

# 10

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## *Stabilizing Population by Reducing Fertility*

World population has more than doubled since 1950. Those born before 1950 are members of the first generation in history to witness such a doubling during their lifetime. Stated otherwise, more people have been added to the world's population since 1950 than during the 4 million preceding years since we first stood upright.<sup>1</sup>

Throughout most of these 4 million years, we were few—numbering only in the thousands. When agriculture began, world population was estimated at 8 million—less than a third the size of Tokyo today. After farming got under way, population growth slowly gained momentum. With the Industrial Revolution, it accelerated further. After 1950, it soared.

We are struggling to understand the dimensions of population growth over the last half-century. We can relate to 100,000 people, the number filling a large stadium for an athletic event or a concert, but relating to an annual increase of 80 million is difficult. To grasp the dimensions of this growth, we can equate it to the combined population of the United Kingdom, Belgium, Denmark, and Sweden today. As someone who spends more time than I would like in planes and airports, it is easier for me to relate population growth to the passenger capacity of a jumbo jet. It takes the world's

growing population less than 3 minutes to fill a jumbo jet with 400 passengers.

Despite the stresses associated with continuing population growth, the United Nations projects that our numbers will grow from 6.1 billion in 2000 to 9.3 billion in 2050. Of even more concern, all of the 3.2 billion additional people will be added in developing countries. Given the analysis in this book, there is reason to doubt that this will actually happen. What is unclear is whether the projections will not materialize because we accelerate the shift to smaller families in time or because we fail to do so and death rates begin to rise.

Many countries that have experienced rapid population growth for several decades are showing signs of demographic fatigue. Governments struggling with the simultaneous challenge of educating growing numbers of children, creating jobs for swelling ranks of young job seekers, and dealing with the environmental effects of population growth are stretched to the limit. Without a concerted effort by national governments and the international community to shift quickly to smaller families, land scarcity and water shortages could become unmanageable—leading to political instability, economic decline, and rising death rates.

In this situation, when a major new threat arises—such as the HIV epidemic or aquifer depletion—governments often cannot cope. Problems routinely managed in industrial societies are becoming full-scale humanitarian crises in many developing ones. As the HIV epidemic continues to spread, rising death rates in some African countries will likely bring their population growth to a halt. This rise in the death rate marks a tragic new development in world demography.

The issue is not whether population growth will slow, but how. In its 1998 update of long-range population projections, the United Nations reduced the predicted population for 2050 by some 500 million. Two thirds of this reduction was due to fertility falling faster than projected. But the other one third was the result of a projected rise in death rates, largely because of HIV in Africa. For the first time in nearly half a century of world population updates, projections were being reduced by rising mortality. The challenge is to slow population growth in all developing countries by lowering birth rates, because if we fail, it will be slowed by rising death rates.<sup>2</sup>

**Breaking Out or Breaking Down**

Today we find ourselves in a demographically divided world, one where national projections of population growth vary more widely than at any time in history. In most European countries and Japan, population has stabilized or is declining; but in others, such as Ethiopia, Pakistan, and Saudi Arabia, population is projected to double or even triple before stabilizing.

Demographers use a three-stage model to understand how population growth rates change over time as modernization proceeds. In the first stage, birth and death rates are both high, resulting in little or no population growth. In the second stage, death rates fall while birth rates remain high, leading to rapid growth. In the third stage, birth rates fall to a low level, balancing low death rates and again leading to population stability while offering greater possibilities for comfort and dignity than in stage one. It is assumed that countries will progress from stage one to stage three.<sup>3</sup>

Today there are no countries in stage one; all are either in stage two or stage three. However, instead of progressing steadily forward toward stage three as expected, some countries are falling back toward stage one as the historical fall in death rates is reversed, leading the world into a new demographic era. If countries do not break out of the middle stage of the demographic transition in a matter of decades, rapid population growth will eventually overwhelm natural systems, leading to economic decline and forcing societies back into stage one as mortality rises. Over the long term, there is no middle ground. Countries either break out or break down. Unfortunately, a number of countries, mostly in Africa, are showing signs of breaking down.

For the first time since China's great famine claimed 30 million lives in 1959–61, world population growth is being slowed by rising death rates. (See Figure 10–1.) Although rapid population growth continues in scores of countries, the world is beginning to divide into two parts: one where population growth is slowing as fertility falls, and another where population growth is slowing as mortality rises. One way or the other, population growth will slow. That rising death rates from AIDS have already reduced the projected population for 2050 by more than 150 million represents a failure of our political institutions unmatched since the outbreak of World War II.<sup>4</sup>

The world is starting to reap the consequences of past neglect of



Figure 10-1. Annual Addition to World Population

the population issue. The two regions where death rates either are already rising or are likely to do so are sub-Saharan Africa and the Indian subcontinent, which together contain 1.9 billion people—nearly one third of humanity. Without clearly defined government strategies in countries with rapid population growth to lower birth rates quickly and a commitment by the international community to support them, one third of humanity could slide into a demographic black hole.

