

## Chapter Four

# Fertility

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**A**T ITS MOST BASIC, population size and growth is determined by the combined effects of fertility, or the ability of a society to reproduce itself, and mortality, or death. Worldwide, large variations in fertility rates are observed, with some of the highest rates observed in sub-Saharan Africa and some of the lowest rates in Eastern Europe, where several countries are faced with population decline.<sup>1</sup> Clearly, there is a large variation in fertility behavior, with fertility determined by both biological and social components. This chapter begins with an examination of fertility patterns. It then discusses the determinants of population fertility and the evolution of fertility trends. The “Focus” section contrasts fertility rates in North America and Uganda, and the “Methods, Measures, and Tools” section explores the various measures of fertility.

## FERTILITY PATTERNS

The past two hundred years have witnessed a tremendous change in fertility patterns across the globe. The question for us is what determines fertility rates, why have they changed (decreased) over time in some places and not in others, and why are they typically slow to change? The demographic transition theory has frequently been used as a template to mark the shift from high to low

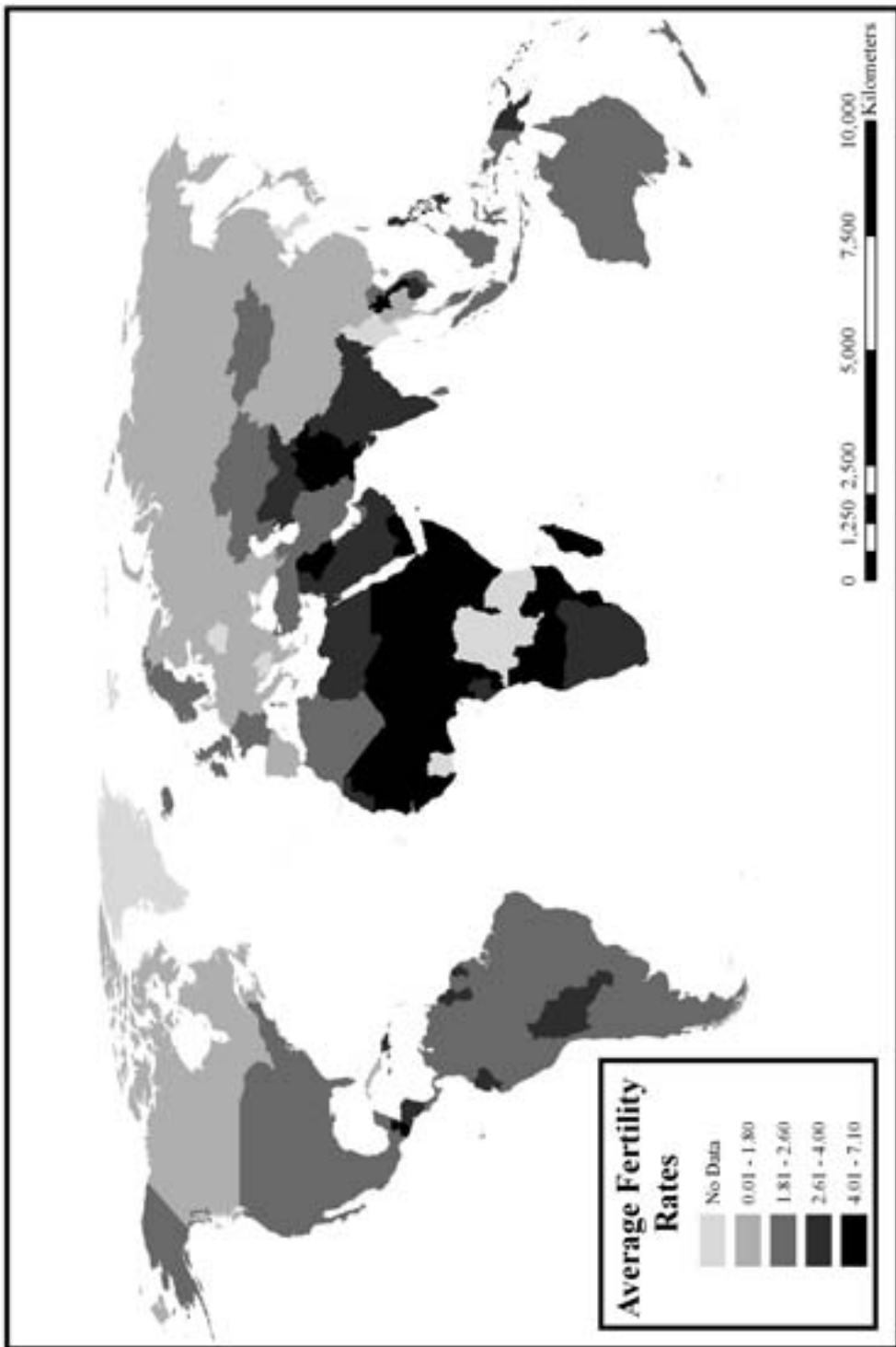


Figure 4.1 Total Fertility Rates, 2009.

