5.3 Human Population Growth

Key Questions

- ***How has human population size changed over time?***
- ***Why do population growth rates differ among countries?***

Vocabulary

demography
demographic transition

Taking Notes

Preview Visuals Before you read, preview the graphs in **Figures 5–11, 5–12,** and **5–13.** Make a list of questions about the graphs. Then, as you read, write down the answers to your questions.

BUILD Vocabulary

ACADEMIC WORDS The adverb **dramatically** means "forcefully" or "significantly." When something is described as having changed dramatically, it means it has changed in a striking way.

THINK ABOUT IT How quickly is the global human population growing? In the United States and other developed countries, the population growth rate is low. But in some developing countries, the population is growing very rapidly. Worldwide, there are more than four human births every second. At this birthrate, the human population is well on its way to reaching 9 billion in your lifetime. What do the present and future of human population growth mean for our species and its interactions with the rest of the biosphere?

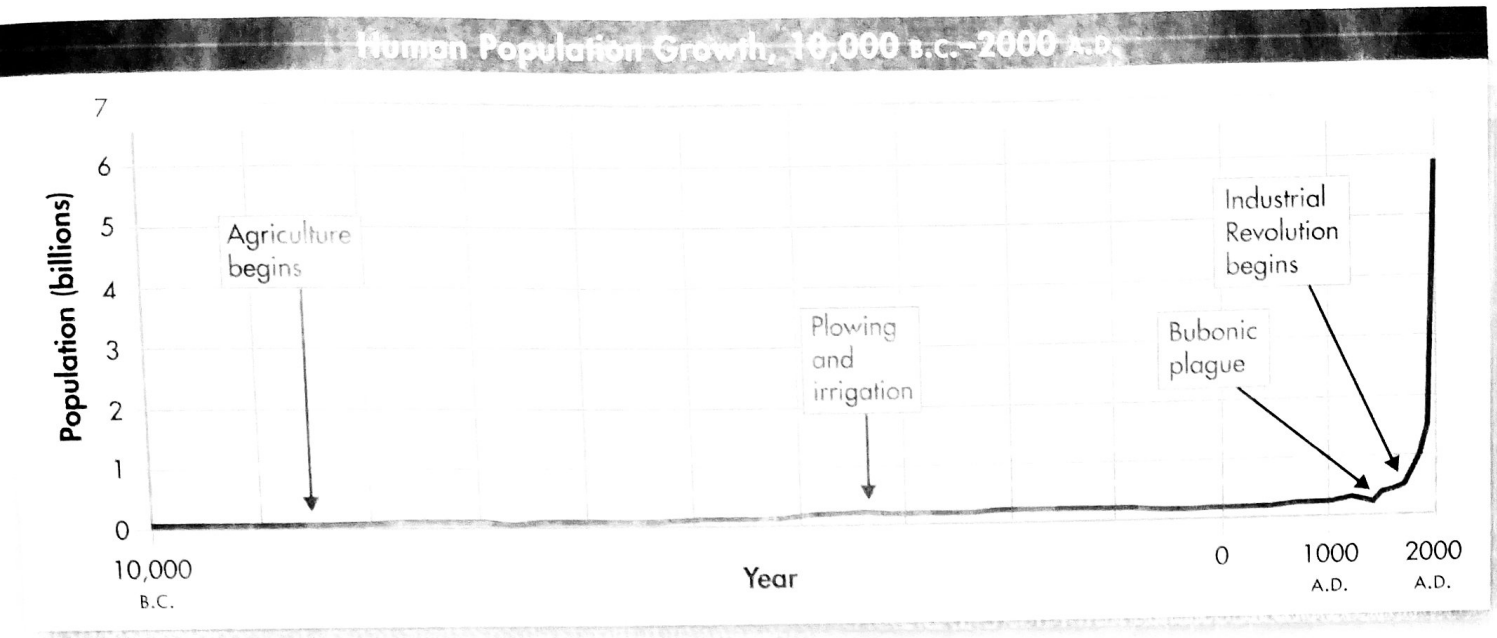
Historical Overview

How has human population size changed over time?

