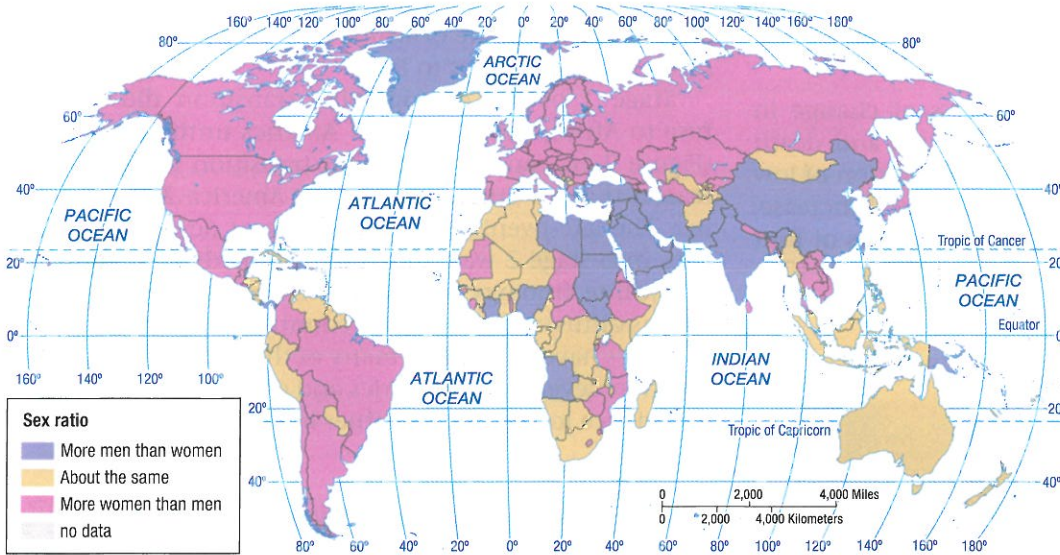


▲ **FIGURE 2-15 POPULATION UNDER AGE 15** Sub-Saharan Africa has the highest percentage of persons under age 15.



◀ **FIGURE 2-16 SEX RATIO** A map of the percentage of people over age 65 would show a reverse pattern, with the highest percentages in Europe and the lowest in Africa and Southwest Asia.

Pause and Reflect 2.2.3

Name a type of community that might have a lot more males than females.

CHECK-IN: KEY ISSUE 2

Why Is Global Population Increasing?

- ✓ The NIR measures population growth as the difference between births and deaths.
- ✓ Births and deaths are measured using several indicators.
- ✓ A community's distinctive distribution by age and gender can be displayed in a population pyramid.

KEY ISSUE 3

Why Does Population Growth Vary among Regions?

- The Demographic Transition
- Malthus on Overpopulation
- Population Futures

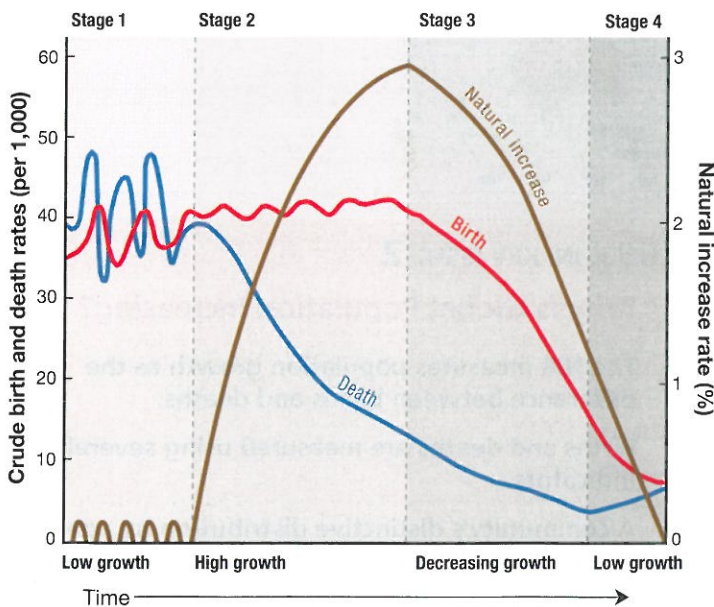
Learning Outcome 2.3.1

Describe the four stages of the demographic transition.

All countries have experienced some changes in NIR, CBR, and CDR, but at different times and at different rates. Why does global growth matter? In view of the current size of Earth's population and the NIR, will there soon be too many of us?

The Demographic Transition

The **demographic transition** is a process of change in a society's population from high crude birth and death rates and low rate of natural increase to a condition of low crude birth and death rates, low rate of natural increase, and higher total population. The process consists of four stages, and every country is in one of them (Figure 2-17).



▲ FIGURE 2-17 DEMOGRAPHIC TRANSITION MODEL The demographic transition model consists of four stages.

STAGE 1: LOW GROWTH

Very high birth and death rates produce virtually no long-term natural increase.

