Chapter 1
Population

Prudent men should judge of future events by what has taken place in the past, and what is taking place in the present.

Miguel de Cervantes (1547–1616), *Persiles and Sigismunda*

The Changing Population of the World

The population of the world is growing. No one will be startled by that sentence, but what is

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startling is the rate of growth, and the fact that the present growth of population is unprecedented in human history. The best historical evidence we have today indicates that there were about 5 million people in the world in about 8000 BCE. By 1 CE there were about 200 million, and by 1650 the population had grown to about 500 million. The world reached its first billion people in about 1800. While it took thousands of years for the global population to reach 1 billion, it only took a little over a century for the population to reach the next billion: the second billion came about 1930. The third billion was reached about 1960, the fourth about 1974, and the fifth about 1987. The sixth came in 1999 and the seventh in 2011. The eighth billion is expected by 2024.[1] These figures indicate how rapidly the population is increasing. Table 1.1 shows how long it took the world to add each billion of its total population. A projection is also given for the next billion.

Table 1.1 Time taken to add each billion to the world population, 1800–2046 (projection)

Date	*Estimated world population (billions)*	*Years to add 1 billion people*
1800	1	2,000,000
1930	2	130
1960	3	30
1974	4	14
1987	5	13
1999	6	12
2011	7	12
2024 (projected)	8	13
2046 (projected)	9	22

Source: Data from UN Department of Economic and Social Affairs, Population Division, *World Population Prospects: The 2012 Revision.*

How can we explain this dramatic increase in population growth? Development gains over the last two centuries have seen major improvements in health conditions for many and the overall lowering of the death rate, dramatically and rapidly reducing rates of early death by disease. With this great success came a population explosion, the rapid increase of the number of humans on the planet that we are facing today, with significant impacts for the Earth's resources. While population growth rates are starting to stabilize in many places, the total number of people on the planet continues to increase while natural resources continue to decline. This chapter explores the complex situation of the global population in the context of development, and later chapters explore the relationships between population, wealth, food, energy, climate, and the environment.

There is another way to look at population growth, one that helps us understand the uniqueness of our situation and its staggering possibilities for harm to life on this planet. Because most people born can have children of their own, the human population can – until certain limits are reached – grow exponentially: 1 to 2; 2 to 4; 4 to 8; 8 to 16; 16 to 32; 32 to

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64; 64 to 128; and so on. When something grows exponentially, there is hardly discernible growth in the early stages and then the numbers shoot up. The French have a riddle they use to help teach the nature of exponential growth to children. It goes like this: if you have a pond with one lily in it that doubles its size every day, and which will completely cover the pond in 30 days, on what day will the lily cover half the pond? The answer is the twenty-ninth day. What this riddle tells you is that if you wait until the lily covers half the pond before cutting it back, you will have only one day to do this – the twenty-ninth day – because it will cover the whole pond the next day.

If you plot on a graph anything that has an exponential growth, you get a J-curve. For a long time there is not much growth but when the bend of the curve in the J is reached, the growth becomes dramatic. Figure 1.1 shows what Earth's population growth curve looks like.

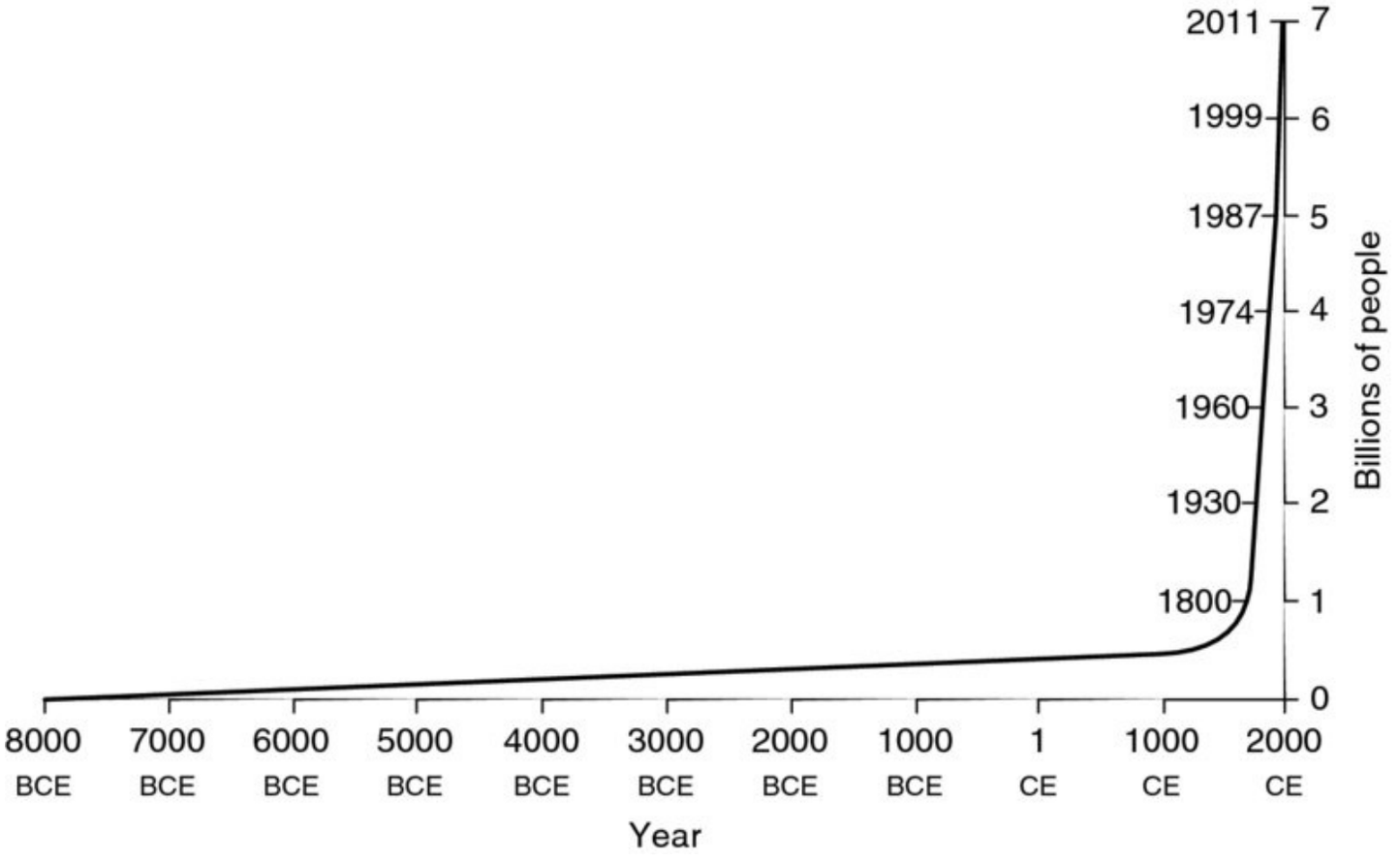

Figure 1.1 Population growth from 8000 BCE to 2011 CE

Source: Based on data from Population Reference Bureau, *2010 World Population Data Sheet*.

The growth of the Earth's population has been compared to a long fuse on a bomb: once the fuse is lit, it sputters along for a long while and then suddenly the bomb explodes. This is what is meant by the phrases “population explosion” and “population bomb.” The analogy is not a bad one. The world's population has passed the bend of the J-curve and is now rapidly expanding. The United Nations estimates that the world's population reached 7 billion in 2011, adding 5 billion people in less than one century. But recent estimates indicate that while the population will grow substantially – especially in Africa – over the coming decades, the population is growing at a slower rate than before: women throughout the world

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now have on average fewer than three children per woman whereas in the 1950s they had five. But an average of slightly less than three children per woman still means the population is growing dramatically.

Figure 1.2 shows that the largest growth in the future will be in the less wealthy countries, with India, China, and some nations in Africa leading the way. In 1950 about one-third of the world's people lived in economically wealthy countries. At the end of the twentieth century that total reduced to about 20 percent living in countries with relatively rich economies. During the present century, nearly all of the growth in population will occur outside of these historically wealthy countries. An ever larger percentage of the world's population will be relatively poor. The United Nations projects that by 2050 about 86 percent of the Earth's population will be residing in the poorer nations.[2]

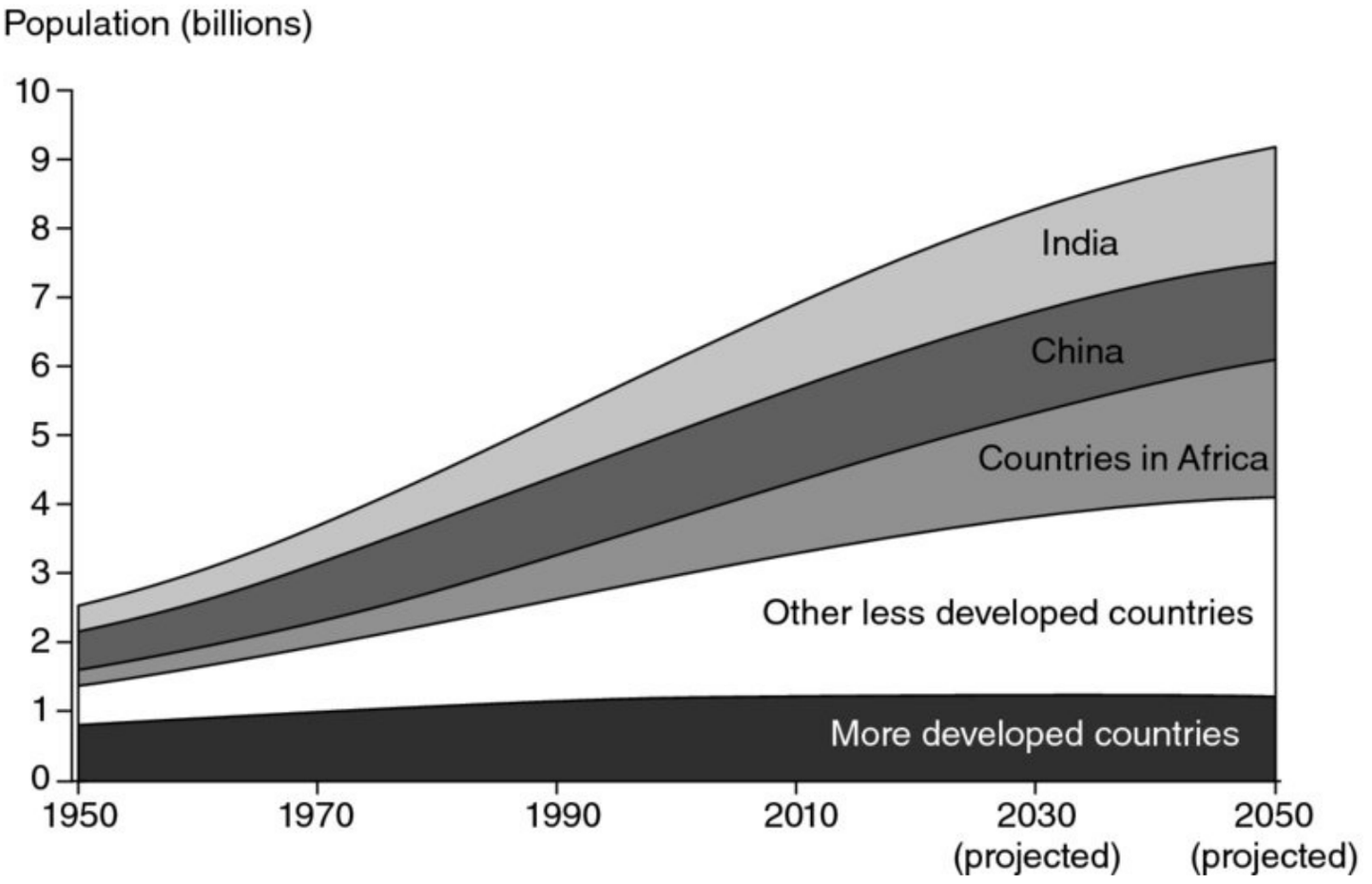

Figure 1.2 Economic differences in population growth, 1950–2050 (projected)

Source: UN Department of Economic and Social Affairs, Population Division, *World Population Prospects: The 2006 Revision, Medium Variant* (2007).

Because no one knows for sure what the size of Earth's population will be in the future, the United Nations gives three projections: a high, medium, and low one, based on the possible number of children the average woman will have. Projections are educated guesses. The United Nations believes the middle projection is the most likely, and most authors writing on the subject use that number. The population in wealthy countries is expected to slowly grow to 1.3 billion in 2050,[3] with migration from poorer countries accounting for most population

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growth.[4] The vast majority of the global population will be in less wealthy countries, which are expected to increase from 6 billion people in 2015 to 8.2 billion in 2050.[5] From 2013 to 2100 about one-half of the annual growth is expected to occur in eight countries – India, Nigeria, Ethiopia, United States, Democratic Republic of the Congo, Tanzania, Niger, and Uganda.[6] The largest growth is expected in India, which is likely to pass China as the largest country in the world by 2028 with 1.4 billion people.[7] At that time India and China will account for about one-third of the world's population. Figure 1.3 gives the three growth projections for the world population by the United Nations up to 2050.