After nearly half a century of continuous population growth, the demand in many countries for food, water, and forest products is simply outrunning the capacity of local life-support systems. In addition, the ever growing number of young people who need health care and education is exceeding the availability of these services. If birth rates do not come down soon, these natural systems and social services are likely to deteriorate to the point where death rates will rise.

But what will cause death rates to go up in individual countries? Will it be starvation? An outbreak of disease? War? Social disintegration? At some point as population pressures build, governments are simply overwhelmed and are not able to respond to new threats. There are now three clearly identifiable threats that either are already pushing death rates up or have the potential to do so—the HIV epidemic, aquifer depletion, and land hunger.

Of these three, the HIV epidemic is the first to spiral out of

control in developing countries. The epidemic should be seen for what it is: an international emergency of epic proportions, one that could claim more lives in the early part of this century than World War II did in the last one. In sub-Saharan Africa, HIV infection rates are soaring, already affecting one fifth to one third or more of adults in Botswana, Namibia, South Africa, Zambia, and Zimbabwe.<sup>5</sup>

Barring a medical miracle, many African countries will lose a fifth or more of their adult populations to AIDS by the end of this decade. To find a precedent for such a potentially devastating loss of life from an infectious disease, we have to go back to the decimation of New World Indian communities by the introduction of smallpox in the sixteenth century or to the Bubonic plague that claimed roughly a third of Europe's population during the fourteenth century.<sup>6</sup>

Ominously, the virus has also established a foothold in the Indian subcontinent. With 3.7 million adults now HIV-positive, India is home to more infected individuals than any other nation except South Africa. And with the infection rate among India's adults at roughly 1 percent—a critical threshold for potentially rapid spread—the epidemic threatens to engulf the country if the government does not move quickly to check it. The virus is also spreading rapidly in Myanmar, Cambodia, and China.<sup>7</sup>

One consequence of continuing population growth is potentially life-threatening water shortages. If rapid population growth continues indefinitely, the demand for water eventually exceeds the sustainable yield of aquifers. The result is excessive water withdrawals and falling water tables. (See Chapter 2.) Since 40 percent of the world's food comes from irrigated land, water shortages can quickly translate into food shortages.<sup>8</sup>

Dozens of developing countries face acute water shortages, but none illustrate the threat better than India, whose population—expanding by 18 million a year—has already surpassed 1 billion. New estimates for India indicate that in some areas water withdrawals are now double the rate of aquifer recharge. As a result, water tables are falling by 1 meter or more per year over parts of the country. Overpumping today means water supply cutbacks tomorrow, a serious matter where half of the harvest comes from irrigated land.<sup>9</sup>

The International Water Management Institute estimates that

aquifer depletion and the resulting cutbacks in irrigation water could override technology gains, reducing the grain harvest in water-short regions of India. In a country where 53 percent of all children are already malnourished and underweight, a shrinking harvest could increase hunger-related deaths, adding to the 6 million worldwide who die each year from hunger and malnutrition. In contrast to AIDS, which takes a heavy toll among young adults, hunger claims mostly infants and children.<sup>10</sup>

The third threat hanging over the future of countries with rapid population growth is land hunger. Once cropland per person shrinks to a certain point, people can no longer feed themselves and they either turn to imported food or go hungry. The risk is that countries will not be able to afford the imported food or that food simply will not be available if world import needs exceed exportable supplies.

Among the larger countries where shrinking cropland per person threatens future food security are Ethiopia, Nigeria, and Pakistan, all countries with weak family planning programs. As Nigeria's population goes from 114 million today to a projected 278 million in 2050, its grainland per person will shrink from 0.16 hectares to 0.06 hectares. Pakistan's projected growth from 141 million today to 344 million by 2050 will reduce its grainland per person from 0.09 hectares at present to 0.04 hectares—scarcely the size of a tennis court. Countries where this number has shrunk to 0.03 hectares, such as Japan, South Korea, and Taiwan, import 70 percent or more of their grain.<sup>11</sup>

The threats from HIV, aquifer depletion, and shrinking cropland are not new or unexpected. We have known for more than a decade that AIDS could decimate human populations if it were not controlled. In each of the last 18 years, the number of new HIV infections has risen. Of the 58 million infected by the year 2000, 22 million people have died. In the absence of a low-cost cure, nearly all the remaining 36 million will die by 2010. It is hard to believe, given our advanced medical knowledge, that a controllable disease could devastate human populations in so many countries.<sup>12</sup>

Similarly, it is hard to imagine that falling water tables, which may prove an even greater threat to future economic progress and political stability, could be so widely ignored. The arithmetic of emerging water shortages is not difficult. A growing population

with a water supply that is essentially fixed by nature means that the water per person will diminish over time, eventually dropping below the level needed to meet basic needs for drinking water, food production, and sanitation.

The same holds true for cropland per person. The mystery is not in the arithmetic. That is straightforward. The mystery is in our failure to respond to the threats associated with continuing population growth.

