on the actual fertility rate of the entire population.
[b]These figures are approximate.

SOURCE: J. Bongaarts, "The Fertility Inhibiting Effects of the Intermediate Fertility Variables," paper prepared for the IUSSP and WFS Seminar on the Analysis of Maternity Histories, London, April 1980.

Table il.—Total Fertility Rate and Total Marital Fertility Rate for Selected Countries*

	Year	Total fertility rate	Total marital fertility rate
LDCs			
Bangladesh	1976	6.3	7.4
Colombia	1976	4.2	7.5
Guatemala (rural)	1970-74	7.0	9.7
Indonesia	1976	4.7	6.6
Jordan	1976	6.4	8.6
South Korea	1970	4.2	7.1
Panama	1976	4.3	6.8
Peru	1977	5.1	8.9
South Lebanon	1973	4.7	8.9
Sri Lanka .,	1975	3.5	6.9
Syria	1973	7.0	9.6
Turkey	1968	5.6	7.2
MDCs			
Denmark	1970	1.8	3.2
Finland,	1971	1.6	3.1
France	1972	2.2	4.3
Hungary	1966	1.8	2.9
Poland	1972	2.1	4.8
United Kingdom	1967	2.4	3.9
United States	1967	2.3	3.7
Yugoslavia	1970	2.1	3.7

[a]The total marital fertility rate is higher because it is the fertility rate for married women only and reflects the depressant effect of proportion married on the actual fertility rate of the entire population. The rates exclude illegitimate births.

SOURCE: J. Bongaarts, "The Fertility Inhibiting Effects of the Intermediate Fertility Variables," paper prepared for the IUSSP and WFS Seminar on the Analysis of Maternity Histories, London, April 1980.

Primary determinants of changes in fertility rates

Lactation

Lactation has a contraceptive effect because it temporarily suppresses ovulation. When a mother breastfeeds, menses may not resume for as long as a year or more following birth. By contrast, women who do not breastfeed resume ovulation and menstruation 1 to 2 months after childbirth. In the absence of contraceptive use, the interval between successive births is 15 to 30 percent longer for women who breastfeed than for those who do not (8,17,18).

By significantly lengthening average birth-intervals (the period between successive births) in populations, the practice of breastfeeding can lower fertility rates, but is an unreliable individual contraceptive method for two reasons. First, resumption of menses is extremely variable. On average, 1 month of amenorrhea is added for 2 months of breastfeeding. Women who breast-feed for 8 to 12 months can begin menstruating again 4 to 7 months after childbirth, and women who breast-feed for 2 years can resume menstruation from 7 to 20 months after the birth. Second, ovulation usually precedes the first menses, so a woman may become pregnant again before she realizes that she is fecund (capable of becoming pregnant) (18).

Most women in LDCs breastfeed their infants, but both the prevalence and duration of breastfeeding are declining. In Bangladesh, Nepal, Pakistan, Indonesia, and Kenya, more than 95 percent of women breast-feed. In other countries, most mothers still breastfeed, but percentages are low: 85 percent in the Philippines, 81 percent in Malaysia, and 79 percent in Panama.

women who are better educated and/or live in urban environments are less likely to breastfeed, and do so for shorter periods. In Malaysia, for example, 85 percent of rural women breast--feed, but only 62 percent of urban women do, and for half as long as their rural counterparts. And there is usually an inverse relationship between the mother's education and the length of breastfeeding. In Thailand, women with no education breastfeed for about 12,0 months on average, those with a primary education for 10.7 months, and those with a secondary or higher education for 7.8 months (9).

The practice of breastfeeding is accompanied by lengthy periods of postpartum abstinence in some LDCs, especially in Africa. This norm was virtually universal in sub-Saharan Africa during the 19th century, when in 55 percent of the 131 societies for which records are available the custom of abstinence was observed for longer than 13 months (14). As traditional cultural supports for these norms are breaking down, the overall contraceptive effect of breastfeeding and breastfeeding accompanied by abstinence is decreasing.

Where fertility rates are high, breastfeeding acts to prevent maximum fertility, For example, in the Philippines in 1973, it was estimated that the additional 5.5 months protection afforded to women who breastfed provided approximately 590,000 "couple years" of protection from pregnancy, nearly equaling the 600,000 couple years of protection provided to the then 2 million participants in the family planning program (4).

Age at marriage and proportion married

Because most births take place within some form of relatively stable union in most LDCs, age at marriage and proportion married have a significant impact on fertility. In the absence of premarital sexual activity, a woman who marries at a later age is exposed to the possibility of pregnancy for fewer years.

Later age at marriage can also have an impact on population growth even when the number of children is the same for later marrying women as for those who marry at younger ages. In-

Photo Credit: Agency for International Development

Many women in LDCs become mothers while in their teens

creasing age at marriage shifts births from one age group and time period to a later one, temporarily lowering the birth rate. Although this increase in age at marriage cannot be repeated once it has taken place, its effects continue. For example, when other factors are equal, a family in which all women marry at age 15 and produce daughters every 5 years until age 40 will have more than five times as many living members after a period of 60 years than a family in which all women marry at age 25 and also produce daughters every 5 years until age 40 (see Technical Note C). This substantial difference occurs because women married at age 15 would average five children apiece in 60 years, whereas women married at age 25 would average only three children apiece in the same period.

In many countries, both rising age at marriage and contraceptive use have contributed to fertility decline. Table 12 lists 26 of the 80 LDCs of more than 1 million population where data are available on fertility and marriage trends. Of the 80 countries, only these 26 have also experienced appreciable fertility declines. The 13 indicated by the letter "a" already record high ages at marriage (in Taiwan and Korea, fewer than 10 percent marry before age 20). In seven of these countries (marked a and b), fertility among women 15 to 19 or 20 to 24 has dropped significantly, confirming the impact of higher age at marriage on fertility. In the other countries, substantial declines in fertility have occurred even though age at marriage has not

Table 12.—Twenty-Six LDCs Where There Have Been Appreciable Declines in Fertility and for Which Data on Fertility Trends and Marriage Trends Are Available

East Asia	**Latin America**
China[a]	Brazil
Hong Kong[a,b]	Chile
South Korea[a]	Colombia
Taiwan[a]	Costa Rica
	Cuba
Southeast Asia	Dominican Republic
Indonesia[a,b]	El Salvador
Malaysia[a,b]	Jamaica
Philippines[a,b]	Panama
Singapore[a,b]	Peru
Thailand	Trinidad and Tobago
	Venezuela
Indian Subcontinent	
India[a]	
Sri Lanka[a,b]	
Middle East	
Iran[a]	
Tunisia[a,b]	
Turkey[a]	

[a]Recent increases in age at marriage or age at marriage already high.
[b]Declining fertility among women 15-19 or 20-24 (additional confirmation of higher age at marriage); the remainder have experienced substantial declines in fertility even though age at marriage has not increased recently.

SOURCE: From Henry and Piotrow, 1979, "Age at Marriage and Fertility," *Population Reports*, Population Information Program, Johns Hopkins University, series M, vol. 4, November 1979.

risen. Fertility in women 15 to 19 or 20 to 24 has fallen appreciably in Brazil, the Dominican Republic, El Salvador, Panama, Peru, Trinidad and Tobago, and Venezuela (7). But as patterns of marriage in these countries make age at first marriage difficult to define, how much of the decline in fertility is due to rising age at marriage and how much to increased contraceptive use is unclear.

Age at marriage is influenced by the sociocultural context in which marriage takes place. In China, Sri Lanka, and Tunisia, age at marriage has risen and fertility has declined, but for very different reasons.

CHINA

In the People's Republic of China (PRC), where the government has embarked on a major campaign to slow population growth, young people are now expected to defer marriage well beyond the minimum legal ages of 18 for women and 20 for men. In the cities, the norms for age at marriage are 24 for women and 26 for men; their rural counterparts may marry at the slightly earlier ages of 23 and 25, respectively (5).

The effectiveness of the Chinese emphasis on delayed marriage and increased opportunities for women is shown in data from Shanghai, where there has been an increase in age at marriage of 5 to 7 years since 1950 (table 13).

Later age at marriage is helping to reduce fertility in the PRC, but age composition and population momentum play significant roles in the country's continuing population growth. Despite China's lowered birth rate and a contraceptive prevalence rate as high as 84 percent in some regions, the sharp rise in numbers of women who will enter the marriageable ages in the 1980's—due to high levels of fertility during the past 20 years—will make the country's population goals difficult to achieve. As this strong momentum for future growth is inherent in China's age composition, the government is taking steps to curb third (and higher) births by 1985 and is moving toward a one-child family norm (table 14).

SRI LANKA

In Sri Lanka, 63 percent of the decline in birth rates between 1963 and 1971 is attributable to changing patterns of marriage in the absence of a government policy designed to encourage such change. Age at marriage has risen as a result of:

- Continuing adherence to cultural practices. prospective mates are expected to be of the same caste and ethnic group; elaborate procedures are undertaken to assure that the

Table 13.—Mean Age at Marriage for Women in Shanghai 1950 to 1979

Period of marriage	City proper	Suburban county
1950 -54.....	19.9	19.8
1955-59	24.9	20.6
1960-64	26.3	23.9
1965-69	26.6	**24.1**
1970-74	**26.8**	**24.6**
1975 -79.....	**27.9**	**25.0**

SOURCE: Gu Xingyvan discussion at WFS Conference, London, July 1980.