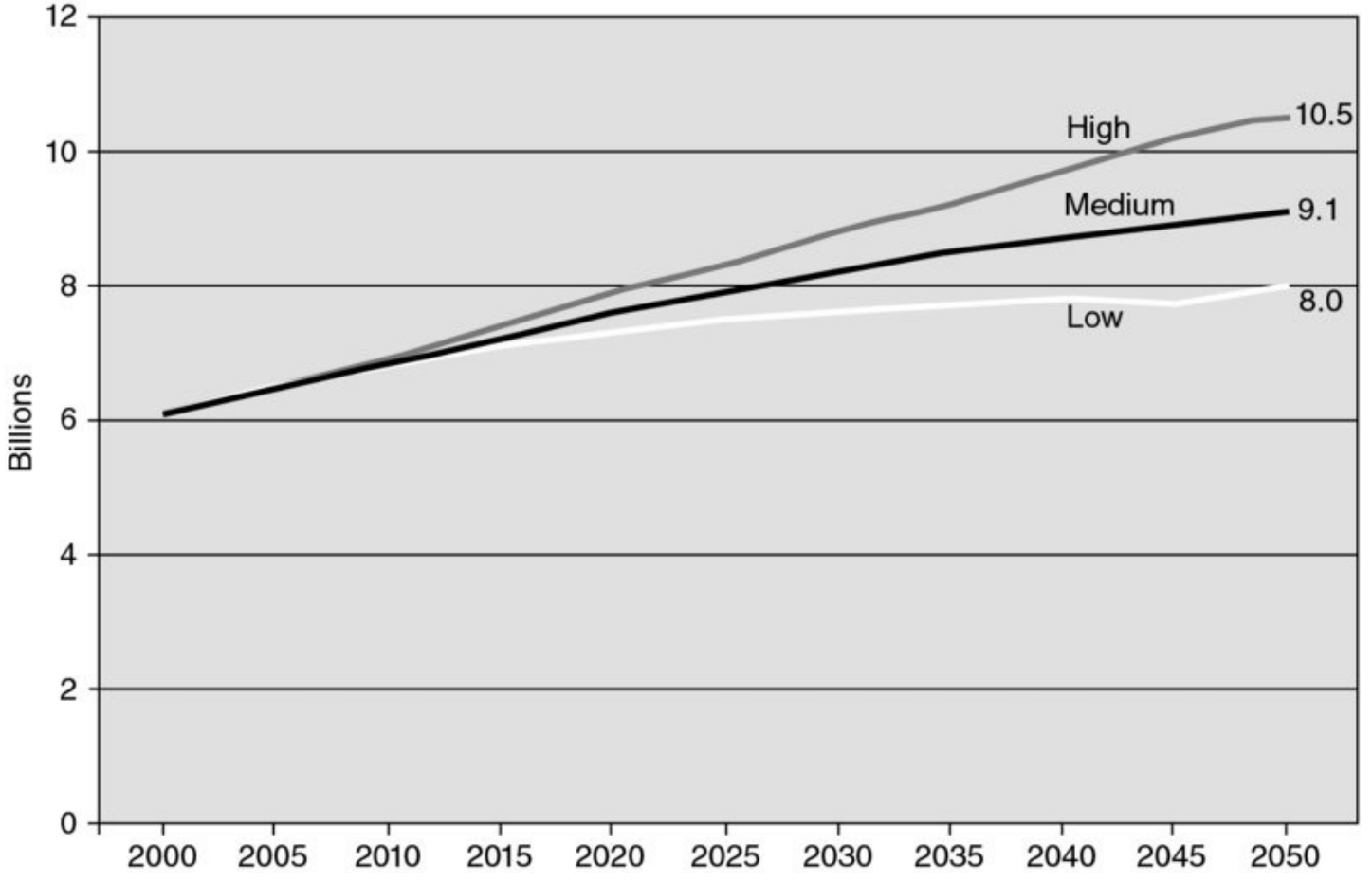

Figure 1.3 World population projections to 2050: three scenarios

Source: Based on data from UN Department of Economic and Social Affairs, Population Division, *World Population Prospects: The 2008 Revision* (2009).

High growth rates will take place in the less wealthy countries because a larger percentage of their population consists of children under the age of 15 who will be growing older and having children themselves. If we plot the number of people in a country according to their ages, we can see clearly the difference between rapidly growing populations, which less wealthy nations tend to have, and relatively stable or slowly growing populations, which tend to occur in wealthier nations. Figure 1.4 shows the difference between these two population structures. The age structure of countries with relatively stable populations is column shaped, while the age structure of growing countries is pyramid shaped.

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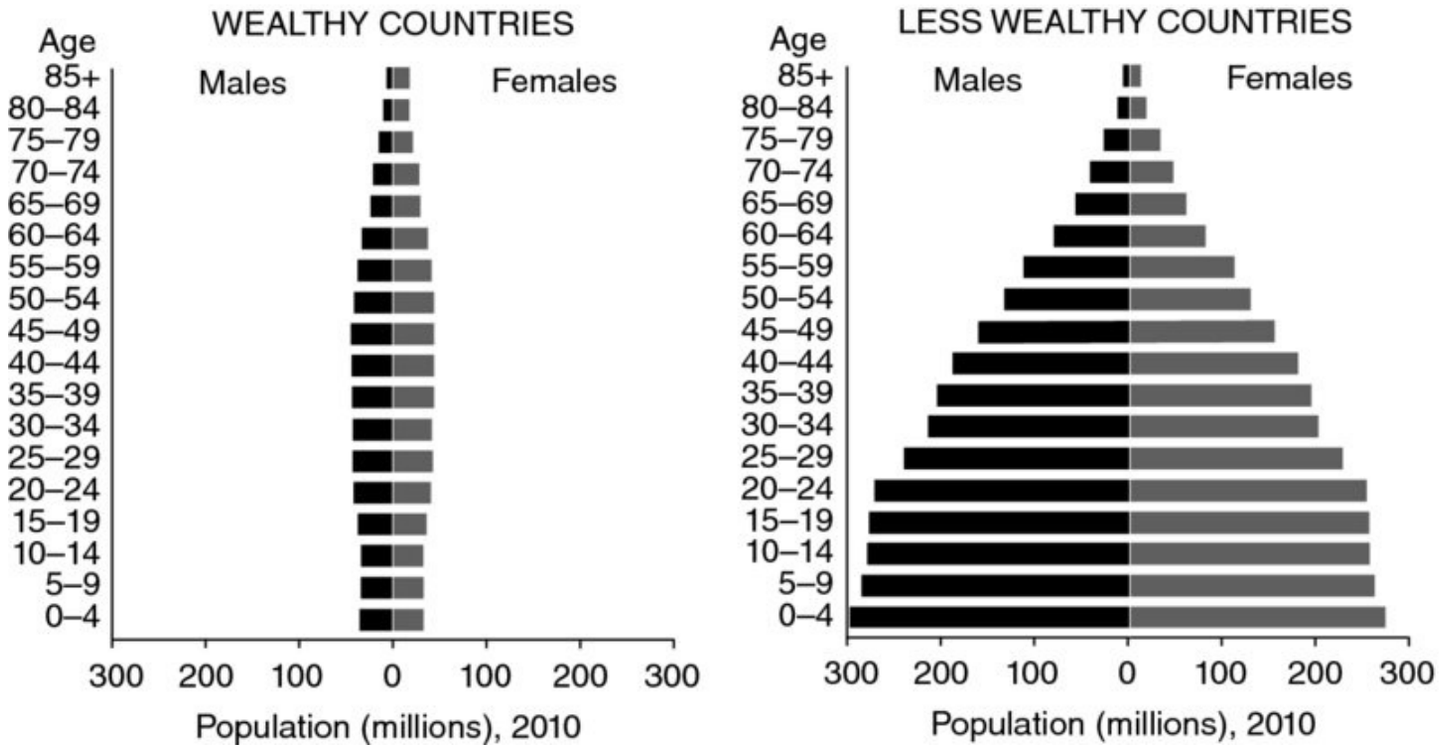

Figure 1.4 Population by age and sex in different groups of countries, 2010 (projected)
Source: UN Department of Economic and Social Affairs, Population Division, *World Population Prospects: The 2008 Revision* (2009).

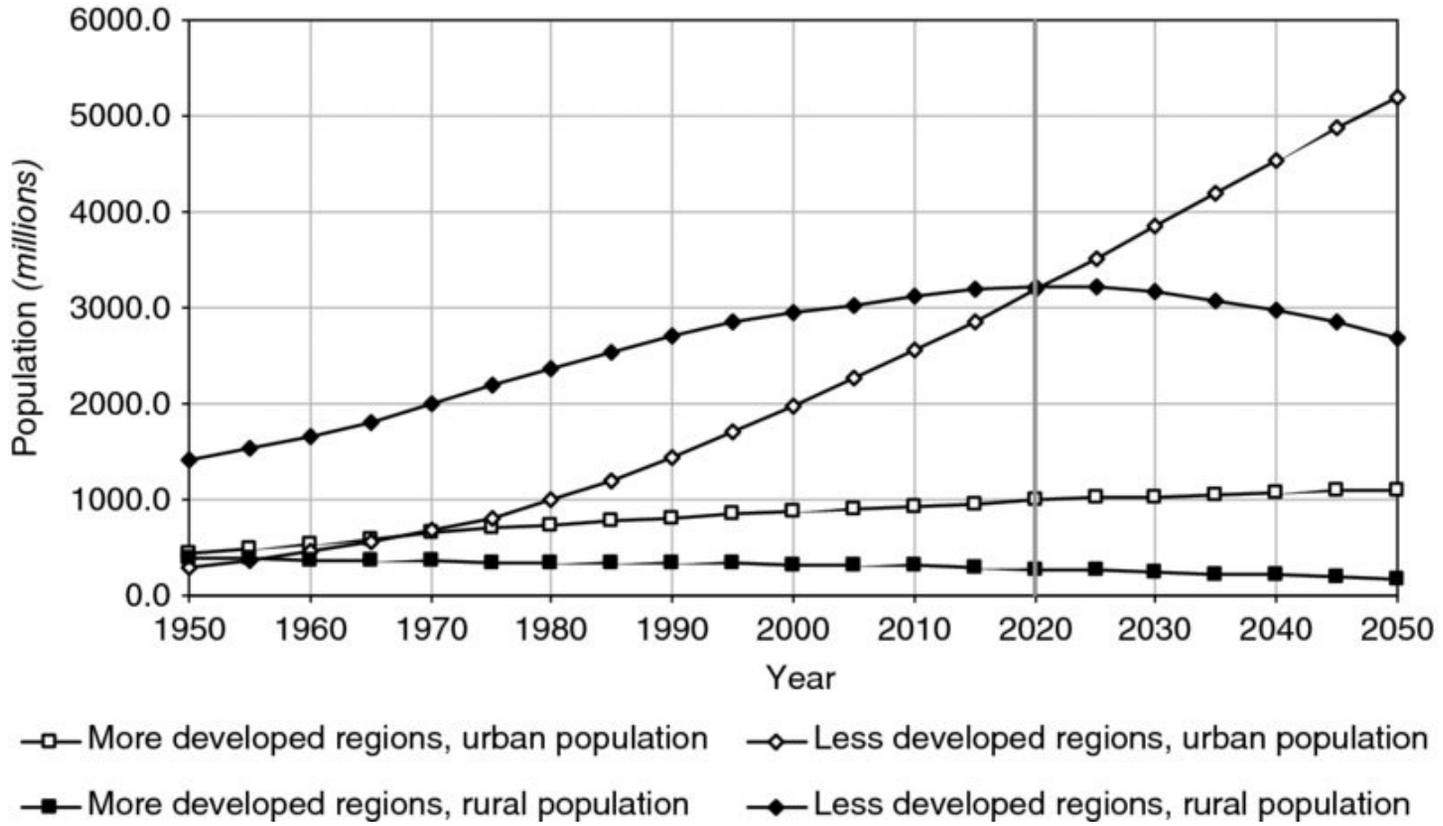

Figure 1.5 Urban and rural population by development group, 1950–2050

Source: UN Department of Economic and Social Affairs, Population Division, *World Urbanization Prospects: The 2009 Revision, Highlights* (New York: United Nations, 2010), p. 3

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Another major change occurring in the world's population is the movement of people from rural areas to urban areas. Although this is happening throughout the world, the trend is especially dramatic in poorer countries, where a significant portion of rural youth are fleeing to cities with hopes of a better life. But all too often jobs are not as available in the cities as hoped, pushing many rural migrants into poorer areas such as slums on the edges of big cities. In 2012, 32.7 percent of the urban population in developing regions lived in these informal settlements.[8] Table 1.2 lists the world's ten largest cities in 1990 and 2014 and the projected ten largest for the year 2030. Note the trend in the growth of cities in countries with economies that have been rapidly growing. It is hard to imagine a city like Calcutta getting any bigger. In 1950, it had a population of about 4 million, with many thousands of people living permanently on the streets; in 1990 it had a population around 10 million and an estimated 400,000 lived on the streets.[9] If the present rate of growth continues, it will have a population of about 19 million by 2030.[10] Note also the increased size of the cities. Cities with over 5–10 million people are sometimes called “megacities.”[11] In 1990, there were only six cities in developing countries with more than 10 million people. By 2014 there were 28 cities in the world with populations over 10 million people, the majority of these in emerging economies.[12] Many of these cities had vast areas of substandard housing and serious urban pollution, and many of their residents lived without sanitation facilities, safe drinking water, or adequate healthcare facilities.

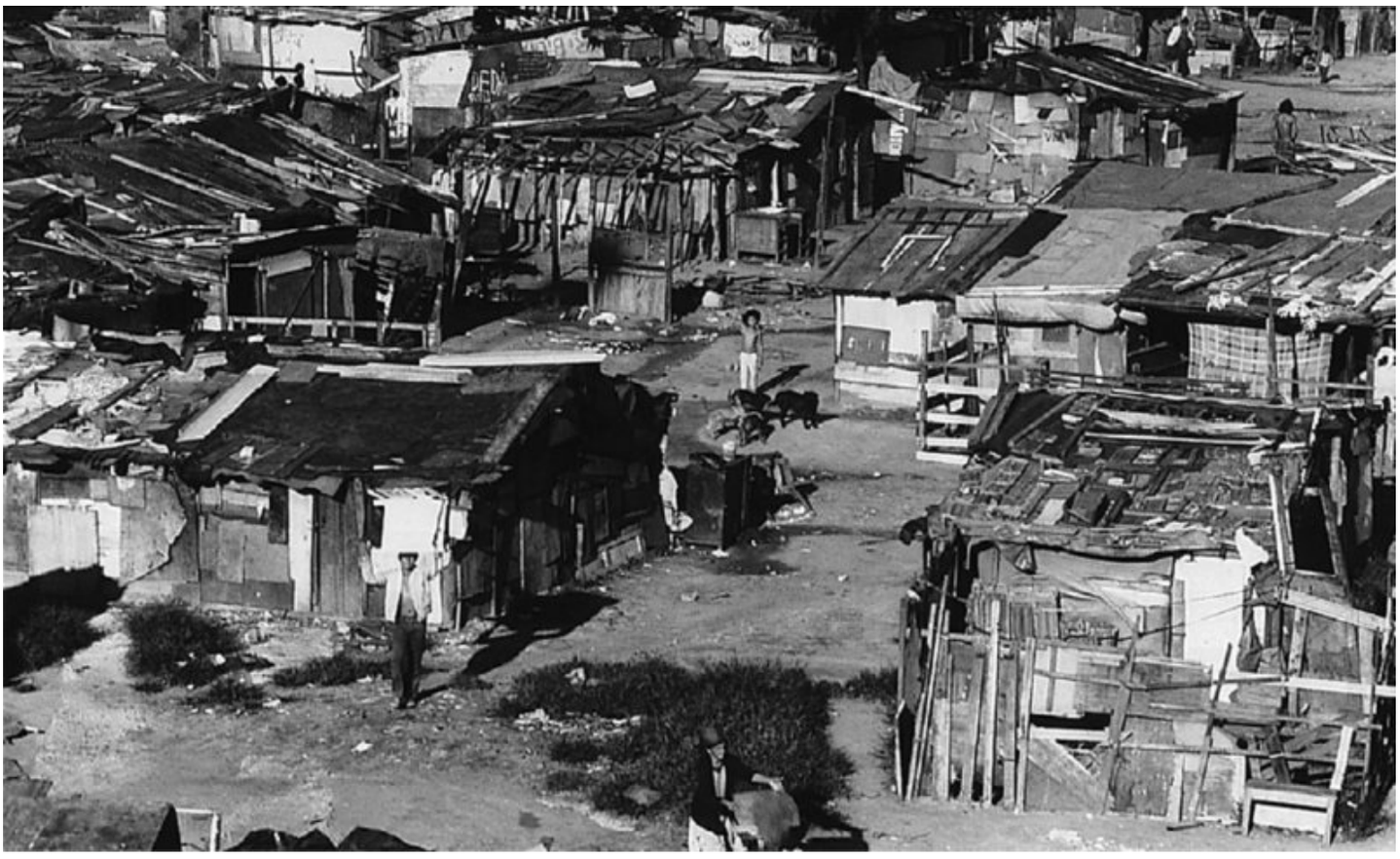

Plate 1.1 Rural migrants often settle in urban slums in developing nations

Source: United Nations.