Source: Derived from PRB.broadside

mortality and fertility, along with the consequent population explosion as life expectancy and mortality rates are improved. This shift in fertility regimes occurred throughout much of North America and Europe in the nineteenth and early twentieth centuries. In North America, fertility rates had already declined to 3.5 by 1900, down from rates in excess of 5 in the first half of the 1800s.<sup>2</sup> The transition to modern fertility patterns, marked by stable and slow population growth, was essentially completed by the 1930s. In other countries, the transition occurred much later, with many developing countries not experiencing mortality declines until the 1950s, while others have yet to experience substantial declines in fertility. While providing a pattern of fertility decline, the demographic transition theory does not provide us with the reasons for fertility decline.

From the perspective of the developed world, one of the most important demographic events in recent history was the *baby boom*, which presented a departure from the long-term trend of declining fertility. Generally referring to those born between 1946 and 1964, it affected the United States, Canada, and other nations involved in World War II, although the demographic impacts tended to be greatest in North America. Although the baby boom was demographically important, with baby boom generation's numbers impacting the provision of education in the 1950s and 1960s, career and leisure pursuits as individuals entered the labor force, and now retirement, social welfare programs, and health care as the baby boom generation ages into retirement within the next decade,<sup>3</sup> it was a short-term phenomenon. Instead of representing a sea change in fertility behavior, it only temporarily boosted fertility levels. Over the longer term, fertility rates continued a decline that was first noticed decades earlier.

## WHAT DETERMINES FERTILITY?

Characteristic of preindustrial societies, survival in prerevolutionary Russia was difficult. Life expectancy was just over thirty years. Infant death rates might have reached upwards of 30 percent of all live births, and 50 percent of all children died by the age of five. In response to such high death rates, families were large, with family structure reinforced by cultural practices, including early marriage before the age of twenty, and any form of birth control was a criminal offense.<sup>4</sup> To remain single was a disgrace, and divorce was a sin. Within forty years of the Russian Revolution, fertility rates had declined to levels comparable with most Western societies.

While social, economic, and environmental considerations demanded large families in prerevolutionary Russia, the Hutterites, a devoutly religious group

found in the United States and Canada, value large families, with an average size of eleven children recorded in the early 1900s.<sup>5</sup> Even at its peak, the fertility of this group fell far below the biological maximum, defined by *fecundity*, or the physiological ability of individuals to have children. What are less evident are the social dimensions which work to keep fertility below its maximum level, including the roles of economic issues, the government, and other institutions in altering fertility behavior. Similarly, cultural values regarding family size and the social roles of men and women alter fertility and the timing of fertility reduction. In many African states, for example, women enter into sexual unions at younger ages and contraceptive use remains low, but families average six or seven children, far below the biological maximum. Cultural practices, including breast-feeding or abstinence from intercourse after birth and indigenous birth control techniques, help to keep fertility below its maximum.

We can look at the experiences of the Hutterites, Russia, and other countries in order to generalize the determinants of fertility. While “distal” and “proximate” determinants of fertility can be identified,<sup>6</sup> demographer John Bongaarts identifies four variables that explain nearly all the variation in fertility levels across populations.<sup>7</sup> These include the proportion married or in a sexual union, the proportion using contraceptives, the proportion of women who are infertile, and the incidence of abortion. First, in all societies, marriage has clearly been an institution that has promoted fertility. The longer a woman waits to enter a sexual union, the lower the fertility rate. Conversely, where women marry at a young age, fertility rates tend to be higher due to the increased exposure to risk of pregnancy and longer periods over which pregnancy could occur. Cultural values and practices relating to sexual activity, childbearing outside of marriage or union, and contraceptive use will have an impact upon fertility decisions as well. In the past, the age at entry into marriage and the age at entry into a sexual union were the same, but the increasing availability of modern birth control techniques and acceptance of premarital intercourse has meant that this is no longer the case. Celibacy and abstinence (either voluntary or involuntary [i.e., because of impotence]), along with frequency of intercourse within a union, will either eliminate or alter the risk of pregnancy.

Second, contraceptive use and abortion are the key determinants of fertility in most developed countries. The “reproductive revolution,” signaled by the availability and development of modern and effective family-planning methods such as the birth control pill, made it easier to avoid pregnancy. Increased access to methods of birth control and the desire to limit family size helped fertility reductions, and, when they are used in developing countries, fertility decline has been much more rapid than the decline developed countries experienced during their fertility transition. Despite the reproductive revolution, contraceptive use varies dramatically over space and echoes variations in fertility levels. Among women

who are in sexual unions and of reproductive age who use modern contraceptives in the United States and Canada, for example, the rate of modern contraceptive usage is approximately 70 percent.<sup>8</sup> Somewhat lower levels of use are observed in Europe, particularly in Eastern Europe where contraceptive use rates are approximately 44 percent, reflecting historically lower levels of contraceptive availability and acceptance and higher abortion rates.

In the developing world, contraceptive use lags behind usage rates found elsewhere, but family-planning programs have had a strong influence on fertility by raising the awareness of means or the need for contraception and control. Contraceptive use is lower in Asia, Latin America, and Africa as well, with less than 10 percent in some areas of the latter using modern birth control methods. Instead, the regulation of fertility largely lies with traditional methods (i.e., withdrawal or abstinence), and the low incidence of contraceptive use is attributed to religious beliefs or societal values. Various governments have also decried the use of birth control methods as an unwanted intrusion of lax Western morals, even in the face of the HIV/AIDS epidemic, with the risk of transmission reduced through condom use.<sup>9</sup> When and how birth control is practiced also varies. Women in developed countries tend to start using birth control in their late teens or early twenties to delay childbearing and, following the birth of a child, to achieve desired spacing. In the developing world, contraception use frequently starts *after* the desired family size is achieved.

