

Chapter 57

Contraception



Ruth Levine, Ana Langer, Nancy Birdsall, Gaverick Matheny, Merrick Wright, and Angela Bayer

The use of modern contraception to prevent pregnancies is a unique health intervention because, in many ways, it is not a health intervention at all. In general, couples in sexual relationships use contraception because, at the time the decision is made, one or both members do not wish to conceive a child, rather than because they wish to become healthier or to prevent a risk to health. Governments also may have an interest in promoting particular patterns of childbearing to meet social and economic objectives. This is most often the case when rapid population growth is seen as a drag on economic growth; in contrast, however, governments in low-fertility countries may promote pro-natalist policies to increase the labor supply. Thus, the effectiveness of contraception has to be seen, first and foremost, in terms of the effectiveness in permitting couples to achieve their desired family size.

Although contraception is rarely used to improve health, it does have health consequences. On the negative side, consequences may include the potential health risks of hormonal contraception or surgery. On the positive side, health may benefit from fewer pregnancies, lower exposure to sexually transmitted infections (STIs), and protection against ovarian cancer through the use of some types of contraception. Some of the consequences affect the users, some affect their sexual partners, and some affect their children. Contraceptives affect a user's sexuality by changing menstrual patterns and, therefore, particularly in some cultures, sexual activity. Also, by eliminating fear of unwanted pregnancy, contraceptives may enhance the quality of sexual experience. Finally, condoms may decrease sexual pleasure for men; true or not, this explanation is one of the most commonly cited to account for why some men (or couples) do not use condoms.

NATURE, CAUSES, AND BURDEN OF THE CONDITIONS THAT CAN BE ADDRESSED

Three rationales—each one involving controversy and touching on deeply held political and cultural perspectives—have underlain policy and programmatic interest in contraception, since the 1960s.

- The *demographic rationale*, typically framed around lowering the rate of population growth to achieve broad economic, social, and environmental aims, was most prominently applied in the 1960s and 1970s.
- The *fertility rationale*, which emerged in the 1980s, promoted lower fertility under the assumption that smaller families are better off in terms of economic and health conditions.
- The *human rights rationale*, which surfaced in 1994 at the International Conference on Population and Development in Cairo, served as a major force in the 1990s to focus attention on women's rights to autonomy and empowerment in childbearing and on female and male reproductive health. The Cairo Programme of Action stressed the political and cultural dimensions of contraception, including gender issues.

Population Growth and Fertility

In part because of the demand for and availability of modern contraception, the worldwide rate of annual population growth has declined from just over 2 percent in the late 1960s to 1.5 percent during 1980–2001. It is projected to decrease to 1 percent during 2001–15. Although the growth rate has

slowed, population growth in absolute terms is unprecedented. World population increased from 2.5 billion people in 1950 to 6.3 billion in 2003 and is expected to rise to 7.1 billion by 2015 (UN 2003; World Bank 2003).

Fertility rates in developing countries have declined rapidly in the past 50 years, from more than 6.0 children per woman in the 1950s to about 2.8 children per woman today. Fertility rates remain high, however, in the 49 least developed countries, which had an average total fertility rate of 5.46 children per woman during 1995–2000 (UN 2003).

Fertility levels and trends vary greatly between regions. Fertility rates are lowest in low- and middle-income countries in East Asia and the Pacific, at 2.1 children per woman. Countries in Central Asia and Latin America and the Caribbean also have relatively low total fertility rates, at 2.5 and 2.6 children per woman, respectively. The Middle East and North Africa and South Asia follow, with average total fertility rates of 3.4 and 3.3 children per woman in 2001, respectively. Fertility rates are highest in Sub-Saharan Africa, at 5.2 children per woman (World Bank 2003).¹ Regional averages conceal substantial variation among and within countries.

Because of a legacy of high fertility and corresponding young population structures, population momentum ensures that many developing countries will continue to grow at a relatively high rate for many decades, even as fertility rates continue to decline. Population momentum alone will account for almost three-fourths of the population growth in developing countries in the next quarter-century. The largest growth at present is in Asia and Sub-Saharan Africa. Total population increase in these regions is now twice what it was in 1950. By 2015, population growth is expected to be substantially lower in all regions except Sub-Saharan Africa.

Demand for Contraception

If a woman wishes to postpone or avoid childbearing and is not using contraception (including use by her partners), she is said to have an unmet need for contraception. The most commonly reported reasons for unmet need are lack of knowledge, health concerns, and social disapproval (Casterline and Sinding 2000).

In 2003, an estimated 122.7 million women in developing countries had an unmet need for contraception, including 105.2 million married women, 8.4 million unmarried women, and 9.1 million women of all marital status in the states of the former Soviet Union. This figure represents 17 percent of all married women, a 2 percent decline from the late 1990s that is due to increasing contraceptive use.

Overall, the highest unmet need is in Sub-Saharan Africa, where 19.4 percent of all women have unmet need. About 13 percent of women in Asia, 10.6 percent of women in North Africa and the Middle East, and 8.5 percent of women in Latin

America and the Caribbean and Central Asia have unmet need for contraception. Whereas women in the other regions of the world have an equally distributed unmet need for spacing and limiting births, the majority of unmet need in Sub-Saharan Africa is for spacing (Ross and Winfrey 2002). Unmet need is highest in countries where growing numbers of women want to avoid pregnancy but contraceptive prevalence is low. So, for example, among developing countries for which data are available from USAID's Demographic and Health Surveys, unmet need is currently highest in Haiti, where it nears 40 percent of all married women; it is more than 30 percent in Cambodia, Nepal, Pakistan, Rwanda, Senegal, Togo, Uganda, and the Republic of Yemen; and it is lowest, at less than 7 percent, in Brazil, Colombia, and Vietnam.

Total Potential Demand for Contraception. A rough measure of the total potential use of modern contraception in a country can be estimated by combining the measure of unmet need with the current proportion of women using contraception. Brazil, Colombia, and Vietnam all have demand for contraception greater than 80 percent of currently married women. They have satisfied most of this demand, with contraceptive prevalence rates above 75 percent, resulting in both low fertility rates and low unmet need (Westoff 2001). In contrast, in most Sub-Saharan African countries, the unmet need percentage exceeds the percentage of women currently using contraception (see table 57.1).

Health Consequences

Excess fertility is responsible for between 12 and 30 percent of the maternal burden of disease (see table 57.2)², although this is clearly an underestimate of the present and future burden of disease that can be prevented through investments in family planning. These estimates include only the direct health benefits of family planning for women by preventing unwanted births, decreasing the number of abortions, and increasing the length of birth intervals. Because of data limitations, these estimates exclude the potential effect of family-planning programs on children's long-term nutritional status and education; women's status and the household economy; and public savings from reduced fertility, AIDS, and other STIs through condom promotion and prevention of mother-to-child transmission (PMTCT). They also exclude the effect of such programs on environmentally related disease owing to population growth. Last, the estimates do not consider the disabling effects of unwanted pregnancies, despite the effect those pregnancies or their termination under unsafe conditions can have on women's welfare and productivity.

Each year, 585,000 women die and more than 54 million women suffer from diseases or complications caused by pregnancy and childbirth (WHO 1997).

Table 57.1 Total Potential Demand for Family Planning
(percentage of currently married women)

Country	Unmet need	Current contraceptive use	Total potential demand	Country	Unmet need	Current contraceptive use	Total potential demand
<i>East Asia and the Pacific</i>				<i>Sub-Saharan Africa</i>			
Cambodia	32.6	23.8	56.4	Benin	25.7	16.4	42.1
Indonesia	9.2	57.4	66.6	Burkina Faso	25.8	11.9	37.7
Philippines	18.8	47.8	66.6	Cameroon	19.7	19.3	39.0
Vietnam	6.9	75.3	82.2	Central African Rep.	16.2	14.8	31.0
<i>Central Asian republics</i>				Chad	9.7	4.1	13.8
Kazakhstan	8.7	66.1	74.8	Côte d'Ivoire	27.7	15.0	42.7
Kyrgyz Republic	11.6	59.5	71.1	Eritrea	27.5	8.0	35.5
Turkmenistan	10.1	61.8	71.9	Ethiopia	23.1	5.9	29.0
Uzbekistan	13.7	55.6	69.3	Gabon	28.0	32.7	60.7
<i>Latin America and the Caribbean</i>				Ghana	23.0	22.0	45.0
Argentina	—	—	—	Guinea	24.2	6.2	30.4
Belize	—	—	—	Kenya	23.9	39.0	62.9
Bolivia	26.1	48.3	74.4	Madagascar	25.6	19.4	45.0
Brazil	7.3	76.7	84.0	Malawi	29.7	30.6	60.3
Colombia	6.2	76.9	83.1	Mali	25.7	6.7	32.4
Dominican Republic	11.8	69.5	81.3	Mozambique	6.7	7.3	14.0
Guatemala	23.1	38.2	61.3	Namibia	21.9	28.9	50.8
Haiti	39.8	28.1	67.9	Niger	16.6	8.2	24.8
Nicaragua	14.7	60.3	75.0	Nigeria	17.5	15.3	32.8
Paraguay	15.0	48.4	63.4	Rwanda	35.6	13.2	48.8
Peru	10.2	68.9	79.1	Senegal	34.8	12.9	47.7
<i>Middle East and North Africa</i>				South Africa	15.0	56.3	71.3
Algeria	—	—	—	Tanzania	21.8	25.4	47.2
Egypt, Arab Rep. of	11.2	56.1	67.3	Togo	32.3	23.5	55.8
Jordan	14.2	52.6	66.8	Uganda	34.6	22.8	57.4
Morocco	16.1	50.3	66.4	Zambia	26.5	25.9	52.4
Yemen, Rep. of	38.6	20.8	59.4	Zimbabwe	12.9	53.5	66.4
<i>South Asia</i>							
Bangladesh	15.3	53.8	69.1				
India	15.8	48.2	64.0				
Nepal	31.4	28.5	59.9				
Pakistan	31.8	11.8	43.6				

Source: Demographic and Health Survey, various years.
— = not available.