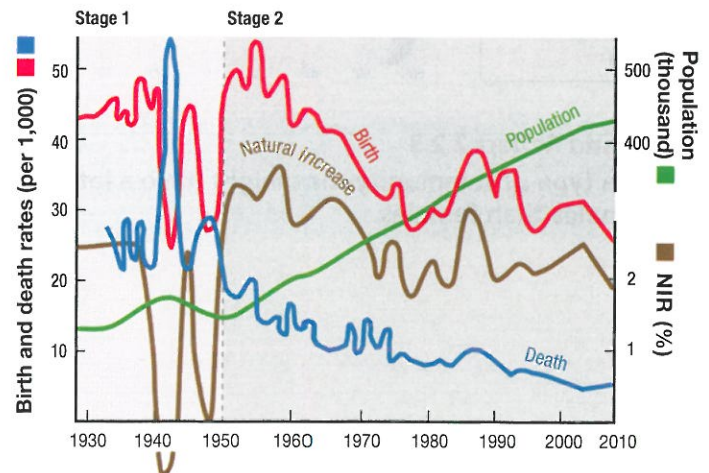
Most of human history was spent in stage 1 of the demographic transition, but today no country remains in stage 1. Every nation has moved on to at least stage 2 of the demographic transition, and, with that transition, has experienced profound changes in population. For most of this period, people depended on hunting and gathering for food (see Chapter 10). When food was easily obtained, a region's population increased, but it declined when people were unable to locate enough animals or vegetation nearby.

STAGE 2: HIGH GROWTH

Rapidly declining death rates and very high birth rates produce very high natural increase.

Europe and North America entered stage 2 of the demographic transition after 1750, as a result of the **Industrial Revolution**, which began in the United Kingdom in the late eighteenth century and diffused to the European continent and North America (including the United States) during the nineteenth century. The Industrial Revolution was a conjunction of major improvements in manufacturing goods and delivering them to market (see Chapter 11). The result of this transformation was an unprecedented level of wealth, some of which was used to make communities healthier places to live.

Stage 2 of the demographic transition did not diffuse to Africa, Asia, and Latin America until around 1950 (Figure 2-18), and it made that transition for a different reason than in Europe and North America 200 years earlier. The late-twentieth-century push of developing countries into stage 2 was caused by the **medical revolution**. Medical technology invented in Europe and North America has diffused to developing countries. Improved medical practices have eliminated many of the traditional causes of death in developing countries and enabled more people to experience longer and healthier lives.



▲ FIGURE 2-18 STAGE 2: CAPE VERDE Cape Verde entered stage 2 of the demographic transition in approximately 1950, as indicated by the large gap between birth and death rates since then.

STAGE 3: DECREASING GROWTH

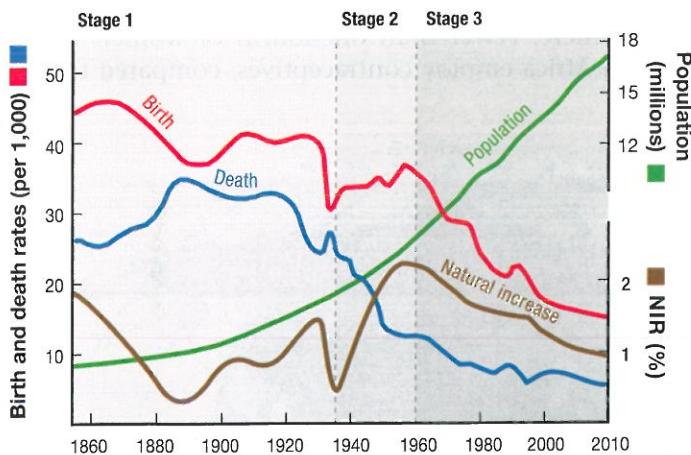
Birth rates rapidly decline, death rates continue to decline, and natural increase rates begin to moderate.

A country moves from stage 2 to stage 3 of the demographic transition when the CBR begins to drop sharply. The CDR continues to fall in stage 3 but at a much slower rate than in stage 2. The population continues to grow because the CBR is still greater than the CDR. But the rate of natural increase is more modest in countries in stage 3 than in those in stage 2 because the gap between the CBR and the CDR narrows.

A society enters stage 3 when people have fewer children. The decision to have fewer children is partly a delayed reaction to a decline in mortality,

Economic changes in stage 3 societies also induce people to have fewer offspring. People in stage 3 societies are more likely to live in cities than in the countryside and to work in offices, shops, or factories rather than on farms. Farmers often consider a large family to be an asset because children can do some of the chores. Urban homes are relatively small and may not have space to accommodate large families.

Most countries in Europe and North America (including the United States) moved from stage 2 to stage 3 of the demographic transition during the first half of the twentieth century. The movement took place during the second half of the twentieth century in many countries of Asia and Latin America, including Chile (Figure 2-19).



▲ **FIGURE 2-19 STAGE 3: CHILE** Chile entered stage 2 of the demographic transition in the 1930s, when death rates declined sharply, and stage 3 in the 1960s, when birth rates declined sharply.

STAGE 4: LOW GROWTH

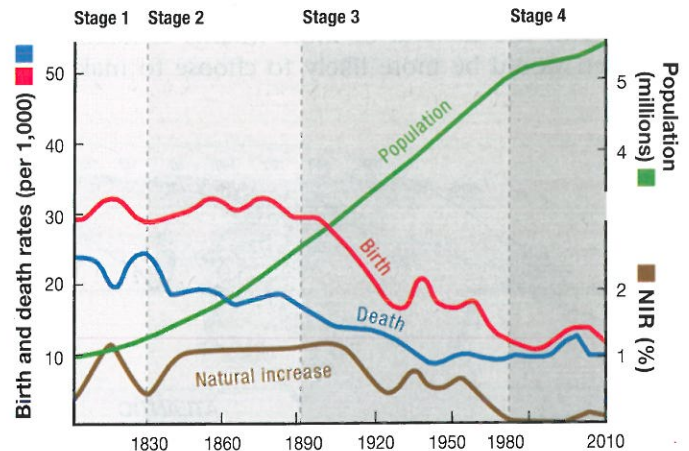
Very low birth and death rates produce virtually no long-term natural increase and possibly a decrease.