Table 14.–Women Expected to Reach Marriage Age, China, 1980=2000

Year	As percent of 1980		Year		As percent of 1980
1980	100		1990		136
1981	87	Born during the "Bitter Years" of famine and high infant mortality	1991		130
1982	70		1992	High fertility rates	134
1983	79		1993		126
1984	130		1994		118
1985	158		1995		108
1986	135		1996		88
1987	133	High fertility rates	1997	Lower fertility rates evident	85
1988	123		1998	from mid-1970's	96
1989	120		1999	onward	90
			2000		90

NOTE: The proportion of women entering the marriageable ages from 1980 to 2000, which is expressed as a percentage of the number of women of marriage age in 1980, illustrates the effect of the built-in momentum of population growth even when fertility rates are declining rapidly. The PRC has been able to realize a significant reduction in birth rates in the past 5 years because relatively fewer women were born during the "Bitter Years" of the late 1950's and early 1960's, or survived this period to reach reproductive age. Due to renewed high fertility in subsequent years, there will be a substantial increase in the absolute number of women entering the marriageable ages (see also fig. 2B illustrating the U.S. "Baby Boom") until 1996, when the effects of declining fertility in the latter half of the 1970's will be felt. This high potential fertility is a major factor in the PRC's decision to promulgate the one-child family norm.

SOURCE: Liu Zheng, "March Toward Zero Population Growth," *Sichuan University Journal* (Philosophy and Social Science Edition), 1980, No. I, p. 13.

two horoscopes are compatible; the bride must be a virgin; the groom must be older, and his potential job security and the dowry provided by the young woman and her family must be acceptable.

- Increasing economic and job opportunities for women. In 1971, 71 percent of Sri Lankan women were literate, and 26 percent were in the labor force.
- A stagnating economic climate. Employment is difficult to obtain, agricultural land shortages have intensified, and males have migrated, leading to
- "Marriage squeeze," a sex ratio imbalance among those in traditional marriageable ages. In 1974 there were 75 males aged 25 to 34 for every 100 females aged 20 to 30 (l).

TUNISIA

In Tunisia, both government intervention and unanticipated economic changes have contributed to rising age at marriage. Age at marriage has risen as a result of:

- Marriage squeeze. In 1975, there were 77 males ages 20 to 24 for every 100 females ages 15 to 19, and 58 males ages 25 to 29 for every 100 females ages 20 to 24. Tunisian men are migrating to Europe and to other Arab countries to seek employment.
- A minimum age at marriage law passed in 1964 set the minimum age at marriage at 17 for women and 20 for men. An antipolygamy law passed in 1956 also guaranteed a voice in marriage decisions and other legal rights to Tunisian women.
- Committed leadership. President Bourguiba has made a strong commitment to the emancipation of women.
- Increased educational and job opportunities for women. By 1971, female literacy had reached 40 percent, and 7 percent of Tunisian women had entered the labor force (l).

When contraceptive use becomes extensive, age at marriage will lose importance as a causal mechanism in fertility change. Nevertheless, age at marriage will continue to be an important factor for the next 20 years, because of the number of people entering the marriageable ages in LDC populations:

> During the 1980's and 1990's, there will be more young adults in their peak reproductive and marriageable years (age 15 to 29) than ever before in history. More than 40 percent of the

people in developing countries today are under 15 years of age. By 1990, there will he 40 percent more potential parents age 15 to 29 than there were in 1975, and more than twice as many as in 1960—in other words, a total of more than 1 billion potential husbands and wives, fathers and mothers. If this new generation marries young and then begins to reproduce at an earl.v age, it will he difficult for many countries to reduce population growth to desired levels even if marital fertility is sharply reduced (7).

Induced abortion

Biological events such as life and death are culturally defined. For example, in some cultures, a child is not considered "born" until its naming ceremony, which can take place as long as a month after the child's birth. Where neonatal mortality rates are high, various "neglect" behaviors are rationalized. In the view of those societies, if the child hasn't been "born" yet, then it didn't '(die. " Although cultural and ethical issues are inexorably entwined in any discussion of induced abortion, it is a direct means of fertility regulation, and certain facts pertaining to abortion can be analyzed separately from ethical issues,

An estimated 55 million abortions are performed throughout the world each year, or about 70 abortion procedures for every 1,000 women of reproductive age. More than half of these occur in LDCs (10,16).

In 1980, 9 percent of the world's population lived in countries where induced abortion was illegal. An additional 19 percent lived in countries where the procedure was officially permitted only to save a woman's life, Some 10 percent lived in countries authorizing abortion on broader medical grounds, and an additional 24 percent lived where social factors were also considered. The largest group—38 percent—lived in countries where induced abortion during the first trimester of pregnancy was legal and available at the request of the pregnant woman (16).

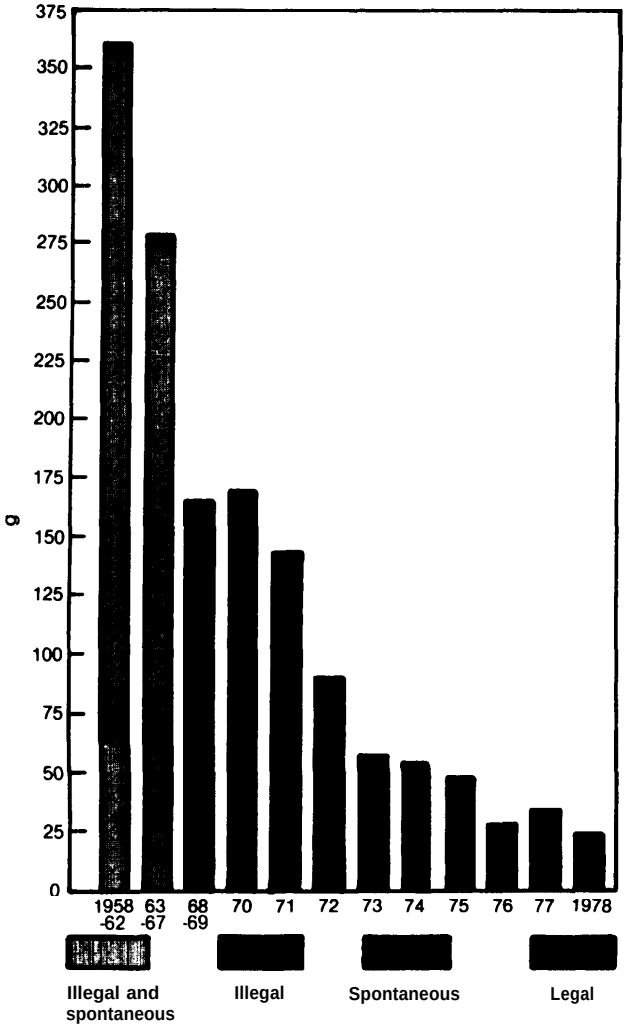
Changes in abortion laws over the past 15 years have taken place for four reasons: 1) public health, to combat the maternal mortality and morbidity associated with illegal abortion; 2) social justice, to give poor women the access to induced abortion previously available only to wealthier women; 3) women's rights, to provide women greater control over their reproductive lives; and 4) in a few countries (China, Singapore) government population policies, to encourage women to utilize the procedure in the event of contraceptive failure.

In the United States, the 1978 abortion rate as reported by the Center for Disease Control was 23 per 1,000 women of reproductive age. New estimates of induced abortion in China place that country's rate at 25 in 1978. Eastern bloc countries have very high rates. In the U. S. S. R., there were 180 abortions per 1,000 women of reproductive age in 1970, the latest year for which data are available, There were 88 abortions per 1,000 women of reproductive age in Romania and 68 per 1,000 for the same group in Bulgaria (1979). The latest data from Japan (1975) show an equivalent rate of 84 per 1,000 (16).

In countries where induced abortion is illegal, maternal mortality from complications of improperly performed procedures can be as high as 1 in 100 procedures (16). When abortion is performed during the first trimester under medically supervised conditions, maternal mortality rates are very low. (In the United States in 1978, 11 times more women died as a result of pregnancy and childbirth than as a result of legal abortions). In the United States, where changes in abortion laws to allow more legal abortions began in 1967, maternal mortality from abortion (spontaneous and induced) fell at a rate of 18 percent per year from 1968 to 1978. Maternal deaths attributed to illegal abortions declined 34 percent per year during the same period (16) (fig. 7).

Induced abortion occurs in all societies, whether legislation permits it or not. The frequency of abortion procedures can often be reduced by making effective contraceptive methods readily available. The introduction of contraceptives can also reduce the maternal mortality that accompanies illegal abortions. This was the justification for establishing official family planning programs in Chile. A survey

Figure 7.– Number of Deaths Associated With Abortion, by Type of Abortion: United States, 1958-78



SOURCE: C. Tietze, *Induced Abortion: A World Review, 1981,* **Population Council, 4th ed.**

taken in the early 1960's, when these efforts began, found that at least 25 percent of women in Chile acknowledged having had an illegal abortion. Between 1964 and 1978, the number of women of reproductive age using contraceptives increased from 3 to 23 percent. During the same period, the number of women admitted to hospitals for complications from illegal abortions declined from more than 56,000 to 37,900. Mortality among women undergoing illegal abortion also decreased markedly, from 11.8 per 10,000 live births to 4.2 per 10,000 live births (10).