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Table 1.2 Ten largest cities in the world, 1990, 2014, and 2030 (projection)

Population in 1990 (millions)		***Population in 2014 (millions)***		***Population in 2030 (projected) (millions)***	
Tokyo, Japan	32	Tokyo, Japan	37	Tokyo, Japan	37
Kinki M.M.A. (Osaka), Japan	18	Delhi, India	24	Delhi, India	36
New York-Newark, USA	16	Shanghai, China	22	Shanghai, China	30
Mexico City, Mexico	15	Mexico City, Mexico	20	Mumbai, India	27
São Paulo, Brazil	14	São Paulo, Brazil	20	Beijing, China	27
Mumbai, India	12	Mumbai, India	20	Dhaka, Bangladesh	27
Kolkata (Calcutta), India	10	Kinki M.M.A. (Osaka), Japan	20	Karachi, Pakistan	24
Los Angeles, USA	10	Beijing, China	19	Cairo, Egypt	24
Seoul, Republic of Korea	10	New York-Newark, USA	18	Lagos, Nigeria	24
Buenos Aires, Argentina	10	Cairo, Egypt	18	Mexico City, Mexico	23

Cites are formally called “urban agglomerations” in UN publications.

Source: Based on data from UN Department of Economic and Social Affairs, Population Division, *World Urbanization Prospects: The 2009 Revision*; *World Urbanization Prospects*: *The 2014 Revision, Highlights*.

Innovative sustainable cities

Shenzhen, China

In 2014, Shenzhen won the City Climate Leadership Award for Urban Transportation, sponsored by Siemens and the C40 Cities Climate Leadership Group. Known around the world as a leader in developing electric vehicles, the city aimed to add 24,000 electric vehicles to its transportation system by 2015. However, what sets Shenzhen apart from other cities is its push to start infusing public transportation sectors, such as buses and taxis, with hybrid and electric vehicles. The city's leadership collaborated with public and private actors to add over 3,000 new energy buses and 850 pure electric taxis to the city's general transportation circuit by late 2013. This project has already led to a reduction of 160,000 tons of carbon pollution between 2009 and 2013, and the city aims to reduce carbon emissions by another 0.82 million tonnes by 2015.

Buenos Aires, Argentina

Buenos Aires, another 2014 recipient of the City Climate Leadership Award, was honored for its Solid Urban Waste Reduction Project. By 2017, the city aims to treat 100

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percent of waste sent to landfills and reduce the overall waste production by 83 percent. The city seeks to achieve these goals through a combination of public education and infrastructure development. Thirty-two public parks contain “Green Stations,” at which residents may bring recyclable waste for sorting, and every city block has a waste disposal bin. This initiative has created 4,500 urban recoverer jobs and has reduced overall landfill waste by 44 percent in 2014.

Curitiba, Brazil

Curitiba has been called the most innovative city in the world. City officials from around the world visit Curitiba to learn how this city, with relatively limited funds, has been tackling urban problems. By using imaginative, low-cost solutions and low technology, Curitiba has created a pleasant urban life that many cities in the more developed nations have yet to achieve. Here is how the city achieved this.

Transportation The city has made public transportation attractive, affordable, and efficient. Instead of building a subway, which the city could not afford, it established a system of extended, high-speed buses, some carrying as many as 275 passengers on express routes, connecting the city center with outlying areas. Many people own cars in Curitiba but 85 percent of the commuters use public transportation. This has reduced traffic congestion and air pollution. There are 30 percent fewer cars on city streets than you would expect from the number of cars owned by its residents.

Trash collection The city's “garbage that is not garbage” initiative encourages residents to exchange their trash for goods such as food, bus tickets, and school supplies. This program has led to the recycling of 70 percent of Curitiba's trash.

Education Small libraries have been built throughout the city in the shape of a lighthouse. Called Lighthouses of Learning, they provide books (many schools in Brazil have no books), an attractive study room, and, in a tower, a strong light and guard to make the area safe.

Health Curitiba has more health clinics – that are open 24 hours a day – per person than any other city in Brazil.

Environmental education The Free University for the Environment was built out of recycled old utility poles next to a lake made from an old quarry. Short courses on how to make better use of the environment have been designed for contractors, merchants, and housewives. Taxi drivers are required to take a course there in order to get their licenses.

Governmental services Colorful, covered Citizenship Streets have been built throughout the city to bring government offices to where the people live and shop. Here people can pay their utility bills, file a police complaint, go to night court, and get a marriage license. Vocational courses are subsidized to help provide accessible classes to all residents.

The main credit for this innovative city has been given to its former mayor Jaime Lerner.

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Lerner, an architect and planner, headed an honest and very capable government. He served three terms as mayor of the city and later served two terms as governor of the state.

Sources: On Shenzhen: "City Climate Leadership Awards 2014: The Winners," at http://cityclimateleadershipawards.com/2014-ccla-winners/); UN Commission on Sustainable Development, *Electric Vehicles in the Context of Sustainable Development in China* (May 2–13, 2011), p. 26, at http://www.un.org/esa/dsd/resources/res_pdfs/csd-19/Background-Paper-9-China.pdf; C40 Cities, "Shenzhen: New Energy Vehicle Promotion," at http://www.c40.org/profiles/2014-shenzhen (all accessed July 2015). On Buenos Aires: C40 Cities, "Buenos Aires: Solid Urban Waste Reduction Project," at http://cityclimateleadershipawards.com/2014-project-buenos-aires-plan-integral/; Buenos Aires Ciudad, "Waste Management," at http://www.turismo.buenosaires.gob.ar/en/article/waste-management (both accessed July 2015). On Curitiba: Ali Soltani and Ehsan Sharifi, "A Case Study of Sustainable Urban Planning Principles in Curitiba (Brazil) and Their Applicability in Shiraz (Iran)," *International Journal of Development and Sustainability*, 1 (2012), p. 126; Robin Wright, "The Most Innovative City in the World," *Los Angeles Times*, June 3, 1996. Curitiba's accomplishments are also described in Jonas Rabinovitch and Josef Leitman, "Urban Planning in Curitiba," *Scientific American*, 274 (March 1996), pp. 46–53; Eugene Linden, "The Exploding Cities of the Developing World," *Foreign Affairs* (January/February 1996), p. 62; Arthur Lubow, "The Road to Curitiba," *New York Times Magazine*, May 20, 2007, pp. 76–83.

With respect to urbanization, although countries differ on their definitions of "urban" (the United States defines urban as places of 2,500 or more, Japan uses 50,000, and Iceland 200), by 2012, more than half of the global population lived in urban areas.[13] There has been a particular trend toward increased urbanization in poorer nations: in 1950 only about 20 percent of their population was urban, but that increased to 40 percent in 2000. In 2009, for the first time in human history, more people lived in urban areas in the world than in rural areas, and by 2012 less than 30 percent of the global urban population resided in wealthy countries.[14] Nevertheless, 60 percent of the population in Africa and 52 percent in Asia still live in rural areas.[15] The trend is toward more urbanization as megacities and other cities continue to grow. The United Nations expects nearly all the world's population growth in the future will be in the urban areas of less wealthy nations.[16]

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Plate 1.2 Growing cities in less developed nations often have a mixture of modern and substandard housing

Source: United Nations.

Causes of the Population Explosion

Although it is easy to illustrate that the human population has grown exponentially, it is not so easy to explain why we are in a situation at present of rapidly expanding population. Exponential growth is only one of many factors that determine population size. Other factors influence how much time will pass before the doublings – found in exponential growth – take place. Still other factors influence how long the exponential growth will continue and how it might be stopped. We will consider these last two matters later in the chapter, but we will first look at some of the factors that drastically reduced the amount of time it took for the world's population to double in size.

The agricultural revolution, which began about 8000 BCE, was the first major event that

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gave population growth a boost. When humans learned how to domesticate plants and animals for food, they greatly increased their food supply. For the next 10,000 years until the industrial revolution, there was a gradually accelerating rate of population growth, but overall the rate of growth was still low because of high death rates, caused mainly by diseases and malnutrition. As the industrial revolution picked up momentum in the eighteenth and nineteenth centuries, population growth was given another boost: advances in industry, agriculture, and transportation improved the living conditions of the average person. Population was growing exponentially, but the periods between the doublings were still long because of continued high death rates. This situation changed drastically after 1945. Lester Brown explains why that happened:

> The burst of scientific innovation and economic activity that began during the forties substantially enhanced the Earth's food-producing capacity and led to dramatic improvements in disease control. The resulting marked reduction in death rates created an unprecedented imbalance between births and deaths and an explosive rate of population growth. Thus, while world population increased at 2 to 5 percent *per century* during the first fifteen centuries of the Christian era, the rate in some countries (in the late 1970s) is between 3 and 4 percent *per year*, very close to the biological maximum.[17]

It was primarily improvements in life expectancies around the world after World War II that gave the most recent boost to population growth. The spreading of public health measures, including the use of vaccines, to less developed countries enabled these countries to control diseases such as smallpox, tuberculosis, yellow fever, and cholera. Children and young adults are especially vulnerable to infectious diseases; thus, the conquering of these diseases allowed more children to live and bear children themselves.

While life expectancies around the world were increasing rapidly, birth rates generally remained higher than death rates. Birth rates have been high throughout human history. If this had not been true, you and I might not be here today since high birth rates were needed to replace the many people who died at birth or at an early age. (If you walk through a very old cemetery in the United States or especially in Europe, you can see evidence of this fact for yourself as you pass the family plots with markers for the many children who died in infancy and through adolescence.) Birth rates remained high right up until the late 1960s, which was the beginning of a gradual lowering of birth rates around the world.

Sons preferred in India

Sons are preferred in many less developed countries. This has been particularly notable in India, where there are a number of places where a strong preference for sons has increased the ratio of men to women over the past century. A census in 2011 found an estimated 943 women for every 1,000 men nationally. Girls are more likely than boys to be neglected or mistreated, and India has a history of higher death rates and lower life expectancy for women than for men. Additionally, medical technology enables expectant parents to abort female fetuses, which has pushed the sex ratio at birth well

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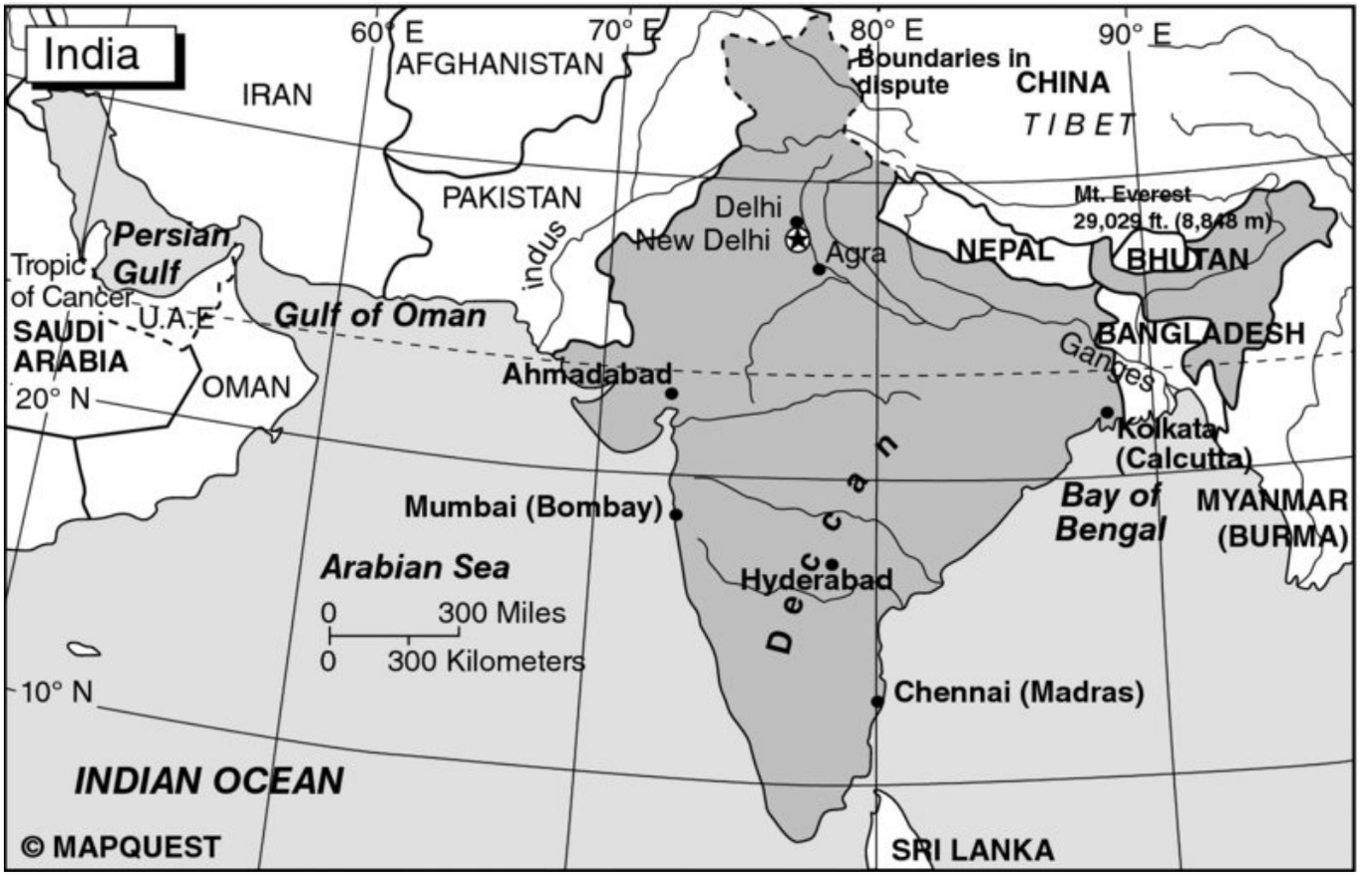
above 105 boys to 100 girls, the normal ratio throughout the world. In the state of Haryana, just to the northwest of New Delhi, for example, a 2011 survey found that for children age 0–6, there were only 834 girls for every 1,000 boys.



