KEY ISSUE 1

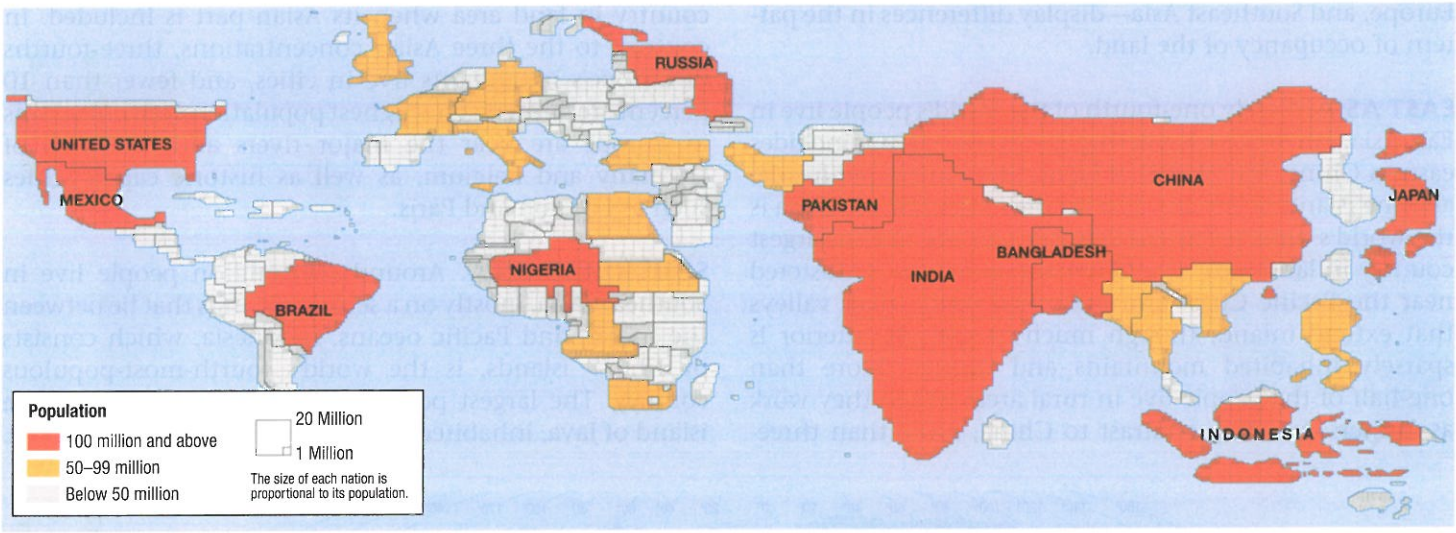
Where Is the World's Population Distributed?

- **Population Concentrations**
- **Population Density**

Human beings are not distributed uniformly across Earth. We can understand how population is distributed by examining two basic properties—concentration and density. Geographers identify regions of Earth's surface where population is clustered and regions where it is sparse. Several density measures help geographers explain the relationship between the number of people and available resources. The number of people is usually determined by a census of population, discussed in Contemporary Geographic Tools.

The concentration of the world's population can be displayed on a cartogram, which depicts the sizes of countries according to population rather than land area, as is the case with most maps (Figure 2-2).

When compared to a more typical equal-area map, such as the one shown in Figure 2-3, the population cartogram displays major population clusters as much larger. As you look at maps of population growth and other topics in this and subsequent chapters, pay special attention to Asia and Europe because global patterns are heavily influenced by conditions in these regions, where two-thirds of the world's people live.



▲ FIGURE 2-2 **POPULATION CARTOGRAM** In a cartogram, countries are displayed by size of population rather than land area.

CONTEMPORARY GEOGRAPHIC TOOLS

Spatial Analysis and the Census

Geography relies on statistical data to conduct spatial analysis. The single most important data source for human geographers is the **census**. Many of the maps in this book rely on census data.

In the United States, a census of population and a census of housing take place once a decade, in years ending in zero, including 2010. Censuses of various types of businesses are undertaken once every five years.

Despite its importance, the census is controversial in many countries, for two reasons:

- **Nonparticipation.** Homeless people, ethnic minorities, and citizens of other countries who do not have proper immigration documents may be less likely to complete the census form. These individuals may fear that the census could turn over the forms to another government agency, such as the FBI or the Department of Homeland Security in the United States.
- **Sampling.** Statistical sampling techniques can be utilized to get a more accurate count, as well as to identify detailed characteristics of people, housing, and businesses. The district boundaries of the U.S. House of Representatives, as well as of the 50 state legislatures, must be redrawn every decade so that each has the same number of people. The U.S. Supreme Court has ruled that Article 1, Section 2 of the U.S. Constitution prevents using sampling to redraw district boundaries. Politicians sympathetic to the needs of the homeless and immigrants have been especially vocal in support of sampling, whereas those from small towns and rural areas, where the census count is more accurate, are more inclined to oppose it.