Risks Associated with Unwanted Pregnancies. Unwanted pregnancies expose women to additional health risks by increasing the number of lifetime pregnancies and deliveries. Because the lifetime risk of maternal mortality is a function of the number of pregnancies and the quality and utilization of health care, reducing the number of pregnancies can lower maternal mortality rates (Koenig and others 1988).

Ambivalence toward pregnancy also is associated with less early and continuous prenatal care and lower use of professional delivery care (Gage 1998; Joyce and Grossman 1990; Weller, Eberstein, and Bailey 1987).

Many women who have unintended pregnancies turn to induced abortion, both in countries where abortion is legal and safe and in those where it is illegal and too often unsafe.

Table 57.2 Maternal Burden of Disease Associated with Unwanted Fertility and Unsafe Abortions

Region	Deaths	Years of life lost	Years lived with disability	Disability-adjusted life years (DALYs)	Percentage of all maternal DALYs
East Asia and the Pacific	3,637	107,795	380,255	420,030	17
Latin America and the Caribbean	6,323	190,544	298,390	429,399	30
Middle East and North Africa	8,428	244,461	256,742	395,368	12
South Asia	30,074	878,028	1,079,661	1,669,727	20
Sub-Saharan Africa	43,077	1,270,598	764,012	1,821,721	18

Sources: Adapted from WHO 2002a. Maternal mortality related to unsafe abortions from WHO 1998. Percentage of infant disease preventable by family planning from Rutstein 2003.

Notes: Because of data limitations, estimates are not available for Eastern Europe and Central Asia. Burden-of-disease estimates include a 3 percent discount rate without age weighting. WHO regions are not identical to the World Bank Regions used here; however, a very close approximation was made by excluding WHO regions AMRO A, WPRO A, and EURO A. These estimates assume that 90 percent of abortion-related disease burden is preventable by family planning and that the percentage of other preventable maternal disease is equal to the percentage of all births that are unwanted.

Accurate measures of abortion are difficult to obtain in most parts of the world. In countries where abortion is illegal, data are lacking or incomplete, and even where it is legal, abortions may be underreported because of societal attitudes (Bongaarts 1997; Henshaw, Singh, and Haas 1999). It is estimated that about one-fourth of the 210 million pregnancies each year end in abortion.

In 1995, approximately 35.5 million abortions were performed in developing countries. The large majority of legal abortions, 10.6 million, occurred in China. Most of the remaining legal abortions took place in other parts of Asia (5.7 million) and in the Caribbean (0.2 million). Developing countries, which experienced an estimated 19 million illegal abortions in 1995, account for 95 percent of illegal abortions worldwide. Nearly 10 million illegal abortions occurred in Asia, followed by an estimated 5 million in Africa and 4 million in Latin America. These figures mark a particularly large increase for Africa, which was estimated to have only 1.5 million illegal abortions in 1987 (Henshaw, Singh, and Haas 1999).

Unsafe abortion, typically associated with illegality, has large impacts on both maternal mortality and maternal morbidity. Each year, unsafe abortion is believed to account for 80,000 maternal deaths, or 13 percent of the burden of disease in women of reproductive age (WHO 2002a). Deaths related to unsafe abortions are estimated at 100 to 600 death per 100,000 abortions, compared with the mortality rate from legal abortions of 0.6 deaths per 100,000 abortions (Salter, Johnston, and Hengen 1997). Survivors of unsafe abortions also experience consequences; unsafe abortion causes disability in an additional 5 million women (WHO 2002a). Treatment of complications from unsafe abortions constitutes a large proportion of emergency gynecological hospital admissions (Konje, Obisesan, and Ladipo 1992) and requires substantial resources (Kinoti and others 1995; Salter, Johnston, and Hengen 1997).

Legalizing abortion, improving the quality of abortion care, and increasing access to safe abortion can have profound impacts on the health consequences of abortion. When abortion was illegal in Romania in 1988, complications from unsafe abortion caused 86 percent of maternal deaths. After abortion was legalized in 1989, the frequency of abortion persisted because of contraceptive supply shortages, but the number of maternal deaths fell by 50 percent (Hord and others 1991).

Risks Associated with Pregnancy and Birth. All pregnancies and births involve some health risks to women, so preventing any pregnancy reduces women's health risks. Higher mortality and morbidity of women, infants, and children are positively associated with the risk factors of giving birth when a woman is too young or too old, the births are too close together, there are too many births, or a woman has a preexisting health condition. Births in most of these groups—women who are older (over age 35), births that are spaced too closely (24 months or less after the preceding birth), and births that are higher order (fifth or higher)—are also more likely to be reported as unintended, making their prevention doubly important (Tsui, Wasserheit, and Haaga 1997).

An estimated 15 million women under age 20 give birth each year. Women age 15 to 19 are twice as likely to die from childbearing as women in their 20s, and women under age 17 are at even greater risk (Starrs 1997). Adolescent mothers are more likely to suffer from obstetric complications if they lack physical maturity or are malnourished (Aitken and Walls 1986). They are also less likely to receive adequate prenatal or obstetric care, which may cause negative outcomes for them and for their infants (McDevitt and others 1996). In many contexts, negative social consequences are profound, including loss of school and employment opportunities.

Children born to adolescent mothers face a number of risks. Research has demonstrated that infants of teenage mothers are

more likely than those born to mothers in their 20s to die before they reach their first birthday (Hobcraft 1992; McDevitt and others 1996; Ross and Frankenberg 1993; Starrs 1997; Sullivan, Rutstein, and Bicego 1994). Children of mothers under age 20 may have a 20 to 30 percent higher risk of death than children of older mothers (Hobcraft 1992; Sullivan, Rutstein, and Bicego 1994). Infants of teenage mothers are also at higher risk of being of low birthweight, small for gestational age, or premature. Finally, adolescent women are less likely to provide adequate care for their infants and children, because they often lack the maturity, education, and resources to do so (Geronimus 1987; Govindasamy and others 1993).

Women over age 35 face an increased risk of maternal mortality. Mothers age 40 to 44, for example, are five times more likely to die during pregnancy or childbirth than mothers in their 20s (Royston and Lopez 1987). Mothers in their late 30s and 40s may also face additional negative consequences, because they may have preexisting health problems owing to age or previous births.

As with children of adolescent mothers, children of women over age 35 also suffer negative consequences. Children born to mothers over age 40 are more likely than those born to younger mothers to die before age 5 (Bicego and Ahad 1996; Sullivan, Rutstein, and Bicego 1994). Older women are also more likely to have stillbirths or to bear children with congenital abnormalities who may not survive childhood (Cnattingius and others 1992; Fretts and Usher 1997).

Longer birth intervals reduce women's risks of death and ill health during pregnancy and childbirth. One study assessed the effects of birth spacing in 450,000 women on the basis of hospital records from 1985 to 1997 in 19 Latin American and Caribbean countries. The study found that women who have their babies 27 to 32 months after a preceding birth are more than two times more likely to survive pregnancy and childbirth than women who have short intervals of 9 to 14 months. Birth intervals of 27 to 32 months are also associated with lower incidence of third trimester bleeding, premature rupture of membranes, anemia, and other negative outcomes (Conde-Agudelo and Belizan 2000).

Recent research suggests that birth intervals of three to five years provide even greater benefits than the two-year intervals that were previously promoted. One study assessed the effect of this longer birth interval in more than 430,000 pregnancies in 18 countries and found that children who are born three to five years after the preceding birth are more likely to survive from the perinatal period through age five. Children born at intervals of three to five years are also 1.2 to 1.4 times less likely to be malnourished or underweight or to experience stunting than those born at intervals shorter than two years (Rutstein 2003).

Putting together a range of patchy data on the effect of family planning on child mortality can yield estimates of the total global impact, but those estimates are highly dependent on

assumptions and have varied widely. The World Bank (1993) estimated that family-planning programs could prevent between 20 and 40 percent of all infant deaths by preventing mistimed and underspaced births. In a study of 25 countries, Hobcraft (1994) estimated that if all birth intervals of less than two years were prevented, child mortality levels would be reduced by an average of 17 percent and up to one-third in several countries. Rutstein (2003) found that birth spacing of three to five years alone could prevent up to 46 percent of infant mortality. Muhuri and Menken (1997) found that in rural Bangladesh poor spacing and timing accounted for 25 percent of child mortality. Trussell and Pebley (1984) estimated that spacing could decrease infant mortality by 10 percent and child (age 1 to 5) mortality by 21 percent. Another study found that, even in Latin America, which has lower child mortality rates, spacing could reduce perinatal mortality by 14 percent (Conde-Agudelo and Belizan 2000).