Third, abortion is one of the most common forms of modern birth control in the world, and is assumed to be an important reason for low birth rates in much of the developed world.<sup>10</sup> Legal in much of the world, including Canada, the United States, much of Europe, China, India, and Russia, some of the highest reported rates of abortion are found in Eastern Europe and Central Asia, with an observed rate of approximately forty-five per one hundred in 2003 in the Russian Federation,<sup>11</sup> where access to abortion is easier than access to contraceptive devices.<sup>12</sup> China, a country that typically had high abortion rates, has seen rates decline in recent years, although anecdotal evidence suggests rates of illegal abortion are high.

Finally, the inability to conceive is associated with voluntary or involuntary fecundity. Breast-feeding, for instance, reduces (but does not eliminate) the likelihood of pregnancy for as long as twenty-one months following childbirth.<sup>13</sup> With modernization, breast-feeding has tended to decline, which may be of particular concern within the developing world where, in the absence of other birth control techniques, fertility may increase. Sterilization also provides a method for lowering fertility, although this is a more popular procedure in developed countries, where it is generally used to prevent further pregnancies after a desired family size has been achieved.

Together, these four variables explain nearly all variations in fertility, with

the importance of each determinant depending on the cultural, economic, health, and social factors within a population. In many African societies, babies are breastfed until age two or three, and women may be expected to abstain from intercourse for up to two years after birth, both of which increase spacing between births. Although Bongaarts provides insight into the key determinants of fertility, the question remains as to what determines the social forces that mold fertility choices. Why, for instance, would marriage be delayed? Why would contraceptive use increase? How do the cultural values attached to children change?

To answer these questions, we must turn to theories of fertility transition over time and space.<sup>14</sup> These may be roughly distinguished by microeconomic interpretations, characterized by Easterlin's "supply and demand" framework,<sup>15</sup> and the "diffusion-innovation" perspective, proposed by a number of authors.<sup>16</sup> Both frameworks find their roots within the demographic transition theory (chapter 1), which ascribes declines in fertility to societal changes related to industrialization and urbanization. In the face of declining mortality and improved economic opportunities, the demographic transition theory implies that people will eventually realize that more children will survive into their reproductive years than can be afforded, resulting in a decline in fertility that preceded modern birth control methods. Urbanization and industrialization therefore set the stage for declines in fertility, such as in pre-twentieth century Europe and North America, creating a way of life that made it more expensive to raise children.<sup>17</sup> Rather than using children to augment household income, children were to be "invested" in through such means as educational opportunities.

The linkages among urbanization, industrialization, and fertility (see also chapter 9) within the demographic transition theory were, however, criticized, especially within the context of the developing world, where the correlation between development and fertility is weak. Several countries in Asia (i.e., Bangladesh) and Latin America (i.e., Haiti) remain poor and underdeveloped and have low levels of urbanization, but are also experiencing fertility decline. In other words, development and economic security is not a sufficient condition to cause fertility to decrease. Building upon the demographic transition theory are the neoclassical theories of fertility decline. Easterlin's classic supply-demand framework defines fertility choice as the outcome of a rational calculation of the costs and benefits associated with fertility behavior, contextualized relative to cultural and household expectations. Families try to maintain a balance between the potential supply of children and the demand for surviving children. Where death rates are high, high fertility ensures the survival of some of the children to an economically active age, and there is no incentive to control fertility. The response to high mortality reflects children as a source of security and labor, a preference for a son, or a desire to "replenish" the popula-

tion. In effect, children may be likened to pension plans, contributing to production and income within the household or the care of elders, making large families a necessity and an investment in future security.

If, on the other hand, supply exceeds demand, fertility regulation becomes important. The decision to control fertility is then based upon the financial and social costs of raising a child, as more children are being produced and surviving into their reproductive years. Casting fertility behavior as an economic choice means that children are, in many ways, seen as luxury items and subject to both time and investment. Investment is represented by the *direct costs* of education, clothing, food, and so forth as well as *opportunity costs*, representing foregone investments and purchases of other consumer goods. Parents are then faced with a trade-off between quality and quantity. In the developed world, quality is emphasized, with resources concentrated on a relatively small number of children. Children in the developed world are not expected to contribute to the economic well-being of the household, or to support parents in their old age. Instead, they represent large direct costs associated with education, clothing, and food, along with indirect or opportunity costs of having children at a time when the same dollar value could be spent on other consumer goods and demands for leisure time.

Criticism of neoclassical determinants of fertility behavior has led social scientists to link changes in fertility behavior to the diffusion of ideas across space.<sup>18</sup> As with any process, diffusion of social norms or new ideas varies spatially, with the timing of the fertility transition hinging upon the diffusion of social norms and new ideas, including birth control techniques. In the past, the preference for small families diffused out of urban areas, from high- to low-income groups, and from country to country. Although important, diffusion is not a spatially smooth process. For instance, poor or inadequate transportation or communication infrastructure, especially evident in rural, agricultural, and poor regions of the world, creates barriers that alter or slow the diffusion of new ideas or norms. Religious ideology remains a persuasive force, limiting the success of family-planning programs and the promotion of birth control methods. Cultural practices may likewise preclude the use of contraceptive devices, such as the condom, which is viewed as interference during sexual intercourse in some cultures.