Although induced abortion can be an effective method of fertility regulation for an individual because it prevents a live birth, it is not an "efficient" way for a society to reduce the total number of births. If an average couple in an MDC were not practicing contraception and the woman did not breastfeed the infant, the couple could have a live birth about 17 months after the previous birth (2 months of postpartum infertility, plus 6 months—the average time to become pregnant–plus 9 months of pregnancy) (fig. 8). If the woman breastfeeds, the birth interval could be 27 months on average because lactation would increase the infertile period by about 10 months. Using induced abortion (after 2 months of pregnancy) as a fertility planning method shortens the pregnancy interval because 7 months of pregnancy and 1 to 11 months of postpartum infertility are interrupted. The period between induced abortions is about 9 months (1 month of postpartum infertility, plus 6 months to become pregnant again, plus 1 or 2 months of pregnancy before another induced abortion interrupts the pregnancy).

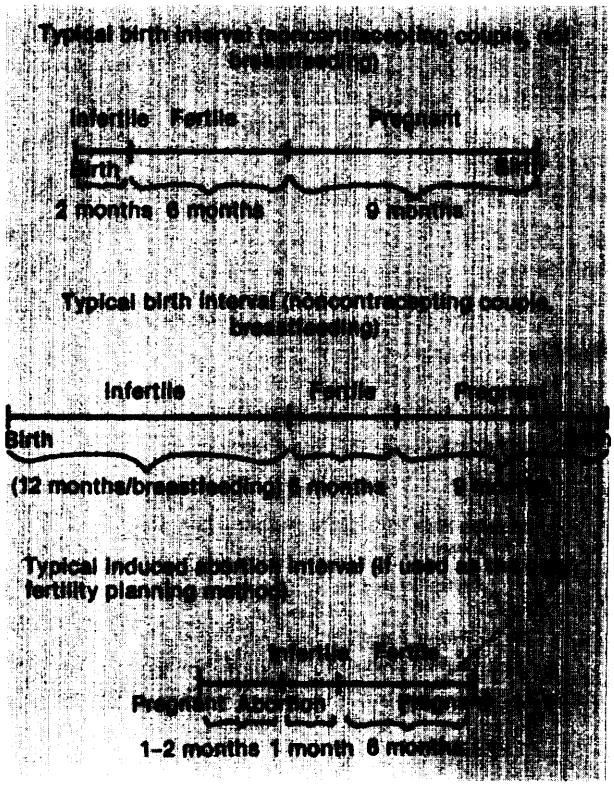
on average, if a woman wished to have two children (replacement fertility) rather than, say, seven (the average number in some LDCs *today), and used* abortion as her sole fertility planning method, she could expect to have about 9 to 10 induced abortions during her reproductive years (i.e., two abortions for each full-term birth averted). The number of induced abortions would be still higher were there no changes in natural sterility with age, divorce, widowhood, coital frequency, etc. (12,13,16).

Contraception

Contraceptive prevalence rates are reliable predictors of crude birth rates despite the effects of the other factors that directly affect fertility" rates. In figure 9, the line relating the contraceptive prevalence rate and the crude birth rate 1 year later indicates that every 2.4-percentage-point increase in contraceptive prevalence (X-axis) is associated with a l-point decline in the birth rate (Y-axis) (11).

Knowledge of the relationship of various factors with the use of contraception is increasing

Figure 8.— Birth Intervals and Induced Abortion



SOURCE: Office of Technology Assessment.

rapidly, as illustrated by the following **examples** of the relationships between contraceptive use and place of residence, age, and education.

Contraceptive prevalence rates tend to have similar patterns in geographic regions. Contraceptive practice is relatively high in Southeast Asia and in Latin America, low in Middle South Asia, and lowest in Africa.

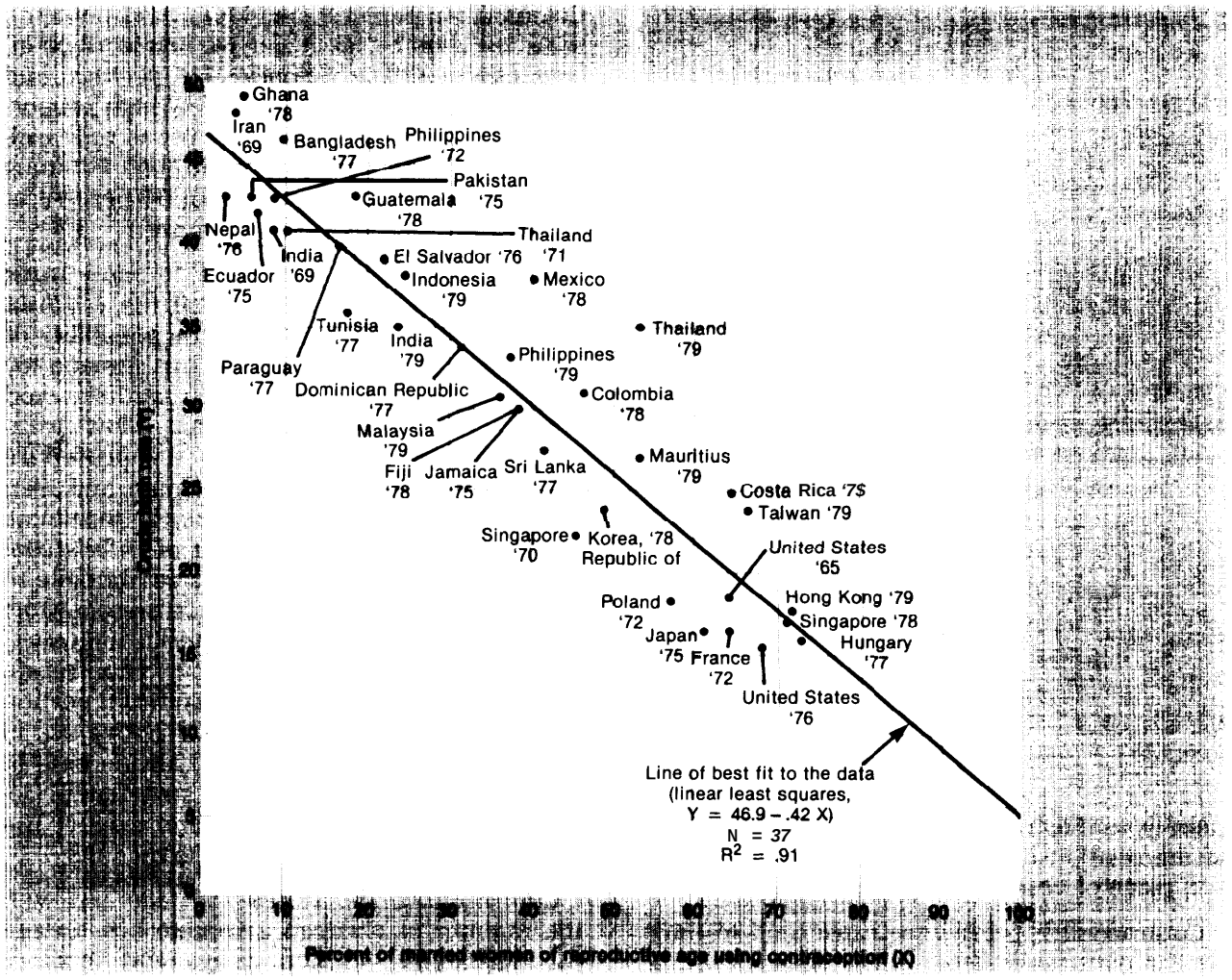
The proportion of couples using particular contraceptive methods differs widely among countries (table 15 and figs. 10, **11,** and **12),** The causes of these differences include cultural factors, the strength and historical antecedents of the program effort, the methods available in the country, and the socioeconomic setting. Fifty-seven percent of women who use contraceptives in Indonesia (Java and Bali), a relatively poor country, use oral contraceptives. Orals require fewer personnel with less medical support than other methods such as IUDs and sterilization. Oral contraceptive use is also high in Malaysia (44 percent of contraceptive users), Colombia (42 percent), and Mexico (31 percent). IUDs are used by far fewer women in all countries except China; Colombia **(16** percent) and Korea (20 percent) have relatively high proportions of IUD users, while IUD use is now estimated by China's State Council Birth Planning Staff office to account for about 50 percent of all contraceptive use in that country.

As a result of early marriage, in many LDCs the majority of women have all the children they want by age 25 yet face the possibility of pregnancy for 20 more years. Thus demand for sterilization is increasing in these countries, and because simpler techniques that allow paramedical personnel to perform the procedure have been developed, many women and men elect this as an efficient means to terminate childbearing. About 87 percent of India's contraceptive use rate in 1979 was attributable to sterilization. In Thailand, a concentrated effort to increase the availability of sterilization services markedly changed the country's contraceptive use rate in just 2 years. A significant portion of the increase in overall contraceptive use in Colombia is also attributable to an increase in male and female sterilization; sterilization accounted for 9.4 percent of all contraceptive use in 1976 and 17 percent of all use by 1978.

Contraceptive use varies with age and with the number of children a woman has. Except for Bangladesh, Pakistan, Kenya, and Nepal, of the countries shown in table 15, 40 percent or more of women with four children are using contraception. In many countries, contraceptive use decreases when women have five or more children. This may be due to the fact that older women may resist the adoption of family planning or may believe they are no longer capable of bearing children. older women who do use contraception are more likely to use more efficient methods, especially sterilization where it is available.