The human population, like populations of other organisms, tends to increase. The rate of that increase has changed dramatically over time. For most of human existence, the population grew slowly because life was harsh. Food was hard to find. Predators and diseases were common and life-threatening. These limiting factors kept human death rates very high. Until fairly recently, only half the children in the world survived to adulthood. Because death rates were so high, families had many children, just to make sure that some would survive.

Exponential Human Population Growth As civilization advanced, life became easier, and the human population began to grow more rapidly. That trend continued through the Industrial Revolution in the 1800s. Food supplies became more reliable, and essential goods could be shipped around the globe. Several factors, including improved nutrition, sanitation, medicine, and healthcare, dramatically reduced death rates. Yet, birthrates in most parts of the world remained high. The combination of lower death rates and high birthrates led to exponential growth, as shown in **Figure 5–11.**

The Predictions of Malthus As you've learned, this kind of exponential growth cannot continue forever. Two centuries ago, this problem troubled English economist Thomas Malthus. Malthus suggested that only war, famine, and disease could limit human population growth. Can you see what Malthus was suggesting? He thought that human populations would be regulated by competition (war), limited resources (famine), parasitism (disease), and other density-dependent factors. Malthus's work was vitally important to the thinking of Charles Darwin.



World Population Growth Slows So what is happening to human population growth today? Exponential growth continued up to the second half of the twentieth century. The human population growth rate reached a peak around 1962–1963, and then it began to drop. The size of the global human population is still growing rapidly, but the rate of growth is slowing down.

It took 123 years for the human population to double from 1 billion in 1804 to 2 billion in 1927. Then it took just 33 years for it to grow by another billion people. The time it took for the population to increase each additional billion continued to fall until 1999, when it began, very slowly, to rise. It now takes longer for the global human population to grow by 1 billion than it did 20 years ago. What has been going on?

FIGURE 5–11 Human Population Growth Over Time After a slow start, the human population grew exponentially following advances in civilization. Change can be dramatic; these photos of Katmandu, Nepal, were taken from the same position in 1969 and 1999—just 30 years apart!

Patterns of Human Population Growth

Why do population growth rates differ among countries?

Scientists have identified several social and economic factors that affect human population growth. The scientific study of human populations is called **demography.** Demography examines characteristics of human populations and attempts to explain how those populations will change over time. **Birthrates, death rates, and the age structure of a population help predict why some countries have high growth rates while other countries grow more slowly.**

In Your Notebook *Explain how the size of the global human population can increase while the rate of growth decreases.*