Map 1.1 India

Many families in India, as in China, Korea, and a number of other East and South Asian countries, value sons because sons usually live with their parents after marriage and contribute to family income. Sons provide vital financial support to elderly or ill parents, who often have no other source of income. Traditionally daughters move away at marriage and transfer their allegiance to their husband's family. At least historically, parents would therefore expect less financial or emotional support from daughters after they leave home.

In many parts of India, daughters can mean an additional cost to parents – the obligation of paying her prospective husband's family a large dowry. Dowries often require parents to go into debt, and the amount families must pay has been increasing over the years.

The financial and social disadvantages of having a daughter prompt some women to abort their pregnancies if they are carrying a daughter. Pregnant women can determine the sex of their fetus through ultrasound and other examinations. As this technology becomes more widely available, more parents are using it to choose the number and sex of their children. Nearly all aborted fetuses in Indian hospitals are female. The national government has passed laws prohibiting sex-selective abortion, as have many Indian

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states, but abortion practices are difficult to regulate.

Sources: Nancy E. Riley, "Gender, Power, and Population Change," *Population Bulletin*, 52 (May 1997), pp. 14–15; Sanjay Kumar, "India: Where Are All the Girls?" The Diplomat, August 27, 2013, at http://thediplomat.com/2013/08/india-where-are-all-the-girls/ (accessed July 2015).

Birth rates have dropped close to or below replacement rates in wealthier nations but remain high in most other countries. There are a number of reasons for this. First, many people want to have many children. If many children die in infancy, as they still do in countries with relatively high infant mortality rates, more births are needed to replace the number of people surviving into adulthood. In many families, particularly in rural areas, children are tasked in helping with domestic and agricultural work, sometimes at the expense of their education. Before child labor laws severely restricted the use of children in factories in the United States and Europe, it was common for children to take paying jobs to help the family gain income. Additionally, the expectation is often that children (and specifically males in many cultures) are needed to ensure that the parents have someone to take care of them when they are old and can no longer work, which becomes a particularly acute need in the many countries where pensions or other assistance are unavailable.

Other reasons for continued high birth rates include tradition and religion. Cultural and religious norms are strong and one does not break with these norms easily. Tradition is very important in many societies, and traditionally families have been large in rural settings. Also, religion is a powerful force in rural societies and some religions either advocate for large families or against birth control. The unavailability or unacceptance of birth control options is a particularly significant factor for higher birth rates in some places. It has been estimated that about 143 million married women of reproductive age worldwide are not using contraceptives even though they do not want more children.[18] It is believed that these women have an unmet need, or demand, for family planning services.[19]

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Plate 1.3 Children take care of children in many poorer countries, as this girl is doing in Mexico

Source: Mark Olencki.

How Population Growth Affects Development

How does population growth affect development? While there is no easy answer to the question of what is “too large” or “too small” a population for a country – a question we will return to in the final section of this chapter – we can identify some obvious negative features of a rapidly growing population, a situation which would apply to many less developed countries today.

Rapid growth

Let's look again at the age distribution of the population in less developed regions in Figure 1.4. It is striking that a large percentage of people is below the age of 15. This means that a

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large proportion of the population in these countries is mainly nonproductive. Food, education, and healthcare must be provided for children and youth until they become independent. Obviously, if a nation has a large portion of its population in the under-15 age group, its economy will be faced with a significant burden to provide for its younger members.

A rapidly growing population also puts a great strain on the resources of the country. If the population is too large or the growth too rapid, people's use of the country's resources for food and income can actually prevent the biological natural resources from renewing themselves. This can lead to the land becoming less fertile, and the forests being destroyed. An example of this is the making of patties out of cow droppings and straw by women in India and Pakistan. These patties are allowed to dry in the sun and are then used for fuel. In fact, dung patties are the only fuel many families have for cooking their food. But the use of animal droppings for fuel prevents essential nutrients from returning to the soil, thus reducing the soil's ability to support vegetation.

A large population of young people also means that there will be a terrific demand for jobs when these children grow old enough to join the labor force – jobs that are unlikely to exist. The ranks of the unemployed and underemployed will grow in many poorer nations, and this can easily lead to political and social unrest. As we saw earlier in this chapter, people from the rapidly growing rural areas of the global South are heading for the cities hoping to find work. What they find, though, is a scarcity of jobs, undoubtedly a contributing factor in the high rates of urban crime.

Rapid population growth can also impact the health of children and women. Malnutrition in infancy can lead to brain damage, and frequent childbearing can deplete certain minerals in a woman's body and bones.

A rapidly growing population also puts a tremendous strain on the ability of a nation to ensure adequate living conditions for everyone. The poor condition of much of the housing available to the poor is something that makes a lasting impression on foreign visitors to these countries – that is, if they venture beyond the Hilton hotels where they sometimes stay. A shortage of affordable housing can lead to overcrowding, which may be exacerbated by a rapidly growing population, impacting privacy and individual rights.

Urban crime: a personal experience by John L. Seitz

An experience in Liberia helped me to understand that urban areas are often less safe than rural areas. I lived at different times in Monrovia, the capital city of that country, and in a small village in a rural area. Once while I was in Monrovia, a thief entered my bedroom and stole my wallet and watch from under my pillow, which was under my sleeping head at the time. Such an event was unheard of in the rural areas, but was not that uncommon in the city. After the theft happened, I was happy to return to my “primitive” village, where I felt much safer.

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Slow growth

Because it impacts the labor force, a slow population growth rate has the potential to impede a country's productive capacity, and therefore also its economic growth. Partly because of low birth rates, a number of European countries welcomed immigrants during the 1950s and 1960s from Turkey, southern Italy, and other relatively poor areas of Europe and North Africa. For some in the business world, a growing population signifies more consumers of products. But a number of the industrial countries have shown in the post–World War II period that a high level of economic growth is possible even when population growth is low.

Japan is a good example to look at. The country has experienced impressive economic growth in recent decades, and its population is projected to decline, dipping below 100 million by 2065.[20] However, the decreasing population has enabled the country's modest economic growth of recent years to trigger increased per capita income.[21] The healthcare advances that have enabled the people of Japan to reach an average lifespan of 84 years have also allowed for a healthier population that spends less on medical care.[22] Additionally, long-term benefits of reduced population pressure include greater availability of food, housing, and land.

An aging population and low birth rates

We saw earlier the types of problems that are created when a country has a large share of its population aged 15 or under. But special problems are also created when the proportion of a population that is over 65 starts to expand. As can be seen in Table 1.3, this is happening in many areas of the world, especially in Europe and North America. For example, as the percentage of the US population that is over 65 expands because of advances in healthcare and healthier lifestyles by some, and the number of new workers is reduced because of low birth rates, the ratio of working-age people to retired people declines and puts a strain on the social security system that provides financial support to retired persons. (It is the payments from the current workers that provide money for the retirement benefits.)

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Table 1.3 Regional trends in aging: percentage of total population 65 years or older, 2000, 2015 (projection), 2030 (projection)

Region	*Year*	*65 years or older*
Asia	2000	6
	2015	8
	2030	12
Europe	2000	15
	2015	18
	2030	24
Latin America/Caribbean	2000	6
	2015	8
	2030	12
Middle East/North Africa	2000	4
	2015	6
	2030	8
North America	2000	12
	2015	15
	2030	20
Oceania	2000	10
	2015	12
	2030	16
Sub-Saharan Africa	2000	3
	2015	3
	2030	4

Source: US Census Bureau, International Data Base, 2004.

There are also increased healthcare costs as a population ages. More government funds are needed to care for the medical and social needs of the aged since the expectation in many countries is that families should not bear the exclusive burden to pay for these services. This is a common concern in Europe, where by the year 2050 it is expected that about 34 percent of its people will be 65 or older, as compared to 23 percent in 2013.[23] At the beginning of the twenty-first century only about 15 percent were of that age. Also of concern in Europe is the more than doubling of the number of people 80 or over, from 4.5 percent in 2013 to 9.5 percent in 2050.[24]

Caring for the aged is a concern in nearly all developed countries. It certainly is for Japan. In

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2013, 32.3 percent of the population was 60 or older, and by 2050 it is expected that this group will increase to about 42.7 percent in a population that will probably be smaller than it was in 2000.[25] By contrast, because of immigration and a relatively higher birth rate, in 2013 19.7 percent of the population in the United States was 60 or older and that group will grow to about 27 percent by 2050.[26]

Some developing countries, such as China, will also face an aging problem in the twenty-first century. Mainly because of the dramatic reduction in its birth rate, the percentage of people aged 60 or over in China is expected to increase from 13.9 percent in 2013 to 32.8 percent by mid-century.[27]

When a country has a low birth rate, and the number of young people entering the labor market is reduced, a situation now common throughout Europe and Japan, this can lead to conflict over immigration policies. Hostility to foreign workers by extreme nationalists in Germany in the early 1990s led to fatal attacks on some foreigners in the country. Japan, a country that traditionally has been wary of outsiders, is also concerned about having to rely on foreign workers. (The Japanese are as worried as the Americans and Europeans that a shrinking workforce will be unable to support the increasing healthcare costs and welfare costs of an aging population.)

A number of European nations and Japan had such low birth rates in the mid-1990s that their populations had started to decline or would soon do so. Declining populations became common in Russia and the former Eastern European satellites, no doubt because of the harsh economic conditions these countries were facing as they tried to replace their planned economies with market economies. Long-term decline in population for most of Europe appears inevitable. In the first half of this century, the population of Europe is expected to decline from about 730 million to 690 million.[28]

Projections have been made that about 50 countries, most of them wealthy, will experience population declines between now and 2050. Germany is expected to go from 82 million to 72 million, Japan from 126 million to 108 million, and the Russian Federation from 142 million to 120 million.[29] The United States would also face a declining population in the twenty-first century were it not for its high immigration levels. Declining populations raise fears about the loss of national power, economic growth, and even national identities by some people in these countries. But most population experts believe that if population decline is gradual, the negative social and economic consequences can be handled. Much more difficult to manage, they believe, are situations where the decline is rapid.[30] It is possible that some nations will find a smaller population easier to maintain in a sustainable manner, a concept which will be discussed in the final chapter.

Some governments have tried different measures to encourage families to have more children – such as direct financial payments for additional children, tax benefits, subsidized housing preferences, longer maternity and paternity leave, childcare, and efforts to promote gender equality in employment – but these policies have had only modest effects in authoritarian states and minimal effects in liberal democracies such as France and Sweden.[31]

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International conferences on population

The first international conference on population was held in 1974 in Romania under the sponsorship of the United Nations. It was anticipated that this conference would dramatize the need for population control programs in the less developed countries, but instead a debate took place between rich and poor countries over what was causing poverty: population growth or underdevelopment. The United States and other wealthy nations argued for the need for birth control measures in the poorer countries, while a number of the poorer countries argued that what they needed was more economic development. Some developing countries called for a new international economic order to support their development. They advocated more foreign aid from the richer countries, and more equitable trade and investment practices. The conference ended with what seemed to be an implicit compromise: that what was needed was both economic development and policies to manage population growth, and that an emphasis on only one factor and a disregard of the other would not work to reduce poverty.

In 1984 the United Nations held its second world population conference in Mexico City. The question of the relationship between economic growth and population growth was raised again. The United States, represented by the Reagan administration, argued that economic growth produced by the private enterprise system was the best way to reduce population growth. The United States did not share the sense of urgency that others felt at the conference concerning the need to reduce the world's increasing population. It announced that it was cutting off its aid to organizations that promoted the use of abortion as a birth control technique. (Subsequently the United States stopped contributing funds to the United Nations Fund for Population Activities and the International Planned Parenthood Federation, two of the largest and most effective organizations concerned with population control.)[32] The United States stood nearly alone in its rejection of the idea that the world faced a global population crisis, as well as in its advocacy of economic growth as the main population control mechanism. The conference endorsed the conclusion reached at the first conference ten years earlier that *both* birth control measures *and* efforts to reduce poverty were needed to reduce the rapidly expanding global population.

In 1992 the United Nations Conference on the Environment and Development – the so-called Earth Summit held at Rio de Janeiro, Brazil, which will be discussed in detail in Chapter 6 – did not directly address the need for population control measures. The Rio Declaration says only that “states should … promote appropriate demographic policies,” and Agenda 21, the action plan to carry out the broad goals stated in the declaration, does not mention family planning. The weak treatment of the population issue by this conference was, in part, the result of North–South conflicts over whether the poor nations or the rich nations were mainly responsible for the destruction of the environment. (When the population issue was raised, attention was focused on the harm to the environment that large numbers of poor people in the South could inflict, whereas the South held that overconsumption by the North caused most of the pollution that was harming the environment.) The rejection of any explicit connection between rapid population growth and environmental damage was also a result of

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opposition by the Vatican to any declarations which could be used to support the use of contraceptives and abortion to control population growth, practices that the Catholic Church has opposed. Also, some countries with conservative social traditions were opposed to raising any issue that could bring up the status of women in their countries.

While there was no explicit reference to population issues in its formal statements, the Rio conference, and the multitude of meetings around the world held to prepare for it, did cause increased attention to be placed on population, especially bringing to the forefront the perspectives of women.

The United Nations held its third conference on population – formally called the International Conference on Population and Development – in Cairo, Egypt in 1994. Although the Vatican and conservative Islamic governments made abortion and sexual mores the topic of discussion in the early days of the conference, the conference broke new ground in agreeing that women must be given more control over their lives if population growth was to be controlled. The conference approved a 20-year plan of action whose aim was to stabilize the world's population at about 7.3 billion by 2015. The plan called for new emphasis to be placed on the education of girls, providing a large range of family planning methods, health services, and economic opportunities for women. The action plan called for both developing and industrial nations to increase the amount they spent on population-related activities to $17 billion by the year 2000, a significant increase over the $5 billion that was then being spent.

Five years after the Cairo conference, the United Nations found that a number of new approaches to managing population had been initiated around the world, but that scarce resources and many needs led to population programs not receiving top priority in all developing nations. It found also that pledges of aid from developed nations were seriously underfunded.[33]

In 2003 the United Nations General Assembly voted to end the automatic holding of international conferences. Because of their large expense of funds and human energy and the danger that they were becoming routine, the United Nations decided that the decision to hold an international conference should be made on a case-by-case basis when there was a special need for international cooperation.