In a study of 19 African countries, Rafalimanana and Westoff (2001) found that median actual birth intervals in every country were shorter than the preferred birth intervals reported by women, reflecting the substantial unmet need for birth spacing. Achieving preferred intervals would decrease neonatal mortality by only 6 percent on average, and infant mortality by a comparable amount, whereas removing all short intervals would decrease both by 13 percent.

Women giving birth for the fourth or higher time are at much higher risk of maternal complications and death. Independent of a woman's age, her risk of dying when giving birth for the fourth or higher time is 1.5 to 3 times greater than during a second or third birth (Winikoff and Sullivan 1987). Women who have had at least three births are also more likely to experience hemorrhage, uterine rupture or prolapse, or kidney disease (Maymon and others 1998).

Children born to mothers who have had many births face risks similar to those of children born to older mothers; they are often the same women. Children born to mothers who have had three or more births are more likely than those born to younger mothers (those under age 20) to die before age 5 (Bicego and Ahad 1996; Sullivan, Rutstein, and Bicego 1994). Women who have had many births are also more likely to have stillbirths or to bear children with congenital abnormalities who may not survive childhood (Cnattingius and others 1992; Fretts and Usher 1997). Children from larger families often receive lower levels of education and health care than children from smaller families because of competition for finite family resources (Blake 1981).

Women with preexisting health conditions often face greater risks in pregnancy and childbirth. Pregnancy can aggravate conditions such as high blood pressure, heart disease, malaria, anemia, tuberculosis, hepatitis, and STIs, including HIV. Indirect causes, including these preexisting conditions, account for an estimated 20 percent of maternal deaths each year (WHO 1997).

INTERVENTIONS

The “intervention” of contraception can be considered as the method itself and as the means by which family-planning clients obtain services (including counseling) and contraceptive commodities. Both the methods and the types of services are diverse.

Contraceptive Methods

Contraceptive methods can be classified as permanent and long term—primarily for those women and couples who have completed childbearing—or temporary—primarily for those women and couples who wish to delay pregnancy.

Permanent and Long-Term Methods. Female sterilization, or tubal ligation, used by about 187 million women worldwide (WHO 2002a), is the most popular and effective contraceptive available. The most effective types of female sterilization have a 10-year cumulative pregnancy rate of 7.5 per 1,000 procedures (Peterson and others 1996).

Sterilization accounts for one-third of all contraceptive practice. Because sterilization is considered a permanent form of contraception, some women may regret their decision during ensuing years. Some dissatisfaction with sterilization is expected and is always observed among sterilized populations; in most cases, the proportion of women regretting sterilization falls below 10 percent. Regret is higher when sterilization was a woman’s first and only contraceptive method, when a woman was sterilized at or under age 30, or when a woman has fewer than four living children (Loaiza 1995).

Between 40 million and 50 million men worldwide have undergone a vasectomy, a figure representing 8 percent of the world’s couples of reproductive age. This method comes in fourth in contraceptive popularity, after female sterilization (19 percent), the intrauterine device (IUD; 13 percent), and oral contraceptives (“the pill”; 8 percent), and right ahead of the male condom (4 percent; WHO 2002a). The method is as effective as female sterilization (failure rate of less than 1 percent) and much simpler and safer than tubal ligation.

The IUD is now used by 150 million women worldwide, or about 13 percent of the world’s women of reproductive age, because of its efficacy, safety, and convenience. After female sterilization, it is the most popular method of contraception. The 5-year life span of the IUD means fewer visits to health providers and less expenditure of money, time, and effort.

IUDs prevent pregnancy through several mechanisms: they alter sperm migrations, inhibit fertilization, and generate a foreign-body reaction in the endometrium. Progestogen-releasing IUDs cause changes in the amount and viscosity of cervical fluid, altering sperm penetration. In a small percentage of women, ovulation is inhibited in the first two years of use.

Failure rates for all copper-bearing IUDs are usually less than 1 per 100 women in the first year of use.

Temporary Methods. By far the most popular temporary contraceptive method is the oral contraceptive, commonly known as “the pill,” which has a failure rate typical use of less than 10 percent over a year. Among 67 developing countries for which survey data are available (not including China or India), about 50 percent of married women who have ever used contraception have used the pill at some point. The pill has been most popular in Latin America; there, about 55 percent of all married women have used the pill. In the Near East and North Africa, about one-third of married women have used the pill, and in Sub-Saharan Africa, about 15 percent have used it at some time (Johns Hopkins Population Information Program 2000).

More than 20 million women use systemic contraceptives containing only progestins. These contraceptives include subdermal implants such as Norplant, injectable products, IUDs, and vaginal rings. These products have high rates of contraceptive efficacy (0.3 to 1.0 percent failure rate over 12 months). Their long duration of action allows for a relatively infrequent dose. Their main drawbacks are their tendencies to cause highly irregular endometrial bleeding and amenorrhea. Although altered bleeding does not have any ill health effects, it does pose a problem for women in societies that bar or restrict women from certain social and religious activities during menstruation. The World Health Organization estimates that between 10 and 30 percent of women abandon their progestin-only methods for this reason (WHO 2002a).

Barrier methods, although less effective than hormonal methods, IUDs, or sterilization, can offer effective contraception when used consistently and correctly. Barrier methods, and particularly condoms, are the only type of contraception that offers additional protection against STIs.

When used correctly during every act of sexual intercourse, the male latex condom is effective against both unwanted pregnancy and HIV infection and other STIs. Typical use results in pregnancy rates of 3 to 14 percent per year. If a condom breaks or tears during intercourse, emergency contraception can be used to reduce the risk of pregnancy.

The female condom, made of soft, pliable polyurethane and prelubricated with a silicone-based substance, is inserted into the vagina before sexual intercourse. The female condom is slightly less effective than the male condom, with a failure rate of 5 to 21 percent. Unlike the male condom, the female condom can be inserted up to eight hours before intercourse. The female condom adds to the arsenal of weapons in the fight against STIs; offers women more control in sexual negotiations; can be used in conjunction with the IUD, hormonal methods, and sterilization; and has no special storage requirements.

The diaphragm, although not a popular method in developing countries, is being studied as a means of preventing not

only pregnancy but also bacterial STIs. Results from those randomized trials are pending.

Emergency Contraception. Since the mid 1960s, the use of certain oral contraceptives has been shown to be effective in preventing pregnancy. Two hormonal regimens have proved to be both safe and effective for emergency contraception: combined oral contraceptives and progestogen-only pills. Both can be taken for up to 120 hours after unprotected intercourse. Emergency contraception represents a second chance to prevent an unwanted pregnancy after unprotected sex, and it is particularly responsive to the needs of youths and of women who have been coerced into intercourse.

Despite the demonstrated safety and efficacy of emergency contraception, its acceptance by providers and the public, and its inclusion on the WHO's essential drug list, emergency contraception is not widely available in many developing countries (Langer and others 1999).

ORGANIZATION OF FAMILY-PLANNING PROGRAMS

Because of the variety of users and methods of contraception, a range of quite distinct ways to deliver needed goods and services has been developed and tried over the past several decades. Some programs are dedicated to providing only family-planning services, often referred to as *vertical programs*; some provide a range of reproductive and other health services, loosely termed *integrated programs*; and some try to reach current and potential clients through social marketing and community-based distribution methods.

Vertical versus Integrated Service Delivery

The original large-scale family-planning programs in developing countries, many of which were launched on the basis of the demographic rationale, tended to be organized around a vertical structure with central management and logistics. Family-planning workers based at fixed sites—whether run by government agencies or by nongovernmental organizations (NGOs)—were dedicated exclusively to providing information, services, and contraceptive commodities related to family planning. Funding, often from external donor agencies, was earmarked for family-planning activities. In many instances, the supervisory, budgeting, training, and logistics systems were all separate from those of other health services. Some of the largest vertical programs, such as the India program, promoted sterilization on a large scale, sometimes provided through rudimentary health facilities. Others, such as the Bangladesh program, relied on the provision of information and commodities through female outreach workers going house to house.

In the past two decades, increasing emphasis has been placed on integrating family-planning programs into other

health services, particularly other types of reproductive health services. Under this arrangement, family-planning services are delivered in conjunction with routine primary care—a recognition that women's health needs are in no way confined to contraception and that a broad range of reproductive and other health services must be provided.

Social Marketing

Social marketing refers to a variety of strategies using traditional commercial-marketing techniques to promote socially beneficial behaviors, products, and services. In family planning, social marketing has focused on making supplies of methods of contraception widely available in existing commercial retail outlets and on promoting these contraceptives to consumers through mass media. In recent years, social-marketing programs have expanded their focus to behavior change and the delivery of clinical services through social franchises.