The uptake of new ideas or norms also depends upon the individual. If new ideas such as birth control are to be accepted, individuals must feel that they exert some power or control over life events.<sup>19</sup> In societies where women lack control and power, fertility rates tend to remain high. The key, therefore, is to produce greater equity between males and females, which is accomplished vis-à-vis improvements in educational attainment, occupational status, or income opportunities. Improved education status and paid employment have reduced

fertility, with a near-universal relationship between improved educational levels among women and decreased fertility. Women with better levels of education also tend to have a higher uptake of family planning, tend to wait longer between pregnancies, and stop childbearing at an earlier age than those who are less educated. Even a secondary-level education has been associated with a one-third to one-half reduction in the number of children born relative to women with no education.<sup>20</sup>

There is an even stronger relationship between women's education and child health, with higher educational attainment linked to healthier and better-nourished children, which in itself promotes a reduction in fertility. Although the exact relationship is unclear, completion of education may delay entry into marriage and expands employment options, suggesting that women delay fertility in order to earn an income. Employment also exposes women to new ideas, behaviors, and influences outside of the family. However, gender equity in employment is vital: if employment does not translate to power and does not enable women to make decisions regarding health care, contraception, the timing of children, and so forth, then declines in fertility are unlikely to occur.<sup>21</sup>

## FERTILITY LEVELS: TOO HIGH OR TOO LOW?

When discussing fertility levels, we tend to focus on the fertility rate and the idea of "replacement fertility." After all, this gives us the sense of whether or not a population is able to replace itself over time. Demographers refer to a TFR of 2.1 as replacement fertility or the number of children needed to exactly replace their parents' generation, accounting for premature death. Yet, these averages tend to hide regional variations in fertility rates, such as the difference in fertility between Hispanics and white non-Hispanics in the United States, or between the French-speaking Quebecois and the larger Canadian population. Moreover, the replacement level is not necessarily consistent: in the developing world, the TFR required for replacement ranges from 2.5 to 3.3 because of higher mortality rates.<sup>22</sup> It is, incidentally, worth noting that there is relatively little separating population growth from population decline. Taking a TFR of 2.1 as replacement fertility, fertility rates in excess of 2.1 will result in population growth. Conversely, rates less than replacement will result in population decline! Both sides of replacement fertility also bring their own troubles.

### *Implications of High Fertility*

By this point, the implications of high fertility should be fairly self-evident. Fertility rates in excess of the replacement level mean an increasing population, and it is certain that the world's population will continue to grow for the foreseeable future. Continued population growth poses deep problems for many



nations, particularly where governments are fiscally strained, state institutions are weak, and health and educational systems are poor. In some cases, the strain of population growth is already showing as governments are unable to maintain investment in public infrastructure, including health care and education. In many cases, high population growth erodes economic growth, deepens poverty, and counters other achievements in social sectors.<sup>23</sup> Population growth and, ultimately, the absolute size of the population will continue to pose challenges to societies and their governments as they deal with growing scarcities of land and water, raising the potential for conflict.

### *Implications of Declining Fertility*

While birth rates remain high in much of the world, an increasing number of countries are dealing with below-replacement fertility.<sup>24</sup> Low birth rates and a slowing or decreasing population growth rate have their own set of problems. Although the anticipated consequences of an aging society are still unclear, the PRB concluded that low fertility is a serious problem, having more disadvantages than advantages and making it a politically unsustainable position.<sup>25</sup> From a demographic perspective, low fertility results in an increasing proportion of elderly. In Canada, the elderly population (aged sixty-five-plus) represented just 7.8 percent of the population in 1951, growing to 14 percent in 2009. Current projections place it at approximately 20 percent by 2026, altering the age distribution of the population from its typical pyramidal shape, dominated by a young population, to a rectangular one, characterized by a proportionately larger elderly population.<sup>26</sup> Although having the highest TFR in the Western world, the United States has seen similar increases in its share of the elderly population, representing just 4.1 percent of the population in 1900, 13 percent in 2009, and projected to grow to nearly 20 percent by 2030.<sup>27</sup> In Europe, the elderly already represent greater than 15 percent of the population in several countries, including Sweden (18 percent), the United Kingdom (16 percent), and Belgium (17 percent), with continued growth ensured.

Economists have tended to assume that the marketplace will be able to react to population change. If children are scarce, they will become more valuable, and the system will correct itself, either by finding substitutes for children (unlikely!) or by placing greater value upon children, achieved through various incentive programs. Yet, the recession of 2008–2009 suggested that this was not the case, with economic opportunities the real driver of fertility. While the full effects of the recession on fertility will not be observed until 2010 or later, it appeared that many families were postponing having children as the recession built and fear of losing jobs or income grew. Moreover, some analysts were wondering if the recession would create a new mindset that it was either work or family, not both.<sup>28</sup> It is also unclear what the economic effects of low or

negative population growth would be.<sup>29</sup> Ester Boserup, a Danish economist, promoted the idea that population growth triggered economic development.<sup>30</sup> Over the long run, countries with growing populations would be more likely to post strong economic growth than a stationary or declining population. It has generally been assumed, for example, that population growth provides an economic stimulus: the growing population needs services and goods, with their purchases driving economic growth. Conversely, declining population growth rates imply slower economic growth with individuals buying less and saving more, a notion that most developed societies have adopted. Although simplistic, we can draw an analogy with the housing market—given declining population and a shrinking market, why would individuals invest in a home knowing that there will be fewer buyers (and therefore lower prices) in coming years? Similarly, the economic recession of 2009 was deepened, in large part, by a reluctance of individuals to buy in the face of soaring unemployment.