A country reaches stage 4 of the demographic transition when the CBR declines to the point where it equals the CDR and the NIR approaches zero. This condition is called **zero population growth (ZPG)**, a term often applied to stage 4 countries.

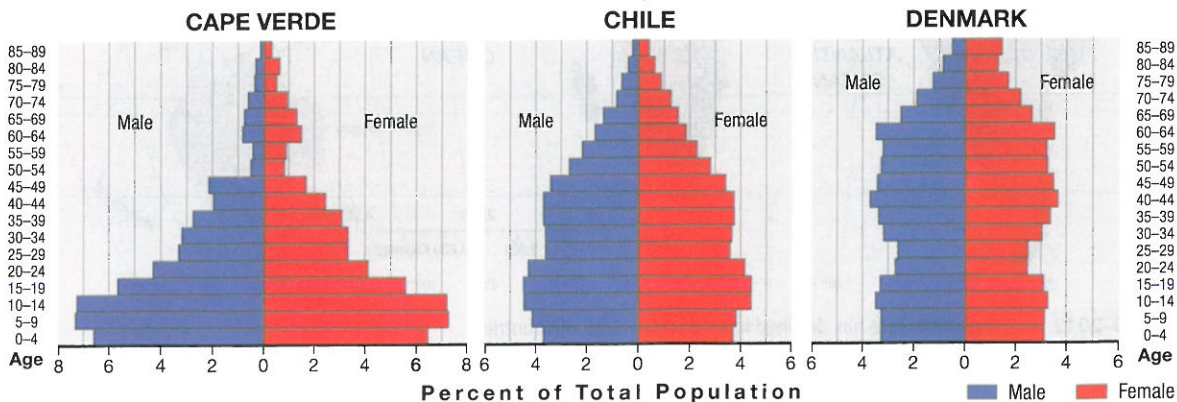
ZPG may occur when the CBR is still slightly higher than the CDR because some females die before reaching childbearing years, and the number of females in their childbearing years can vary. To account for these discrepancies, demographers more precisely define ZPG as the TFR that results in a lack of change in the total population over a long term. A TFR of approximately 2.1 produces ZPG.

Social customs again explain the movement to stage 4. Increasingly, women in stage 4 societies enter the labor force rather than remain at home as full-time homemakers. People who have access to a wider variety of birth-control methods are more likely to use some of them.

Denmark, like most other European countries, has reached stage 4 of the demographic transition (Figure 2-20). Denmark's population pyramid shows the impact of the demographic transition. Instead of a classic pyramid shape, Denmark has a column, demonstrating that the percentages of young and elderly people are nearly the same (Figure 2-21).



▲ **FIGURE 2-20 STAGE 4: DENMARK** Denmark has been in stage 4 of the demographic transition and has experienced virtually no change in total population since the 1970s.



▲ **FIGURE 2-21 POPULATION PYRAMIDS** As a country moves through the demographic transition, the shape of the pyramid flattens. (left) Cape Verde's pyramid has a broad base, as is typical of a stage 2 country. (center) Chile's graph still resembles a pyramid. (right) Denmark's pyramid is flat, an indication of the aging of the population.

DECLINING BIRTH RATES

Learning Outcome 2.3.2

Summarize two approaches to reducing birth rates.

The CBR has declined rapidly since 1990, from 27 to 20 in the world as a whole and from 31 to 22 in developing countries (Figure 2-22). Two strategies have been successful in reducing birth rates:

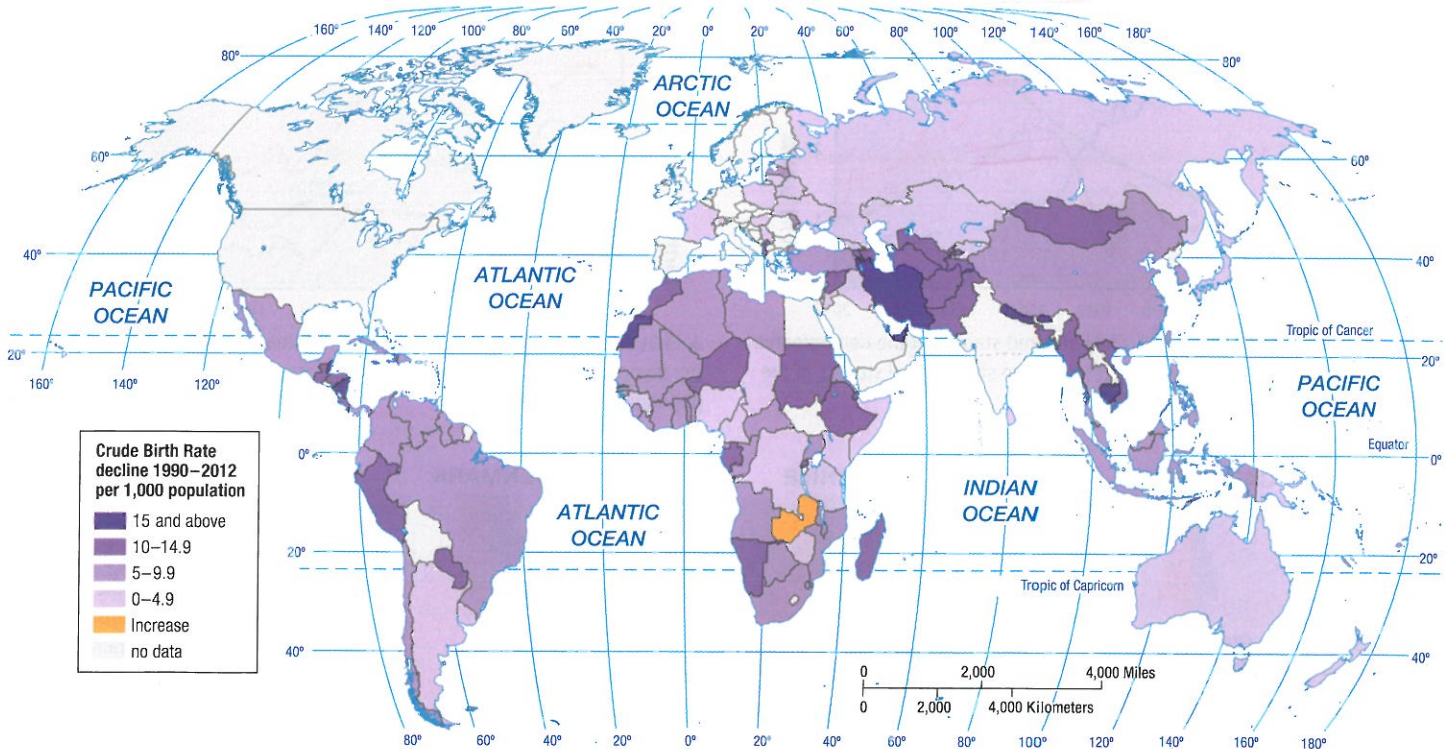
1. **Lowering birth rates through education and health care.** One approach to lowering birth rates emphasizes the importance of improving local economic conditions (Figure 2-23). A wealthier community has more money to spend on education and health-care programs that promote lower birth rates. According to this approach:
 - With more women able to attend school and to remain in school longer, they would be more likely to learn employment skills and gain more economic control over their lives.
 - With better education, women would better understand their reproductive rights, make more informed reproductive choices, and select more effective methods of contraception.
 - With improved health-care programs, IMRs would decline through such programs as improved prenatal care, counseling about sexually transmitted diseases, and child immunization.
 - With the survival of more infants ensured, women would be more likely to choose to make more

effective use of contraceptives to limit the number of children.

2. **Lowering birth rates through contraception.** The other approach to lowering birth rates emphasizes the importance of rapidly diffusing modern contraceptive methods (Figure 2-24). Economic development may promote lower birth rates in the long run, but the world cannot wait around for that alternative to take effect. Putting resources into family-planning programs can reduce birth rates much more rapidly. In developing countries, demand for contraceptive devices is greater than the available supply. Therefore, the most effective way to increase their use is to distribute more of them cheaply and quickly. According to this approach, contraceptives are the best method for lowering the birth rate.

Bangladesh is an example of a country that has had little improvement in the wealth and literacy of its people, but 56 percent of the women in the country used contraceptives in 2011 compared to 6 percent three decades earlier. Similar growth in the use of contraceptives has occurred in other developing countries, including Colombia, Morocco, and Thailand. Rapid growth in the acceptance of family planning is evidence that in the modern world, ideas can diffuse rapidly, even to places where people have limited access to education and modern communications.

The percentage of women using contraceptives is especially low in sub-Saharan Africa, so the alternative of distributing contraceptives could have an especially strong impact there. Fewer than one-fourth of women in sub-Saharan Africa employ contraceptives, compared to more



▲ **FIGURE 2-22 CBR CHANGE 1980–2012** The crude birth rate has declined in all but a handful of countries. Declines have been most rapid in Latin America and South and Southwest Asia.