### **Africa Breaking Down**

A generation ago, virtually the entire world appeared to be progressing economically and socially. A better future was in prospect for all. Now that has changed as the HIV epidemic ravages Africa. It is not only causing millions of deaths, it is undermining the continent's economic future. If issues rooted in population growth, such as land hunger and water shortages, are not addressed, they could be equally disastrous. By analyzing what happened in Africa, perhaps we can avoid a social catastrophe of similar dimensions elsewhere.

History offers few examples of leadership failure comparable to that of Africa's in response to the HIV crisis. The HIV epidemic that is raging across Africa is now taking some 6,030 lives each day, the equivalent of 15 fully loaded jumbo jets crashing daily—with no survivors. This number, climbing higher each year, is expected to double during this decade.<sup>13</sup>

Public attention has initially focused on the dramatic rise in adult mortality and the precipitous drop in life expectancy. But we need now to look at the longer-term economic consequences—falling food production, deteriorating health care, and disintegrating educational systems. Effectively dealing with this epidemic and the heavy loss of adults will make the rebuilding of Europe after World War II seem like child's play by comparison.

While industrial countries have held the HIV infection rate among adults to less than 1 percent, in 16 African countries the figure is over 10 percent. In South Africa, it is 20 percent. In Zimbabwe and Swaziland, 25 percent. And in Botswana, which has the highest infection rate, 36 percent of adults are HIV-positive. These countries are expected to lose one fifth to one third of their adults by the end of this decade.<sup>14</sup>

Attention is focusing on the high cost of treating those already

ill, but the virus is continuing to spread. As deaths multiply, life expectancy—the sentinel indicator of economic development—is falling. Without AIDS, countries with high infection rates, like Botswana, South Africa, and Zimbabwe, would have a life expectancy of some 65 years or more. With the virus continuing to spread, life expectancy could drop to 35 years—a medieval life span.<sup>15</sup>

Whereas infectious diseases typically take their heaviest toll among the eldest and the very young who have weaker immune systems, AIDS claims mostly young adults, depriving countries of their most productive workers. In the epidemic's early stages, the virus typically spreads most rapidly among the better educated, more socially mobile segment of society. It claims the agronomists, engineers, and teachers needed for economic development.

The HIV epidemic is affecting every segment of society, every sector of the economy, and every facet of life. For example, close to half of Zimbabwe's health care budget is used to treat AIDS patients. In some hospitals in Burundi and South Africa, AIDS patients occupy 60 percent of the beds. Health care workers labor until the point of exhaustion. This epidemic could easily produce 40 million orphans by 2010, a number that will overwhelm the resources of extended families.<sup>16</sup>

Education is also suffering. In Zambia, the number of teachers dying with AIDS each year approaches the number of new teachers being trained. In the Central African Republic, the reduction of the teaching force by AIDS closed 107 primary schools, leaving only 66 open. At the college level, the damage is equally devastating. At the University of Durban-Westville in South Africa, 25 percent of the student body is HIV-positive.<sup>17</sup>

In addition to the continuing handicaps of a lack of infrastructure and trained personnel, Africa must now contend with the adverse economic effects of the epidemic. AIDS dramatically increases the dependency ratio—the number of young and elderly who depend on productive adults. This in turn makes it much more difficult for a society to save. Reduced savings means reduced investment and slower economic growth or even decline.

At the corporate level, firms in countries with high infection rates are seeing their employee health care insurance costs double, triple, or even quadruple. Companies that were until recently comfortably in the black now find themselves in the red. Under these circumstances, investment inflows from abroad are dwindling and

could dry up entirely.<sup>18</sup>

Even as disease consumes Africa, food security is deteriorating. Land hunger, water scarcity, and nutrient depletion are reducing the grain produced per person. In East, Central, and Southern Africa, the undernourished share of the population has increased over the last two decades.<sup>19</sup>

Making matters worse, food security is declining as the epidemic progresses. At the family level, food supplies drop precipitously when the first adult develops full-blown AIDS. This deprives the family not only of a worker in the fields, but also of the work time of the adult caring for the AIDS sufferer. A survey in Tanzania found that a woman whose husband had AIDS spent 60 percent less time tending the crops. Declines in food production from the epidemic have been reported in Burkina Faso, Côte d'Ivoire, and Zimbabwe. In pastoral economies, such as Namibia, the loss of the male head of household is often followed by the loss of cattle, the family's livelihood.<sup>20</sup>

Sub-Saharan Africa, a region of 600 million people, is moving into uncharted territory. There are historical precedents for epidemics on this scale, but not for such a concentrated loss of adults. The good news is that some countries are halting the spread of the virus. The key is strong leadership from the top. In Uganda, where the epidemic first took root, the active personal leadership of President Yoweri Museveni over the last dozen years has reduced the share of adults infected with the virus from a peak of 14 percent down to 8 percent. In effect, the number of new infections has dropped well below the number of deaths from AIDS. Senegal also responded early to the threat from the virus. As a result, it prevented AIDS from gaining momentum and held the infection rate to 2 percent of its adults, a number only slightly higher than in industrial countries.<sup>21</sup>

Saving Africa depends on a Marshall Plan-scale effort on two fronts: one to curb the spread of HIV and the other to restore economic progress. Winning the former depends directly on Africa's national political leaders. Unless they personally lead, the effort will almost certainly fail. Once a leader outlines the behavioral changes needed to contain the virus—such as delaying first intercourse, reducing the number of sexual partners, and using condoms—then others can contribute. This includes the medical establishment within the country, religious leaders, nongovernmen-

tal groups, and international health and family planning agencies.