Population Concentrations

Learning Outcome 2.1.1

Describe regions where population is clustered and where it is sparse.

Two-thirds of the world's inhabitants are clustered in four regions (Figure 2-3). The four population clusters occupy generally low-lying areas, with fertile soil and temperate climate. Most live near the ocean or near a river with easy access to an ocean, rather than in the interior of major landmasses.

CLUSTERS

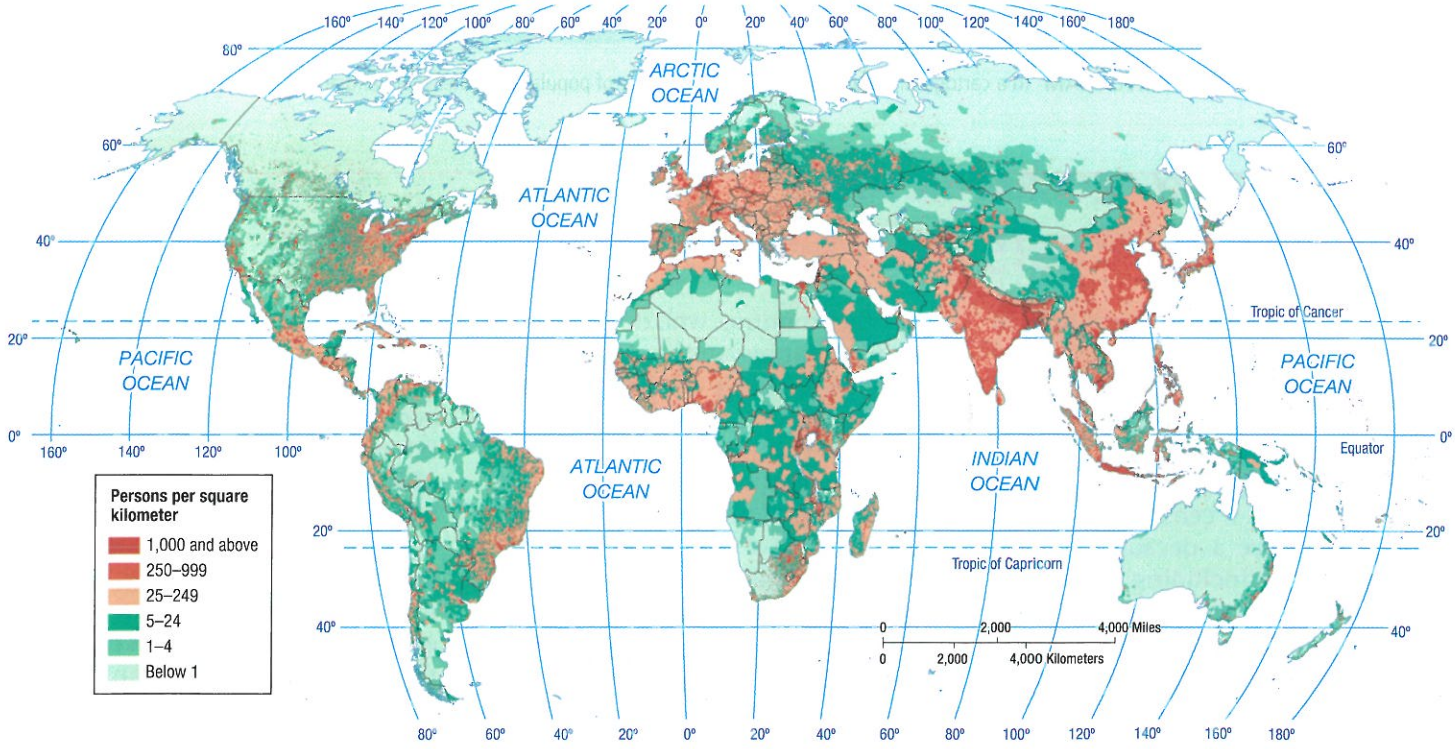
The four major population clusters—East Asia, South Asia, Europe, and Southeast Asia—display differences in the pattern of occupancy of the land.

EAST ASIA. Nearly one-fourth of the world's people live in East Asia. The region, bordering the Pacific Ocean, includes eastern China, the islands of Japan, the Korean peninsula, and the island of Taiwan. The People's Republic of China is the world's most populous country and the fourth-largest country in land area. The Chinese population is clustered near the Pacific Coast and in several fertile river valleys that extend inland, though much of China's interior is sparsely inhabited mountains and deserts. More than one-half of the people live in rural areas where they work as farmers. In sharp contrast to China, more than three-fourths of all Japanese and Koreans are clustered in urban areas and work at industrial or service jobs.