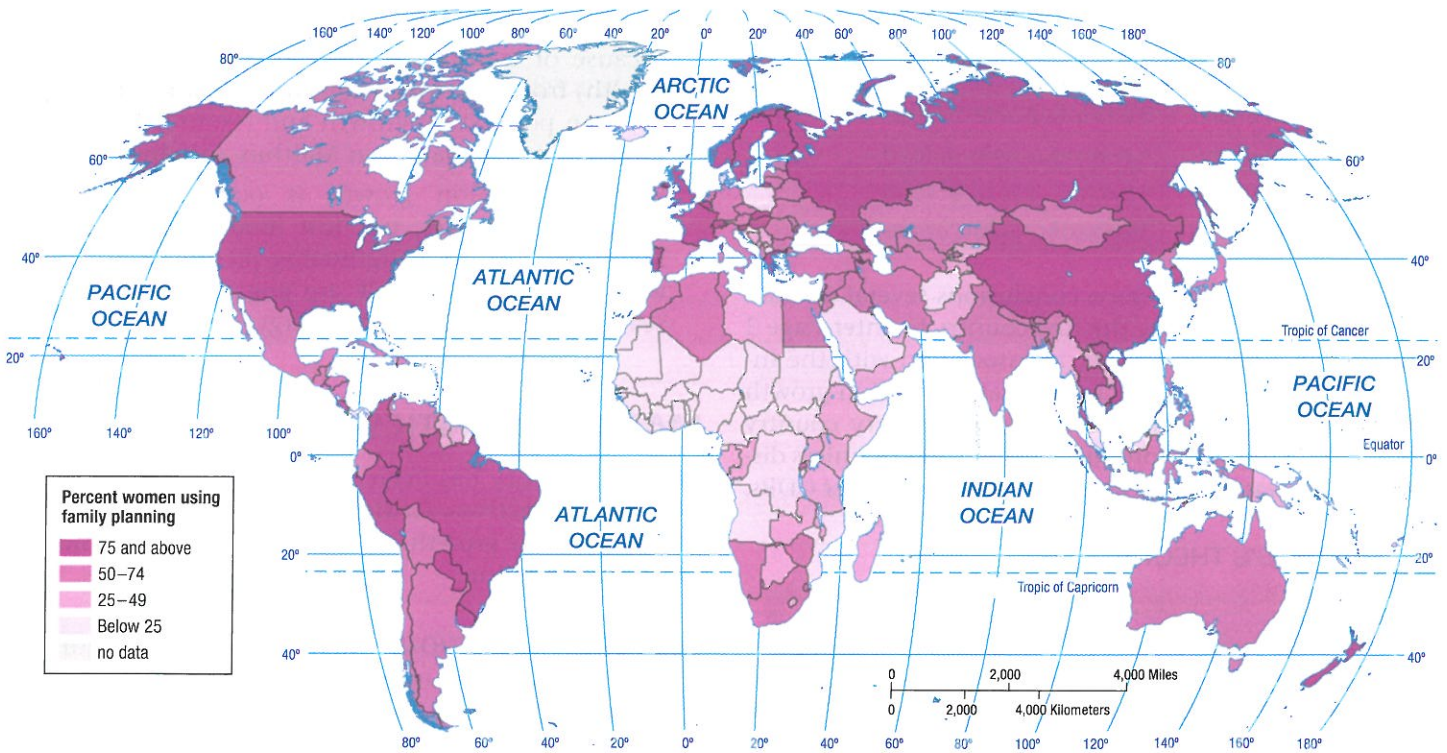
▲ FIGURE 2-23 PROMOTING FEWER CHILDREN Women talk about birth control at a health clinic in Kampong Cham, Cambodia.

than two-thirds in Asia and three-fourths in Latin America (Figure 2-25).

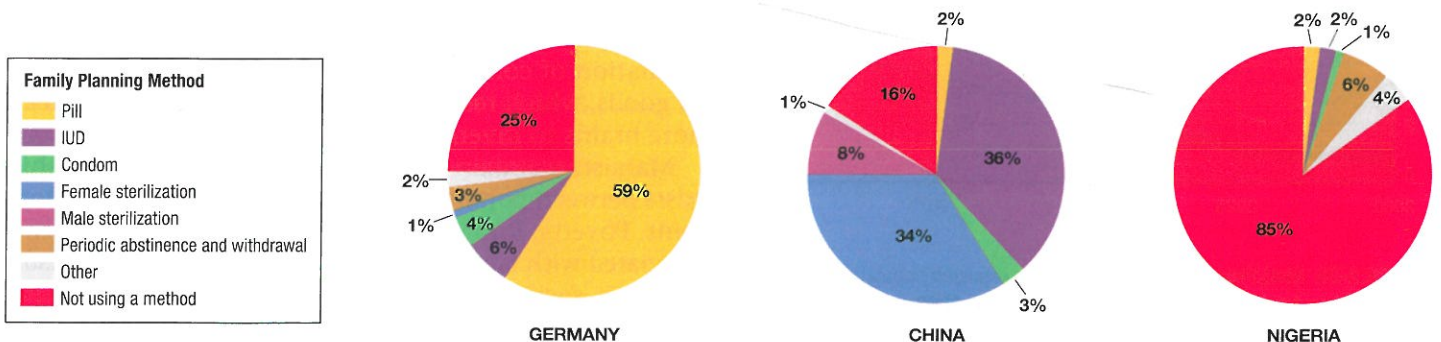
Regardless of which alternative is more successful, many oppose birth-control programs for religious and political reasons. Adherents of several religions, including Roman Catholics, fundamentalist Protestants, Muslims, and Hindus, have religious convictions that prevent them from using some or all birth-control methods. In the United States opposition is strong to terminating pregnancy by abortion, and the U.S. government has at times withheld aid to countries and family-planning organizations that advise abortion, even when such advice is only a small part of the overall aid program.

Pause and Reflect 2.3.2

Why have countries in Northern Europe had little if any decline in CBR since 1990?



▲ FIGURE 2-24 WOMEN USING FAMILY PLANNING More than two-thirds of couples in developed countries use a family-planning method. Family-planning varies widely in developing countries. China reports the world's highest rate of family planning; the lowest rates are in sub-Saharan Africa.



▲ FIGURE 2-25 FAMILY PLANNING METHODS The principal family-planning methods in developed countries like Germany are condoms and birth-control pills. The principal methods in China are intrauterine devices (IUDs) and female sterilization. People in sub-Saharan African countries such as Nigeria make minimal use of family-planning.