Rural-urban differences in contraceptive use follow the same pattern in all countries; a higher percentage of urban women use contraception. This difference is based on both personal

Figure 9.–Contraceptive Prevalence Rates Among Married Women of Reproductive Age and Crude Birth Rates 1 Year Later



SOURCE: D. Nortman and E. Hofstatter, *Population and Family Planning Programs: A Compendium of* Oate *Through 1978,* **Population Council, IOth edition.**

Table 15.—Contraceptive Prevalence by Method In Selected Countries

	Source	Year	Age	MWRA total prevalence	Barrier	Sterilization	IUD	Orals/ Injection	Other
Asia									
Bangladesh	WFS	1975	15–49	8	[a]	0.8	0.5	2.9	3.8
	CPS	1979		11	1.3	3.0	0.2	3.5	3.0
China[b]	Chen	1980	15–44	70	4.0	21.0	35.0	8.0	2.0
India[b]	Government	1979	15–44	23	—	20.1	0.9	—	1.6
Indonesia (Java & Bali)..	WFS	1976	15–49	26	—	0.3	5.5	14.8	5.5
South Korea	WFS	1974	15–49	35	—	4.9	8.1	8.8	13.3
	FPS	1978	20–44	49	—	16.2	9.8	6.4	16.7
	CPS	1979	15–44	55	5.2	20.4	9.6	7.2	12.1
Malaysia	PC	1969	15–44	6	—	0.3	0.1	5.5	0.1
	WFS	1974	15–49	35	—	7.0	0.7	15.4	11.9
Nepal	WFS	1976	15–49	2	—	1.4	0	0.3	0.3

Table 15.–Contraceptive Prevalence by Method in Selected Countries (Continued)

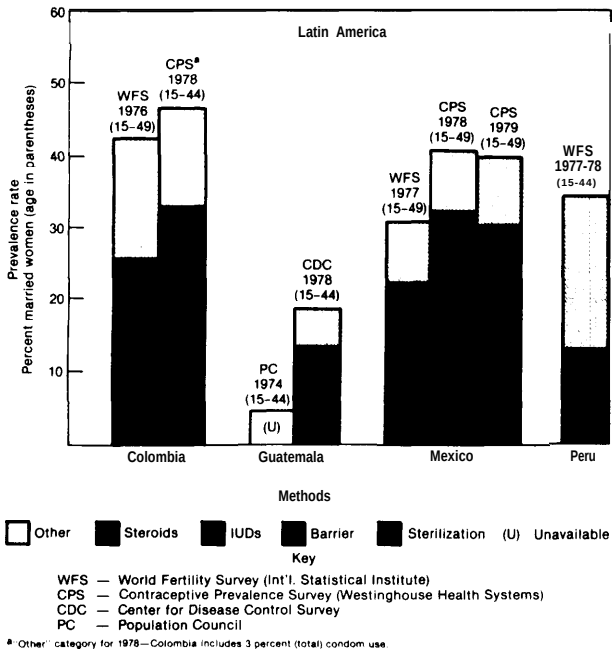
	Source	Year	Age	MWRA total prevalence	Barrier	Sterilization	IUD	Orals/ injection	Other
Pakistan	WFS	1975	15-49	**5**	—	1.0	**0.6**	**1.0**	2.5
Philippines	PC	1972	15-44	**8**	—	0	**1.8**	**4.9**	1.3
	WFS	1977	15-44	**36**	3.5	5.4	**2.3**	**4.7**	20.2
Sri Lanka	WFS	1975	15-49	**33**	—	10.2	**5.0**	**2.0**	15.8
Thailand	WFS	1975	15-49	**33**	—	7.9	**5.9**	**15.5**	3.6
	CPS	1978	15-49	**53**	2.2	16.5	**4.0**	**26.6**	4.1
Latin America									
Colombia	WFS	1976	15-49	**42**	—	3.9	8.4	13.4	16.0
	CPS	1978	15-44	**46**	—	7.8	7.4	17.0	13.8
Guatemala	CDC	1978	15-44	**18**	—	6.3	1.3	5.4	5.0
Mexico	WFS	1976-77	15-49	**30**	**0.7**	2.9	5.7	12.5	8.2
	CPS	1978	15-49	**40**	**1.0**	7.1	6.5	16.6	8.8
	CPS	1979	15-49	**38**	**0.8**	9.1	6.1	15.0	7.0
Peru.	WFS	1977-78	15-49	**34**	**1.1**	2.8	1.5	5.7	22.4
Brazil, ...	CDC								
Sao Paulo , . . .		1978	*15-44*	64	**6.6**	16.1	—	27.8	13.4
Piaui		1979	*15-44*	31	—	15.4	—	10.0	5.4
Africa/Middle East									
Egypt[b]	Government		?	**20**	**0.3**	**0**	1.7	16.5	**1.1**
Kenya	WFS	*1977-78*	15-49	**9**	—	1.3	**0.9**	3.4	**3.6**
MDCs									
United Kingdom.	WFS	1976	16-49	75	—	16.0	6.0	25.0	**30.0**
France.	WFS	1978	20-44	79	—	4.7	9.5	30.8	**34.0**
United States . . .	WFS	1976	15-44	68	—	19.0	6.1	22.4	**20.4**

[a]Barrier is often included in other category.
[b]Government programs only.

MWRA - Married women of reproductive age.
WFS - World Fertility Survey of international Statistical institute.
CPS - Contraceptive Prevalence Survey of Westinghouse Health Systems.
Chen - From Office of Technology Assessment Contractor Report of Pi-Chao Chen.
PC - Population Council.
CDC - Center for Disease Control Survey.
FPS - Family Practice Survey of Korean institute for Family Planning.

SOURCE: Office of Technology Assessment.

Figure 10.—Contraceptive Prevalence in Selected Countries Over Time by Method Mix, Latin America

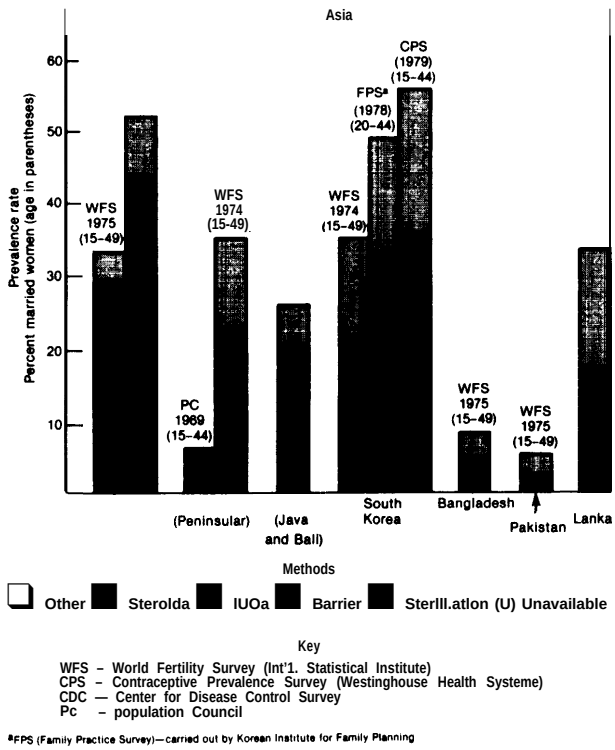


SOURCE: Off Ice of Technology Assessment

factors and on the availability of contraceptive methods. In many countries family planning programs effectively reach only urban women. In Pakistan, for example, 15 percent of urban women but only 3 percent of rural women are currently using contraception. Yet the country's population is predominantly rural–74 percent of Pakistanis live in rural areas. In Bangladesh, where the population is 91 percent rural, 23 percent of urban women use contraception but only 9 percent of those in rural areas do so. In Indonesia (Java and Bali), which is 82 percent rural, a deliberate goal of the family planning program has been to reach women in the countryside. Here the difference is less extreme; 40 percent of urban women are contraceptive users as compared with 36 percent of rural women. Where government programs make no special effort to reach rural couples, socioeconomic factors such as educational level and income substantialy influence contraceptive use, but where governments provide services in rural areas, the influence of these factors becomes less important.

Women who have more education are more likely to use contraceptives. It should be noted, however, that few women in these populations achieve even a secondary education. Thus, the high rates observed in the better educated groups often represent only a small minority of women in the country.

Figure il.—Contraceptive Prevalence in Selected Countries Over Time Method Mix, Asia



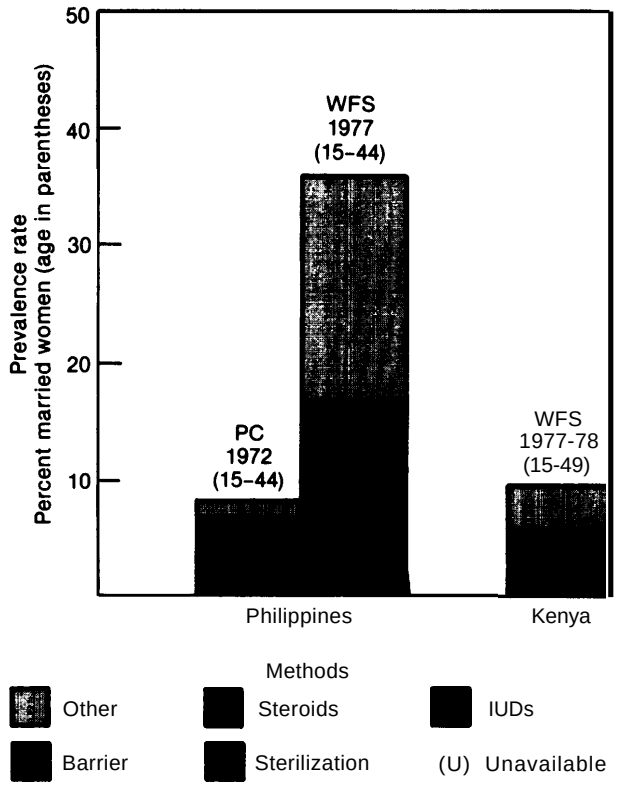
Key

WFS – World Fertility Survey (Int'1. Statistical Institute)
CPS – Contraceptive Prevalence Survey (Westinghouse Health Systeme)
CDC — Center for Disease Control Survey
Pc – population Council

[a]FPS (Family Practice Survey)—carried out by Korean Institute for Family Planning

SOURCE: Office of Technology Assessment

Figure 12.—Contraceptive Prevalence in Selected Countries Over Time by Method Mix, Philippines and Kenya



Key

WFS – World Fertility Survey (Int'1. Statistical Institute)
CPS – Contraceptive Prevalence Survey (Westinghouse Health Systems)
CDC – Center for Disease Control Survey
PC – Population Council

SOURCE: Office of Technology Assessment.