SOUTH ASIA. Nearly one-fourth of the world's people live in South Asia, which includes India, Pakistan, Bangladesh, and the island of Sri Lanka. The largest concentration of people within South Asia lives along a 1,500-kilometer (900-mile) corridor from Lahore, Pakistan, through India and Bangladesh to the Bay of Bengal. Much of this area's population is concentrated along the plains of the Indus and Ganges rivers. Population is also heavily concentrated near India's two long coastlines—the Arabian Sea to the west and the Bay of Bengal to the east. Like the Chinese, most people in South Asia are farmers living in rural areas.

EUROPE. Europe includes four dozen countries, ranging from Monaco, with 1 square kilometer (0.7 square miles) and a population of 33,000, to Russia, the world's largest country in land area when its Asian part is included. In contrast to the three Asian concentrations, three-fourths of Europe's inhabitants live in cities, and fewer than 10 percent are farmers. The highest population concentrations in Europe are near the major rivers and coalfields of Germany and Belgium, as well as historic capital cities such as London and Paris.

SOUTHEAST ASIA. Around 600 million people live in Southeast Asia, mostly on a series of islands that lie between the Indian and Pacific oceans. Indonesia, which consists of 13,677 islands, is the world's fourth-most-populous country. The largest population concentration is on the island of Java, inhabited by more than 100 million people.



▲ **FIGURE 2-3 POPULATION DISTRIBUTION** People are not distributed uniformly across Earth's surface.

Several islands that belong to the Philippines contain high population concentrations, and population is also clustered along several river valleys and deltas at the southeastern tip of the Asian mainland, known as Indochina. Like China and South Asia, the Southeast Asia concentration is characterized by a high percentage of people working as farmers in rural areas.

OTHER CLUSTERS. The largest population concentration in the Western Hemisphere is in the northeastern United States and southeastern Canada. This cluster extends along the Atlantic Coast from Boston to Newport News, Virginia, and westward along the Great Lakes to Chicago. The largest cluster in Africa is along the Atlantic coast, especially the portion facing south. Nigeria is the most populous country in Africa. As in the three Asian concentrations, most West Africans work in agriculture.

Pause and Reflect 2.1.1
Why isn't North America one of the four major population clusters?

SPARSELY POPULATED REGIONS

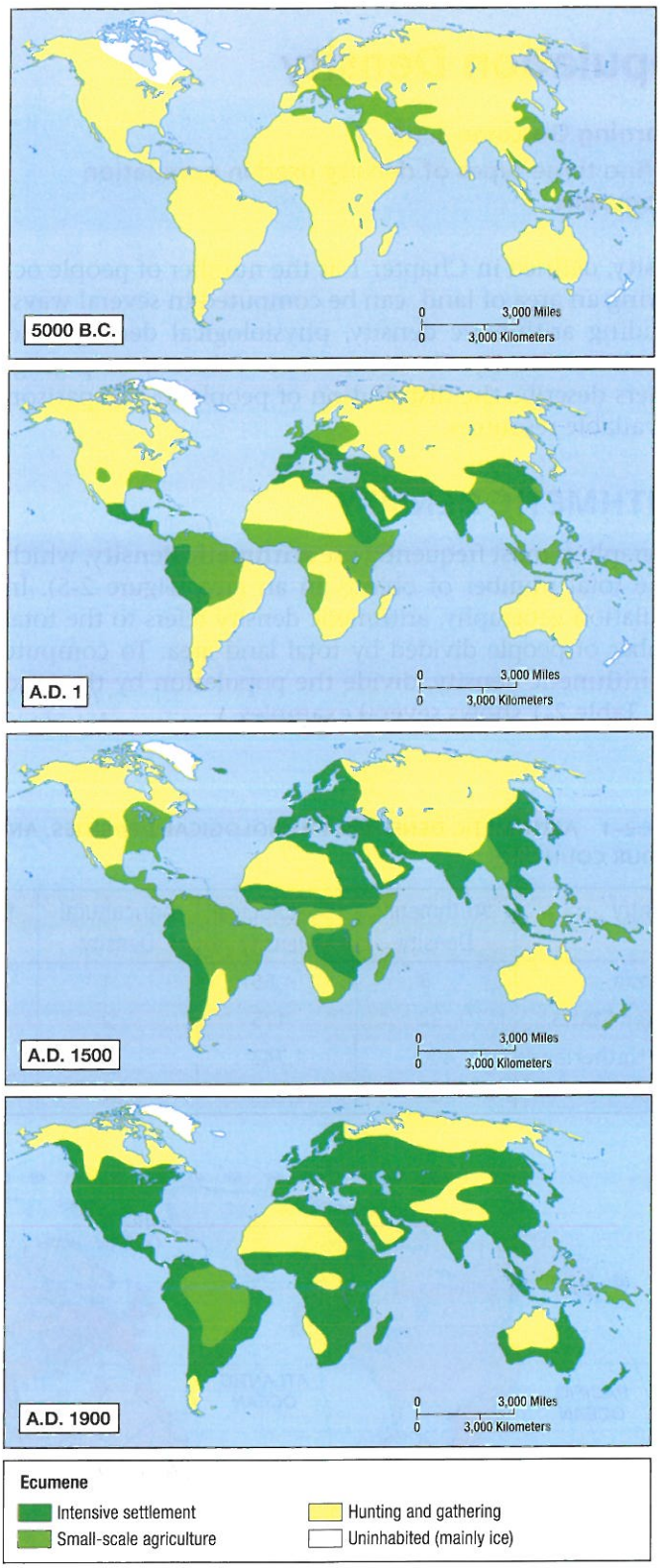
Human beings avoid clustering in certain physical environments. Relatively few people live in regions that are too dry, too wet, too cold, or too mountainous for activities such as agriculture. The areas of Earth that humans consider too harsh for occupancy have diminished over time, whereas the portion of Earth's surface occupied by permanent human settlement—called the **ecumene**—has increased (Figure 2-4).