With an aging population, the costs of providing services to it will be carried by a smaller labor force. The negative economic impacts associated with low or negative population growth may be associated with greater inequalities within society. There is little doubt that countries with an aging population will face an increased burden of supporting the elderly, placing pressure on social-welfare programs. Countries with low fertility rates will have a smaller labor force with which to support the elderly population and may face severe labor shortages that threaten the economic livelihood or stability of the country.<sup>31</sup> The changing age structure of the population therefore raises questions regarding the provision of income security for the aged, housing, transportation, and other services, highlighted by recent debates regarding the crisis (and reform) of Social Security in the United States. Health care provision is of particular concern, since the elderly, and particularly those older than seventy-five, consume a disproportionate share of medical services. Concurrently, the welfare of children may suffer as funds are diverted to meet the needs of the elderly population.

The largest negative consequences of low or negative population growth may, in fact, be political rather than economic.<sup>32</sup> Internally, countries may face a “graying of politics,” as political and economic concerns increasingly represent those of older generations at the expense of the young. Internationally, a shrinking population has been associated with demographic marginalization. A “population implosion” may infringe upon the very essence of nationality, with governments fearing that a declining population will threaten the ability of a country to defend itself. Even national identity is at stake, with national influence dependent upon the vitality and size of a population.

Overall, the negative economic impacts of an aging population are expected to be minimal. Instead, an aging population may be associated with higher savings rates, greater expertise, less unemployment, and higher innovation,

although educational costs for retraining and continuing education of an older labor force are likely to increase. Likewise, low or negative population growth should not influence rates of technological change, consumption, or investment, although the distribution of these impacts across regions or age groups is unlikely to be equal, as is the case with the consumption of medical care.<sup>33</sup>

## AFRICA'S FERTILITY TRANSITION?

Since the 1950s and the beginning of the population explosion in the developing world, demographers and governments alike have searched for indications that the characteristic high fertility levels found in the developing world would decrease. While fertility rates have declined as expected in most instances, they have stalled in others, such that population growth will continue for the next few decades, fueled by population momentum associated with the young age structure, increased life expectancies, and above-replacement fertility. The multidimensional factors associated with fertility decline, which are further complicated by national and international policies, make it difficult to ascertain whether all countries will complete some form of fertility transition. Pressure within segments of China's population to have more than the allotted one child shows a continuing desire to have larger families, and the problems associated with a rapidly aging population may force the government to relax its fertility policy. Fertility rates continue to remain above replacement in many other regions. Despite early successes in reducing fertility in Bangladesh, which saw fertility rates drop from over 6.0 children per woman in the early 1970s to 2.5 in 2009, fertility rates have remained relatively unchanged over the past twenty years. Similarly, Egypt's birth rate has remained equal to or greater than 3.0 since 1993, and it is uncertain whether it will be further reduced.<sup>34</sup>

After observing fertility transitions in Asia and Latin America, all eyes have focused upon Africa, where fertility rates remain stubbornly high, and most African nations (notably in sub-Saharan Africa) have made little progress toward the fertility transition.<sup>35</sup> In short, much of Africa is still waiting for the fertility transition. Africa is arguably faced with the most pressing fertility concerns: some fifty years after mortality levels were dramatically reduced in the developing world, Africa's TFR remains high at 4.8, while sub-Saharan Africa still has fertility rates well in excess of 5.0. Fertility rates this high, corresponding to an annual increase of 2.5 percent, enable the population to grow rapidly. While population growth is expected to slow and there is emerging evidence that fertility rates will ultimately decline, the population of Africa will, under current conditions, double by 2050. In sub-Saharan Africa, only South Africa, Zimbabwe, Kenya, and Namibia would appear to have entered a period

of transition in fertility behavior, which could be characterized by higher contraceptive use, longer life expectancies, and a declining fertility rate, although HIV/AIDS threatens this success. Fertility reduction remains a distant goal for the majority of sub-Saharan countries.

Although most observers expect fertility rates to ultimately decline in African states, the question remains as to when large-scale reductions will occur, how far rates will drop, and how long it will take to achieve significant reductions. Like explanations for fertility decline, the answers to these questions are also multidimensional. First, although contraceptive use is increasing, it is used more for control of the spacing of children<sup>36</sup> or after desired family size is achieved, rather than as a form of fertility control to limit family size. Just 23 percent of married women use some form of modern birth control in many African nations, which compares with 69 percent in North America. Based on a study in three French-speaking West African countries, there was a high level of awareness of contraceptives, but use of contraceptives was low amongst married women and higher among unmarried women who were sexually active.<sup>37</sup>