In countries with low contraceptive prevalence, social-marketing programs for contraceptives typically import donated contraceptives and then repackage and promote them with their own sales force. In higher-prevalence countries, programs may partner with commercial manufacturers to market existing brands, often subsidizing promotion in exchange for price guarantees. In the Dominican Republic, for instance, the oral contraceptive manufacturer Schering agreed to cut the price of its pills in half in exchange for advertising by a social-marketing organization.

Most social-marketing programs for contraceptives distribute commodities through existing commercial outlets, such as shops, pharmacies, and tobacco shops. Retailers make a small profit, which increases their incentive to stock and promote the products. Because such programs do not spend money building their own distribution network, they typically enjoy low costs per output.

Social-marketing programs have achieved dramatic contraceptive sales throughout the developing world, providing contraception to about 10 million couples in 60 countries, in addition to promoting a variety of other health products. However, evidence from cross-national studies suggests that social marketing's effect on contraceptive use is driven less by its brand sales—because users often switch brands—and more by its promotional activity (Bulatao 2002).

INTERVENTION COST AND COST-EFFECTIVENESS

Synthesizing data on family-planning costs, outputs, and outcomes to inform resource allocation has distinct challenges. First, nearly all existing studies have estimated average—not marginal—costs. The dearth of marginal cost data, general to most of the cost-effectiveness studies presented in this volume, severely weakens the ability to recommend interventions.

Second, cost data based on units of output that cannot be linked to health outcomes have limited use. Most studies on effectiveness have not included costs, and most studies on costs have not included effectiveness. In the family-planning literature, cost per output (such as the cost per couple-year of protection, or CYP) has often been called cost-effectiveness. Here, we reserve the term *cost-effectiveness* for measures of cost per unit of health impact (Gift, Haddix, and Corso 2003). Those studies that have measured cost-effectiveness typically come from mature programs, where both marginal costs and marginal effects are likely to be low.

Third, costs vary considerably according to the accounting method used, the program setting and scale, the level of latent demand among couples targeted, the method mix, the quality, and the existing supply and service infrastructure (Dayaratna and others 2000; Janowitz and Bratt 1992). Clinical costs are particularly sensitive to setting, given the broad differences in local salaries.

Finally, most evaluations of family planning estimate effects within a single generation. However, averting a birth also averts grandchildren, great-grandchildren, and so on. For economic cost-benefit analyses, the multigenerational effects of a single birth averted can be significant. However, this consideration can be addressed through the use of an appropriate discount rate.

Cost per Output

The most common measure of output in family-planning programs is the CYP. Stover and others (1996) estimated the number of contraceptives of various methods needed to provide 1 CYP, given typical use: 15 cycles of pills, 120 condoms, 120 foaming tablets, or 4 three-month or 12 one-month injectables. An IUD provides 3.5 CYPs; male and female sterilization, 11 CYPs; and an individual trained in natural methods, 2 CYPs.

IUDs and voluntary sterilization have the lowest cost per CYP, although they have a high up-front cost. Oral contraceptives are usually the least costly methods. Condoms and injectables are more expensive than the pill, and implants are often the most expensive method per CYP. Mauldin and Miller (1994) estimated that, based on the method mix in developing countries, the weighted average commodity cost of contraception was US\$1.55 per CYP.³

Commodity costs are relatively constant across programs, although there is some variation owing to bulk procurement. When program costs are added, costs vary considerably by the program setting and mode of delivery. A review of programs in Africa, for instance, found method costs per CYP could vary by an order of magnitude, with the greatest variation in the cost of condoms.

Barberis and Harvey (1997) found considerable variation in costs per CYP by region and mode of service delivery in 14

developing countries. Across regions, costs per CYP were comparable in Asia, Latin America, and the Middle East, at US\$4.00 to US\$5.00. Costs were considerably greater in Africa, where the average cost per CYP was US\$14.00.

The least expensive mode of service delivery was clinical provision of sterilization, with a weighted average cost of US\$2.34 per CYP. The second most economical mode was social marketing of contraceptives, although those costs are highly dependent on setting. In African countries, where such programs were less developed, the costs were high—up to US\$19.00 per CYP. The weighted average cost of social marketing of contraceptives was US\$3.00.

Costs of community-based distribution programs ranged from US\$4.85 to US\$35.37 per CYP, with a weighted average of US\$12.55. Costs of clinic-based services, excluding sterilization, ranged from US\$4.44 to US\$16.65 per CYP, with a weighted average of US\$7.93. Clinic-based services supplemented with community-based distribution were the most expensive mode of service delivery, ranging from US\$4.44 to US\$19.38, with a weighted average of US\$18.21. As noted above, these estimates have typically not included costs to users (see table 57.3).

Marginal Costs

Knowles and Wagman (1991) found that unit costs decline as the number of contraceptive users increases. Larger programs enjoy an economy of scale in procurement; average costs

Table 57.3 Weighted Average Program Costs per CYP, by Region and Mode of Delivery (2001 U.S. dollars)

Region	Mode of service delivery	Cost per CYP
Africa	Social marketing	15.95
	Community-based distribution	20.32
	Clinics	16.65
	Clinics with community-based distribution	8.02
Asia	Social marketing	2.59
	Community-based distribution	6.50
	Clinics	5.07
	Clinics with community-based distribution	19.38
Latin America	Social marketing	−1.64
	Community-based distribution	35.37
	Clinics	6.40
	Clinics with community-based distribution	6.47
Middle East	Social marketing	3.82
	Community-based distribution	4.85
	Clinics	4.44
	Clinics with community-based distribution	9.03

Source: Adapted from Barberis and Harvey 1997.

decrease as fixed costs from training and from information, education, and communication (IEC) programs are distributed over more units; labor may be more efficiently used at higher volumes; and larger programs may be further ahead on the learning curve. However, as marginal costs diminish with size, so may marginal returns in mature programs (Haaga and Tsui 1995).

High rates of underutilization suggest marginal costs may be close to zero for many clinics. Knowles and Wagman (1991) and Janowitz and others (1996) found underutilization of clinical capacity in Morocco and Bangladesh. In Morocco, more than a third of all labor costs were spent waiting for patients. Foreit and others (1992) found that administrative costs accounted for 16 to 65 percent of fixed costs for a sample of clinics, whereas capacity utilization ranged from only 32 to 76 percent.

One study of a community-based distribution project in Bangladesh found that marginal costs represented 20 to 40 percent of average costs and decreased with scale (Attanayake, Fauveau, and Chakraborty 1993). In social-marketing programs, marginal costs are close to commodity costs less revenue (Bulatao 1993). A weighted average of current commodity costs based on the existing method mix in developing countries suggests a marginal cost of about US\$1.55 per CYP (Mauldin and Miller 1994).

Cost-Effectiveness Outside of Programs

The estimates of cost-effectiveness included here show only the direct health benefits of family planning for women and children from increasing birth intervals and reducing teenage pregnancies. As noted earlier, these estimates ignore important benefits of family planning for the health of families. Because of data limitations, most of these omissions cannot be corrected here. Some are a general consequence of using the global burden-of-disease framework, which takes disease, rather than health interventions, as the starting point. This orientation makes results less useful for the purpose of setting priorities in health care, particularly for interventions, such as family planning, that affect a number of sequelae (Williams 1999).

Despite the abundance of cost-per-output data in family planning, these data cannot be used to set priorities in health funding because the protection offered by a unit of contraception is related to the behavior of a particular user. Several studies have sought to estimate a program's impact on fertility as a simple division of CYPs distributed in a population by the mean birth interval in the population (Cakir, Fabricant, and Kircalioglu 1996). However, such adjustments are not substitutes for actual measures of impact.

A considerable literature has developed around the problems of using CYP as a measure of protection (for reviews, see Fort 1996 and Shelton 1991). The typical calculation of CYPs does not account for use-failure rates, wastage, and client char-

acteristics such as fecundity, coital frequency, use effectiveness, or frequency of contraceptive use—one couple using condoms all the time has a greater effect on fertility than two couples using condoms half the time.

Most critically, even if CYP were an appropriate measure of protection, CYPs do not account for method substitution. Many clients who obtain contraceptives from a family-planning program, at some program expense, were buying or would otherwise have bought contraceptives from commercial providers or would have relied on natural methods. Community-based distribution programs, for instance, may be more expensive per CYP than social-marketing programs, but if such programs reach more nonusers than social-marketing programs, they may be more cost effective in preventing unwanted pregnancies. Similarly, sterilization is the cheapest method per CYP, but in many countries, it has a limited impact on fertility.

Three examples demonstrate the hazard of confusing output, or even intermediate outcomes, with impact. Jensen (1996) found that public providers in Indonesia, while more expensive per CYP than private providers, had a greater effect on fertility per unit output. Public programs may have reached more nonusers. Janowitz and others (1992) found that a Honduran social-marketing program distributed more than 40,000 CYPs but had no net effect on contraceptive prevalence. Users substituted one contraceptive brand or method for another. Bertrand and others (1986) found that a community-based distribution program in then Zaire increased modern contraceptive prevalence without affecting total contraceptive prevalence. Modern methods were substituted for traditional ones, such as prolonged lactation, periodic abstinence, or withdrawal. (Such substitution can be an improvement when the traditional method replaced is rhythm or withdrawal, but there is no more protective contraception than postpartum abstinence.)