DRY LANDS. Areas too dry for farming cover approximately 20 percent of Earth's land surface. Deserts generally lack sufficient water to grow crops that could feed a large population, although some people survive there by raising animals, such as camels, that are adapted to the climate. Dry lands contain natural resources useful to people—notably, much of the world's oil reserves.

WET LANDS. Lands that receive very high levels of precipitation, located primarily near the equator, may also be inhospitable for human occupation. The combination of rain and heat rapidly depletes nutrients from the soil and thus hinders agriculture.

COLD LANDS. Much of the land near the North and South poles is perpetually covered with ice or the ground is permanently frozen (permafrost). The polar regions are unsuitable for planting crops, few animals can survive the extreme cold, and few humans live there.

HIGH LANDS. The highest mountains in the world are steep, snow covered, and sparsely settled. However, some high-altitude plateaus and mountain regions are more densely populated, especially at low latitudes (near the equator) where agriculture is possible at high elevations.



▲ **FIGURE 2-4 ECUMENE** Seven thousand years ago humans occupied only a small percentage of Earth's land area, primarily in Southwest Asia, Eastern Europe, and East Asia. Even 500 years ago much of North America and Asia lay outside the ecumene. Still, approximately three-fourths of the world's population live on only 5 percent of Earth's surface. The balance of Earth's surface consists of oceans (about 71 percent) and less intensively inhabited land.

Population Density

Learning Outcome 2.1.2
Define three types of density used in population geography.

Density, defined in Chapter 1 as the number of people occupying an area of land, can be computed in several ways, including arithmetic density, physiological density, and agricultural density. These measures of density help geographers describe the distribution of people in comparison to available resources.

ARITHMETIC DENSITY

Geographers most frequently use **arithmetic density**, which is the total number of objects in an area (Figure 2-5). In population geography, arithmetic density refers to the total number of people divided by total land area. To compute the arithmetic density, divide the population by the land area. Table 2-1 shows several examples.

Arithmetic density enables geographers to compare the number of people trying to live on a given piece of land in different regions of the world. Thus, arithmetic density answers the "where" question. However, to explain why people are not uniformly distributed across Earth's surface, other density measures are more useful.