Relative effects of the direct determinants on fertility rates

What is the role of these direct factors in fertility change and why are some more important than others? A useful way to evaluate these factors is to examine their fertility-inhibiting impact in recent years in terms of the maximum number of children women would have if these factors were not present.

A maximum fertility rate of almost 13 is the highest ever recorded in a human population. High fertility rates prevail in populations where there is little marital disruption due to divorce or death, limited duration of breastfeeding, little induced abortion, and no contraceptive use. The total fertility rate, usually much lower than

the maximum of 13, is the rate actually measured in populations and reflects the effects of these fertility inhibiting factors. If only married people are counted, the rate is higher than the total fertility rate and is called the total marital fertility rate. If the inhibiting effects of contraception and induced abortion are removed, fertility would rise to the total natural fertility rate. And, finally, if the inhibiting effect of breastfeeding is removed, fertility would rise to the maximum; about 15 births per woman on average.

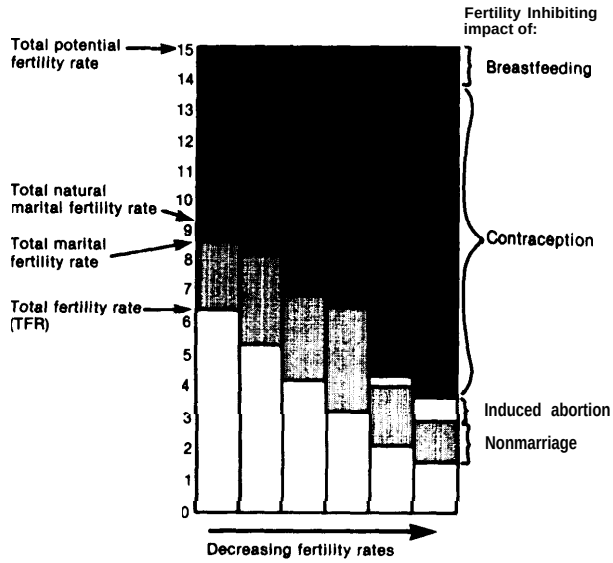
These relationships are summarized in figure 13. The vertical axis represents fertility rates, and the partitions represent the contributions of each of the four primary factors in lowering the potential rate. The horizontal axis represents successively smaller total fertility rates (the white partition in each column) down to below replacement levels. This figure illustrates the relative importence of each fertility-inhibiting factor as replacement fertility levels are approached.

Figure 14 summarizes the historical contribution of each of the fertility inhibiting factors as population fertility rates have changed. When fertility rates are high, breastfeeding is found to have a significant impact, reducing potential fertility by 37 percent. At replacement levels of fertility, however, breastfeeding is not significant, contributing only 7 percent of the inhibiting effect on the total fertility rates (fig. **14).**

By contrast, the fertility-inhibiting effect of the other factors has been found to increase as fertility approaches replacement levels. The effect of proportions not married (later age at marriage) rises from 25 to 47 percent as total fertility rates fall. Induced abortion is insignificant when total fertility rates are above 3 but has some impact when these rates are at replacement levels.

The pattern of the fertility-inhibiting effects of these variables changes slightly when different countries are used in calculating the rates. For example, because Eastern European conf-

Figure 13.—Fertility4nhibiting Impact of Selected Factors

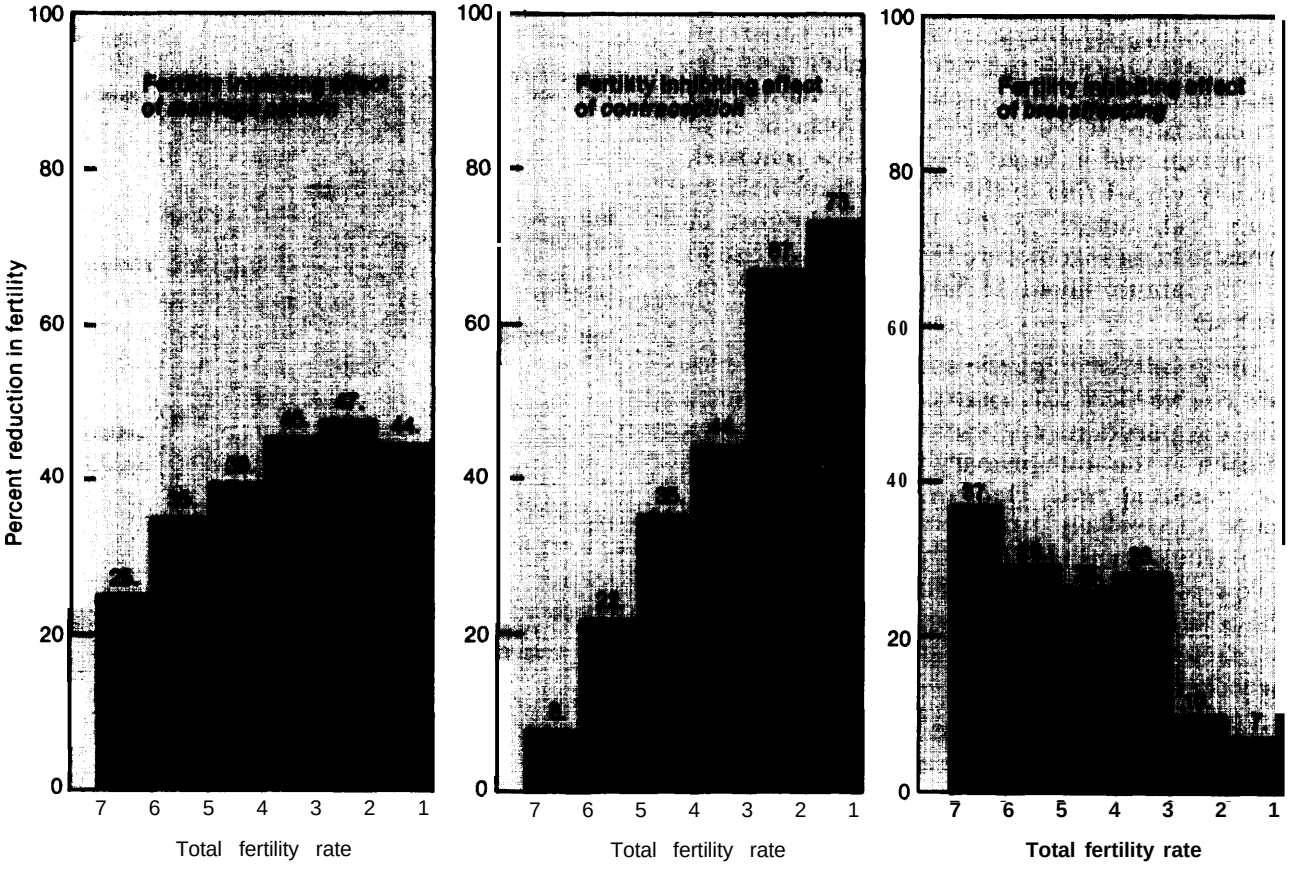


SOURCE: J. Bongaarts, "The Fertility Inhibiting Effects of the Intermediate Fertility Variables," paper prepared for the IUSSP and WFS Seminar on the Analysis of Maternity Histories, London, April 1980,

tries were included with LDCs and other MDCs in this analysis, induced abortion was shown to have a significant impact at replacement levels. (Eastern European countries have total fertility rates at or below replacement levels and induced abortion is used extensively.) In populations with higher total fertility rates and similar rates of induced abortion, the demographic effect of induced abortion may be more significant than shown here.

The demographic transition in Europe was a relatively slow process by comparison with the current transition in LDCs, and the effects of these four direct factors—proportions married and age at marriage, contraceptive use, induced abortion, and lactation—were different in the relative degree of their impact on declines in total fertility rates. Today, however, the finding that contraception has a markedly intensified capability to reduce potential fertility as total fertility rates approach replacement levels is particularly important. Contraceptive use has

Figure 14.—Fertility Inhibiting Effects of Marriage Patterns, Contraception, and Breastfeeding



NOTE: Percent reduction in fertility caused by late marriage, divorce, or death; contraception; and breastfeeding In groups of populations with declining total fertility rates

SOURCE: J. Bongaarts, "The Fertility Inhibiting Effects of the Intermediate Fertility Variables," Paper prepared for the IUSSP and WFS Seminar on the Analysis of Maternity Histories, London, April 1980.

been found to contribute only 8 percent of the inhibiting effect at high total fertility levels but 73 percent when replacement rates are appreached (2). Thus, of all of the factors that directly determine total fertility rates, contraceptive use has been established as of unique importance in achieving replacement fertility.