Second, childhood mortality remains high in many African nations. As we have already noted, mortality rates have decreased within Africa, but perhaps not sufficiently to initiate fertility decline. The general rule is that life expectancy at birth must be greater than fifty years for fertility levels to decrease. This has only been recently achieved in some African states, while in others (particularly sub-Saharan states), life expectancy hovers near or remains below the fifty-year mark. Third, the HIV/AIDS crisis may reverse gains in life expectancy (see discussion of the demographic implications of HIV/AIDS in chapter 5). Although there is no evidence that fertility choices will be affected, declines in life expectancy have already been noted. It has been estimated that life expectancies in Zimbabwe are now twenty-one years lower than they would have been without AIDS.<sup>38</sup> Fourth, gender equity is a distant goal in many societies. Women remain marginalized, literacy rates remain low, and rapid population growth and economic crises in the 1980s and 1990s prevented many countries from expanding educational opportunities to meet the growing population. Too frequently, the consequence is poor reproductive health. Health care systems are also casualties of high rates of population growth and stagnant economies that have limited development, modernization, and investment in basic health care services. Many systems are poorly funded or in ruin, preventing access to the most basic of health services at times when both mother and child are in need.

In the past, policy options have offered little hope of reducing fertility levels in Africa,<sup>39</sup> evidenced by the experiences of the United Nations and other international groups that have worked since the 1950s to address population growth issues. This is not to imply that progress in reducing fertility has not been (or

is not) possible, merely that the implementation of successful family-planning programs is challenging, recognizing that there are particular needs to target the underprivileged and those in rural areas through the provision of family planning, the encouragement of gender equality, education, and economic development. In general, countries that have invested in health and family planning have slower population growth and greater economic development than those countries that have not made such investments. Many African governments have recognized the intimate link between population and development, and have promoted programs that would reduce fertility levels, but have frequently lacked the financial ability to fully implement programs. Alternatively, they have not sufficiently involved all stakeholders, including religious leaders and men that would work to ensure success by altering social, political, and economic forces influencing fertility choices that prove slow to change. Ensuring that fertility rates are reduced in Africa will provide an ongoing challenge.

## WOMEN'S REPRODUCTIVE HEALTH

Underlying many fertility decisions, and ultimately their outcome, is women's reproductive health, which includes safe motherhood, HIV/AIDS, adolescent reproductive health, and family planning. Clearly, these are not mutually exclusive concerns, although they are more often than not developing world concerns. Maternal mortality, for example, is greatest in sub-Saharan Africa (920 maternal deaths per 100,000 live births), with many countries experiencing rates in excess of 1,000. In comparison, maternal mortality is only 6 in Canada, 17 in the United States, and 12 in western Europe.<sup>40</sup> Morbidity associated with poor reproductive outcomes is also significant.<sup>41</sup>

Not surprisingly, maternal mortality is associated with the absence of good medical care before, during, and after delivery. For instance, a majority of births in sub-Saharan Africa are not attended by skilled health personnel, and antenatal care is frequently lacking and sought out only when there is a complaint.<sup>42</sup> Equally problematic, there is frequently a lack of awareness about the importance of, and need for, medical care during pregnancy. Maternal mortality is compounded by gender roles and social and economic conditions within individual societies. For example, cost and accessibility of reproductive health care providers may limit use, particularly in rural areas where trained providers are few, access to information is either limited or difficult, and the population simply lacks the funds for appropriate care.<sup>43</sup> Similarly, while women may prefer to seek female health care providers, few may be available and husbands may be the ones who decide whether to seek care. As a consequence, males must also be included in reproductive health discussions. Complications from illegal and unsafe abortions

are also a major cause of maternal death or morbidity, and one that is common in areas where access to safe abortion is limited or illegal. In Nicaragua, complications from unsafe abortions have been identified as one of the leading causes of hospitalization among women, and upward of 8 percent of maternal deaths may be linked to complications associated with unsafe abortions.<sup>44</sup>

Adolescents are perhaps at greatest risk for negative reproductive health outcomes, given their potential exposure to sexually transmitted diseases, unintended pregnancies, and complications from pregnancy and childbirth.<sup>45</sup> Worldwide, more adolescent girls die from pregnancy-related causes than any other cause, and maternal mortality is four times as high for women younger than seventeen years. In part, their poor reproductive health reflects an inability to address adolescent reproductive needs and early marriage, and lack of knowledge or experience in terms of family planning. Female genital cutting, or the removal of all or part of a young girl's external genitalia, remains a major reproductive health issue in some African and Middle Eastern countries, and can lead to infertility and other health complications.

In large part, improvements in female reproductive health reflect increased access to trained health care providers and education, including family planning, which contributes to both maternal and infant health by reducing the number of unintended pregnancies. As noted earlier in this chapter, the use of contraceptive devices varies widely. There is, however, a relationship between family-planning programs and the practice of some form of family planning, whether that is contraception use or some other method to limit and space pregnancies. In Iran, which introduced family-planning programs in the 1980s, 56 percent of married women practice modern family planning. Correspondingly, rates tend to be lower in countries with newer or more limited family-planning programs. At the same time, unmet need for contraceptive devices—which includes such diverse issues as fear of contraception's side effects, disapproval by husband or family, religious objections, and difficulties in obtaining contraceptives—limits the success of family-planning programs. Unmet needs are typically highest amongst poor and uneducated women.<sup>46</sup>

## CONCLUSION

While generally declining, fertility rates vary at the global and local scales. Although low fertility is implicitly desired, resulting in slower or negative population growth, there is little agreement on what constitutes a desirable rate of population growth. Is it sufficient to simply replace the current generation? Can societies with below-replacement fertility, such as many European countries, survive politically and grow economically? What are the political, economic,

and social implications of below-replacement fertility? In such countries, governments may actively promote fertility through pronatalist policies, typically by providing financial incentives to couples. Yet, how can governments speak of needing to increase fertility when there is an abundance of it elsewhere that could be used to augment growth in the developed world through immigration? Elsewhere, countries with rapid population growth will attempt to reduce fertility and slow population growth, with China's experiment at fertility control being the most widely known (see chapter 10, "Focus").