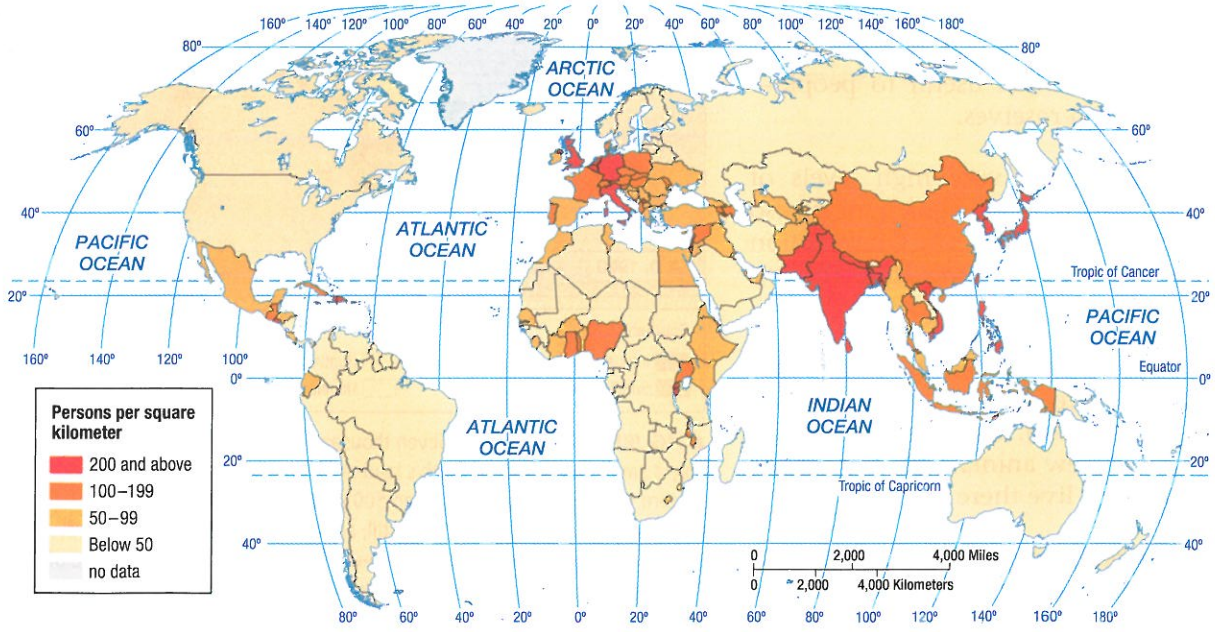
PHYSIOLOGICAL DENSITY

Looking at the number of people per area of a certain type of land in a region provides a more meaningful population measure than arithmetic density. Land suited for agriculture is called arable land. In a region, the number of people supported by a unit area of arable land is called the **physiological density** (Figure 2-6).

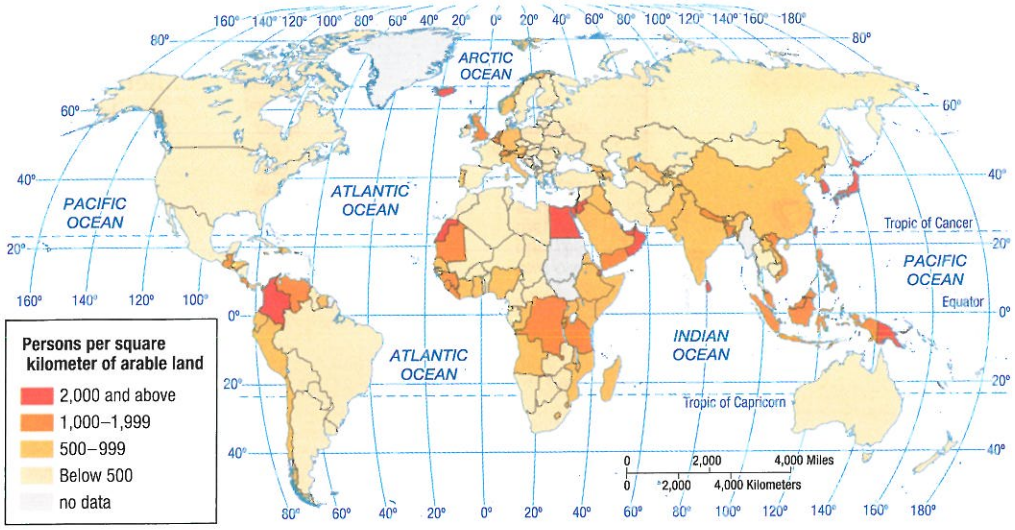
Comparing physiological and arithmetic densities helps geographers understand the capacity of the land to yield enough food for the needs of the people. In Egypt, for example, the large difference between the physiological density and arithmetic density indicates that most of the country's land is unsuitable for intensive agriculture. In fact, all but 5 percent of Egyptians live in the Nile River valley and delta because it is the only area in the country that receives enough moisture (by irrigation from the river) to allow intensive cultivation of crops.

TABLE 2–1 ARITHMETIC DENSITIES, PHYSIOLOGICAL DENSITIES, AND AGRICULTURAL DENSITIES OF FOUR COUNTRIES

Country	Arithmetic Density	Physiological Density	Agricultural Density	Percentage Farmers	Percent Arable Land
Canada	3	65	1	2	0.5
United States	32	175	2	2	1.7
The Netherlands	400	1,748	23	3	0.01
Egypt	80	2,296	251	31	0.03



▲ **FIGURE 2-5 ARITHMETIC DENSITY** Geographers rely on the arithmetic density to compare conditions in different countries because the two pieces of information–total population and total land area–are easy to obtain. The highest arithmetic densities are found in Asia, Europe, and Central America. The lowest are in North and South America and South Pacific.