Technical Note A: The demographic transition

The shift from high to low fertility known as the demographic transition is accompanied by vast social changes and has long intrigued social scientists. Based on the apparent experience of Western Europe, a general "theory of the demographic transition" was developed, which held that fertility decline follows only after, and as the result of, a decline in mortality (particularly infant mortality) and improvement in socioeconomic conditions, or "modernization." Because much of Europe's fertility decline took place before modern contraceptives or safe medical

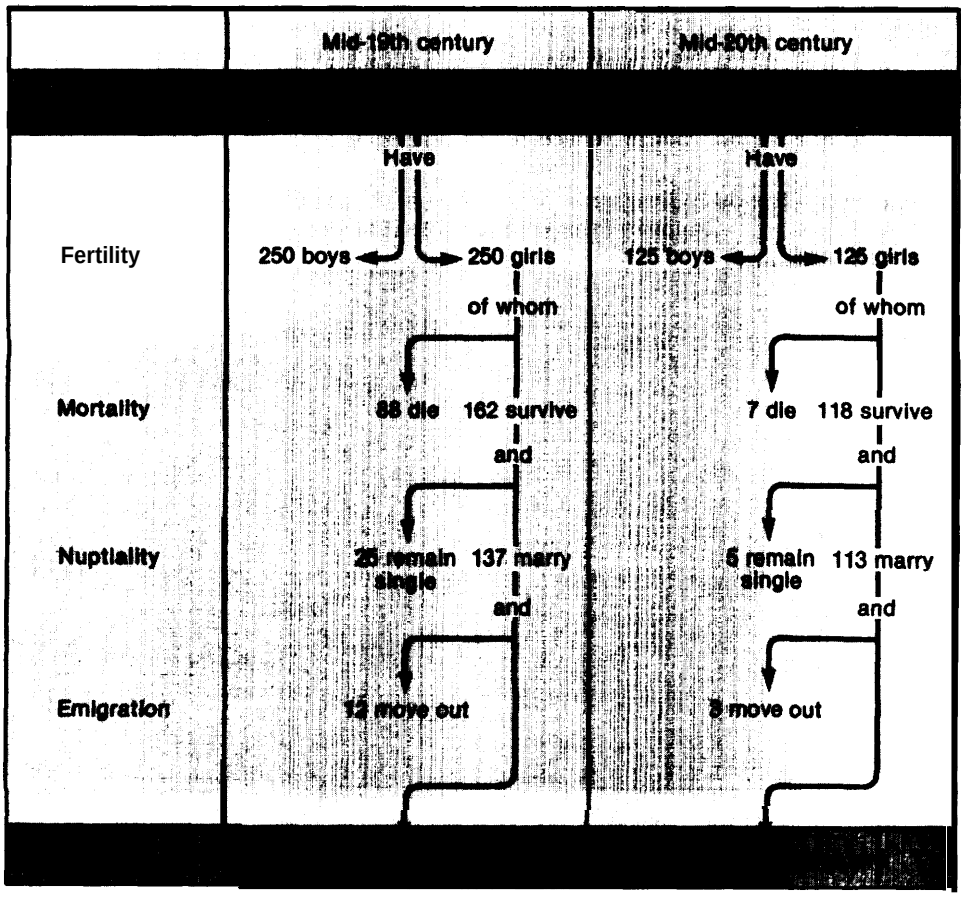
[1]John Knodel and Etienne van de Walle examine the European Demographic Transition in detail in "Lessons From the Past: Policy Implications of Historical Fertility Studies," *Population and Development Review*, vol. 5, No. 2, June 1979; and "Europe's Fertility Transition: New Evidence and Lessons for Today's Developing World," *Population Bulletin*, vol. 34, No. 6 (Washington, D.C.: Population Reference Bureau, Inc., 1980), from which this description draws heavily.

abortion were readily available, it is argued that couples who limited their family size must have done s. by practicing withdrawal or abstinence. Induced abortion was rarely resorted to because of the dangers associated with the procedures then in use.

The demographic record has now been examined more closely. New information sources and analytical methods indicate that sustained fertility declines in Europe began under a much wider variety of social, economic, and demographic conditions than had been thought, appeared to follow cultural and linguistic lines, were remarkably concentrated as to onset—mostly between 1880 and 1910—and became irreversible processes once under way. Large families were not necessarily desired in pretransition Europe, according to these new findings, and high infant and child mortality may have been partly the result of high fertility rather than the other way around. The then-available fertility planning methods—withdrawal, abstinence, and induced abortion—may not have been used because they were unthinkable for married couples, ineffective, or simply unknown.

The European demographic transition can be visualized by contrasting the typical childbearing experiences of 100 women married in the middle of the 19th century with those of a similar group at mid-20th century (fig. 15). Much of 19th century Europe's high fertility was neutralized by high mortality, patterns of delayed marriage, and lifetime celibacy. Because of late marriage and widowhood, mothers averaged only five children apiece, a number well below their potential total. By the mid-20th century, a substantial decline in fertility reduced the number of children per family, but the likelihood that these offspring would survive to reach childbearing age had risen to almost 95 percent. Relatively more of

Figure 15.—Typical Demographic Patterns in Western Europe: Mid-19th and Mid-20th Centuries



SOURCE: E. van de Wane and J. Knodel, "Europe's Fertility Transition: New Evidence and Lessons for Today's Developing World," *Populafion Bulletin, vol.* 34, No. 6, Population Reference Bureau, Inc.,Washington, D.C 1960.

these surviving daughters were likely to marry and fewer to emigrate. The net result was a 10-percent gain in population over a generation in contrast to a gain of 25 percent a century earlier.

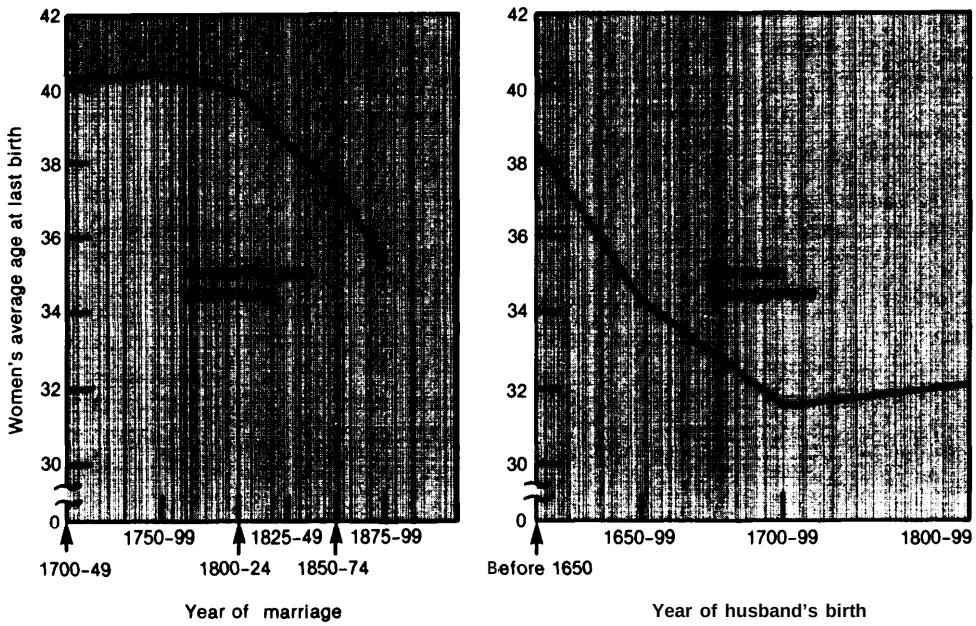
Information on these occurrences has been drawn from three principal sources: censuses, parish registers, and contemporary accounts. Family histories are reconstructed from parish registers, compared with censuses where available, and analyzed by new techniques, Contemporary accounts of socioeconomic conditions are then used where possible to confirm the results.

The concepts of natural fertility and family limitation are central to descriptions of the demographic transition. "Natural" fertility occurs among **couples who make no attempt to limit or terminate childbearing during the biological reproductive lifespan. Family limitation describes couples who make a deliberate effort to terminate childbearing once a desired number of offspring have been born. Such limitation is not synonymous with "birth control" but refers instead to behavior designed to halt childbearing altogether. Birth control, or family planning, refers to spacing and limiting the total number of births. Birth spacing can occur under conditions of natural fertility, as when couples deliberately space births but are unconcerned with their total number. This practice has been common in sub-Saharan Africa, where it persists in many regions. The techniques used to study historical data can detect stopping behavior but cannot detect deliberate spacing behavior. This is important because the introduction and spread of stopping behavior characterized the onset of the fertility transition.**

Because the decline in fertility in Europe resulted from a shift from natural fertility to family limitation, the age of women at last birth becomes an index for the degree of family limitation behavior being practiced. These trends are seen in two cultural groups in figure 16. The transition from natural fertility to family limitation began relatively early in the town of Grafenhausen, Germany. The bourgeoisie of Geneva, Switzerland, were an elite group who began practicing family limitation early in the 17th century, long before most other European couples did so. In both groups the shift is clearly evident: before the fertility decline, women had their last birth at about *40* years of age; toward the latter part of the decline they gave birth for the last time nearer 30 years of age.