Cost-effectiveness analysis thus requires true estimates of project effect—the difference between what happens in a project's presence and what happens in that project's absence. A number of studies have estimated effect, measuring births averted, total or unwanted pregnancies averted, unsafe abortions averted, maternal and child deaths averted, and measures of health utility, such as the disability-adjusted life year (DALY).

As table 57.4 shows, costs vary significantly within regions. In some regions, maximum and minimum costs differ by two orders of magnitude. Our sensitivity analysis found that the cost-effectiveness of programs was most sensitive (as a percentage of swing) to the existing level of unmet need for birth spacing and limiting.

Costs per Births Averted. In a review, Pritchett (1994) found that costs per birth averted ranged from US\$37 in Jamaica, the Philippines, and Thailand to US\$415 in Nepal, with the median value of 12 studies being US\$82. Cochrane (1988) estimated US\$78 per averted birth in a cross-national analysis.

Table 57.4 Average Costs per Benefit of Family Planning
(2001 U.S. dollars)

Region	Births averted	Infant deaths averted	Maternal deaths averted	Disability-adjusted life years saved	Years of life lost averted	Years lived with disability
East Asia and the Pacific	163	4,907	12,880	60	110	103
Latin America and the Caribbean	87	2,316	34,564	53	66	187
Middle East and North Africa	97	1,989	18,917	49	55	209
South Asia	113	1,577	5,172	30	37	98
Sub-Saharan Africa	131	1,367	10,231	34	37	194

Source: Authors, based on a model by AGI and others (2000).

Note: The model used country-level data for 68 developing countries. Output costs were based on Population Action International estimates in 1994 of the public sector cost per user. Estimates are not available for Eastern Europe and Central Asia.

Experimental studies in Bangladesh estimated the cost per averted birth at US\$95 (Attanayake, Fauveau, and Chakraborty 1993), US\$281 (Pritchett 1994), US\$293 (Balk and others 1988), and US\$296 (Simmons, Balk, and Faiz 1991), varying by the accounting method used. The Bangladesh experiment was likely more expensive than other programs, as it involved a frequent schedule of visitation for community-based distribution. The model we developed for the Disease Control Priorities Project produced costs between US\$87 and US\$163 per birth averted, with costs lowest in Latin America and the Caribbean and in the Middle East and North Africa.

Costs per Death Averted. Walsh and others (1993) estimated that in a typical high-mortality country with a 20 percent contraceptive prevalence rate, family-planning programs cost US\$8,261 per maternal death averted and US\$1,276 per perinatal infant death averted. In a setting with high mortality and low contraceptive prevalence rates, offering family planning alone was considerably more cost-effective in averting both maternal and infant deaths than offering an integrated program including prenatal care and birth attendant training. The model developed for the Disease Control Priorities Project produced regional average costs between US\$5,172 and US\$34,564 per maternal death averted and between US\$1,367 and US\$4,907 per infant death averted. Costs were lowest in South Asia and Sub-Saharan Africa. Costs within regions varied by as much as two orders of magnitude.

Stover (2003) estimated that by offering family-planning services at PMTCT and voluntary counseling and testing sites in countries with high HIV prevalence, child HIV infections could be averted at a cost of US\$489, and child deaths could be averted at a cost of US\$278 per event—well below the costs of averting these events using traditional PMTCT services. In addition, these family programs would avert orphans at a cost of US\$278, and maternal deaths at a cost of US\$1,824 per event.

Costs per DALY. The 1993 report on world development (World Bank 1993) estimated that family-planning programs in low-income countries cost from US\$40 to US\$60 per DALY. In the first edition of *Disease Control Priorities in Developing Countries*, Jamison (1993) estimated the costs of IEC or behavior-change communication (BCC) programs promoting condom use for family planning at between US\$20 and US\$100 per DALY, depending on child and maternal mortality rates.

Average costs for regions per YLL ranged from US\$37 to US\$110. Costs per DALY and year of life lost (YLL) were lowest in South Asia and Sub-Saharan Africa, whereas costs per year lived with disability (YLD) were lowest in South Asia and in East Asia and the Pacific. As with costs per death averted, costs per DALY varied within regions by as much as two orders of magnitude.

Family-planning programs that target HIV-positive women to prevent mother-to-child transmission may be even more cost-effective. According to an analysis of Stover's (2003) estimates, such programs cost about US\$5 per DALY. In comparison, traditional PMTCT services, including antiretrovirals and replacement feeding, cost US\$37 per DALY, and nevirapine regimens cost US\$5 to US\$12 per DALY (Marseille and others 1999; UNAIDS 1999). Kumar (2000) found that adding family-planning and abortion services to PMTCT programs increased their cost-effectiveness from US\$124 per DALY for a short-course antiretroviral drug regimen to US\$93 per DALY for an integrated strategy. Despite its cost-effectiveness, family planning is not currently included in most policies addressing mother-to-child transmission of HIV.

Cost-Effectiveness within Programs

Few studies compare the cost-effectiveness of program designs and elements—for instance, between social marketing and

community-based distribution, or between price subsidies and promotional spending. Thus, although donors or government ministers may have enough information to justify funding family-planning programs, managers of such programs have much less information to use in deciding how best to spend money within their programs.

Program Inputs. Roughly half of program funds are spent subsidizing price (Sanderson and Tan 1996), but there is little evidence that price subsidies significantly affect contraceptive use, even among the poor (Matheny 2004). In every demographic and health survey over the past decade, price has been reported as a barrier to contraceptive use by fewer than 2 percent of women with unmet need. Several studies suggest that even the poorest urban users are typically willing to pay commercial contraceptive prices—once they intend to contracept. This finding is not entirely surprising, because the economic costs of childbearing dwarf those of contraception (Pritchett 1994). Particularly if profits are reinvested in a program's quality of services, higher prices may permit the provision of amenities that attract more clients (Foreit and Levine 1993; Litvack and Bodart 1993).

The most commonly reported barriers to contraceptive use are lack of knowledge, health concerns, and social disapproval (Casterline and Sinding 2000). It is likely, then, that the most cost-effective inputs are those that address these barriers—by increasing accurate knowledge about and social acceptance of contraception, as well as by improving the quality of and access to a variety of contraceptive methods.

Evidence suggests that quality has improved contraceptive use for birth spacing in Tunisia (Cochrane and Guilkey 1995). However, results are mixed in Peru (Mensch, Arends-Kuenning, and Jain 1996) and the Philippines (DeGraff, Bilsborrow, and Herrin 1993). Schultz (1994) found that, on average, improved quality does not affect the contraceptive prevalence rate at the national level.

Some improvements in quality require additional resources—expanding facilities, adding equipment and staff, and diversifying services. Quality improvements are necessary to respond to ethical imperatives. Beyond the ethical rationale, quality improvements can reduce the cost per unit of output—improving the flow of clients and shifting service delivery from physicians to paramedics. Improvements in quality can also increase utilization and allow higher prices to be charged.

Unfortunately, the relative cost-effectiveness of investments in these inputs has not been established. However, there is reason to believe that, among all inputs, investments in IEC and BCC activities are the most cost-effective—especially those that encourage users to purchase contraceptives or services from the private sector. Studies in many countries show that exposure to IEC and BCC messages through television, radio, and print

increases the likelihood of contraceptive use (Dayaratna and others 2000; Westoff and Bankole 1997). Social-marketing programs appear to succeed in increasing contraceptive use principally through their promotional activities (Bulatao 2002). IEC and BCC activities can also increase the efficiency of clinic programs by increasing caseloads. Last, among all family-planning activities, IEC and BCC activities may be the most prone to market failure, providing a strong rationale for public investment.

Integration. Integrating family planning with other reproductive health services was a major goal of the 1994 International Conference on Population and Development. Although the logic of integration is compelling, little research has been done on the costs of integrated programs. In theory, integrated programs should be more efficient because they distribute joint costs across more services. In clinics, integration should increase cost-effectiveness if services such as Papanicolaou smears, ultrasounds, pregnancy testing, abortions, and post-abortion care are used to cross-subsidize less profitable contraceptive services. Mitchell, Littlefield, and Gutter (1999) found relatively low family-planning costs in two integrated clinics and concluded that adding clients has a larger effect on costs in a clinical setting than adding services does. Mancini, Stecklov, and Stewart (2003), however, found that vertical programs that focused exclusively on family planning offered contraceptive supplies and services at a significantly lower cost per CYP than integrated programs.

Delivering contraception services alongside abortion or postabortion care can be cost-effective. Few clinics and hospitals that treat women suffering from abortion complications offer contraceptive counseling and services as part of their postabortion care, yet these services are effective in increasing contraceptive use. The key obstacle is finding support from abortion providers—especially private providers, who may not see profit potential in providing family planning. The same is true of prenatal care. One study in Kenya showed that exposing women to information about family planning during prenatal care doubled the likelihood that they would use contraception (Ndhlovu 1997). A study of 27 countries found that two-thirds of women had an unmet need for contraception within one year of their last childbirth (Ross and Winfrey 2001). In fact, about one-third of all unmet need was among women postpartum. This need could be satisfied with greater integration of maternal and child health services and family planning, particularly during prenatal visits, delivery care, and six-week postpartum visits.