To compensate for the “missing generation,” countries will need assistance across the board in education. This is an area where the U.S. Peace Corps and its equivalents in other countries can play a central role, particularly in supplying the teachers needed to keep schools open. Social workers are needed to work with orphans. A program of financial assistance is necessary for the extended families trying to absorb the projected millions of orphans.

Given the high cost of doing business in an AIDS-ridden society, special incentives in the form of tax relief are needed to attract corporate investors, incentives that could be underwritten by international development agencies. And debt relief is essential to the rebuilding of sub-Saharan Africa.

The bottom line is that there is no precedent in international development for the challenge the world now faces in Africa. The question is not whether we can respond to this challenge. We can. We have the resources to do so. If we fail to respond to Africa’s pain, we may not only witness the economic decline of an entire continent, but in the process we will forfeit the right to call ourselves a civilized society.

### **Filling the Family Planning Gap**

Given the immediate need to slow world population growth, it would be easy to assume that couples everywhere by now have access to family planning services. Unfortunately, despite the pivotal influence of family planning services on the global future, there is still a huge gap between people who want to plan their families and their access to family planning services.

The first step in stabilizing population is to remove the physical and social barriers that prevent women from using family planning services. John Bongaarts of the Population Council reports that 42 percent of all pregnancies in the developing world are unintended. Of these, 23 percent end in abortion. This leads Bongaarts to conclude that one third of projected world population growth will be due to unintended pregnancies. Of all the unmet social needs in the world today, none is more likely to adversely affect the human prospect more than the unmet need for family planning.<sup>22</sup>

There are several reasons why couples are not planning their families despite their desire for fewer children. In many countries, such as Saudi Arabia and Argentina, government policies restrict

access to contraceptives. Geographic accessibility also affects use; in some rural areas of sub-Saharan Africa, it can take two hours or more to reach the nearest contraceptive provider. For those with low incomes, family planning services can be expensive. Even where family planning clinics are accessible, they are often underfunded, leaving them short of supplies and understaffed.<sup>23</sup>

Women who want fewer children may also be constrained from using family planning by a lack of knowledge, prevailing cultural and religious values, or the disapproval of family members. Studies have shown that a husband's opposition to family planning constrains the efforts to limit family size in numerous countries, including Egypt, Guatemala, India, Nepal, and Pakistan. Moreover, some 14 countries require a woman to obtain her husband's consent before she can receive any contraceptive services, while 60 require spousal authorization for permanent birth control methods. Although it has been argued that these practices lessen conflicts between spouses and health care personnel, they are serious impediments to a woman's ability to control her fertility.<sup>24</sup>

One way of reducing the unplanned pregnancies that account for a large share of world population growth is through medical abortions. A prescription drug used for many years in France to induce abortion, RU 486 (also known as mifepristone), is now available in several other European countries, the United States, China, India, Pakistan, and several smaller countries in Asia. Another drug, methotrexate, used worldwide in cancer therapy, works well as a "morning after" pill when used in combination with misoprostol. This procedure, prescribed by many U.S. doctors before RU 486 was approved in 2000, typically induces abortion within 72 hours. Although medical abortions are widely used in industrial countries, such as France and the United States, they are of even greater value in developing countries, where many people do not have access to family planning services and, even if they do, where supplies of contraceptives sometimes run out.<sup>25</sup>

Information about contraceptives and family planning for young men and women facilitates the use of birth control. In Thailand, people of all ages have been educated on the importance of family planning. Mechai Viravidaiya, the charismatic founder of the Thai Population and Community Development Association (PCDA), encouraged familiarity with contraceptives through demonstrations, ads, and witty songs. Math teachers even use population-related

examples in their classes. As a result of the efforts of Mechai, the PCDA, and the government, the growth of Thailand's population has slowed from more than 3 percent in 1960 to approximately 1 percent in 2000—the same as that of the United States.<sup>26</sup>

More recently, Iran has emerged as a leader in population policy. After the Islamic revolution in 1979, when Ayatollah Khomeini came to power, the family planning programs put in place by the Shah were dismantled. Khomeini exhorted women to have more babies to create “soldiers for Islam,” pushing annual population growth rates to over 4 percent—some of the highest ever recorded. By the late 1980s, the social and environmental costs of such growth rates were becoming apparent. As a result, policy shifted. Religious leaders argued that having fewer children was a social responsibility. Eighty percent of family planning costs were covered in the budget. Some 15,000 “health houses” were established to provide family planning and health services to Iran's rural population. As literacy levels among rural women climbed from 17 percent in 1976 to nearly 90 percent, fertility dropped to an average of 2.6 children per woman. Within 15 years, Iran's population growth rate has fallen from over 4 percent a year to scarcely 1 percent, making it a model for other developing countries.<sup>27</sup>