Malthus on Overpopulation

Learning Outcome 2.3.3

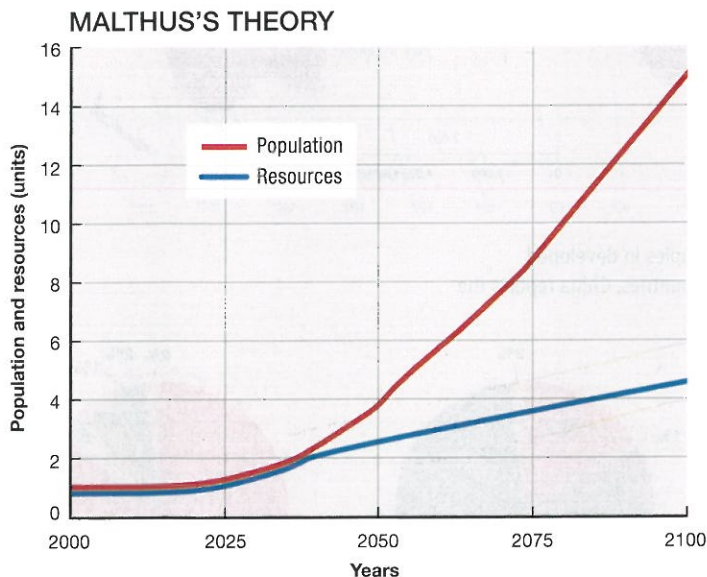
Summarize Malthus's argument about the relationship between population and resources.

English economist Thomas Malthus (1766–1834) was one of the first to argue that the world's rate of population increase was far outrunning the development of food supplies. In *An Essay on the Principle of Population*, published in 1798, Malthus claimed that the population was growing much more rapidly than Earth's food supply because population increased geometrically, whereas food supply increased arithmetically (Figure 2-26).

According to Malthus, these growth rates would produce the following relationships between people and food in the future:

Today:	1 person, 1 unit of food
25 years from now:	2 persons, 2 units of food
50 years from now:	4 persons, 3 units of food
75 years from now:	8 persons, 4 units of food
100 years from now:	16 persons, 5 units of food

Malthus stated made these conclusions several decades after England had become the first country to enter stage 2 of the demographic transition, in association with the Industrial Revolution. He concluded that population growth would press against available resources in every country unless “moral restraint” produced lower CBRs or unless disease, famine, war, or other disasters produced higher CDRs.



▲ **FIGURE 2-26 MALTHUS'S THEORY** Malthus expected population to grow more rapidly than food supply. The graph shows that if in 2000, the population of a place were 1 unit (such as 1 billion people) and the amount of resources were 1 unit (such as 1 billion tons of grain), then according to Malthus's theory, in 2100 the place would have around 15 billion people and 5 billion tons of grain).

Pause and Reflect 2.3.3

Calculate the units of population and food that Malthus predicted would exist in 200 years.

CONTEMPORARY NEO-MALTHUSIANS

Malthus's views remain influential today. Contemporary geographers and other analysts are taking another look at Malthus's theory because of Earth's unprecedented rate of natural increase during the twentieth century. Neo-Malthusians argue that two characteristics of recent population growth make Malthus's thesis even more frightening than when it was first written more than 200 years ago:

- In Malthus's time only a few relatively wealthy countries had entered stage 2 of the demographic transition, characterized by rapid population increase. Malthus failed to anticipate that relatively poor countries would have the most rapid population growth because of transfer of medical technology (but not wealth) from developed countries. As a result, the gap between population growth and resources is wider in some countries than even Malthus anticipated.
- World population growth is outstripping a wide variety of resources, not just food production. Neo-Malthusians paint a frightening picture of a world in which billions of people are engaged in a desperate search for food, water, and energy.

MALTHUS'S CRITICS

Malthus's theory has been severely criticized from a variety of perspectives. Criticism has been leveled at both the population growth and resource depletion sides of Malthus's equation.

RESOURCE DEPLETION. Many geographers consider Malthusian beliefs unrealistically pessimistic because they are based on a belief that the world's supply of resources is fixed rather than expanding.

POPULATION GROWTH. Critics disagree with Malthus's theory that population growth is a problem. To the contrary, a larger population could stimulate economic growth and, therefore, production of more food. A large population of consumers can generate a greater demand for goods, which results in more jobs. More people mean more brains to invent good ideas for improving life.

Marxists maintain that no cause-and-effect relationship exists between population growth and economic development. Poverty, hunger, and other social welfare problems associated with lack of economic development are a result of unjust social and economic institutions, not population growth. They argue that the world possesses sufficient resources to eliminate global hunger and poverty, if only these resources are shared equally.

MALTHUS'S THEORY AND REALITY

On a global scale, conditions during the past half-century have not supported Malthus's theory. Even though the human population has grown at its most rapid rate ever, world food production has consistently grown at a faster rate than the NIR since 1950. Malthus was fairly close to the mark on food production but much too pessimistic on population growth.

Overall food production has increased during the last half-century somewhat more rapidly than Malthus predicted. In India, for example, rice production has followed Malthus's expectations fairly closely, but wheat production has increased twice as fast as Malthus expected (Figure 2-27). Better growing techniques, higher-yielding seeds, and cultivation of more land have contributed to the expansion in the food supply (see Chapter 10). Many people in the world cannot afford to buy food or do not have access to sources of food, but these are problems of distribution of wealth rather than insufficient global production of food, as Malthus theorized.