How Development Affects Population Growth

How does development affect the growth rate of population? There is no easy answer to that question, but population experts strongly suspect that there *is* a relationship, since the West had a fairly rapid decline in its population growth rate after it industrialized. In the nineteenth century, Europe began to go through what is called the “demographic transition.”

Demographic transition

The demographic transition, which is shown in Figure 1.6, has four basic stages. In the first

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stage, which is often characteristic of preindustrial societies, there are high birth rates and high death rates that lead to a stable or slowly growing population. Death rates are high because of harsh living conditions and poor health. In the second stage, there is a decline in the death rate as modern medicine and sanitation measures are adopted and living conditions improve. Birth rates continue to be high in this stage as social attitudes favoring large families take longer to change even as technology, health, and economic conditions evolve. This situation ignites what is known as the population explosion. In the third stage birth rates become more aligned with the lower death rate. Population growth remains high during the early part of the third stage but falls to near zero during the latter part. Most industrial nations passed through the second and third stages from about the mid-1800s to the mid-1900s. In the final and fourth stage, both the death and birth rates are low, and they fluctuate at a low level. As in the first stage, there is a stable or slowly growing population.

Most wealthy nations are already in the fourth stage of the demographic transition, but globally most countries are still in the second stage or the early parts of the third stage. There have been some significant differences between the developed and developing nations with regard to the second and third stages. For the developed nations, the reduction in the death rate was gradual as modern medicines were slowly developed and the knowledge of germs gradually spread. The birth rate dropped sharply, but only after a delay that caused the population to expand. For the developing countries, the drop in the death rate has been sharper than it was for the developed nations as antibiotics were quickly adopted, but because poverty lingered for many, the reduction in the birth rate has lagged more than it did for the developed nations. Both of these facts have caused a much larger increase in the population of the less wealthy nations than had occurred in the nations that shifted to industrialized economies in the nineteenth century. These two facts can be seen in Figure 1.7, which compares the demographic transitions of Sweden and Mexico.

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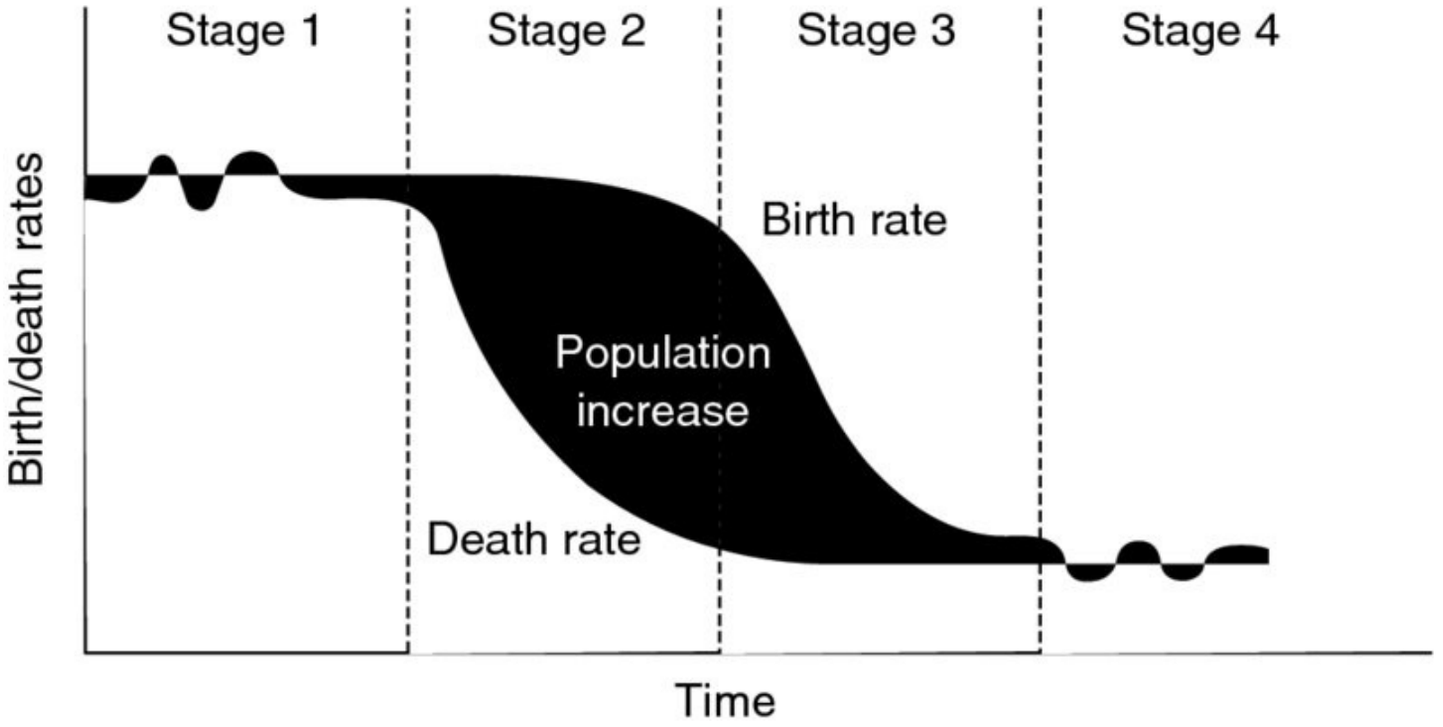

Figure 1.6 The classic stages of demographic transitions

Source: Joseph A. McFalls Jr, "Population: A Lively Introduction," *Population Bulletin*, 53 (3) (September 1998), Figure 12, p. 39.

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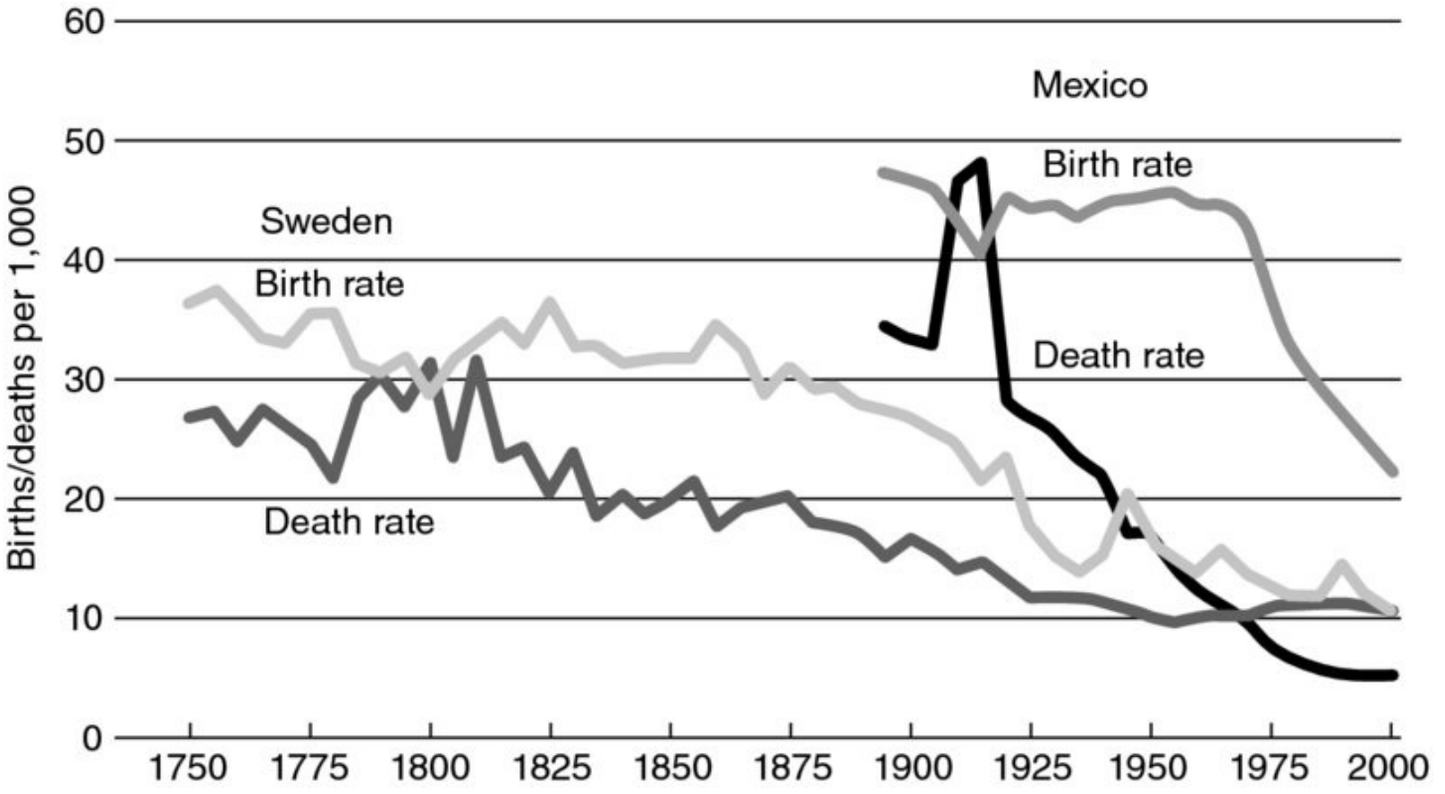

Figure 1.7 Demographic transition in Sweden and Mexico

Sources: B. R. Mitchell, *European Historical Statistics 1750–1970* (1976), Table B6; Council of Europe, *Recent Demographic Developments in Europe 2001* (2001), Tables T3.1 and T4.1; Centro Latinoamericano y Caribeño de Demografía, *Boletín demográfico*, 69 (2002), Tables 4 and 7; Francisco Alba-Hernández, *La población de México* (1976), p. 14; UN Department of Economic and Social Affairs, Population Division, *World Population Prospects: The 2002 Revision* (2003), p. 326. As presented in "Transitions in World Population," *Population Bulletin*, 59 (March 2004), p. 7.

The differences in the experiences of many nations have led many demographers to change the opinion they had in the 1950s that economic development would cause less wealthy nations to go through the same demographic transition as wealthy ones, and thus achieve lower population growth. There are obviously important differences between the experience of countries that industrialized early and that of the rest of the world. Probably as important as the fact that death rates dropped much faster last century than those prior is the fact that the industrialization that is taking place in emerging economies today is not providing many jobs and is not benefiting the vast majority of people in those regions. A relatively small, modern sector *is* benefiting from this economic development and the birth rate of this group is generally declining, but for the vast majority in the rural areas and in poor urban areas, high birth rates continue.

Factors lowering birth rates

If industrialization as it is occurring in the less developed world is not an automatic contributor to lower birth rates, what factors do cause birth rates to decline? As the West industrialized, it became more urban, and living space in urban societies is scarcer and more expensive than it was in rural societies. The availability of goods and services increased,

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which led to families increasing their consumption of these rather than spending their income on raising more children. Women now had job opportunities in the urban areas that hadn't existed in the rural areas and now could contribute to the family's wealth.

Certainly, better healthcare and better nutrition, both of which lower infant mortality and thus raise a family's expectations of how many children will survive, are important factors. (The irony here, of course, is that these advances, at least in the short run, tend to worsen the population problem since more children live to reproduce.)

Another factor tending to lower birth rates is the changing role of women. Better educated women are more likely to use some sort of contraception than are those women with little or no education.[34] Education for women tends to be associated with delayed marriage, increased knowledge about contraceptives, increased employment opportunities, and evolving views of their role in society.

As Western nations industrialized, child labor laws, compulsory education for children, and old age pension laws reduced some of the economic incentives for having many children. These laws made it more difficult for children to be viewed as producers on the farms and in the early factories; instead, they were considered consumers at some economic cost to their families. Traditional religious beliefs, which often support large families, also tended to decline.

There is little debate today that economic growth, especially if it benefits the many and not just the few, can lead to lower birth rates. There is also ample evidence that improving the social and economic status of women can lead to lower birth rates, even in areas which remain very poor – such as in the southern state of Kerala in India, where birth rates are significantly lower than in the rest of India. But there is also evidence that birth rates can decrease and are decreasing in poor countries – even in some where there has been little or no economic growth and where the education and social status of women remains very low, such as in Bangladesh – where an effective family planning program exists and modern contraceptives are available.[35] (Fertility rates dropped in Bangladesh from 6.7 births per woman in the early 1950s to 2.7 births per woman in about 2008.)[36]

The conclusion of some researchers who have reviewed the results of fertility studies conducted in various less developed countries is that “although development and social change create conditions that encourage smaller family size, contraceptives are the best contraceptive.”[37] These researchers found that three factors are mainly responsible for the impressive decline in birth rates that has occurred in many less developed countries since the mid-l960s: more influential and more effective family planning programs; new contraceptive technology; and the use of the mass media to educate women and men about birth control.[38]

In the past several decades, fertility has declined significantly in the world, although as Figure 1.8 shows, the decline has been much greater in some regions than in others. Note that Europe is below replacement level, which is generally considered to be an average of 2.1 children per woman (the extra one-tenth compensates for the death of some girls and women before the end of their childbearing years). Also note that Africa still has high fertility.