A comparison of population trends in Bangladesh and Pakistan illustrates the importance of acting now. When Bangladesh was created in a split with Pakistan in 1971, the former had 66 million people and the latter 62 million, roughly the same population sizes. Then their demographic trends diverged. Bangladesh's political leaders made a strong commitment to reduce fertility rates, while the leaders in Islamabad wavered over the need to do so. As a result, the average number of children per family in Bangladesh today is 3.3, compared with 5.6 in Pakistan. Each year the gap in the population trajectories of the two countries widens. By putting family planning programs in place sooner rather than later, Bangladesh—the poorer country—is projected to have 79 million fewer people than Pakistan in 2050. (See Figure 10–2.)<sup>28</sup>

The world now faces a similar choice. The United Nations projects that the number of people on the earth could reach anywhere from 7.9 billion to 10.9 billion by 2050. According to its latest medium-level projections, population in the developing world is projected to rise from 4.9 billion in 2000 to 8.1 billion in 2050. Such an increase would likely lead to organizational overload and

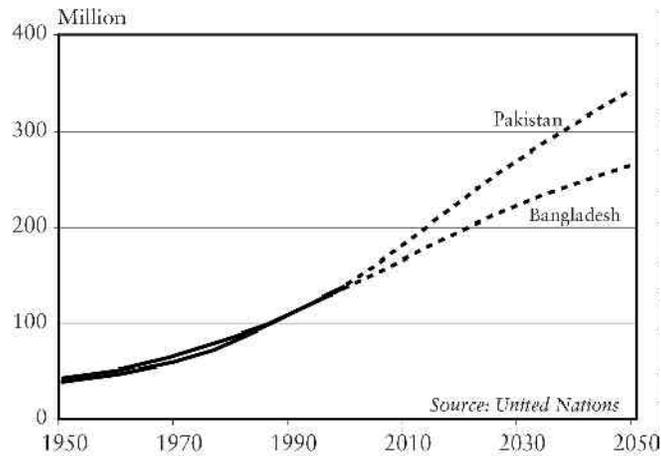


Figure 10-2. Populations of Bangladesh and Pakistan, 1950–2000, with Projections to 2050

ecosystem collapse in dozens of countries.

Heading off such a prospect depends on filling the family planning gap by ensuring that women everywhere have access to a full complement of family planning services, including the “morning after” pill. The second front in this worldwide effort to stabilize population is to help create the social conditions that will lead to smaller families, specifically by improving the status of women. George Moffett, author of *Critical Masses*, observes quite rightly that “There’s a critical connection between a woman’s productive role—the improved legal, educational, and economic opportunities that are the source of empowerment—and a woman’s reproductive role.”<sup>29</sup>

In some developing countries, having many children is seen as a matter of survival: children are a vital part of the family economy and a source of security in old age. Institutions such as the Grameen Bank in Bangladesh, which specializes in microenterprise loans, are attempting to change this situation by providing credit to well over a million villagers—mostly impoverished women. These loans are empowering women, helping to end the cycle of poverty, and thus reducing the need for large families.<sup>30</sup>

Rapid economic growth is not always a prerequisite for reduced fertility rates. Bangladesh has reduced fertility rates from nearly 7 children per woman in the early 1970s to 3.3 children today de-

spite incomes averaging only \$200 a year, among the lowest in the world. In the struggle to slow population growth, government leadership, access to family planning services, and improvement in social conditions are proving to be more important than the growth of a nation's economy.<sup>31</sup>

Slowly, governments are realizing the value of investing in population stabilization. One study found that the government of Bangladesh spends \$62 to prevent a birth, but saves \$615 on social services expenditures for each birth averted—a 10-fold difference in cost. Based on the study's estimate, the program prevents 890,000 births annually. The net savings to the government total \$547 million each year, leaving more to invest in education and health care.<sup>32</sup>

At the 1994 International Conference on Population and Development in Cairo, the governments of the world agreed to a 20-year population and reproductive health program. The United Nations estimated that \$17 billion a year would be needed for this effort by 2000 and \$22 billion by 2015. (By comparison, \$22 billion is less than is spent every 10 days on military expenditures.) Developing countries and countries in transition agreed to cover two thirds of the price tag, while donor countries promised to pay the rest—\$5.7 billion a year by 2000 and \$7.2 billion by 2015.<sup>33</sup>

Unfortunately, while developing countries are largely on track with their part of the expenditures, having covered about two thirds of their allotted payments, donor countries have fallen far behind—honoring only one third of their commitment. As a result of shortfalls following the Cairo conference, the United Nations estimated that there were an additional 122 million unintended pregnancies by 2000. An estimated one third of these were aborted. Moreover, an estimated 65,000 women who did not wish to be pregnant died in childbirth and 844,000 suffered chronic or permanent injury from their pregnancies.<sup>34</sup>