▲ **FIGURE 2-6 PHYSIOLOGICAL DENSITY** Physiological density provides insights into the relationship between the size of a population and the availability of resources in a region. The relatively large physiological densities of Egypt and the Netherlands demonstrates that crops grown on a hectare of land in these two countries must feed far more people than in the United States or Canada, which have much lower physiological densities. The highest physiological densities are found in Asia, sub-Saharan Africa, and South America. The lowest are in North America, Europe, and South Pacific.

To understand relationships between population and resources in a country, geographers examine a country's physiological and agricultural densities together. For example, the physiological densities of both Egypt and the Netherlands are high, but the Dutch have a much lower agricultural density than the Egyptians. Geographers conclude that both the Dutch and Egyptians put heavy pressure on the land to produce food, but the more efficient Dutch agricultural system requires fewer farmers than does the Egyptian system.

Pause and Reflect 2.1.2

Name a country other than Egypt that has high physiological and agricultural densities.

AGRICULTURAL DENSITY

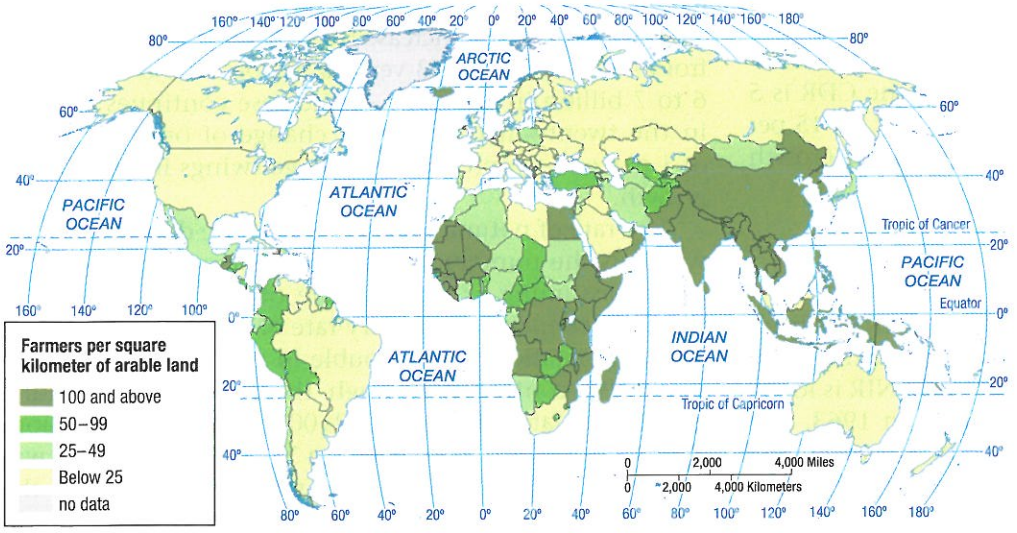
Two countries can have similar physiological densities but produce significantly different amounts of food because of different economic conditions. **Agricultural density** is the ratio of the number of farmers to the amount of arable land (Figure 2-7). Table 2-1 shows several examples.

Measuring agricultural density helps account for economic differences. Developed countries have lower agricultural densities because technology and finance allow a few people to farm extensive land areas and feed many people.

CHECK-IN: KEY ISSUE 1

Where Is The World's Population Distributed?

- ✓ **Most of the world's population is highly clustered in four regions.**
- ✓ **Arithmetic, physiological, and agricultural densities are different approaches to describing the distribution of people.**



▲ **FIGURE 2-7 AGRICULTURAL DENSITY** The highest agricultural densities are found in Asia and sub-Saharan Africa. The lowest are in North America, Europe, and South Pacific.

KEY ISSUE 2

Why Is Global Population Increasing?

- Components of Population Growth
- Population Structure

Learning Outcome 2.2.1

Understand how to measure population growth through the natural increase rate.

Population increases rapidly in places where many more people are born than die, and it declines in places where deaths outnumber births. The population of a place also increases when people move in and decreases when people move out. This element of population change—migration—is discussed in Chapter 3.