Finally, integrating STI services with family planning can help identify women with STIs who wish to avoid risky pregnancies and prevent fetal and neonatal complications. Integrating STI services may also draw more men to family-planning clinics.

EQUITY: DISTRIBUTING THE BENEFITS OF SUBSIDIES

It is the poorest whose health and prosperity are most threatened by unwanted pregnancies, and who are least able to pay for family-planning services. Yet a significant portion of public subsidies for family planning benefit the wealthy. This outcome is in part a natural consequence of the demand for family planning. Wealthier couples typically want smaller families than poorer couples. If subsidies follow demand rather than need, they will concentrate among the wealthy. However, because there is substantial unmet need for family planning among poor couples, an efficient segmentation of the market would have subsidized providers target poorer clients and unsubsidized providers target wealthier clients.

In a study of 10 countries, Sine (2002) found that nonpoor users obtained 45 percent of subsidized oral contraceptives and 56 percent of subsidized condoms supplied by governments and nonprofit organizations. An analysis in Indonesia found that only 16 percent of public subsidies for family planning accrued to the poorest quartile. In the Philippines, 64 percent of subsidies accrued to the richest half of households, whereas 17 percent accrued to the poorest quarter. In the Philippines, the distribution of subsidies varied widely by contraceptive method, with vasectomy subsidies concentrated among the poor and condom subsidies concentrated among the middle class (Haaga and Tsui 1995).

Behrman and Knowles (1998) found that the family-planning program in Vietnam was only weakly pro-poor. The main source of inefficiency stemmed from the greater use of more heavily subsidized government providers, particularly hospitals, by wealthier clients. One study in Bangladesh found that, although family-planning workers had the largest effect on the contraceptive behavior of uneducated women, the workers—who typically come from the educated class—were more likely to visit educated women (Arends-Kuenning 1997). For similar reasons, clinics are often located in wealthier areas.

Whereas a significant share of wealthier users obtain subsidized goods, a large share of poor users obtain goods from the commercial sector. In a study of 12 countries, more than half of even the poorest condom users purchased condoms from the commercial sector in all countries but the Philippines (Foreit 1999). Sine (2002), in turn, found that 20 percent of poor and near-poor users obtained their oral contraceptives from the commercial sector, even in countries where free or subsidized brands were available.

ECONOMIC BENEFITS OF INTERVENTION

Contraception or family planning can yield long-term economic benefits through three main routes. One is reasonably direct and easy to quantify; the others are more complex. First,

contraception can produce economic benefits by reducing maternal mortality and morbidity and improving child health—benefits that can be captured through estimates of savings to the health system.

Second, contraception can have economic payoffs if it occurs in a setting where high fertility is constraining economic growth. Longstanding arguments in development economics have centered on whether rapid population growth acts as a drag on economic growth. Some camps argued that high fertility, in particular, would condemn a country to slow (or even negative) per capita income growth. Others argued that the negative effects would be mild and short lived, as households adapt to existing resource constraints by reducing childbearing and as technological changes, such as those that result in higher agricultural yields, alter the productivity equation. By the late 1990s, however, a consensus emerged from examination of more than 40 years of experience and data: rapid population growth, in general, and high fertility, in particular, typically lead to slower economic growth and higher levels of poverty than would otherwise be realized (Birdsall and Sinding 2003).

Third, when contraception reduces the rate of population growth, it can have multiple effects (economic and other) on the environment. High fertility, coupled with rural-to-urban migration, has led to rapid urban growth, often outpacing the provision of clean water and sanitation. In an analysis of 42 cities in Latin America, Asia, and Africa, Brouckerhoff and Brennan (1998) found that urban growth rates were positively correlated with infant mortality rates, likely owing to crowding, a weakening of the public infrastructure, and increased air pollution. Ambient air pollution is now emerging as a serious threat to human health in virtually all the large cities in the world, responsible for 1 percent of global deaths and DALYs (WHO 2002b).⁴

Population growth is also responsible for much of the increase in carbon emissions that contribute to global climate change. Although developing countries account for only 20 percent of carbon emissions today, some researchers have estimated that these countries will account for 50 percent by 2050, given current rates of development (Bongaarts 1992). Bongaarts estimated that population growth would account for 48 percent of the growth in carbon emissions in developing countries between 1985 and 2100. Birdsall (1994) estimated that realistic reductions in fertility could reduce emissions in 2050 by as much as 15 percent in developing countries; more important, however, she estimated that by reducing fertility, family-planning programs could reduce emissions more cost-effectively than taxes on carbon emissions could. Similarly, Brinkley, Potts, and Walsh (2003) found that family-planning programs are likely more cost-effective than any emissions policy. (At the same time, it is important to note that the largest per capita consumption of nonrenewable natural resources occurs in the low-fertility settings of wealthy countries, where policies promoting conservation are overdue.)

RESEARCH AND DEVELOPMENT AGENDA

The agenda for research and development in the field of contraceptives and family planning is ample. It benefits from a strong tradition of data- and research-driven policy and programmatic decisions. Priorities suggested below fall into the realms of science, operations (or program), and policy.

On the scientific agenda, the top priority must be the development of contraceptive products that protect women and men against both pregnancy and HIV infection in ways that are more acceptable from a user perspective than male or female condoms. Two other high-priority topics are the development of male contraceptives and of microbicides, a female-controlled method that protects against both STIs (especially, HIV) and unwanted pregnancy.

With respect to operations research, high-priority questions include how to reach adolescents effectively and cost-effectively; what to do in settings where progress has stalled (for example, Bangladesh); and how to stimulate demand for family planning in Sub-Saharan African countries, where the demand is relatively low.

Another important and neglected topic is how to introduce the sexual health dimension into contraceptive services. In general, providers do not take into account sexuality and sexual health during counseling or service delivery, in spite of the mutual influence between sexual behavior and preferences and contraception. On the one hand, women and couples' sexual activities strongly influence the adoption of contraception, and the preference of these women and couples for a certain method, in turn, influences its effective use and continuity. On the other hand, particular characteristics of the different methods affect women's and couples' perceptions of their own sexuality (Bruce 1987). In spite of these obvious links, neither the family-planning literature nor family-planning services have yet paid enough attention to the matter (Dixon-Mueller 1993).

On the policy research agenda, further research is required to understand the relationship between fertility and other reproductive health outcomes and economic outcomes at microeconomic and macroeconomic levels. Such research includes, for example, a careful analysis of how access to contraception may affect women's productivity, as well as human capital investments in the next generation. In addition, better understanding of the distributional effect of family planning and other reproductive health services would inform policies about how best to target public resources.

NOTES

1. These are 2001 averages; country-by-country figures are 2000 and earlier.

2. One problem in applying the burden-of-disease framework to family planning is unique to interventions that affect the size of a population. In most effectiveness analyses, one compares the state of the world with a

particular program to the state of the world without that program. However, effectiveness analyses using disability-adjusted life years (DALYs) are typically not conducted this way. The number of DALYs averted by family planning is not the number of DALYs without a family-planning program minus the total number of DALYs with a family-planning program. Given the negative nature of DALYs as a measure, such an exercise would lead to an absurd result. Nearly all lives have some number of DALYs attached to them. These DALYs may be averted most cost-effectively by preventing all births, reducing the burden of disease to zero. To avoid this result, we cannot measure the effect of family planning by comparison with a pure counterfactual. Rather, it is measured by ignoring the DALYs that would have been attributed to contingent persons. By the definition of DALYs, no individual can have any expectation of healthy life until the moment of live birth. This, however, is not an ideal solution. Both parents and health practitioners typically want to avoid perinatal deaths, even if doing so means preventing the birth of an infant. This fact suggests that one aim of health care is to prevent the ill health of contingent persons—in which case we ought, at least in some circumstances, to measure the potential DALYs averted by preventing a birth.

3. All dollar amounts are expressed in 2001 U.S. dollars. In a few cases, the year was not specified in the original source, and currency was converted from the year of publication.

4. Because of data limitations, these DALYs include no morbidity.

REFERENCES

- AGI (Alan Guttmacher Institute), Futures Group International, Population Action International, Population Reference Bureau, and Population Council. 2000. *The Potential Impact of Increased Family Planning Funding on the Lives of Women and Their Families*. Washington, DC: AGI.
- Aitken, I. W., and B. Walls. 1986. "Maternal Height and Cephalopelvic Disproportion in Sierra Leone." *Tropical Doctor* 16 (3): 132–4.
- Arends-Kuenning, M. 1997. "The Equity and Efficiency of Doorstep Delivery of Contraceptives in Bangladesh." Policy Research Division Working Paper 101, Population Council, New York.
- Attanayake, N., V. Fauveau, and J. Chakraborty. 1993. "Cost-Effectiveness of the Matlab MCH-FP Project in Bangladesh." *Health Policy and Planning* 8 (4): 327–38.
- Balk, D., K. K. Faiz, U. Rob, J. Chakraborty, and G. Simmons. 1988. "An Analysis of Costs and Cost-Effectiveness of the Family Planning Health Services Project in Matlab, Bangladesh." International Centre for Diarrhoeal Disease Research, Dhaka.
- Barberis, M., and P. D. Harvey. 1997. "Costs of Family Planning Programmes in Fourteen Developing Countries by Method of Service Delivery." *Journal of Biosocial Science* 29 (2): 219–33.
- Behrman, J. R., and J. C. Knowles. 1998. "Population and Reproductive Health: An Economic Framework for Policy Evaluation." *Population and Development Review* 24 (4): 697–737.
- Bertrand, J. T., N. Mangani, M. Mansilu, M. McBride, and J. Tharp. 1986. "Strategies for Family Planning Service Delivery in Bas Zaire." *International Family Planning Perspectives* 12 (4): 108–15.
- Bicego, G., and O. B. Ahad. 1996. *Infant and Child Mortality*. Demographic and Health Surveys Comparative Studies 20. Calverton, MD: Macro International.
- Birdsall, N. 1994. "Another Look at Population and Global Warming." In *Population, Environment, and Development*, ed. United Nations, 39–54. New York: United Nations.
- Birdsall, N., and S. Sinding, eds. 2003. *Population Matters: Demographic Change, Economic Growth, and Poverty in the Developing World*. New York: Oxford University Press.
- Blake, J. 1981. "Family Size and the Quality of Children." *Demography* 18 (4): 421–42.