## **FOCUS: CONTRASTING FERTILITY RATES AND CHOICES IN NORTH AMERICA AND UGANDA**

When we compare the fertility choices and rates between the developed and developing world, large differences in both are typically exposed.<sup>1</sup> These contrasts can be highlighted by looking at two cases—North America and Uganda.

### **THE NORTH AMERICAN EXPERIENCE**

While fertility rates over the past century have fluctuated, they have generally declined. In 1900, the fertility rate was approximately 3.5. As the nation moved into the depression of the 1930s and World War II, fertility rates dropped. Post-World War II, this picture changed dramatically with the baby boom. In the United States, the TFR peaked at 3.58 in 1957, up from 2.19 immediately after the war. By the mid-1960s, fertility rates had once again dropped to levels similar to those observed prior to the baby boom, with fertility rates continuing to drift slowly downward. By the 1970s, the TFR stood at approximately 1.7. After the 1970s, fertility moved upwards slightly toward 2.0 children per woman in the 1980s and 1990s, and reached 2.1 in 2001, giving the United States one of the highest total fertility rates in the developed world. Most re-

cently, birth rates in the United States fell, leading some to speculate that the recession of 2008/2009 was to blame, echoing similar fluctuations in fertility associated with economic cycles.<sup>2</sup>

The United States and Canada share a similar demographic profile and history, with Canada also experiencing declining fertility from 1900 through the Depression and wars, followed by the postwar baby boom. In Canada, the TFR reached a slightly higher level (3.9) and peaked slightly later (1959) before dropping below the replacement level of 2.1 by 1972. Surprisingly, the decline was led by the French-speaking province of Quebec, where the role of the Catholic church in society was assumed to ensure that fertility rates would remain higher than those observed elsewhere in Canada. In more recent years, Canada's fertility experience has diverged from that of the United States. As of 2009, its fertility rate was 1.6, much lower than that observed in the United States. Despite sharing similar social changes, such as reduced marriage rates, increased average ages for marriage, and increased educational levels, Canada's fertility experience has tended to follow more closely that of Europe.<sup>3</sup> The

important difference may lie in Canada's immigrant population, which given immigration policy, tends to be highly educated, implying lower levels of fertility.

In both the United States and Canada, the baby boom reflected the pent-up demand for children following World War II and the Depression, along with rising incomes and expectations and earlier marriages. Likewise, the drop in fertility in both countries was associated with several factors.<sup>4</sup> First, couples were increasingly delaying marriage as women placed greater emphasis on education and the development of their own careers over development of families. This was also closely related to income potential: higher education meant increasing income opportunities. Consequently, staying at home to raise a family meant income foregone. Second, the 1960s marked the sexual revolution and the increased availability and acceptance of contraception, and particularly the contraceptive pill. Together, these made planning and spacing of pregnancies easier, or ensured that a pregnancy would not occur altogether. Third, an economic interpretation has also been applied to explain declining fertility, given the "demographic squeeze" due to the baby boom generation. As these children aged first into school, then post-secondary education, and finally the labor market, male wages fell at the same time as more women entered the market, in part to compensate for declining wages and as an expression of their own career interests and educational attainment. As a result, marriage and families were postponed.

As already noted, US fertility is higher than most developed countries, and is even higher than some countries in the developing world. Various reasons for this difference have been put forward.<sup>5</sup> In large part, its relatively high fertility rate has been attributed to its ethnic diversity, with minority

groups having higher fertility than native-born white Americans.<sup>6</sup> For instance, the TFR for non-Hispanic whites is 1.9. In contrast, Asian Americans had a TFR of 2.0, blacks 2.1, and the TFR was 3.2 amongst Hispanics. For Hispanics, fertility rates are likely higher for reasons including lower educational attainment and cultures and religions that promote larger families. Although fertility rates amongst foreign-born Hispanics are much higher than amongst their native-born counterparts, Hispanic fertility rates are likely to decline toward those of native-born Americans over successive generations.<sup>7</sup> Second, differences in the cost of childbearing have been suggested: generally higher costs for housing and other commodities in Europe, for example, increase the costs of raising a family, and therefore result in lower fertility levels.