Slowing population growth depends on simultaneously creating the social conditions for fertility decline and filling the family planning gap. "Global population problems cannot be put on hold while countries reform their health care, rebuild their inner cities, and reduce budget deficit[s]. Avoiding another world population doubling...requires rapid action," notes Sharon Camp, former vice president of Population Action International. The difference between acting today and putting it off until tomorrow is the differ-

ence between population stabilizing at a level the earth can support and population expanding until environmental deterioration disrupts economic progress.<sup>35</sup>

### **The Role of Female Education**

Over the last two decades, scores of studies have analyzed the relationship between female education and fertility and have concluded that the more education women have, the fewer children they bear. A 1999 survey of research by the U.S. National Academy of Sciences (NAS) analyzes studies that compare countries with varying levels of female education and studies that examine changing levels of female education in individual countries over time. Both groups of studies support this basic hypothesis.<sup>36</sup>

The NAS study contrasts Sri Lanka and Pakistan, for example. Sri Lanka, which has a female literacy level of 87 percent for women over age 15, has a total fertility rate of just over two children per woman. In Pakistan, where only 24 percent of adult women can read and write, the fertility rate is 5.6 children. Pakistan is typical of most countries, but there are occasional exceptions. For example, in Jordan 86 percent of the women are literate, but the fertility rate is the same as in Pakistan. Bangladesh is also something of an anomaly, because although only 26 percent of its women are literate, its fertility rate has dropped by half over the last generation.<sup>37</sup>

As the NAS survey notes, the relationship between educational level and fertility is not always a simple one. For example, while rising female educational levels lead to smaller family size, so does the desire to educate children. Once couples decide that they want to educate their children, including girls, they are faced with the cost of education. This in itself is apparently reducing family size.<sup>38</sup>

In Bangladesh, as noted earlier, the fertility rate was almost cut in half within 16 years. One factor apparently affecting family size was spreading land poverty as land was divided and subdivided from one generation to the next. Among families with relatively small plots of land to begin with, fragmentation leads to basic changes in thinking. At one time, economic security came from owning land. It was always a source of employment and food. But as the land per family shrinks, this security diminishes, leading many couples to define economic security for their children, and thus indirectly for themselves, in the form of a wage-paying job. Getting such a job requires education. This is costly, leading to a con-

scious reduction in family size that is not necessarily dependent on any gains in income or female literacy.<sup>39</sup>

Research in Bangladesh shows that thinking about family size is not occurring in a vacuum. As people are exposed to higher living standards elsewhere in the world, they begin to think about how to achieve the same thing for their children. Again, they come back to education. Investment in education is the key both to a better life for their children and to their old age security. Large families, which were an asset when there was more land to farm, have now become a liability.

While sociologists have looked at the relation between education and family size, economists have looked at the economics of this relationship. Lawrence Summers, while Director of Research at the World Bank, pointed out that at prevailing levels of education, each additional year of female education reduces fertility by roughly 10 percent. Using this information to analyze the economics of educating girls, he noted that raising female enrollment in primary school to the same level as that of males in developing countries would mean adding some 25 million girls to the current primary school enrollment. This, he estimated, would cost \$938 million per year. Gender balancing in secondary schools would mean adding 21 million girls to current enrollment at a cost of roughly \$1.4 billion per year.<sup>40</sup>

Summers then went on to estimate that this investment of \$2.3 billion would yield a return of 20 percent annually. He noted that it was the most effective way of breaking the cycle of poverty. As female education levels rise, women have healthier, better-educated children, a gain that is typically passed from one generation to the next. The difficult part is the initial break out of poverty.<sup>41</sup>

This 20-percent annual return dwarfs that of almost any other investment in development. For example, the roughly \$1 trillion that developing countries were planning to spend on new power generating facilities over the next decade would yield an annual return of at most 6 percent, and sometimes substantially less. Diverting a small amount of investment from power generation to the education of girls and young women could both raise families out of poverty and accelerate development.<sup>42</sup>

### Using Soap Operas and Sitcoms

While the attention of researchers has focused on the role of formal education in reducing fertility, soap operas on radio and television can even more quickly change people's attitudes about reproductive health, gender equity, family size, and environmental protection. A well-written soap opera can have a profound short-term effect on population growth. It costs little and can proceed even while formal educational systems are being expanded.