- Bongaarts, J. 1992. "Do Reproductive Intentions Matter?" *International Family Planning Perspectives* 18 (3): 102–8.
- . 1997. "Trends in Unwanted Childbearing in the Developing World." *Studies in Family Planning* 28 (4): 267–77.
- Brinkley, G., M. Potts, and J. Walsh. 2003. "Reducing Global CO₂ Emissions through Family Planning Tradable Permits." School of Public Health, University of California, Berkeley.
- Brockhoff, M., and E. Brennan. 1998. "The Poverty of Cities in Developing Regions." *Population and Development Review* 24 (1): 75–114.
- Bruce, J. 1987. "Users' Perspectives on Contraceptive Technology and Delivery Systems: Highlighting Some Feminist Issues." *Technology in Society* 9: 359–83.
- Bula tao, R. 1993. *Effective Family Planning Programs*. Washington, DC: World Bank.
- Cakir, H. V., S. J. Fabricant, and F. N. Kircalioglu. 1996. "Comparative Costs of Family Planning Services and Hospital-Based Maternity Care in Turkey." *Studies in Family Planning* 27 (5): 269–76.
- Casterline, J. B., and S. W. Sinding. 2000. "Unmet Need for Family Planning in Developing Countries and Implications for Population Policy." *Population and Development Review* 26 (4): 691–723.
- Cnattingius, S., M. R. Forman, H. W. Berendes, and L. Isotalo. 1992. "Delayed Childbearing and Risk of Adverse Perinatal Outcome. A Population-Based Study." *Journal of the American Medical Association* 268 (7): 886–90.
- Cochrane, S. H. 1988. "The Effects of Education, Health, and Social Security on Fertility in Developing Countries." Policy, Planning, and Research Working Paper 93, World Bank, Washington, DC.
- Cochrane, S. H., and D. K. Guilkey. 1995. "The Effects of Fertility Intentions and Access to Services on Contraceptive Use in Tunisia." *Economic Development and Cultural Change* 43: 779–804.
- Conde-Agudelo, A., and J. M. Belizan. 2000. "Maternal Morbidity and Mortality Associated with Interpregnancy Interval: Cross Sectional Study." *British Medical Journal* (Clinical Research Ed.) 321 (7271): 1255–59.
- Dayaratna, V., W. Winfrey, K. Hardee, J. Smith, E. Mumford, W. McGreevey, and others. 2000. "Reproductive Health Interventions: Which Ones Work and What Do They Cost?" Policy Project Occasional Paper 5, Futures Group International, Washington, DC.
- DeGraff, D., R. Bilsborrow, and A. Herrin. 1993. "The Implications of High Fertility for Children's Time Use in the Philippines." In *Fertility, Family Size, and Structure: Consequences for Families and Children*, ed. C. Lloyd, 297–329. New York: Population Council.
- Dixon-Mueller, R. 1993. "The Sexuality Connection in Reproductive Health." *Studies in Family Planning* 23 (5): 330–35.
- Foreit, J. R., M. R. Garate, A. Brazzoduro, F. Guillen, M. C. Herrera, and F. C. Suarez. 1992. "A Comparison of the Performance of Male and Female CBD Distributors in Peru." *Studies in Family Planning* 23 (1): 58–62.
- Foreit, K. G. 1999. "Use of Commercial and Government Sources of Family Planning and Maternal and Child Health Care." Policy Project Working Paper Series 4, Futures Group International, Washington, DC.
- Foreit, K. G., and R. E. Levine. 1993. "Cost Recovery and User Fees in Family Planning." Options for Population Policy, Policy Paper Series 5, Futures Group International, Washington, DC.
- Fort, A. L. 1996. "More Evils of CYP." *Studies in Family Planning* 27 (4): 228–31.
- Fretts, R. C., and R. H. Usher. 1997. "Causes of Fetal Death in Women of Advanced Maternal Age." *Obstetrics and Gynecology* 89 (1): 40–45.
- Gage, A. 1998. "Premarital Childbearing, Unwanted Fertility and Maternity Care in Kenya and Namibia." *Population Studies* 52 (1): 21–34.
- Geronimus, A. T. 1987. "On Teenage Childbearing and Neonatal Mortality in the United States." *Population and Development Review* 13 (2): 245–79.
- Gift, T. L., A. C. Haddix, and P. S. Corso. 2003. "Cost-Effectiveness Analysis." In *Prevention Effectiveness: A Guide to Decision Analysis and Economic Evaluation*, ed. A. C. Haddix, S. M. Teutsch, and P. S. Corso, New York: Oxford University Press.
- Govindasamy, P., M. K. Stewart, S. O. Rutstein, J. T. Boerma, and A. E. Sommerfelt. 1993. *High-Risk Births and Maternity Care*. Columbia, MD: Macro International.
- Haaga, J. G., and A. O. Tsui, eds. 1995. *Resource Allocation for Family Planning in Developing Countries*. Washington, DC: National Academy Press.
- Henshaw, S. K., S. Singh, and T. Haas. 1999. "The Incidence of Abortion Worldwide." *International Family Planning Perspectives* 25 (Suppl.): S30–38.
- Hobcraft, J. 1992. "Fertility Patterns and Child Survival: A Comparative Analysis." *Population Bulletin of the United Nations* 33: 1–31.
- . 1994. *The Health Rationale for Family Planning: Timing of Births and Child Survival*. New York: United Nations.
- Hord, C., H. P. David, F. Donnay, and A. Koblinsky. 1991. "Reproductive Health in Romania: Reversing the Ceausescu Legacy." *Studies in Family Planning* 22 (4): 231–40.
- Jamison, D. T. 1993. "Disease Control Priorities in Developing Countries." In *Disease Control Priorities in Developing Countries*, ed. D. T. Jamison, W. H. Mosley, A. R. Measham, and J. L. Bobadilla, 1–34. New York: Oxford University Press.
- Janowitz, B., and J. Bratt. 1992. "Costs of Family Planning Services." *International Family Planning Perspectives* 18 (4): 137–44.
- Janowitz, B., K. Jamil, J. Chowdhury, B. Rahman, and D. Hubacher. 1996. "Productivity and Costs for Family Planning Service Delivery in Bangladesh." Technical Report, Family Health International, Research Triangle Park, NC.
- Janowitz, B., M. Suazo, D. B. Fried, J. Bratt, and P. Bailey. 1992. "Impact of Social Marketing on Contraceptive Prevalence and Cost in Honduras." *Studies in Family Planning* 23 (2): 110–7.
- Jensen, E. R. 1996. "The Fertility Impact of Alternative Family Planning Distribution Channels in Indonesia." *Demography* 33 (2): 153–65.
- Johns Hopkins Population Information Program. 2000. "Oral Contraceptives." *Population Reports Series A-9*, Johns Hopkins University, Baltimore.
- Joyce, T. J., and M. Grossman. 1990. "Pregnancy Wantedness and the Initiation of Prenatal Care." *Demography* 27: 1–17.
- Kinoti, S. N., L. Gaffikin, J. Benson, and L. A. Nicholson. 1995. *Monograph on Complications of Unsafe Abortion in Africa*. Arusha, Tanzania: Commonwealth Regional Health Community Secretariat.
- Knowles, J. C., and A. Wagman. 1991. *The Relationship between Family Planning Costs and Contraceptive Prevalence: Will FP Costs per User Decline over Time?* Chapel Hill, NC: Futures Group International.
- Koenig, M. A., V. Fauveau, A. I. Chowdhury, J. Chakraborty, and M. A. Khan. 1988. "Maternal Mortality in Matlab, Bangladesh, 1976–1985." *Studies in Family Planning* 19 (2): 69–80.
- Konje, J. C., K. A. Obisesan, and O. A. Ladipo. 1992. "Health and Economic Consequences of Septic Induced Abortion." *International Journal of Gynecology and Obstetrics* 37 (3): 193–7.
- Kumar, M. 2000. "Cost-Effectiveness of Prevention of Mother-to-Child HIV Transmission in Kerala, India." Paper presented at the International AIDS Economic Network Symposium, Durban, South Africa, July 7–8.