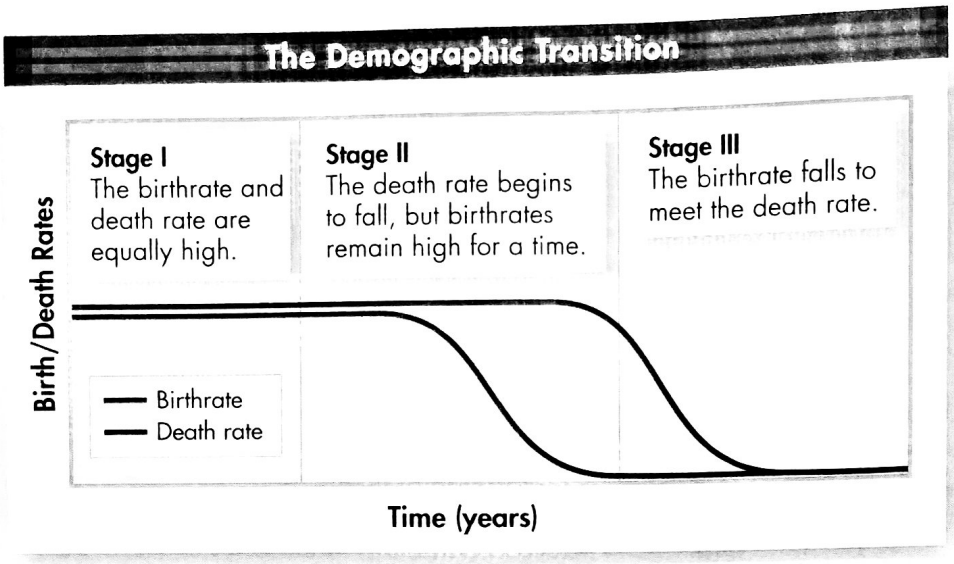
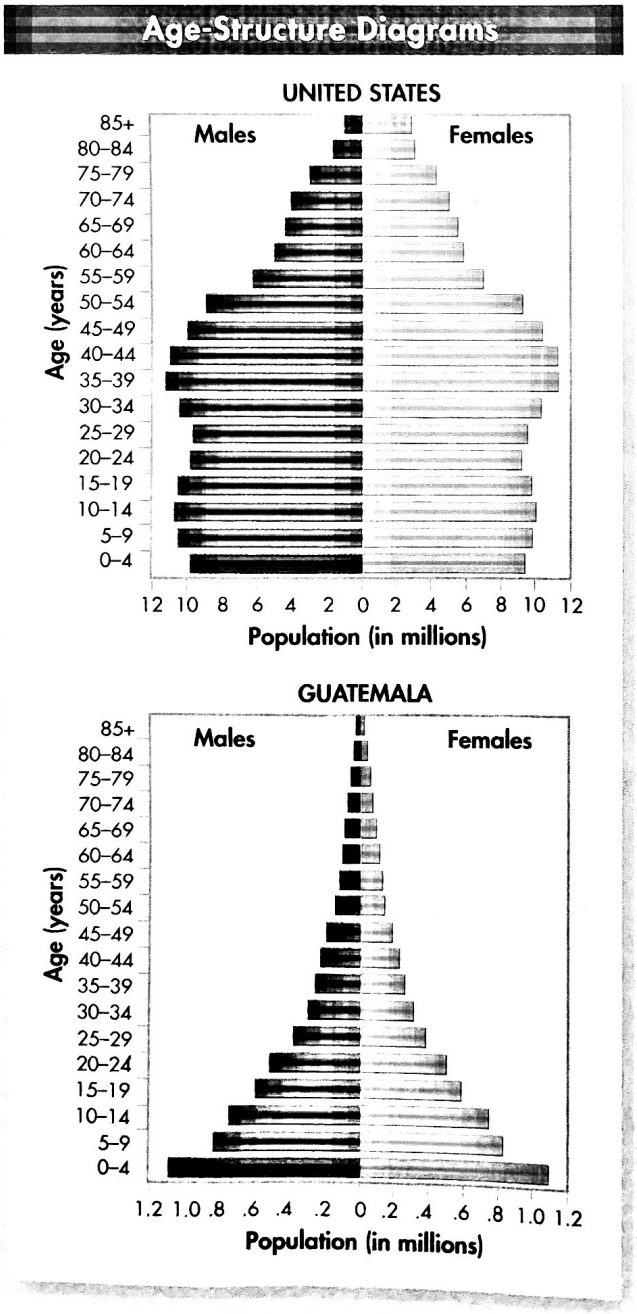


FIGURE 5–12 The Demographic Transition Human birthrates and death rates are high for most of history (Stage I). Advances in nutrition, sanitation, and medicine lead to lower death rates. Birthrates remain high for a time, so births greatly exceed deaths (Stage II), and the population increases exponentially. As levels of education and living standards rise, families have fewer children and the birthrate falls (Stage III), and population growth slows. The demographic transition is complete when the birthrate meets the death rate, and population growth stops.



The Demographic Transition

Human societies had equally high birthrates and death rates during most of history. But over the past century, population growth in the United States, Japan, and much of Europe slowed dramatically. Demographers developed a hypothesis to explain this shift. According to this hypothesis, these countries have completed the **demographic transition,** a dramatic change from high birthrates and death rates to low birthrates and death rates. The demographic transition is divided into three stages, as shown in **Figure 5–12.**

To date, the United States, Japan, and Europe have completed the demographic transition. Parts of South America, Africa, and Asia are passing through Stage II. (The United States passed through Stage II between 1790 and 1910.) A large part of ongoing human population growth is happening in only ten countries, with India and China in the lead. Globally, human population is still growing rapidly, but the rate of growth is slowing down. Our J-shaped growth curve may be changing into a logistic growth curve.