This approach was pioneered by Miguel Sabido, a vice president of Televisa, Mexico's national television network. The power of this medium was first illustrated by Sabido when he did a series of soap opera segments on illiteracy. The day after one of the characters in his soap opera visited a literacy office wanting to learn how to read and write, a quarter-million people showed up at these offices in Mexico City. Eventually 840,000 Mexicans enrolled in literacy courses after watching the series.<sup>43</sup>

Sabido dealt with contraception in a soap opera entitled *Acompaneme*, which translates as *Come With Me*. According to one observer, "This serial, which ran over two years, featured a fairly typical, poor young family. The mother, a sympathetic but ignorant character, was desperate to stop at the three children she already had but didn't know how. Her husband, macho and lusty, resented her efforts to try the rhythm method. Over a period of time, and many melodramatic arguments and tears, the woman decided to seek the advice of another woman she knew who had 'miraculously' restricted her family size. Eventually she learned about birth control. By the time she and her smiling husband walked out of the gynecologist's office with a prescription in hand, values had changed—in this family and among viewers—about ideal family size, about not having more children than one can afford and about the woman's role in her family."<sup>44</sup>

As these family planning soap operas continued over the next decade, the birth rate fell by 34 percent. In 1986, Mexico was awarded the United Nations Population Prize for its outstanding achievement in slowing population growth. David Poindexter, founder of Population Communications International (PCI) in 1985, used his new organization to promote Sabido's model as a prototype for other countries. Today PCI is operating in 6 of the 10 most populous countries—China, India, Brazil, Pakistan, Nigeria, and Mexico.<sup>45</sup>

In Kenya, PCI has developed a similarly oriented soap opera that has aired on the radio, the medium of choice for 96 percent of the country's people. After the highly popular early evening news, people stay tuned for a radio serial entitled *Ushikwapo Shikamana* (which means *If Assisted, Assist Yourself*). With close to half the country's people following the twice weekly program, this has provided an ideal vehicle for communicating information on a range of topics from reproductive health and family planning to environment, gender equality, and protection from AIDS. These examples are but two of many that illustrate the success of radio and television in raising public understanding and in changing attitudes.<sup>46</sup>

### Stopping at Two

You do not need to be a mathematician to understand that there is no long-term alternative to having only two children per couple, the number needed for replacement. Joel Cohen, population analyst at Rockefeller University, makes this point rather effectively. He notes that if the 1990 population growth rates in various regions had continued until 2150, there would be 694 billion people in the world. This compares with 6.1 billion people today. "No way," says Cohen. "Not enough water falls from the sky to satisfy the needs of such a vast human population."<sup>47</sup>

The basic arithmetic is not new. We have always known that a seemingly innocuous growth of 3 percent a year, a rate that has been common in many developing countries, would lead to a 20-fold increase in one century and a 400-fold increase in two centuries. Saudi Arabia today has 20 million people and a population that is expanding at this rate. If this were to continue throughout this century, it would have 440 million people in 2100—more than the current population of North America.

Or look at Nigeria, also growing at roughly 3 percent a year. A century from now, Nigeria's 114 million people would total 2.46 billion. Considering that all of Africa is supporting 800 million today, it is impossible to visualize 2.46 billion people in Nigeria alone. It is hard to argue with Cohen's basic point that the only viable long-term option is two children per couple. A population that is growing, however slowly, will eventually overwhelm its life-support systems. Conversely, a population that is declining, however slowly, will eventually disappear.

The growth in world population over the last half-century is

sufficiently recent that we are still struggling to understand what it means. We may intuitively understand that a 20-fold increase in a century is not possible, but we have yet to come to terms with the reasons why. For some threats to our future we have designed response systems. For example, an outbreak of a deadly infectious disease such as the Ebola virus sets off programmed responses to contain and eradicate it. This response involves the World Health Organization, the U.S. Centers for Disease Control and Prevention, and the appropriate agencies in the government of the country affected. And if the currency of a country like Indonesia or Russia collapses, the international monetary system is programmed to respond to that threat. Such is not the case when population growth crosses key support system thresholds.

When the water use of a growing population surpasses the sustainable yield of an aquifer and the water table starts to fall, there is no alarm system that triggers a response in the councils of government. As a result, the gap between the demand for water and the sustainable yield of the aquifer widens. Each year, the drop in the aquifer is greater than the year before, setting the stage for an eventual dramatic reduction in the water supply as an aquifer is depleted and the amount pumped out is reduced to the recharge level. If overpumping is extensive, the drop in water supply could be traumatic, disrupting food production.

Unfortunately, no one regularly measures the water table level under the North China Plain, the Punjab in India, or the southern Great Plains of the United States, announcing when overpumping begins, how much water is left, and when the aquifer will be depleted. As a result, instead of societies planning for a soft landing by bringing the demand for water into balance with sustainable yield, they keep going until the inevitable crash occurs.

Societies with water demands surpassing the sustainable yield of the aquifers and desiring more water per person in the future will have to consider the possibility of reducing population size, a trend already under way in some European countries. This means shifting not to a two-child family, but to a one-child family.

In countries where rural populations continue to grow and holdings are divided among the children in each generation, the land per family eventually shrinks to the point where survival is threatened. Halting the fragmentation that is creating a nightmarish situation in many rural communities in Africa and Asia depends either

on moving quickly to replacement-level fertility or accepting massive rural-urban migration.