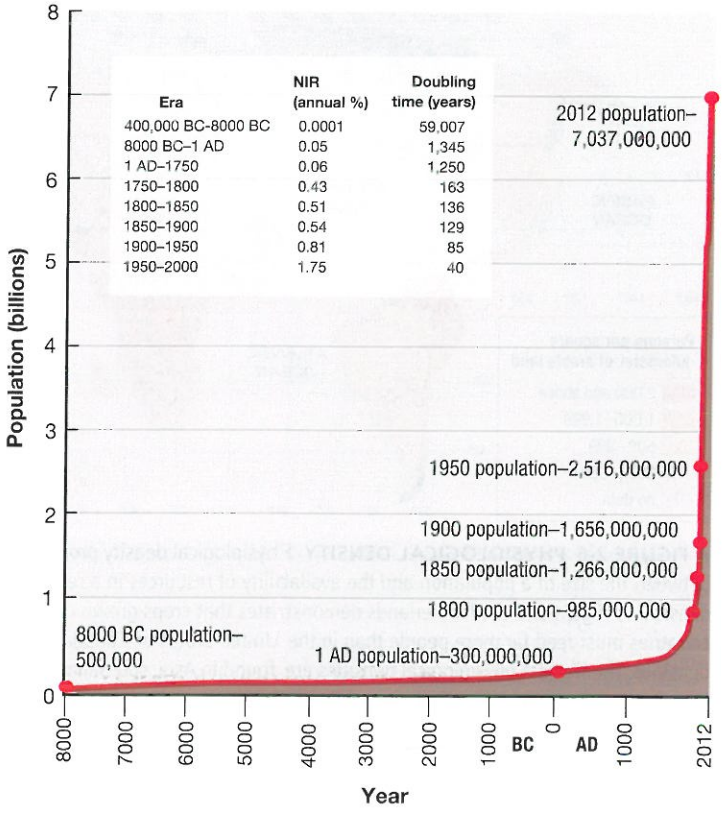
COMPONENTS OF POPULATION GROWTH

Geographers most frequently measure population change in a country or the world as a whole by using three measures:

- **Crude birth rate (CBR)** is the total number of live births in a year for every 1,000 people alive in the society. A CBR of 20 means that for every 1,000 people in a country, 20 babies are born over a one-year period.
- **Crude death rate (CDR)** is the total number of deaths in a year for every 1,000 people alive in the society. Comparable to the CBR, the CDR is expressed as the annual number of deaths per 1,000 population.
- **Natural increase rate (NIR)** is the percentage by which a population grows in a year. It is computed by subtracting CDR from CBR, after first converting the two measures from numbers per 1,000 to percentages (numbers per 100). Thus if the CBR is 20 and the CDR is 5 (both per 1,000), then the NIR is 1.5 percent, or 15 per 1,000. The term *natural* means that a country's growth rate excludes migration.

NATURAL INCREASE

During the twenty-first century, the world NIR has been 1.2, meaning that the population of the world had been growing each year by 1.2 percent. The world NIR is lower today than its all-time peak of 2.2 percent in 1963, and it has declined sharply since the 1990s. However, the NIR during the second half of the twentieth century was high by historical standards. Most of humanity's several-hundred-thousand-year occupancy of Earth was characterized by an NIR of essentially zero, and Earth's population was unchanged, at perhaps a half-million (Figure 2-8).

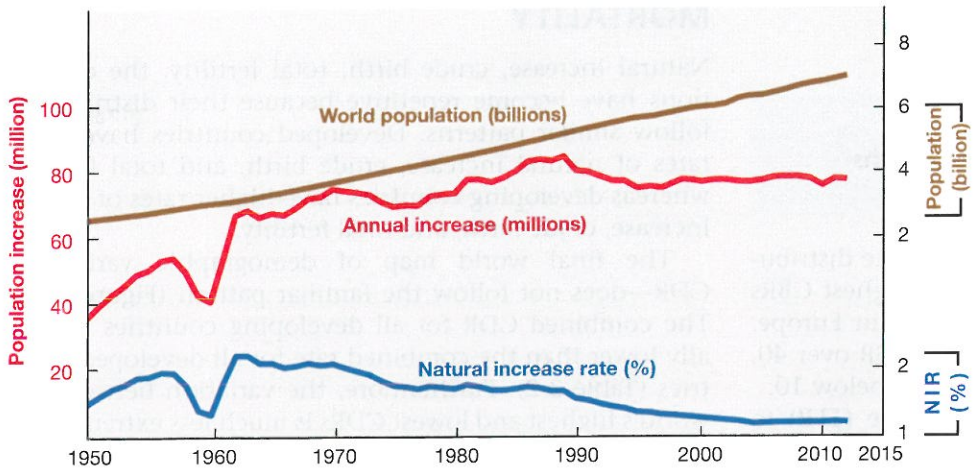


▲ **FIGURE 2-8 WORLD POPULATION THROUGH HISTORY** Through most of human history population growth was virtually nil. Population increased rapidly beginning in the eighteenth century.

About 82 million people are being added to the population of the world annually (Figure 2-9). This number represents a decline from the historic high of 87 million in 1990. The number of people added each year has dropped much more slowly than the NIR because the population base is much higher now than in the past.