Age Structure and Population Growth

To understand population growth in different countries, we turn to age-structure diagrams. **Figure 5–13** compares the age structure of the U.S. population with that of Guatemala, a country in Central America. In the United States, there are nearly equal numbers of people in each age group. This age structure predicts a slow but steady growth rate for the near future. In Guatemala, on the other hand, there are many more young children than teenagers, and many more teenagers than adults. This age structure predicts a population that will double in about 30 years.

FIGURE 5–13 Comparison of Age Structures These diagrams compare the populations of the United States and Guatemala. Notice the difference in their *x*-axis scales. **Analyze Data** *How do the two countries differ in the percentages of 10–14-year-olds in their populations?*

Future Population Growth To predict how the world's human population will grow, demographers consider many factors, including the age structure of each country and the effects of diseases on death rates—especially AIDS in Africa and parts of Asia. Current projections suggest that by 2050 the world population will reach 9 billion people. Will the human population level out to a logistic growth curve and become stable? This may happen if countries that are currently growing rapidly complete the demographic transition.

Current data suggest that global human population will grow more slowly over the next 50 years than it grew over the last 50 years. But because the growth rate will still be higher than zero in 2050, our population will continue to grow. In the next chapter, we will examine the effect of human population growth on the biosphere.

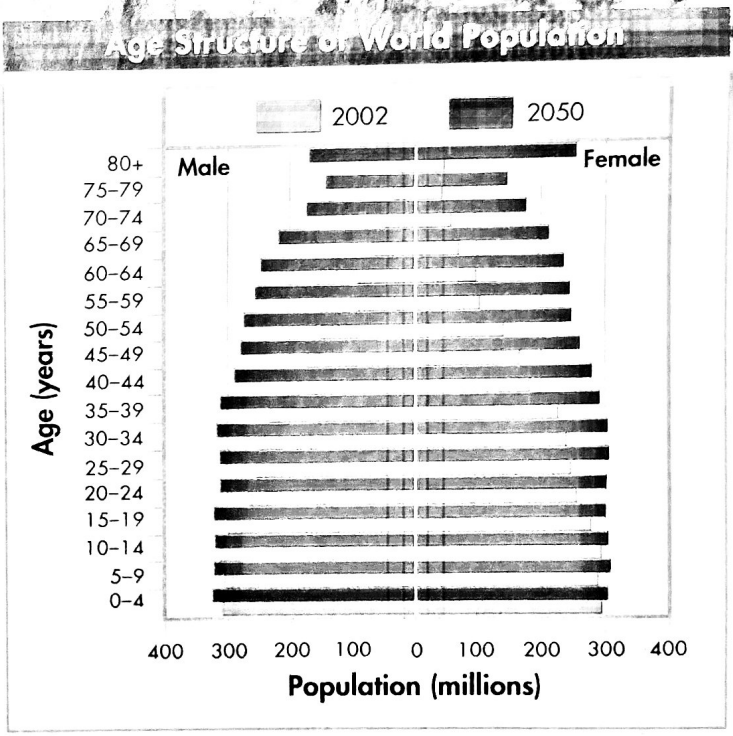


FIGURE 5–14 A Growing Population This graph (from the U.S. Census Bureau, International Database) shows the projected age structure of the world population in 2050. As population numbers climb, cities face various challenges, such as housing. The photo above shows a housing complex in Hong Kong; each apartment building is home to thousands of residents.

5.3 Assessment

Review Key Concepts

1. a. Review Describe the general trend of human population growth over time.

b. Relate Cause and Effect What factors contributed to the pattern of growth shown in **Figure 5–11**?

2. a. Review Why do populations in different countries grow at different rates?

b. Explain Describe the demographic transition and explain how it could affect a country's population growth rate.

c. Form an Opinion Are age-structure diagrams useful in predicting future population trends?

VISUAL THINKING

3. Describe the changes in human population predicted by **Figure 5–14**. How do you think those changes will affect society?