- Langer, A., C. Harper, C. Garcia-Barrios, R. Schiavon, A. Heimburger, B. Elul, and others. 1999. "Emergency Contraception in Mexico City: What Do Health Care Providers and Potential Users Know and Think about It?" *Contraception* 60: 233–41.
- Litvack, J. L., and C. Bodart. 1993. "User Fees plus Quality Equals Improved Access to Health Care: Results of a Field Experiment in Cameroon." *Social Science and Medicine* 37 (3): 369–83.
- Loaiza, E. 1995. "Sterilization Regret in the Dominican Republic: Looking for Quality of Care Issues." *Studies in Family Planning* 26 (1): 39–48.
- Mancini, D. J., G. Stecklov, and J. F. Stewart. 2003. "The Effect of Structural Characteristics on Family Planning Program Performance in Côte d'Ivoire and Nigeria." *Social Science and Medicine* 56 (10): 2123–37.
- Marseille, E., J. G. Kahn, F. Mmiro, L. Guay, P. Musoke, M. G. Fowler, and J. B. Jackson. 1999. "Cost Effectiveness of Single-Dose Nevirapine Regimen for Mothers and Babies to Decrease Vertical HIV-1 Transmission in Sub-Saharan Africa." *Lancet* 354: 803–9.
- Matheny, G. 2004. "Family Planning Programs: Getting the Most for the Money." *International Family Planning Perspectives* 30 (3): 134–8.
- Mauldin, W. P., and V. C. Miller. 1994. *Contraceptive Use and Commodity Costs in Developing Countries, 1994–2005*. New York: United Nations Population Fund.
- Maymon, E., F. Ghezzi, I. Shoham-Vardi, R. Hershkowitz, M. Franchi, M. Katz, and M. Mazor. 1998. "Peripartum Complications in Grand Multiparous Women." *European Journal of Obstetrics, Gynecology, and Reproductive Biology* 81 (1): 21–25.
- McDevitt, T. M., A. Adlakha, T. B. Fowler, and V. Harris-Bourne. 1996. *Trends in Adolescent Fertility and Contraceptive Use in the Developing World*. Washington, DC: Bureau of the Census.
- Mensch, B., M. Arends-Kuening, and A. Jain. 1996. "The Impact of the Quality of Family Planning Services on Contraceptive Use in Peru." *Studies in Family Planning* 27 (N2): 59–75.
- Mitchell, M. D., J. Littlefield, and A. Gutter. 1999. "Costing of Reproductive Health Services." *International Family Planning Perspectives* 25 (Suppl.): S17–21.
- Muhuri, P. K., and J. Menken. 1997. "Adverse Effects of Next Birth, Gender, and Family Composition on Child Survival in Rural Bangladesh." *Population Studies* 51 (3): 279–94.
- Ndhlovu, L. 1997. "The Route from MCH to Family Planning: Why Do Women Switch Health Facilities in the Kenyan MCH/FP Program?" Paper presented at the 125th annual meeting of the American Public Health Association, Indianapolis.
- Peterson, H. B., Z. Xia, J. M. Hughes, L. S. Wilcox, L. R. Tylor, and J. Trussell. 1996. "The Risk of Pregnancy after Tubal Sterilization: Findings from the U.S. Collaborative Review of Sterilization." *American Journal of Obstetric Gynecology* 174 (4): 1161–68.
- Pritchett, L. H. 1994. "Desired Fertility and the Impact of Population Policies." *Population and Development Review* 20 (1): 1–56.
- Rafalimanana, H., and C. F. Westoff. 2001. *Gap between Preferred and Actual Birth Intervals in Sub-Saharan Africa: Implications for Fertility and Child Health*. Demographic and Health Surveys Analytical Studies 2. Calverton, MD: Macro International.
- Ross, J. A., and E. Frankenberg. 1993. *Findings from Two Decades of Family Planning Research*. New York: Population Council.
- Ross, J. A., and W. L. Winfrey. 2001. "Contraceptive Use, Intention to Use, and Unmet Need during the Extended Postpartum Period." *International Family Planning Perspectives* 27 (1): 20–27.
- . 2002. "Unmet Need for Contraception in the Developing World and the Former Soviet Union: An Updated Estimate." *International Family Planning Perspectives* 28 (3): 138–43.
- Royston, E., and A. D. Lopez. 1987. "On the Assessment of Maternal Mortality." *World Health Statistics Quarterly* 40 (3): 214–24.
- Rutstein, S. O. 2003. *Effect of Birth Intervals on Mortality and Health*. Calverton, MD: Measure/DHS+/Macro International.
- Salter, C., H. B. Johnston, and N. Hengen. 1997. "Care for Postabortion Complications: Saving Women's Lives." *Population Reports Series L-10*, Johns Hopkins University, Baltimore.
- Sanderson, E. C., and J. Tan. 1996. *Population in Asia*. Washington DC: World Bank.
- Schultz, T. P. 1994. *Human Capital, Family Planning, and Their Effects on Population Growth*. New Haven, CT: Yale University.
- Shelton, J. D. 1991. "What's Wrong with CYP?" *Studies in Family Planning* 22 (5): 332–35.
- Simmons, G. B., D. Balk, and K. K. Faiz. 1991. "Cost Effectiveness Analysis of Family Planning Programs in Rural Bangladesh: Evidence from Matlab." *Studies in Family Planning* 22 (2): 83–101.
- Sine, J. 2002. *How Much Is Enough? Estimating Requirements for Subsidized Contraceptives*. Washington, DC: Commercial Market Strategies.
- Starrs, A. 1997. *The Safe Motherhood Action Agenda: Priorities for the Next Decade*. New York: Family Care International.
- Stover, J. 2003. "Costs and Benefits of Providing Family Planning Services at PMTCT and VCT Sites." Futures Group International, Washington, DC.
- Stover, J., J. Bertrand, S. Smith, N. Rutenberg, and K. Meyer-Ramirez. 1996. "Empirically Based Conversion Factors for Calculating Couple-Years of Protection." Futures Group, Chapel Hill, NC.
- Sullivan, J. M., S. O. Rutstein, and G. T. Bicego. 1994. *Infant and Child Mortality*. Demographic and Health Surveys Comparative Studies 15. Calverton, MD: Macro International.
- Trussell, J., and A. Pebley. 1984. "The Potential Impact of Changes in Fertility on Infant, Child, and Maternal Mortality." *Studies in Family Planning* 15 (6): 267–80.
- Tsui, A. O., J. N. Wasserheit, and J. G. Haaga, eds. 1997. *Reproductive Health in Developing Countries: Expanding Dimensions, Building Solutions*. Washington, DC: Panel on Reproductive Health, Committee on Population, and Commission on Behavioral and Social Sciences and Education, National Research Council.
- UN (United Nations). 2003. *State of the World's Population*. New York: UN.
- UNAIDS (Joint United Nations Programme on HIV/AIDS). 1999. *Prevention of HIV Transmission from Mother to Child: Strategic Options*. Geneva: UNAIDS.
- Walsh, J. A., C. N. Feifer, A. R. Measham, and P. J. Gertler. 1993. "Maternal and Perinatal Health." In *Disease Control Priorities in Developing Countries*, ed. D. T. Jamison, W. H. Mosley, A. R. Measham, and J. L. Bobadilla, 363–90. New York: Oxford University Press.
- Weller, R. D., I. W. Eberstein, and M. Bailey. 1987. "Pregnancy Wantedness and Maternal Behavior during Pregnancy." *Demography* 24: 407–12.
- Westoff, C. F. 2001. *Unmet Need at the End of the Century*. Demographic and Health Surveys Comparative Reports 1. Calverton, MD: ORC Macro International.
- Westoff, C. F., and A. Bankole. 1995. *Unmet Need 1990–1994*. Demographic and Health Surveys Comparative Studies 16. Calverton, MD: ORC Macro.
- . 1997. *Mass Media and Reproductive Health*. Demographic and Health Surveys Analytical Reports 2. Calverton, MD: Macro International.
- WHO (World Health Organization). 1997. "Maternal Health around the World." Wall Chart. Department of Reproductive Health and Research, Geneva.
- . 1998. *Abortion in the Developing World*. Geneva: WHO.

- . 2002a. *Research on Reproductive Health at WHO: Biennial Report 2000–2001*. Special Programme of Research, Development, and Research Training in Human Reproduction. Geneva: UNDP/UNFPA/WHO/World Bank.
- . 2002b. *World Health Report*. Geneva: WHO.
- Williams, A. 1999. “Calculating the Global Burden of Disease: Time for a Strategic Reappraisal?” *Health Economics* 8 (1): 1–8.
- Winikoff, B., and M. Sullivan. 1987. “Assessing the Role of Family Planning in Reducing Maternal Mortality.” *Studies in Family Planning* 18 (3): 128–43.
- World Bank. 1993. *Investing in Health: World Development Report 1993*. New York: Oxford University Press.
- . 2003. *World Development Indicators 2003*. New York: Oxford University Press.
- Yun, S. H., D. L. Kincaid, Y. Yaser, and G. Ozler. 1990. “The National Family Planning IEC Campaign of Turkey.” Population Communication Services, Johns Hopkins University, Baltimore.