## THE UGANDAN EXPERIENCE

Having one of the highest levels of fertility in Africa (the 2009 TFR was 6.7) and a rapidly growing population, Uganda presents a strikingly different picture, reflecting its stage in the demographic transition. Over the past fifty years, the fertility rate changed little, and actually increased slightly during the 1970s and 1980s.<sup>8</sup> As a consequence, the country's population is young, with a stunning 49 percent below the age of fifteen. This young population has yet to move into its reproductive years, meaning that Uganda's population is projected to grow to 51.8 million by 2025, up from 30.7 million in 2009,<sup>9</sup> and fertility rates are expected to remain high.<sup>10</sup>

In large part, Uganda's high fertility reflects a continuation of social trends and the need for large families in order to diversify income opportunities and help the household. In short, fertility has not yet adjusted to increased life expectancy and reduced mor-



tality within the population. War and political and economic turmoil have also helped to ensure that fertility remains high. At the same time, the PRB reports a huge unmet demand for contraception, suggesting that there is a desire to decrease fertility levels by either avoiding pregnancy or through better spacing of pregnancies.<sup>11</sup> That is, there is a demand for contraception, but it is not readily available or affordable. Indeed, only 24 percent of married women aged fifteen to forty-nine use some method of birth control,

while only 18 percent use a modern method. The PRB, however, estimates that some 35 percent of married women in the same fifteen to forty-nine age group would prefer to use contraception, but cannot access it. In addition, unmet needs may reflect a lack of awareness of modern contraception techniques, social and cultural constraints that limit a woman's ability to control birth decisions, and fears of side effects or that use of birth control could be seen as a sign of promiscuity.<sup>12</sup>

## METHODS, MEASURES, AND TOOLS: MEASURING FERTILITY

The basic notion of measuring fertility is understanding how the size of a population can be determined by birth choices. The fertility of a population is commonly measured in various ways, the most common of which are presented here. Fertility measures are broadly divided into two types. Period data refers to a particular time period (i.e., calendar year or some other period of time) and is essentially a cross section or snapshot of fertility at a particular point in time. Conversely, *cohort* measures follow a group of women over time, describing how their fertility choices and behavior vary over the period. Data used to measure fertility are drawn from a variety of sources. Commonly, governments will collect birth data and compile it along with other so-called "vital" statistics. While comparing fertility is facilitated by age standardization, it can also be complicated due to variations in the quality and quantity of collected data: the better the data, the more accurate the conclusion.

In 2006, a total of 4,265,555 births were registered in the United States. The crude birth rate was 14.2, and the total fertility

rate was 2.1.<sup>1</sup> Although we have discussed the meaning of the TFR, how else can we measure fertility? Perhaps the most basic measure of fertility is the *crude birth rate* (CBR), defined by

$$CBR = 1,000 \left( \frac{B}{P} \right)$$

where  $B$  is the number of annual births and  $P$  is the midyear population at risk of giving birth (i.e., women in their reproductive years). While simple to calculate and providing a quick measure of the contribution of fertility to population change, the crude birth rate does not account for the age and sex structure of a population, and therefore does not allow comparison across populations or regions. That is, women from regions with the same crude birth rate may in fact have very different propensities to have children. Consequently, the *age-specific fertility rate* (ASFR,  ${}_nF_x$ ) is commonly used, and defined as

$${}_nF_x = 1,000 \left( \frac{{}_nB_x}{{}_nP'_x} \right)$$

where  ${}_hB_x$  is the number of live births to women aged  $x$  to  $x + h$  during the year, and  ${}_hP_x^f$  is the midyear population of females aged  $x$  to  $x + h$ , and  $h$  is the width of the cohort, typically defined as five years and corresponding to population data that is commonly available in data files such as the census.

The TFR measures the expected total number of children that a woman will have over her reproductive career, assuming (1) survival at least through the childbearing ages and (2) that children will be born according to the age-specific rates as women age. This measure is commonly used in describing fertility patterns and in comparing the rates of fertility across different regions and is a better measure of fertility than the crude birth rate because it is independent of the age structure of the population. It is defined by the following formula.

$$TFR = h \sum_x {}_hF_x$$

The TFR is calculated by summing all of the age-specific fertility rates ( $F_x$ ) over all reproductive age groups and then multiplying the result by the width of the age group used ( $h$ ).

While the TFR can be used to gauge whether a population is growing or declining due to fertility, the *gross reproduction rate* (GRR) provides the expected number of female children a woman will have, relative to age-specific rates and assuming survival through the reproductive years. In this way, the GRR provides an alternate measure of whether a population is replacing itself and is defined by multiplying the TFR by the percentage of births that are female. GRR values close to 1.0 represent one female exactly re-

placing herself, so the population growth rate will be equal to 0. Values less than 1.0 indicate that the next generation of women will not replace themselves, while the current generation will more than replace themselves if the GRR is greater than 1.0.

Finally, the *net reproduction rate* (NRR) is a more precise indicator of whether a population will grow or decline over time by accounting for the fact that not all females will survive to childbearing ages, which is an underlying assumption of the GRR. The NRR defines the number of daughters born to a woman if she were subject to prevailing age-specific fertility and mortality rates in the given year. The NRR is defined as the following formula.

$$NRR = \frac{W}{l_0} \sum_x {}_hF_x {}_hL_x$$

In essence, this is the gross reproduction rate multiplied by the proportion of female babies surviving to the midpoint of the age interval, which can be derived from a life table. If the calculated NRR is equal to 1.0, each generation of women is exactly replacing itself. If it is greater than 1.0, the population will grow, while a value less than 1 is the converse (shrinking), and 0 indicates that the current generation will not be replaced.

Cohort measures of fertility include *completed fertility*, which measures the total number of births to a cohort of women. Alternatively, *fertility intentions* provide an estimate of the number of children a woman intends to have over her reproductive years. However, fertility intentions can be altered by changing preferences or economic situations, which may increase or decrease the number of desired children.