In general, although predecline levels of fertility remained relatively constant within cultural or geographic areas, there was considerable variability in fertility levels among groups, due to a mix of physiological factors, social customs, health conditions, and differences in breastfeeding patterns. Evidence is strong that, despite regional differences in overall

Figure 16.—Trends in Average Age of Women at Last Birth: Grafenhausen and Genevan Bourgeoisie, 17th-19th Centuries



SOURCE: E. van de Walle and J. Knodel, "Europe's Fertility Transition: New Evidence and Lessons for Today's Developing World," *Population Bulletin,* vol. 34, No. 6, Population Reference Bureau, Inc., Washington, D.C. 1980.

levels, fertility levels remained high and relatively constant until the decline began. The decline then, in all cases, became irrevocable, taking the same path in all areas and differing only in pace.

Indigenous methods of birth control, which have always been available in traditional societies, were available to married couples in pretransition Europe for the termination of childbearing if this had been their choice; there are references to methods of contraception and induced abortion in many cultural contexts. There is evidence that women in the late 19th and early 20th century, after the decline had begun, were ingesting a variety of substances in efforts to induce abortions. Because about 20 percent of known pregnancies end in spontaneous abortion, at least 20 women of 100 using a particular potion could "succeed" in such efforts despite the ineffectiveness of substances then in use. The practice of withdrawal as a method of family limitation is considered to have been little known until the period of the demographic transition, and the idea of family limitation was generally deemed impractical or even scandalous before this period.

The relationship between infant mortality and fertility is a component of fertility decline, in that high fertility (in Europe in the past and in LDCs today) is often viewed as an adaptation to high infant mortality. However, the evidence from European village studies shows that couples whose children all survived continued childbearing just as long as those who had lost offspring. Contemporary observers noted that deaths of children were often welcomed because they provided relief from the burdens of parenthood. In England, smallpox was commonly called "the poor man's friend." This evidence suggests that women continued bearing children because they had few alternatives.

Abusive child care practices and general child neglect appear to have been common in much of Europe. Historians refer to "unconscious infanticide" or "infanticide by neglect" in describing such traditional practices as sending a newborn out to a wet nurse, dosing an infant with liquor or opiates to keep it quiet, rocking babies violently in their cradles until knocked into insensibility, leaving them swaddled and unattended in their own excrement for hours on end, and having them sleep with parents and thus risk "overlaying" and suffocation. The practice of handfeeding rather than breastfeeding of infants was particularly devastating.

The nearly universal practice of abandonment or exposure of children undoubtedly contributed to high mortality rates. The city of Paris averaged some 7,000 foundlings per year in the period before the French Revolution. Data for the end of the 18th century indicate that a third of these abandoned children were legitimate and many came from bourgeois, master craftsman, and merchant families. In the Hospital of the Innocents (or foundlings) in Florence for the period 1775-94, foundlings constituted 4.2 percent of legitimate births in the two nearby villages of Fiesole and South Godenzo. In this latter case, where documentation was complete, abandonments were clearly related to the number of children in the family (table 16). The abandonment of infants declined and finally disappeared after the middle of the 19th century.

If deliberate abandonment and negligent childrearing practices and resultant high infant mortality indeed served as methods of limiting family size before voluntary means were deemed acceptable, the argument that high fertility is a result of high mortality may be the reverse order of causality. The recent evidence in Latin American that associates child neglect with increasing family size (15) may be a partial explanation of why marital fertility began its decline in Europe and has begun to decline in some LDCs today despite high rates of infant mortality.

The European decline in fertility began at different times under a wide variety of socioeconomic conditions. Table 17 shows the dates of an observed 10-percent decline in fertility and contemporary indicators of socioeconomic status. At the beginning of declines, there were large differences in rates of infant mortality, which declined slowly in many European countries during the 18th century and most of the 19th century. In the last quarter of the 19th century, both marital fertility and infant mortality declined rapidly. It may be that the ability to choose family size through family limitation was a preliminary condition to any real progress in infant and child survival.

Table 16.—Child Abandonment: Tuscany, Italy, 18th Century
(Legitimate children abandoned at the Foundling Hospital of Florence by number of children in the family: two near. by villages, 1775-94)

Number of children in family	Percent of children abandoned
1-3	24.8
4-5	37.1
6 plus	50.6

NOTE: Refers to 170 children from 133 families who abandoned at least one child and for whom there are complete records,

SOURCE: E. van de Walle and J. Knodel, "Europe's Fertility Transition: New Evidence and Lessons for Today's Developing World," *Population Bulletin*, vol. 34, No. 6, Population Reference Bureau, Inc., Washington, D.C. 1980.

Table 17.—Starting Date of Fertility Transition and Indicators of Concurrent Demographic and Socioeconomic Conditions: Selected European and Developing Countries

	Date of decline in marital fertility by 10 percent	Marital fertility before decline (I_g)	Proportion of women married (I_m)	Infant deaths per 1,000 live births	Percent of male labor force in agriculture	Percent rural[d]	Percent in cities over 20,000 population	Percent illiterate[e]
European countries								
France	ca. 1800	0.70	0.51[a]	185[c]	70	81	7	High
Belgium	1882	0.82	0.44	161	30	56	22	30
Switzerland	1885	0.72	0.44	165	33	78	9	Low
Germany	1890	0.76	0.50	221	38	68	21	Low
Hungary	ca. 1890	0.63	0.70	250	73	84	11	49'
England and Wales	1892	0.68	0.48	149	15	28	57	Low
Sweden	1892	0.71	0.42	102	49	81	11	Low
Scotland	1894	0.75	0.42	124	13	27	49	Low
Netherlands	1897	0.85	0.45	153[c]	29	26	42	Low
Denmark	1900	0.68	0.47	131	42	61	23	Low
Norway	1904	0.75	0.42	76	37	72	18	Low
Austria	1908	0.68	0.51	205	40		19	21
Finland	1910	0.70	0.46	114	66	35	9	44
Italy	1911	0.68	0.54	146	46	38	28	39
Bulgaria	1912	ca. 0.70	ca. 0.74	159	70	32	7	60
Spain	1918	0.64	0.51	158	66	45	26	46
Ireland	1929	0.71	0.35	69	48	73	20	Low
Developing countries								
Costa Rica	1962	0.89[b]	0.50[b]	74	58	66	20	14
Taiwan	1963	0.70	0.70	49	47	42	31	30
Chile	1964	0.65[b]	0.50[b]	103	37	29	53	15
Thailand	ca. 1970	ca. 0.75	0.75	77	75	85	12	18

NOTE: Country borders are of the date of decline. All figures refer to the year estimated as the date of a 10-percent decline in marital fertility except the index of the level of marital fertility before decline. Estimates were obtained by interpolation or extrapolation when data were not directly available for the year indicated.

[a] In 1831.
[b] Excluding consensual unions.
[c] Children dead after registration only.
[d] In communities of fewer than 5,000 or legal definition.
[e] Both sexes, aged 10 + or 15 +; high refers to percentages of young adults unable to sign their name on the marriage certificate or of illiterate army recruits, exceeding 50 percent; low refers to percentages under 10 percent.
[f] 6 +.

SOURCE: E. van de Walle and J. Knodel, "Europe's Fertility Transition: New Evidence and Lessons for Today's Developing World," *Population Bulletin*, vol. 34, No. 6, Population Reference Bureau, Inc., Washington, D.C., 1980.

The four LDCs shown in table 17 display great diversity in rates of infant mortality and socioeconomic development. For example, Thailand was 85 percent rural but Chile less than 30 percent rural when each first recorded a fertility decline of more than 10 percent. Chile's infant mortality rate was 103 deaths per 1,000 live births in contrast to Taiwan's 49 deaths per 1,000 live births when these countries began their fertility declines. Although a number of LDCs are more industrialized and have lower illiteracy and infant mortality today than many European countries had in the 19th century, their fertility levels have not yet begun to decline.

Recent research has consistently shown the onset and spread of Europe's fertility decline to have been clustered regionally in a way that cannot be attributed to similar socioeconomic characteristics. Fertility trends were more alike among provinces in the same region, where common language, religion, or less easily documented customs are typically shared, than where cultural boundaries impeded the flow of information and the process of diffusion. Thus, the diffusion of knowledge of the ability to limit fertility as facilitated by cultural homogeneity played a major role.

There are differences between LDCs today and European countries prior to their fertility decline that have important implications for the demographic transition in LDCs. There are also valuable lessons to be learned from the similarities between these groups. Population growth rates in Western Europe were far lower than the extremely rapid rates of many LDCs in recent decades. There are two principal reasons for this. First, although marital fertility during the predecline period in Europe was high, if not higher, than in these LDCs, overall birth rates

were substantially lower in Europe due to late age at marriage and large proportions who remained permanently single. Second, because death rates declined more slowly than they have recently in LDCs, they were generally higher in Europe at equivalent stages of the demographic transition. In addition, because of rapidly declining mortality, sustained high fertility that has only recently begun to decline, and larger initial populations, LDCs today are experiencing unprecedented increases in absolute numbers. For example, in Sweden in 1855—about 40 years before its fertility decline began—the birth rate was 33 per 1,000 population and the death rate 22 per 1,000, which translates to an annual growth rate of 1.1 percent and a population doubling time of 63 years. By contrast, in Taiwan in 1953, 10 years before its fertility decline began, the birth rate was 45 per 1,000 and the death rate 9 per 1,000, producing an annual growth rate of 3.6 percent and a doubling time of 19 years. The unique marriage pattern in predecline Europe coupled with slower declines in mortality rates kept birth rates and annual growth rates lower.