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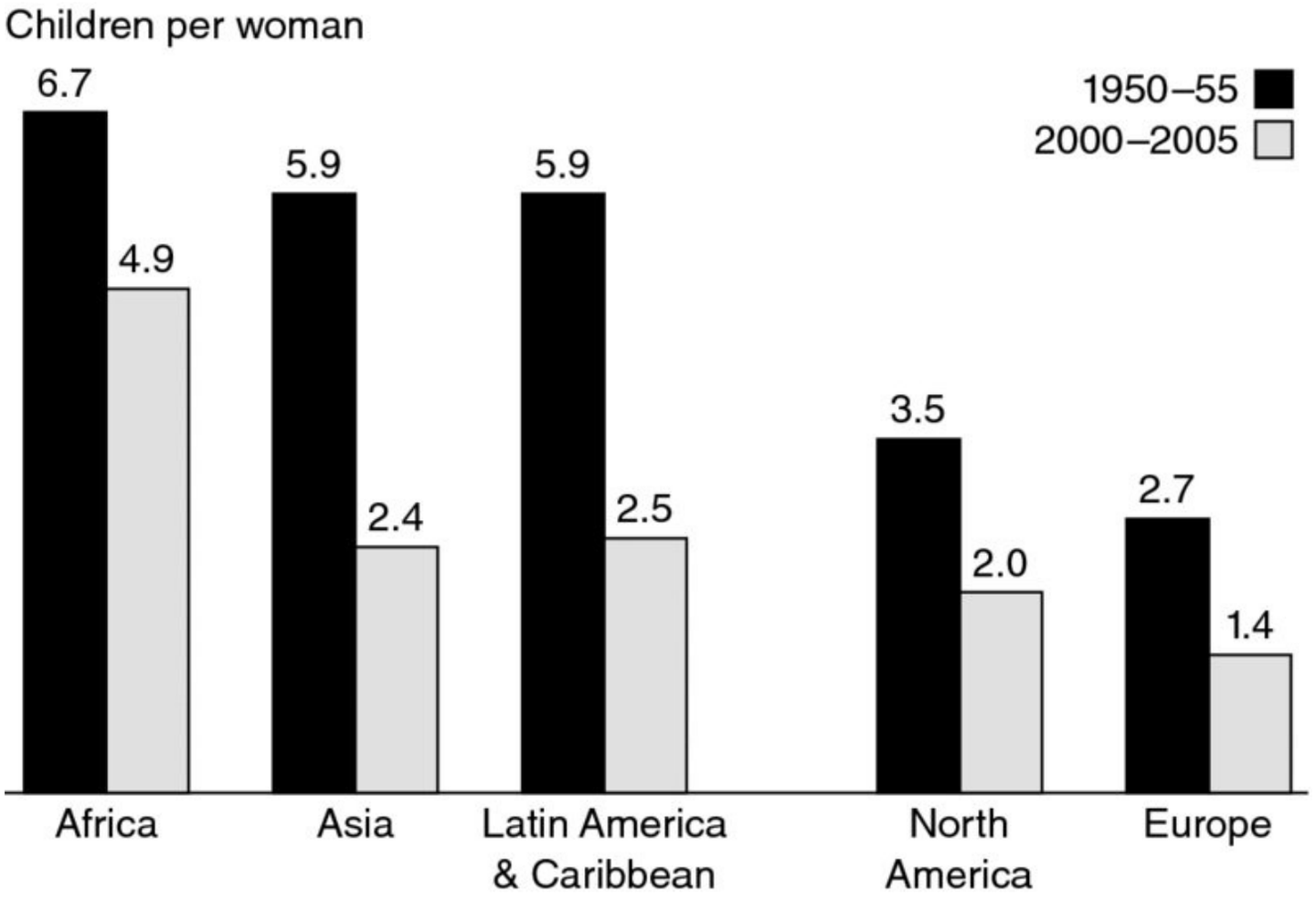

Figure 1.8 Fertility decline in world regions, 1950–1955, 2000–2005

Source: Based on data from UN Department of Economic and Social Affairs, Population Division, *World Population Prospects: The 2008 Revision* (2009).

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Plate 1.4 Breast-feeding can delay a woman's ability to conceive and provides the most healthful food for a baby

Source: United Nations.

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Lowering fertility rates drastically in just 10–15 years – can it be done?

The answer is yes it can be done. We know it can because countries such as Iran, Tunisia, and Algeria have done it under a four-part strategy:

1. Promote child survival
2. Promote girls' education and gender equality
3. Promote availability of contraceptives and family planning, especially for the poor who cannot afford them
4. Raise productivity on the farm so mothers use scarce time in income-earning employment rather than childrearing

Source: Jeffrey D. Sachs, "Lower Fertility: A Wise Investment," *Scientific American*, 295 (September 2006), p. 42.

Governmental Population Policies

Controlling growth

Many governments today have some policies that try to control the growth of their populations, but this is a very recent trend. Traditionally, governments have sought to increase their populations, either through encouraging immigration (as the United States did in its early years) or through tax and other economic assistance to those families with many children. As late as the mid-1970s, many governments had no programs to help manage population levels. A survey of developing nations taken in conjunction with the 1974 United Nations population conference found that, out of 110 developing countries, about 30 had population control programs, another 30 had information and social welfare programs, and about 50 had no population limitation programs at all.[39] This United Nations conference ended with no explicit consensus among the participants that there was a world population problem at all. The delegates at the conference did pass a resolution stating that all families have the right to plan their families and that it is the responsibility of governments to make sure all families have the ability to do so.

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Plate 1.5 Advertisement for contraceptives in Costa Rica

Source: George Shiflet.

The ability to control the number and timing of children a couple has is called family planning. Family planning services provide healthcare and information on contraceptives. The expansion of family planning services around the world in the past 40 years has been truly revolutionary. By 2011 about 63 percent of married couples worldwide were using contraceptives, a dramatic increase from the approximately 10 percent in the 1960s.[40] The average number of children per woman dropped from more than five in 1950 to less than three by 2012,[41] still more than needed for a population to stabilize. In the least developed countries, the average number of children per woman was still over four.[42] Most wealthy countries and a few rapidly industrializing countries maintain a birth rate at or below two children per couple, the replacement level.

Although more than half of married women worldwide used contraceptives in 2011, the rate among countries varied greatly. In sub-Saharan countries the contraceptive rate among married women was about 25 percent, while in Mexico and Thailand the use was closer to 70 percent and 80 percent respectively.[43] Wealthier countries had a contraceptive use rate of about 70 percent at this time.[44] As mentioned before in this chapter, at the beginning of the twenty-first century about 143 million women of reproductive age in the poor nations wanted no further children but were not using contraceptives. They are considered to be potential family planning users if the services were made available to them. Figure 1.9 depicts increases in contraceptive use in selected countries.

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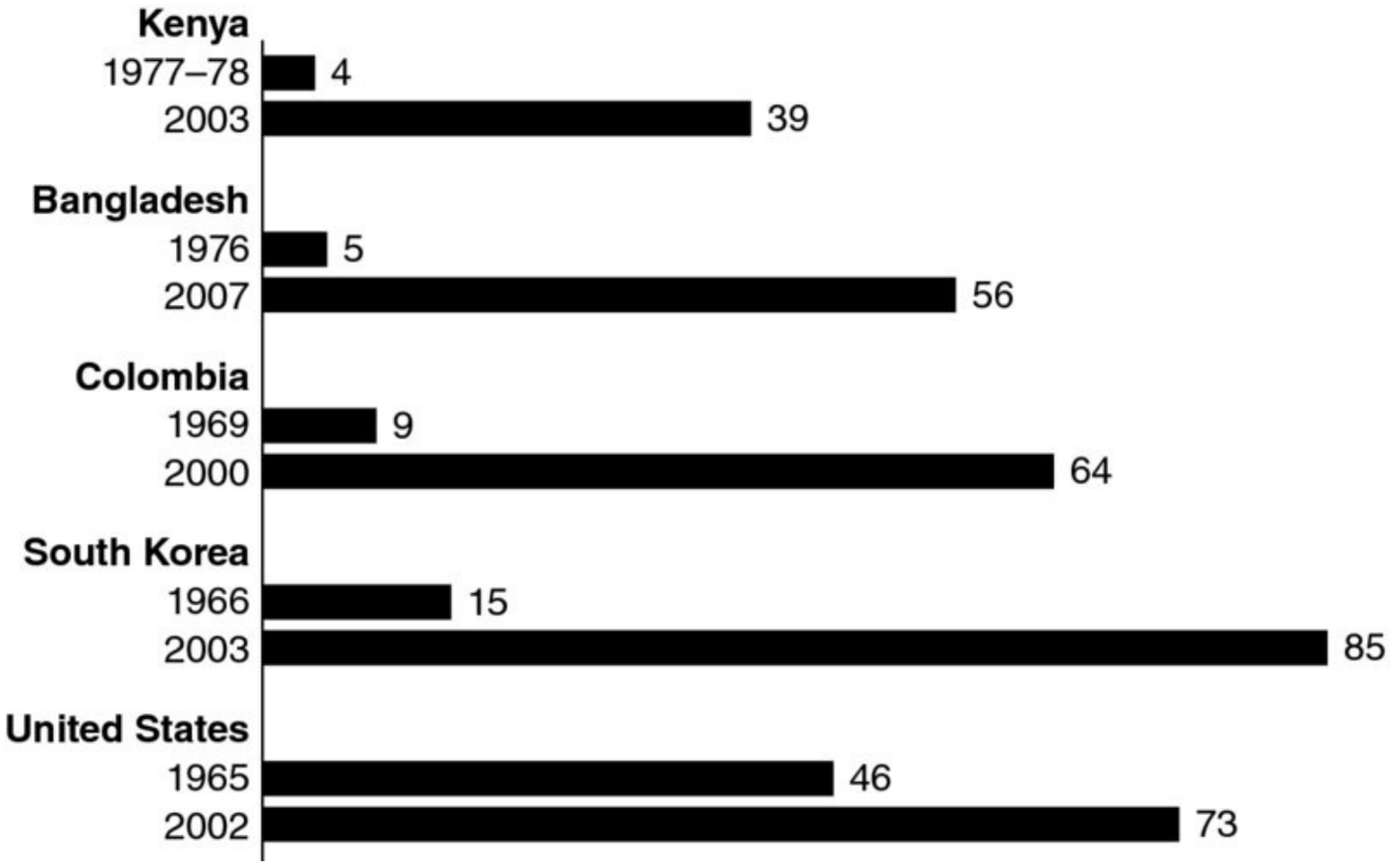

Figure 1.9 Increases in modern contraceptive use in selected countries Percentage of married women aged 15–49 using a modern contraceptive method. US figures are for women aged 15–44. Modern contraceptives include sterilization, oral contraceptives, IUDs, condoms, diaphragms, Depoprovera, Norplant, and other barrier and chemical methods.

Sources: Based on data from UN Department of Economic and Social Affairs, Population Division, *Levels and Trends in Contraceptive Use, 1998* (2000); C. Haub and B. Herstad, *Family Planning Worldwide* (2002); ORC Macro, Demographic and Health Survey data. As presented in "Transitions in World Population," *Population Bulletin*, 59 (March 2004), p. 8; UN Department of Economic and Social Affairs, Population Division, *World Contraceptive Use 2009*.

Requests by countries for foreign aid to help them control their population growth now, for the first time, exceed the international assistance available for this activity. It was calculated in 2012 that providing family planning services to the estimated 222 million women whose potential demand remained unmet would cost an estimated $3 billion annually. While this seems like a huge amount, relative to other expenditures being made at present it is not. (The cost of one modern submarine in the United States is over $2 billion, and the US tobacco industry spends about that amount yearly on advertising.) Despite some controversial policies (see discussion earlier in this chapter about US policy in the 1980s), the US government has been the largest single donor of aid for population and family planning activities in the developing world. However, as we discuss in Chapter 2, its development assistance, which includes population assistance, is far below the recommended level.

Recognizing that many Member States were not on track to meeting their commitments pursuant to the 1994 International Conference on Population and Development (!CPD) and

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its Programme of Action, which had been set to expire in 2014, the UN General Assembly extended the Programme of Action by resolution in 2010.[45] Accordingly, the Commission on Population and Development adopted a resolution reaffirming the Programme of Action and its central implementation provisions in 2014, including the commitment of each Member State to provide 0.7 percent of its annual gross national product in assistance toward population and development programs.[46] However, the international assistance provided continued to fall below the cost of population assistance: in 2011 the total assistance provided for population programs amounted to $11 billion, while the ICPD estimated that global costs for that year were close to $67 billion.[47]

Plate 1.6 Family planning class

Source: United Nations.

Mexico is a country that has had rather dramatic success with its family planning program. The government began this program only in 1972, when it had one of the highest rates of population growth in the world. In the early 1970s the annual population growth rate was estimated to be above 3 percent, while in 2010 it was estimated to be down to about 1.4 percent.[48] The average number of children per woman in Mexico dropped from about 7 in 1965 to about 2.5 in 2000.

In 1972 Mexico's President Luis Echeverria Alvarez announced a reversal of governmental policy on the population issue. His decision to support a strong effort to control the rapid growth of the Mexican population led the government to use Mexfam, the local affiliate of the International Planned Parenthood Federation, to set up family planning clinics throughout

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the country. (By the early 1990s Mexfam had set up 200 of these clinics.) Besides making contraceptives readily available, the government and Mexfam mounted a large propaganda campaign using television soap operas, popular songs, billboards, posters on buses and in subway stations, and spot announcements on radio and television. The leaders of the Catholic Church in Mexico did not oppose the government's efforts.

But if the present birth rate is not reduced further, Mexico's population will increase by 15 percent by 2050. To increase the use of contraceptives, the National Population Council began focusing its efforts on the rural population, adolescents, and men. Men are an especially important target since the rate of contraceptive use by men in Mexico is low and social and economic conditions have evolved such that men have become more receptive to the message that controlling family size makes sense.

A few countries have adopted more forceful measures than family planning to try to reduce their population growth. Japan drastically reduced its population growth by legalizing abortion after World War II, by some accounts in order to reduce the number of Japanese children fathered by American military men stationed in Japan.

India, which did not see significant changes with its voluntary family planning programs, enacted more forceful measures in the mid-1970s, such as the compulsory sterilization of some government workers with more than two children. Several states in India passed laws requiring sterilization and/or imprisonment for those couples who bore more than two or three children. A male vasectomy program was also vigorously pursued, with transistor radios and money being given as an incentive to those agreeing to have the sterilization operation. Public resentment against these policies mounted and helped lead to the defeat of Prime Minister Indira Gandhi's government in 1977. Birth control efforts slackened after that event. The government in India has now returned to voluntary measures to help manage the growth of its population. Fertility has declined substantially in India from about five children per woman in 1970 to about two children in 2015.[49] Even with this decline, population is now increasing by about 15 million a year,[50] an increase which leads the world. India now has about 18 percent of the world's population[51] on only 2.5 percent of the world's land, and is poised to soon become the most populous country on the planet.[52]

China, which has about 19 percent of the world's population[53] but only about 7 percent of its arable land, has implemented vigorous programs to limit its population growth and has drastically reduced its birth rate. For many years the communist government, under the leadership of Mao Zedong, encouraged the growth of the population, believing that there was strength in numbers. The policy was eventually reversed and the average number of children per woman dropped from about six in 1970 to about two in the year 2000. In 2015 China's population was about 1.4 billion, and the population is expected to decline to 1.2 billion by 2075.[54]

China employed a wide assortment of measures to limit the growth. These included broadly promoting contraceptives, encouraging sterilization, and making abortions readily available. The government, through extensive publicity efforts, promoted the one-child family as the

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ideal, encouraging late marriages and providing employment and housing incentives to one-child couples.