Although population projections for the world have been available since the 1950s, remarkably little has been done to analyze the relationship between the size of current and future populations and the earth's capacity to satisfy people's needs for basic resources, such as water and cropland. Demographers who do the projections have long since abandoned this area as a field of research. In his 1996 book *How Many People Can the Earth Support?*, Joel Cohen analyzed the 1992 and 1993 annual meetings of the Population Association of America, where there were some 200 symposia. Not one of these panels attempted to analyze the relationship between projected population growth and the earth's natural resource base.<sup>48</sup>

The good news is that the world is making progress in achieving replacement-level fertility. Fifty-four countries have now reduced average family size to two children or less. (See Table 10-1.) Together these countries contain 2.5 billion people. Family size in China, at 1.8 children per couple, is now below the level in the United States (2.1). Even so, the large number of young people reaching reproductive age in China means that the population is still expected to reach 1.49 billion by 2038, before its numbers begin to decline, dropping to 1.46 billion in 2050. Some countries have seen fertility drop well below replacement level. For example, Russia's fertility rate is 1.2 children. As a result of this decline, and a rise in mortality over the last decade, Russia's population of 144 million is now declining by 900,000 per year. Other countries where population is beginning to decline include Bulgaria, the Czech Republic, Italy, and the Ukraine.<sup>49</sup>

Despite these trends, the threat of continuing population growth in more than a hundred developing countries is all too real. Perhaps the most dangerous educational gap is the lack of understanding of the relationship between family size, the longer-term population trajectory, and the future availability of resources per person. Filling this gap requires projections that link a range of family sizes—say, two, four, or six children—to the future availability of land, water, and other basic resources. Without this information, individuals may simply not understand the urgency of shifting to smaller families. And of even more concern, political leaders will not be able to make responsible decisions on population and related poli-

Table 10–1. *Fertility Levels in Selected Countries in 2001*

Country	Average Number of Children Per Woman <sup>1</sup> (number)	Population, Mid-2001 (million)
<u>Countries with Fertility at or Below Replacement Level<sup>2</sup></u>		
Russia	1.2	144
Italy	1.2	58
Japan	1.3	127
Germany	1.3	82
Poland	1.4	39
Australia	1.7	19
United Kingdom	1.7	60
China	1.8	1,273
France	1.8	59
United States	2.1	285
<u>Countries with Fertility Above Replacement Level<sup>2</sup></u>		
Brazil	2.4	172
Indonesia	2.7	206
India	3.2	1,033
Pakistan	5.6	145
Tanzania	5.6	36
Saudi Arabia	5.7	21
Nigeria	5.8	127
Ethiopia	5.9	65
Dem. Rep. of Congo	7.0	54
Yemen	7.2	18

<sup>1</sup>The average number of children born to a woman in her lifetime is also known as the Total Fertility Rate. <sup>2</sup>Replacement-level fertility is an average of 2.1 children per woman.

Source: Population Reference Bureau, *2001 World Population Data Sheet*, wall chart (Washington, DC: 2001).

cies, such as investment in family planning services.

Discussions of future population growth in this chapter use the U.N. medium projections, those that have world population going from 6.1 billion at present to 9.3 billion by 2050. There is also a high projection, which has human numbers approaching 11 bil-

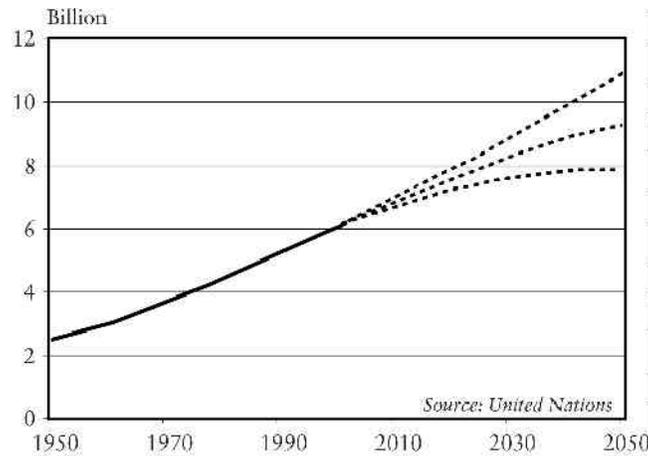


Figure 10-3. *Total World Population, 1950–2050, Under Three Assumptions of Growth*

lion by 2050, and a low projection, which has population peaking at 7.9 billion in 2046 and then declining. (See Figure 10-3.)<sup>50</sup>

This low number assumes that the entire world will quickly move below replacement-level fertility to 1.7 children per couple. This is not only achievable, it is the only humane population option. Otherwise the land and water scarcity that is already increasing hunger and deaths in some countries could spread to many more.

Achieving this lower figure is the responsibility of national political leaders, but unless world leaders—the Secretary-General of the United Nations, the President of the World Bank, and the President of the United States—urge governments and couples everywhere to adopt a goal of two surviving children per couple, resource constraints will likely lead to economic decline. The issue today is not whether individual couples can afford more than two children, but whether the earth can afford for couples to have more than two children.