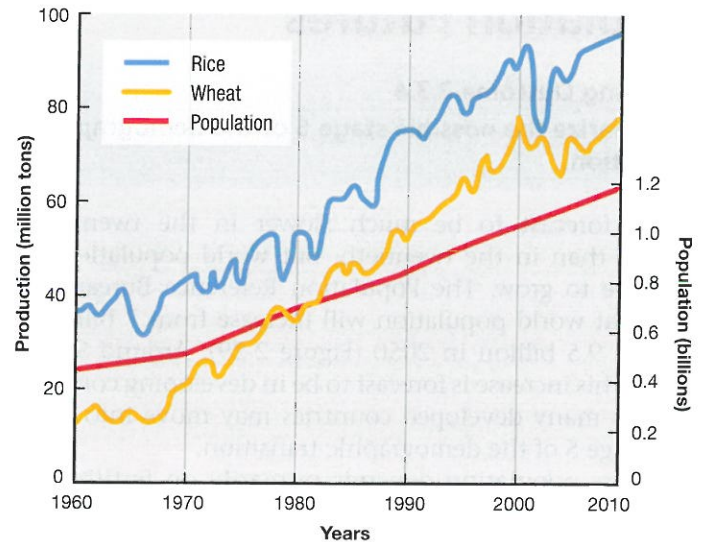
It is on the population side of the equation that Malthus has proved to be inaccurate. His model expected population to quadruple during a half-century, but even in India—a country known for relatively rapid growth (see the next section)—population has increased more slowly than food supply.

However, neo-Malthusians point out that production of both wheat and rice has slowed in India in recent years, as shown in Figure 2-27. Without new breakthroughs in food production, India will not be able to keep food supply ahead of population growth.

JAPAN'S DECLINING POPULATION

Japan is an example of a country that faces the prospect of population decline in future, from 127 million in 2010 to 95 million in 2050, according to the Japanese government. With population decline will come a dramatic shift in the country's population structure (Figure 2-28). By 2050, the Japanese pyramid is expected to be reversed from that of 1950. Instead of a very high percentage of children, Japan will have a very high percentage of elderly people.

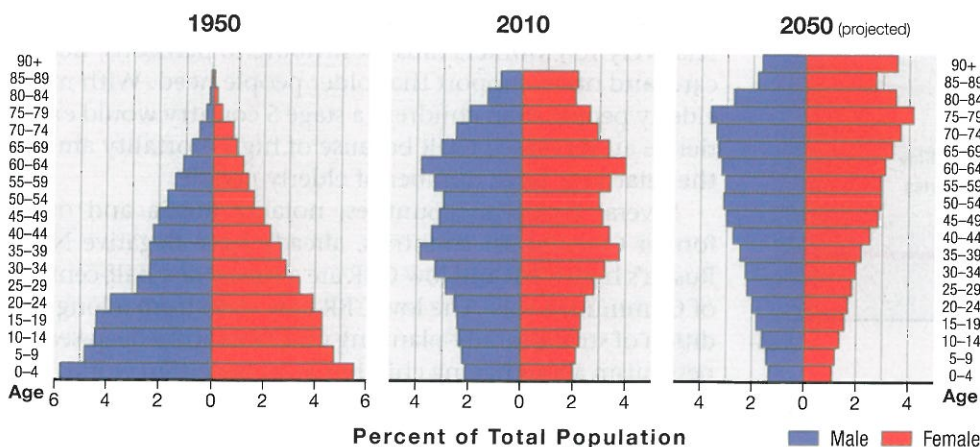
INDIA'S RECENT EXPERIENCE



▲ **FIGURE 2-27** POPULATION AND FOOD PRODUCTION IN INDIA
Production of wheat and rice has increased more rapidly than has population.

In the United States, the population is expected to continue to grow through immigration rather than through natural increase (see Chapter 3), but Japan discourages immigration. Japanese society, having placed a high value on social conformity for thousands of years, does not welcome outsiders from other cultural traditions.

With few immigrants, Japan faces a severe shortage of workers. Japan is addressing the labor force shortage primarily by encouraging more Japanese people to work, especially older people and women. Programs make it more attractive for older people to continue working, to receive more health-care services at home instead of in hospitals, and to borrow against the value of their homes to pay for health care. In the long run, more women in the labor force may translate into an even lower birth rate and therefore an even lower NIR in the future. Rather than combine work with child rearing, Japanese women are expected to make a stark choice: either marry and raise children or remain single and work.



◀ **FIGURE 2-28** JAPAN'S CHANGING POPULATION PYRAMIDS
Japan's population pyramid has shifted from a broad base in 1950 to a rectangular shape. In the future, the bottom of the pyramid is expected to contract and the top to expand.

Population Futures

Learning Outcome 2.3.4

Summarize the possible stage 5 of the demographic transition.