Partly because of a concern that there will not be enough adult children to care for their aging parents, the one-child policy is being moderated. It has been widely enforced in the urban areas, but in rural areas, where about 60 percent of the people still live, couples were usually allowed to have a second child if the first child was a female. The one-child policy was also not applied to ethnic groups in the country, partly because many of them live in strategic border areas and the government did not want to cause resentment among them. There is evidence that there was widespread disregard of the policy in some rural areas where it is not uncommon today to find families with three, four, five, or even more children.[55] A male child is still strongly desired in many areas to carry on the family name, to take care of his parents when they get old (an old age social security system still does not exist in the rural areas), and to help with agricultural work.[56]

China's birth control policies have been both admired and criticized in other countries. Admiration has been given for the spectacular accomplishment, for producing one of the fastest, if not the fastest, demographic transitions in history. The policy has been credited with having prevented the birth of an additional 400 million children,[57] which some experts believe could have caused a demographic disaster. The one-child policy was criticized because of the means used to enforce it, which included the use of abortions as a backup to contraceptives – sometimes on women who strongly preferred not to have one. The use of the coercive techniques of the past has mainly ended and emphasis is now placed on education and “family planning fees” for women who have unapproved children.[58] Concern has also been expressed at the unnaturally low numbers of female births being reported. Because of stringent family planning policies and a social preference for having a male child, there is speculation that many couples resorted to measures such as aborting pregnancies if the fetus was female – ultrasound equipment has become widespread to indicate the sex of the fetus.[59]

Population-related challenges in China's future include an aging population because of low fertility; fewer children to take care of aging parents; single children with no siblings, aunts or uncles; and a shortage of females for males to marry. Dissatisfaction is also spreading in parts of the country because of the increasing social and financial inequality that has come with China's increasing economic prosperity as it follows the market approach. Also, as the population continues to grow in tandem with consumption and industrialization expands, there will be increasing stress on the environment.

Promoting growth

Although most countries now recognize a need to limit population growth, a few have openly favored increasing their populations, among them the military governments that ruled in Argentina and Brazil in the 1960s and 1970s. Both countries have large areas that are still sparsely populated and both are rivals for the role of being the dominant power in Latin America. A few Brazilian military officers even advocated encouraging population growth so that Brazil could pass the United States in size and become the dominant nation in the

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Western hemisphere. It is doubtful that a larger population alone could ever put a country in this position without concurrent economic advances.

Aside from some pro-growth statements, the Brazilian military governments did not effectively promote population growth. They became basically neutral on the issue of population and gradually made it possible for the main nongovernmental family planning organization to operate in the country. After the military left power in Brazil in the mid-1980s, a new constitution acknowledged the right of women to family planning. This provision had the tacit approval of the Brazilian Catholic Church. By the mid-1990s about 75 percent of Brazilian women were using some form of contraception.[60] From 1960 to 2005 the average number of children born to a Brazilian woman dropped from about six to about two. Despite legal limitations, abortions have not been uncommon. One estimate is that there were about 1.4 million abortions performed annually in Brazil in the mid-2000s.[61]

Other countries, such as Mongolia and some in sub-Saharan Africa, have at times advocated larger populations both for strategic reasons and because of the belief that a large population is necessary for economic development. Even the US government, which generally recognizes the need for a check on population growth, has some policies that promote large families, such as income tax laws that allow deductions for children. Many developed nations have contradictory policies, some encouraging population growth while others discourage it. Some developing nations also have such contradictions, although the greater agreement now in these countries about the need to limit growth often causes the contradictions to be exposed and eliminated.

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Romania: a disastrous pro-birth policy

Romania is an example of a country that tried to promote the growth of its population. After World War II, the birth rate there fell so sharply that within a few years the population of the country would actually have started declining. In the mid-1960s the communist government, headed by Nicolae Ceauşescu, decided to try to reverse this trend, not only to ward off a possible decline of population but to actually increase the number of people. Ceauşescu believed that a large population would improve Romania's economic position and preserve its culture, since Romania was surrounded by countries with different cultures. “A great nation needs a great population,” said Ceauşescu. He called on all women of childbearing age to have five children. Monthly – and in some places, even weekly – gynecological exams were given to all working women 20 to 30 years old. If a woman was found to be pregnant, a “demographic command body” was called in to monitor her pregnancy to make sure she did not interrupt it. A special tax was placed on those who were childless.

The main techniques the government used to promote its pro-growth policy were to outlaw abortion, which was one of the main methods couples had used in the postwar period to limit the size of their families, and to ban the importation and sale of contraceptives. The birth rate immediately shot up, but within a few years it was nearly back to its previous low as couples found other means to limit their families. One of the means was secret abortions, and many women either died or ended up in hospital after abortions were performed or attempted by incompetent personnel. Another tragic result of Ceauşescu's pro-birth policy (as well as of his failed economic policies) was the abandoning of unwanted children. Tens of thousands of these children ended up in understaffed and ill-equipped orphanages (there are photo essays of Romania's orphanages in the sources below). Many babies were even sold for hard currency to infertile Western couples. The pro-growth policy ended in 1989 with the overthrow of the Ceauşescu regime and with his execution.

Sources: James Nachtwey, “Romania's Lost Children,” *New York Times Magazine*, June 24, 1990, pp. 28–33; and Jane Perlez and Ettore Malanca, “Romania's Lost Boys,” *New York Times Magazine*, May 10, 1998, pp. 26–9.

A generalization one can make about governmental policies that are aimed at influencing population growth is that, aside from drastic measures, governmental policies have not been very successful in either promoting or limiting birth rates very much if these policies are out of line with what the population desires. One can also generalize that matters pertaining to reproduction are still considered to be private decisions and not matters for public policy to control.

A growing number of industrialized countries are increasingly faced with a rapidly expanding retirement-age population and a shrinking labor force that will have to support its elderly citizens. Some of these countries, such as Sweden, Hungary, South Korea, and Japan, have tried various policies to encourage women to have more children. The policies have included

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paid maternity and paternity leave, free childcare, tax breaks for large families, family housing allowances, and even cash paid to parents raising a child. At the start of this century, a study of these efforts concluded:

> As we enter the next century, a growing number of countries will have near-zero growth or will decline in size. Experience in Europe, Japan, and other countries suggests that governments can encourage people to have more children, but at a high price and not enough to affect long-term trends.[62]

The Future

The growth of the world's population

In 2015 the world's population was estimated to be about 7 billion. The United Nations projects that the world's population will continue to grow to about 8 to 10 billion by 2050, depending on the success of efforts to control population growth. The most likely total, according to the United Nations, is between 9 and 10 billion. The United Nations bases its projection on the assumption that the world's population growth rates, while still above their replacement rates, will continue the decline that started in the late 1960s.[63]

Unusually for a developed country, the population of the United States is expected to continue to grow significantly, increasing from about 300 million in 2010 to about 400 million around 2050. Rather atypical of Northern Europe, the United Kingdom's population is projected to grow from about 62 million in 2010 to about 77 million in 2050.[64]

The carrying capacity of the Earth

Will the Earth be able to support a population of 9 to 10 billion, 2–3 billion more than the present size, or will catastrophe strike before that figure is reached? (The world was 2 billion when one of your authors (Seitz) was born. Now it is more than three times that size, a remarkable change in just a single lifetime.) Understanding the concept of “carrying capacity” will help answer the question of potential catastrophe. Carrying capacity is the number of individuals of a certain species that can be sustained indefinitely in a particular area. Carrying capacity can change over time, making a larger or smaller population possible. Human ingenuity has greatly increased the carrying capacity of Earth to support human beings, for example, by increasing the production of food. (This was unforeseen by Thomas Malthus, who wrote about the dangers of overpopulation in the late 1700s.) But carrying capacity can also change so that fewer members of the species can live. A change in the climate might do this. Care must be exercised when using the concept of carrying capacity because, in the past, its definition implied a balance of nature. Many ecologists no longer use the concept of balance of nature because numerous studies have shown that nature is much more often in a state of change than in a balance.[65] Populations of different forms of life on Earth are usually in a state of flux as fires, wind storms, disease, changing climate, new or decreasing predators, and other forces make for changing conditions and thus changing

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carrying capacity.

There are four basic relationships that can exist between a growing population and the carrying capacity of the environment in which it exists. A simplified depiction of these is given in Figure 1.10 Graph (a) illustrates a continuously growing carrying capacity and population. Although human ingenuity as seen in the agricultural revolution (to be discussed in Chapter 3) and in the industrial/scientific revolution has greatly increased the capacity of the Earth to support a larger number of human beings, it is doubtful the human population can continue to expand indefinitely. A basic ecological law is that the size of a population is limited by the short supply of a resource needed for survival. The scarcity of only one of the essential resources for humans – which would include air, energy, food, space, nonrenewable resources, heat, and water – would be enough to put a limit on its population growth. It is unknown how much farther the carrying capacity can be expanded before one of the limits is reached, or whether the global population has already overshot its limit.

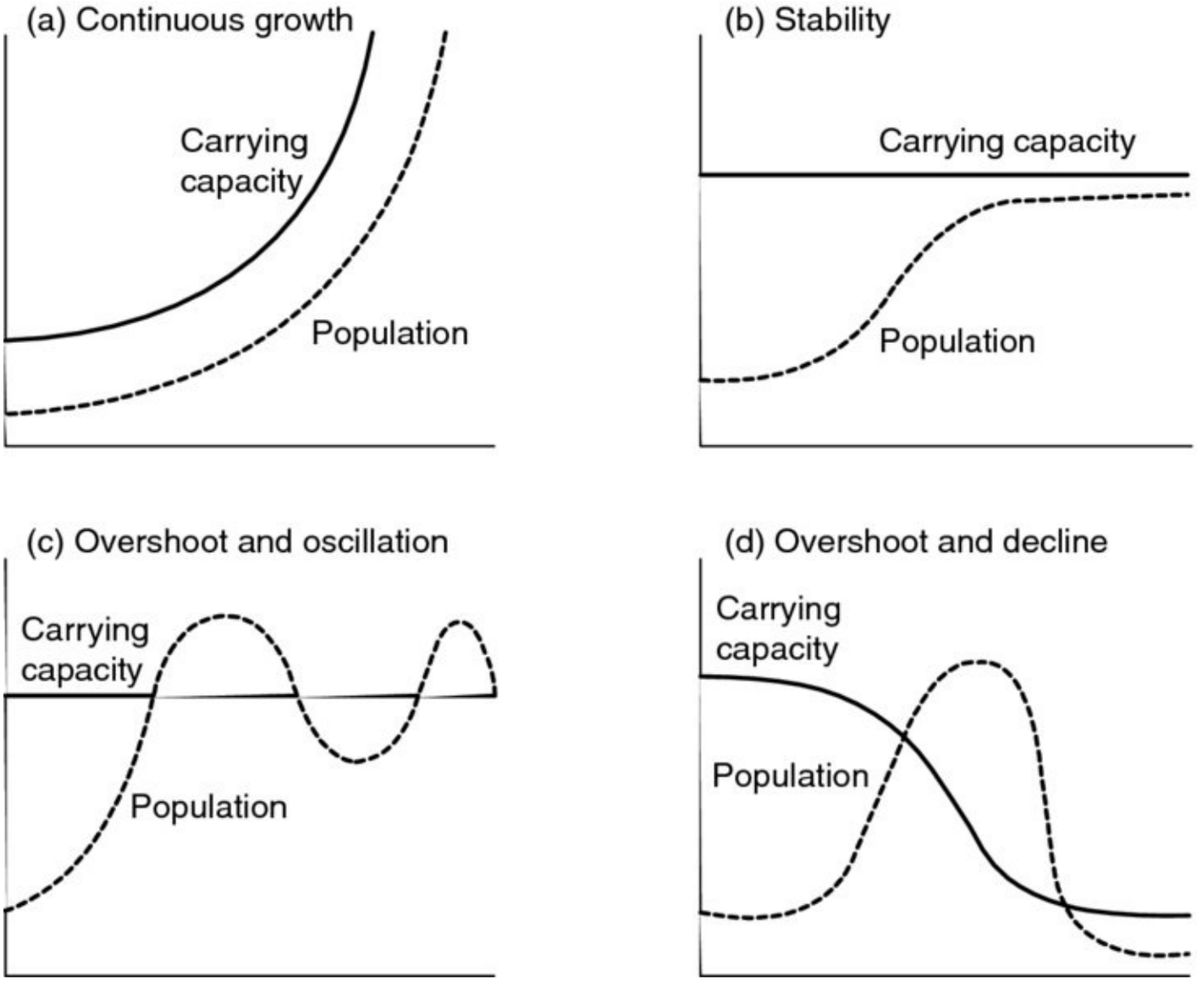

Figure 1.10 A growing population and carrying capacity

Graph (b) of Figure 1.10 illustrates a population that has stabilized somewhat below the

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carrying capacity. (In actuality the population may fluctuate slightly above and below the carrying capacity, but the carrying capacity remains basically unchanged.) Examples of this can be seen in relatively undisturbed tropical rainforests where many species are relatively stable in an environment where average temperature and rainfall vary little.[66] Graph (c) portrays a situation where the population has overshot the carrying capacity of the environment and then oscillates above and below it. An example of this situation may be the relationship between the great gray owls and their prey, lemmings and voles, in northern forests. Lemmings and voles are an important food source for the owls. Their populations rapidly increase over a period of four to six years and then, as predators increase their consumption of them, their numbers crash catastrophically, causing the owls to flee the area to escape mass starvation.[67] Graph (d) illustrates a situation in which the overshooting of the carrying capacity leads to a precipitous decline in the population, or even to its extinction, and also to a decline in the carrying capacity. Such a situation has occurred with deer on the north rim of the Grand Canyon in the United States,[68] and with elephants in Kenya's Tsavo National Park.[69] In both cases, the number of animals increased to a point where they destroyed the vegetation they fed upon.

It is our hope that the human species with its unique mental powers will create a situation that combines elements of graphs (a) and (b), using its abilities to increase the carrying capacity of Earth, where possible, and where it is not, making sure its numbers do not exceed that capacity. But there are many indications that the species has not yet recognized its danger and is not yet taking effective efforts to prevent either situation (c) – which would mean the death of millions – or situation (d), which could lead to the decline of the human race. There are places in the world where population expansion has already passed the carrying capacity of the land and the land itself is now being destroyed; in parts of Africa, for example, fertile land is turning into desert and in the Himalayan mountain area, land is being destroyed by human-made erosion and floods. There are many other examples of the reduction of the carrying capacity of the Earth that is taking place at unprecedented rates today around the world – the result of uncontrolled overgrazing, overfishing, overplanting, overcutting of forests, and the overproduction of waste which leads to pollution. (Some of this reduction of carrying capacity is being caused by population pressures and some by economic forces, for example the desire to increase short-term profits.) This deterioration has led many ecologists to believe that unless there is a rapid and dramatic change in many governmental policies, the human species may indeed be headed for the situations depicted in either the oscillation or decline graphs in Figure 1.10.