Other features make the two transitions similar and provide valuable lessons for LDCs today. These include the diversity of social, economic, and demographic conditions under which Europe's fertility transition took hold; the remarkable concentration of the starting dates; the absence of deliberate birth control within marriage before the decline despite evidence that a substantial proportion of births were unwanted; the apparent coincidence of the decline with the sudden adoption of family limitation practices; the rapid spread of such practices, once they appeared; the resulting drastic change in reproductive behavior; the irreversibility of the process once under way; and the importance of cultural factors among those that appeared to influence the onset and spread of the fertility decline. These same features can be identified in many LDCs today.

There was only a loose relationship in Europe between the level of socioeconomic development and fertility decline. Although a relatively high level of development may often accompany a decline in fertility, it is clearly not a precondition. There appears to have been an important innovation-diffusion dimension to the reproductive revolution that swept Europe. Thus, the "legitimating" function of a government or privately sponsored program may be of considerable importance. The inexorable spread of family limitation in the past sharply contradicts the assumption sometimes made that family planning programs in today's LDCs can reach only a limited number of users and that, after initial success, demand for contraceptives services will lessen. Because it has traditionally been and continues to be the wife who wants to limit her fertility, and today's methods are primarily used by women, use of modern contraceptive methods should accelerate rapidly once introduced. Whether or not a family planning program meets with success will be determined by how receptive couples are to the idea of reducing their fertility once the knowledge and means to do so are available. The absence of family planning efforts prior to campaigns to disseminate information and services does not necessarily indicate a lack of such receptivity. It may instead reflect an unfamiliarity with the concept and methods of family limitation.

Knowledge of the factors that determined receptivity during the early stages of the transition is quite incomplete, and the level of development necessary to provoke a change in reproductive behavior is so variable that no prediction can be made. The historical record provides no affirmation that efforts to reduce fertility or hasten fertility decline through raising the level of socioeconomic development will meet with early success. It is reasonable to assume, however, that efforts designed to influence fertility will fail unless attention is paid to the long-established cultural values that govern fertility behavior in specific societies.

Until these cultural barriers are modified, neither higher levels of socioeconomic development nor family planning programs are likely to hasten fertility decline. Although the historical record does not identify those cultural factors most likely to influence the acceptance of family limitation, it does suggest that factors that determine the status of women and their ability to assert their own wishes regarding childbearing are extremely important. Where the concept of family planning becomes legitimate and the knowledge and means to plan fertility become available, a climate of receptivity is created that is likely to be rapidly diffused.

Technical Note B: The measurement of contraceptive prevalence

Estimating the prevalence of contraceptive use in a population, which is a measure of the proportion of a population practicing contraception at a particular point in time, is analogous to taking a snapshot of the reproductive behavior of that population. The prevalence rate is the percentage of all women of reproductive age (15 or 20 to 44 or 49) currently living in some type of stable union ("married") who are currently using contraception. For example, 23 percent of such women in India are currently using some form of contraception while only 5 percent of their counterparts in Pakistan are doing so. These figures are snapshot views for 1979 and 1975, respectively (table 15).

Although prevalence rates appear straightforward, reliable prevalence rates are difficult to obtain for several reasons. If there is extensive use of contraception outside of marriage, this use will not be measured since rates are calculated on the basis of women currently in some type of stable union. Unless the survey is truly representative of the population and the quality of research, questionnaire design, and fieldwork are adequately controlled, the data will be questionable. Even with good quality control, contraceptive use can be underreported because respondents may be shy, may wish to hide the truth, or may misunderstand the questions.

Prevalence rates can vary depending on the contraceptive methods included in the index of current contraceptive use. Traditional methods such as herbs, withdrawal, or abstinence can augment the percent of women who report using contraception. Traditional methods, however, are not usually reliable and such women are in effect at risk of unwanted pregnancy. Menstrual regulation and induced abortion as post coital methods are usually excluded from calculations of the percentages of women using contraception, but their use may represent a significant proportion of the effective contraceptive protection in a population. Thus, the prevalence rate may be lower than expected when compared with the birth rate because women are relying on postcoital methods in cases of contraceptive failure. For example, because pills or IUDs may not be as available as spermicides or condoms in some countries, menstrual regulation and/or induced abortion are used in the event of method failure.

It is necessary to distinguish between sterilization for contraceptive purposes and sterilization for health reasons. The basis for the sterilization procedure is ascertained from women survey respondents. It is often difficult for a woman to distinguish the *primary* cause for sterilization when she has as many children as she wants, her doctor has advised her that having more would probably threaten her health and well-being, and when the couple's income is inadequate for the support of another child.

Thus, there is always a margin for error in the determination of contraceptive prevalence rates. In surveys such as the World Fertility Survey and the contraceptive prevalence surveys currently being undertaken by Westinghouse and the Center for Disease Control,[2] this "sampling" error is being calculated and prevalence rates are shown with calculations of probable ranges of error (e.g., a rate of 50 percent plus or minus several percentage points). These sampling ranges have not been included in this document, but may be obtained from the sources cited in the text tables of contraceptive prevalence.

[2]For details on contraceptive prevalence surveys see Sir Maurice Kendall, "The World Fertility Survey Current Slat us and Findings," *Population Reports,* Series M, No 3, Population Information Program, The Johns Hopkins University, July 1979; and L Monis, et al., "Contraceptive Prevalence Surveys: A New Source of Family Planning Data," *Population Reports,* Series M, No .5, May-June 1981, Population Information Program, The Johns Hopkins University, Baltimore, kid.

Technical Note C: Age at marriage[3]

Women who marry early tend to have more children than those who marry later for three demographic reasons:

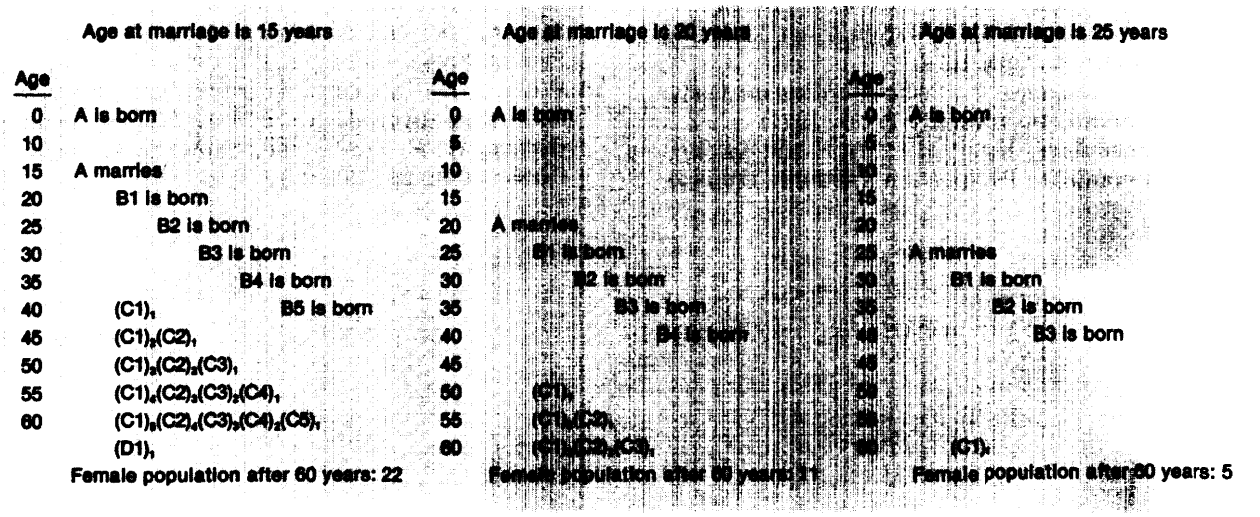
- they are likely to have sexual intercourse frequently throughout their most fecund years (later-marrying women will have sexual intercourse during fewer of their fecund years);
- they begin childbearing at an early age, live through a longer period of exposure to the possibility of pregnancy, and thus, in the absence of

[3]For further details see J. Henry and P Piotrow, "Age at Marriage and Fertility," *Population Reports,* Series M, No 4, November 1979, Population Information Program, The Johns Hopkins University Baltimore, Md

contraception, are apt to have more children than women who marry later; and
- by their early childbearing, they shorten the interval before the next generation is born.

Figure 17, which illustrates the effect of age at marriage (in the absence of contraceptive use), assumes that a woman gives birth to a daughter every 5 years until she reaches age 40. If her age at marriage is 15, she gives birth to a daugher at age 20 (at left of figure). By the time this woman reaches age 40, she has had 5 daughters and the eldest has given birth to *her* first daughter. After a period of 60 years, if age at marriage is 15, the resulting female population would total 22. Using the same assumptions, but changing age at marriage to 20 (as shown in the central portion of the figure), the total female population would rise to only 11 after 60 years. If age at marriage is raised to age 25 (as shown at the right of the figure), the female population would consist of only 5 members after the same time period.

Figure 17.—Effect of Age at Marriage



SOURCE: After A. Henry and P.T. Piotrow, "Age at Marriage and Fertility," *Population Reports*, Series M, No. 4, 1979 Population Information Program. The Johns Hopkins University, Baltimore, Md.

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