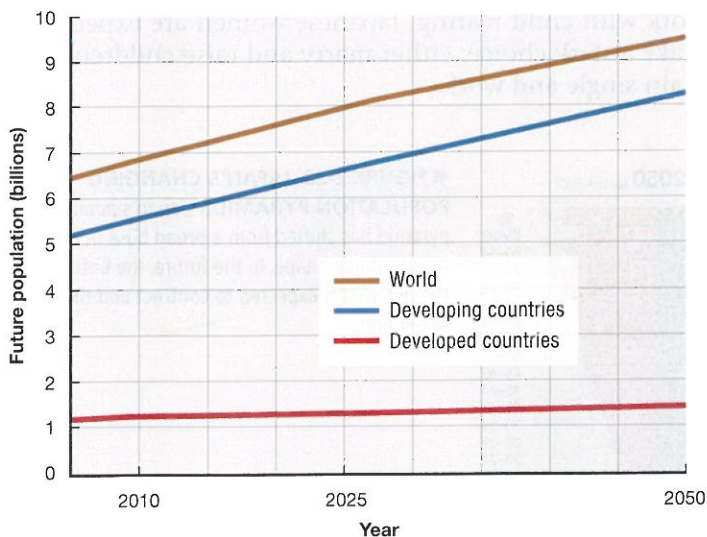
NIR is forecast to be much slower in the twenty-first century than in the twentieth, but world population will continue to grow. The Population Reference Bureau forecasts that world population will increase from 7 billion in 2011 to 9.5 billion in 2050 (Figure 2-29). Around 97 percent of this increase is forecast to be in developing countries, whereas many developed countries may move into a possible stage 5 of the demographic transition.

Future population depends primarily on fertility. The United Nations forecasts that if the current TFR of 2.5 remains unchanged, world population would reach 12 billion in 2050. On the other hand, if TFR declines in the next few years to 1.5, world population would actually decline to 8 billion in 2050.

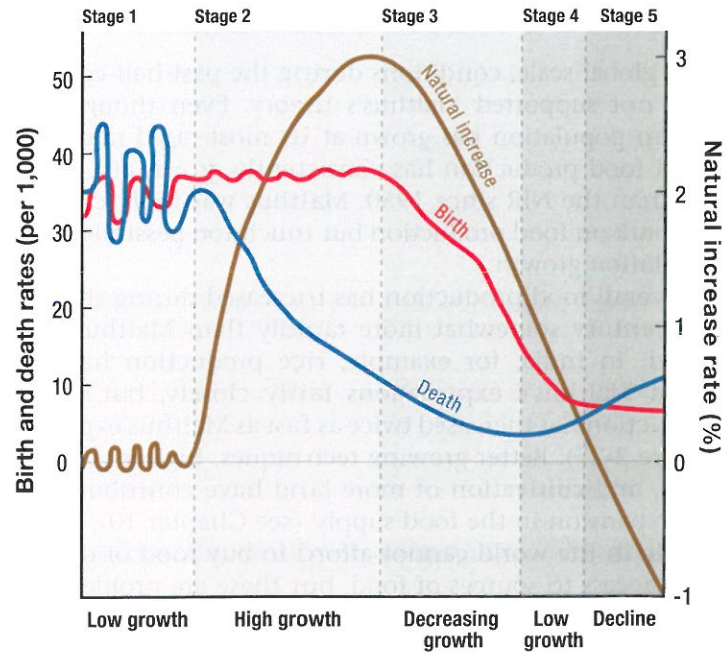
DEMOGRAPHIC TRANSITION POSSIBLE STAGE 5: DECLINE

A country that has passed through the four stages of the demographic transition has in some ways completed a cycle—from little or no natural increase in stage 1 to little or no natural increase in stage 4. Two crucial demographic differences underlie this process:

- The total population of the country is much higher in stage 4 than in stage 1.
- At the beginning of the demographic transition, the CBRs and CDRs are high—35 to 40 per 1,000—whereas at the end of the process the rates are very low, approximately 10 per 1,000.



▲ FIGURE 2-29 FUTURE POPULATION GROWTH Nearly all of the world's population growth is forecast to be in developing countries.



▲ FIGURE 2-30 POSSIBLE DEMOGRAPHIC TRANSITION STAGE 5 Stage 5 of the demographic transition would be characterized by a negative NIR, because the CDR would be greater than the CBR.

The four-stage demographic transition is characterized by two big breaks with the past. The first break—the sudden drop in the death rate that comes from technological innovation—has been accomplished everywhere. The second break—the sudden drop in the birth rate that comes from changing social customs—has yet to be achieved in many countries.

Meanwhile, a possible stage 5 of the demographic transition is predicted by demographers for some developed countries. Stage 5 would be characterized by a very low CBR, an increasing CDR, and therefore a negative NIR (Figure 2-31). After several decades of very low birth rates, a stage 5 country would have relatively few young women aging into child-bearing years. As the smaller pool of women each chooses to have fewer children, birth rates would continue to fall even more than in stage 4.

The world's future population will definitely be older. The elderly support ratio is the number of working-age people (ages 15 to 64) divided by the number of persons 65 and older (Figure 2-30). A small number means that relatively few workers must contribute to pensions, health care, and other support that older people need. With more elderly people than children, a stage 5 country would experience an increased CDR because of high mortality among the relatively large number of elderly people.

Several European countries, notably Russia and other former Communist countries, already have negative NIRs. Russia's high CDR and low CBR are a legacy of a half-century of Communist rule. The low CBR may stem from a long tradition of strong family-planning programs and a deep-seated pessimism about having children in an uncertain world. The high CDR may be a legacy of inadequate pollution controls and inaccurate reporting by the Communists.