There is one other aspect of the carrying capacity concept that demonstrates some of the trade-offs in evaluating the global carrying capacity for humans: what quality of life should the population enjoy? Joel Cohen, a distinguished biologist, head of the Laboratory of Populations at Rockefeller University and Columbia University and author of the influential book *How Many People Can the Earth Support?*, persuasively argues that when asking the question “How many people can the Earth support?” an attempt must be made to answer questions such as the following:

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- *How many at what average level of well-being?* What type of diet, transportation, and health system will be provided?
- *How many with what distribution of well-being?* If we are content to have a few rich and a large number poor, the Earth can probably support more than if the income distribution is fairly equal.
- *How many with what physical, chemical, and biological environments?* How much clean air, water, and wilderness do we want?
- *How many with what kinds of domestic and international political institutions?* How will conflicts be settled at home and internationally?
- *How many with what technology?* How food and goods and services are produced affects the Earth's carrying capacity.
- *How many with what values, tastes, and fashions?* Are we vegetarians or meat eaters? Do we commute to work by car, mass transport or bicycle?
- *How many for how long?* How long can that number of people be supported?[70]

The concept “sustainable development,” which will be discussed in Chapter 9, is related to carrying capacity and is now being used more frequently than carrying capacity to convey some of the same concerns.

Optimum size of the Earth's population

What is the optimum size of the Earth's population? That question, like others we have asked in this chapter, is not going to be easy to answer, but it is worth asking. Paul Ehrlich, professor of population studies and of biology at Stanford University, defines the optimum size of the Earth's population as that “below which well-being per person is increased by further growth and above which well-being per person is decreased by further growth.” What does “well-being” mean? Ehrlich explains what he believes it means:

> The physical necessities – food, water, clothing, shelter, a healthful environment – are indispensable ingredients of well-being. A population too large and too poor to be supplied adequately with them has exceeded the optimum, regardless of whatever other aspects of well-being might, in theory, be enhanced by further growth. Similarly, a population so large that it can be supplied with physical necessities only by the rapid consumption of nonrenewable resources or by activities that irreversibly degrade the environment has also exceeded the optimum, for it is reducing Earth's carrying capacity for future generations.[71]

Ehrlich believes that, given the present patterns of human behavior – behavior that includes the grossly unequal distribution of essential commodities such as food and the misuse of the environment – and the present level of technology, we have already passed the optimum size of population for this planet.

Julian Simon, author of *The Ultimate Resource*, believed that the ultimate resource on Earth

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is the human mind. The more human minds there are, said Simon, the more solutions there will be to human problems. Simon admitted that population growth in poor countries could lead to short-term problems since more children will have to be fed. But in the long run these children will become producers, so the Earth will benefit from their presence. Simon agreed that rapid population growth could harm development prospects in poor nations, but he was not disturbed by moderate growth in these countries. According to Simon, larger populations make economies of scale possible; cheaper products can be made if there are many potential consumers. Also, services can improve, as seen by the development of efficient mass transportation in Japan and Europe in areas of dense population.[72]

Simon's views won favor in the Reagan and Bush administrations (father and son) in the United States and were used to give academic support to a new US policy on population – popularly called the Mexico City policy. This policy basically saw the effect of population growth as a "neutral phenomenon … not necessarily good or ill," a position which Marxist ideology also held.[73] While many economists in the United States do not share Simon's view that "more is better," many do share his view that human ingenuity, especially new technology and resource management practices, can increase the carrying capacity of the Earth as it has in the past.[74]

Joel Cohen believes there is no way to estimate the optimum size of the human population on Earth because no scientifically based answers have been given to the questions he presented above. In simpler terms, no one has answered the fundamental question: "How many people can the Earth support with what quality of life?" Obviously the Earth can support a large number of people if they are all living at a subsistence level – with barely enough to eat – or if a relatively few are rich and the rest poor, or if they accept frequent risks of violent storms and droughts. But Cohen believes that even without an agreed-upon "optimum number," the many things that governments and individuals can do to improve conditions for the present generation and future generations are worth doing.[75]

Population-related problems in our future

Throughout this book we are going to be looking at many current problems related to population rates increasing in tandem with consumption. Here we mention a few of the most important ones. Hunger is an obvious problem in which overpopulation plays a key role, and the number of hungry people is huge. The news media are used to dramatizing this problem only when there are many children with bloated bellies to be photographed, but much more common than the starving child today, and probably in the future, will be the child or adult who is permanently debilitated or who dies because of malnutrition-related diseases. Pollution and the depletion of nonrenewable resources will increase as the world's population grows. Migration of people to lands that do not want them will probably increase in the future and this can cause international tension. At least 300,000 immigrants, and probably more, enter the United States through informal channels annually, many of whom come from Latin America looking for work.

In Assam, India, several thousand "unwanted" immigrants were massacred in 1983. Wars

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have taken place in the past in which overpopulation played an important role and they will probably occur in the future. In the 1960s a border war broke out between El Salvador and Honduras over “unwanted” Salvadorians in Honduras. In the 1990s numerous brutal civil wars occurred in Africa. While we cannot identify overpopulation as the main cause of these conflicts, it is likely that increasing population pressures made the ethnic conflicts more likely.

Growing populations in countries situated in regions with serious water shortages are a direct cause of competition and conflict over the scarce water. The most critical areas are the Middle East and North Africa where population more than tripled between 1960 and 2010, thus greatly reducing the amount of water available per person. About 1 billion people today, mostly in rural areas, do not have access to safe drinking water. According to the United Nations, 700 million people in 43 countries already face severe water shortages.[76] In some of these regions, droughts have been common throughout history. What is not common in these regions is the population density that is present and projected. While water scarcity can obviously promote conflict, it also has the potential of promoting cooperation as nations are forced to devise ways to conserve and share scarce water. It is projected that by 2025, 1.8 billion people will be living in areas with absolute water scarcity, while one-half of the global population will live in water-stressed areas.[77]

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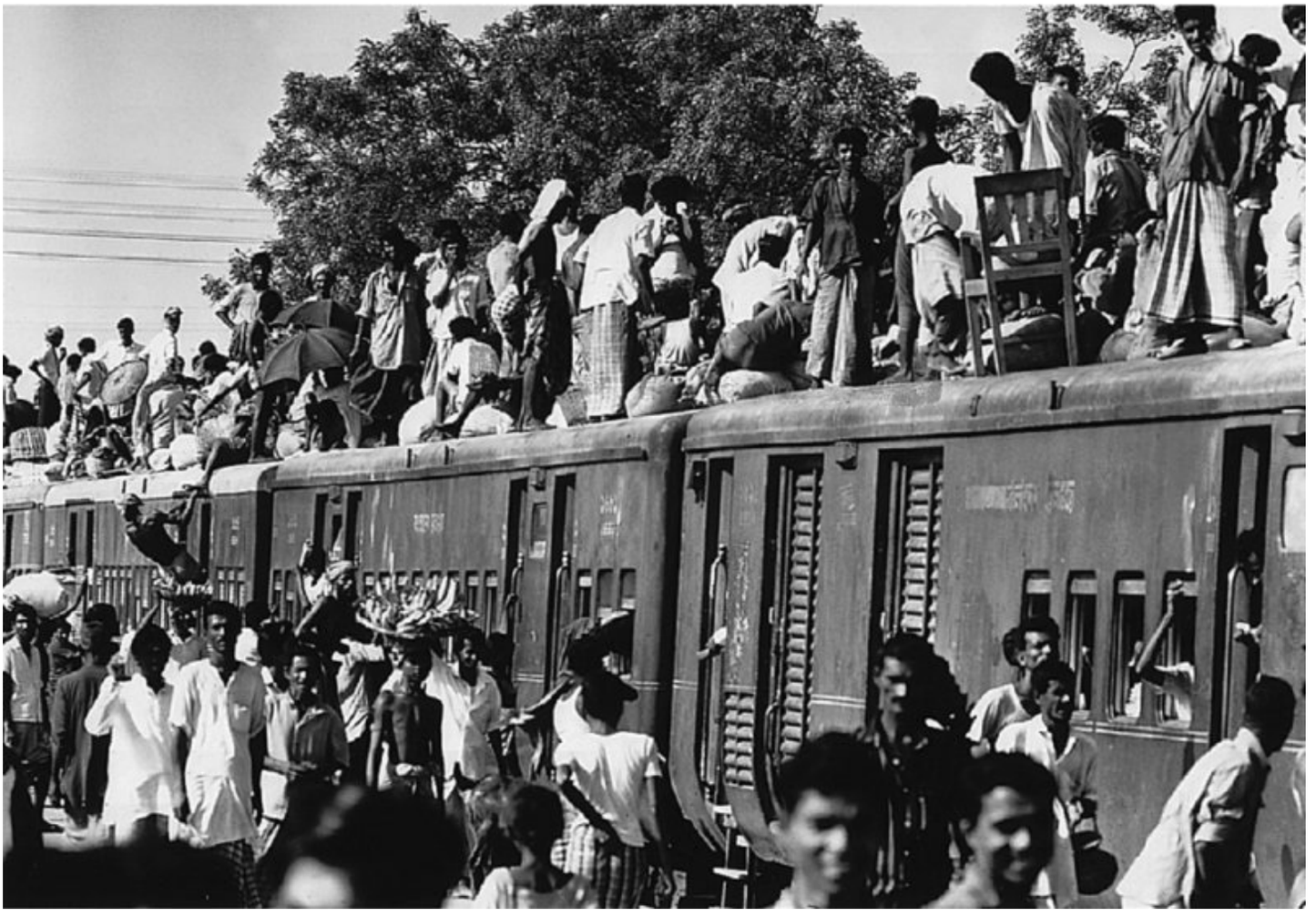

Plate 1.7 A more frequent picture in the future? A crowded train in Bangladesh

Source: World Bank.

Another potential problem is climate change, which will be discussed in Chapter 5. An increase in the average global temperature could intensify the water cycle. There could be more rain in some locations but also more droughts.

One bright development is that the industrialized countries are learning to conserve water and to use it more efficiently. Water use in the United States has actually declined about 20 percent since 1980. This decline came because of new water-saving technologies and practices such as less wasteful irrigation techniques and water-stingy toilets. (In the United States toilets used about 6 gallons of water per flush. After a law passed by Congress in 1992 set new standards, new toilets now use 1.5 gallons per flush, a big reduction.) Japan has made major reductions in water use in its industry. Some of these water-saving practices have spread to other nations, including less wealthy ones.[78]

Conclusions

While the population in many less wealthy countries is still growing, it is actually relatively stable or even decreasing in other countries. More economic growth raised the living

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standards in some countries to a level where having more children made it difficult for them to increase their living standards further. We see this happening in countries that have a high GNP or income per capita. At the same time, many other countries with lower GNPs continue to grow in population as they try to improve their living standards. Thus we find ourselves today with a relatively few countries considered “more developed” that have stopped growing in population, while the majority of countries are considered to be “developing” or “less developed” have higher growth rates that are contributing to a planet with unprecedented population growth.

We can use a more expansive concept of development to look at the progress or lack of progress many countries are making today in lowering their birth rates. First of all, we know that economic growth that benefits the majority in a country, and not just a few, is associated with lower population rates. As we have seen in this chapter, if the majority are receiving a higher standard of living, they tend to reduce the number of children a family has. And other parts of our definition of development help us evaluate why some countries are doing better than others in lowering the number of children women in those countries have. So we want to know how the increased wealth in the country that comes from the economic growth is affecting society. Is corruption increasing in the society, in the government? Is the wealth being used to provide more services to the majority of people, such as medical clinics for the rural poor who have the high birth rates, and family planning services that will help rural women receive contraceptives and help them plan their families, or is the wealth mainly benefiting the rich and urban class? All of these questions and others need to be answered when analyzing the type of development a country has. To put all nations with a certain range of GNP or national income per capita in the category of “developing” or “less developed” does not help us understand the differences that exist among countries regarding population growth. It is only when you look at a country's economic wealth *and* the social changes that are caused by or accompany that economic growth that you can begin to understand why some countries are doing much better than others in lowering their birth rates.

Looking over the statements by a number of population experts, they seem to share the conclusion that the Earth faces an overwhelming problem with its current population growth of about 1 million people every four days. This is a problem, along with climate change and the threat of nuclear weapons, which will be discussed later in this book, that has the potential for causing untold human misery. But many of these experts also emphasize that human thinking and governmental policies are starting to change and impressive reductions in birth rates are taking place in various countries around the world. We know how to reduce birth rates, and many countries have already transitioned to a stable or even shrinking population. But there are many places where population growth continues at exponential rates. Even if population growth were to halt immediately, the consumption habits of the world's population already demand more resources than the Earth can sustain. While population growth is slowing, the world is still expected to add billions more people in the coming decades, with societies that are increasingly adopting more resource-consumptive lifestyles. What is lacking at present is the political will to do what needs to be done to address the problem. We will do it if we take seriously the warning given in a joint statement

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by the US National Academy of Sciences and its British counterpart, the Royal Society of London:

> If current predictions of population growth prove accurate and patterns of human activity on the planet remain unchanged, science and technology may not be able to prevent either irreversible degradation of the environment or continued poverty for much of the world.[79]

Notes

[1] UN Department of Economic and Social Affairs (DESA), Population Division, *World Population Prospects: The 2012 Revision*, at http://esa.un.org/unpd/wpp/unpp/panel_population.htm (accessed July 2015).

[2] Ibid.

[3] Ibid.

[4] UN General Assembly Report A/68/190, para. 38 (July 25, 2013), at http://www.un.org/esa/population/migration/SG_Report_A_68_190.pdf (accessed July 2015).

[5] UN DESA, Population Division, *World Population Prospects: The 2012 Revision*.

[6] Ibid., p. xix.

[7] Ibid., p. 3.

[8] UN Habitat, *State of the World's Cities 2012/2013*, p. 127, at https://sustainabledevelopment.un.org/content/documents/745habitat.pdf (accessed July 2015).

[9] Edward Gargan, "On Meanest of Streets, Salvaging Useful Lives," *New York Times*, January 8, 1992, p. A2.

[10] UN DESA, Population Division, *World Urbanization Prospects: The 2014 Revision, Highlights*, p. 26, at http://esa.un.org/unpd/wup/Highlights/WUP2014-Highlights.pdf (accessed July 2015).

[11] Ibid., p. 13.

[12] Ibid., pp. 26–7.

[13] UN Habitat, *State of the World's Cities 2012/2013*, p. 25.

[14] Ibid.

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[15] UN DESA, Population Division, *World Urbanization Prospects: The 2014 Revision, Highlights*, p. 1.

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Further Reading

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