World population increased from 3 to 4 billion in 14 years, from 4 to 5 billion in 13 years, and from 5 to 6 billion and 6 to 7 billion in 12 years. As the base continues to grow in the twenty-first century, a change of only one-tenth of 1 percent can produce very large swings in population growth.

The rate of natural increase affects the **doubling time**, which is the number of years needed to double a population, assuming a constant rate of natural increase. At the early twenty-first-century rate of 1.2 percent per year, world population would double in about 54 years. If the same NIR continued through the twenty-first century, global population in the year 2100 would reach 24 billion. When the NIR was 2.2 percent in 1963, doubling time was 35 years. Had the 2.2 percent rate continued into the twenty-first century, Earth's population in 2010 would



◀ **FIGURE 2-9 WORLD POPULATION GROWTH, 1950–2011** The NIR declined from its historic peak in the 1960s, but the number of people added each year has not declined very much because with world population increasing from 2.5 billion to more than 7 billion people during the period, the percentage has been applied to an ever larger base.

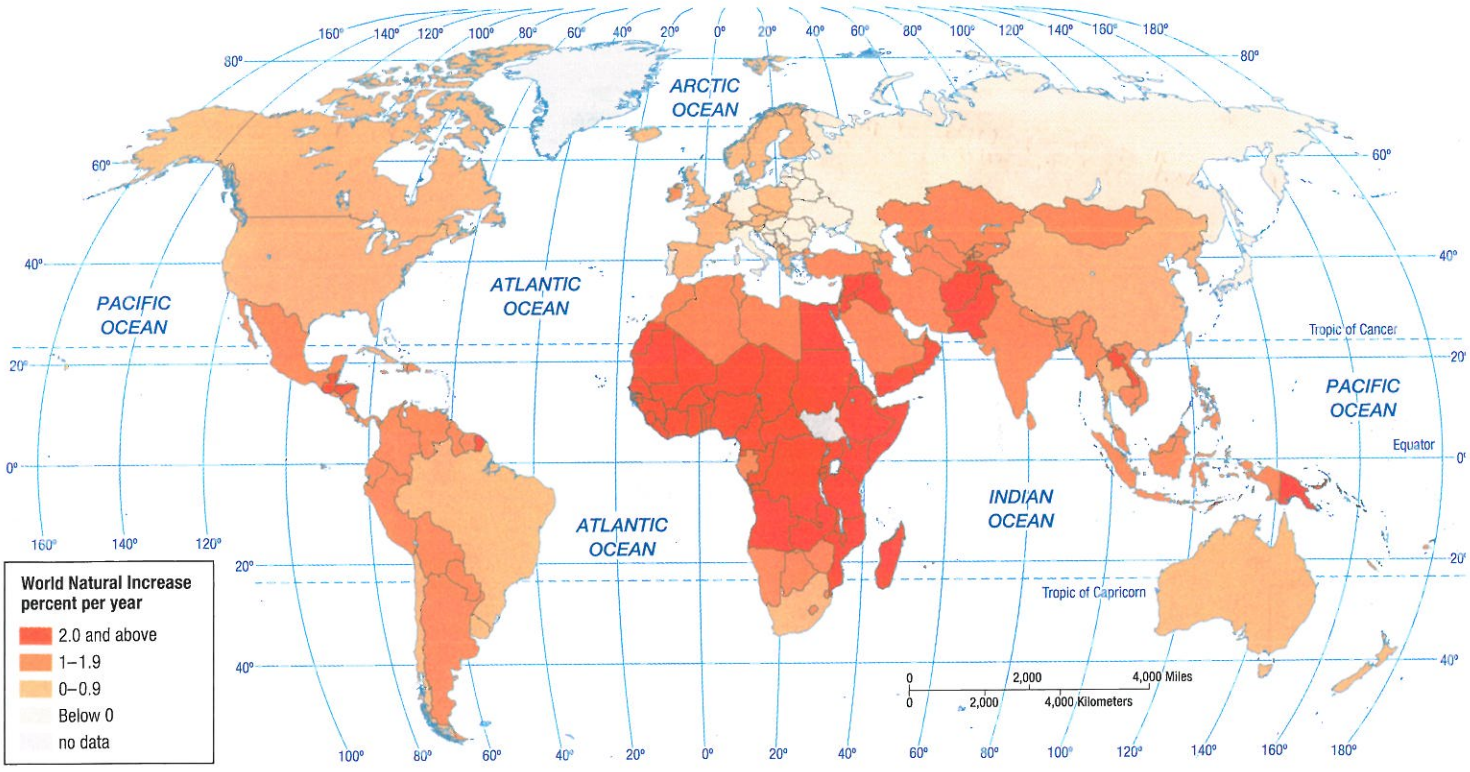
have been nearly 10 billion instead of nearly 7 billion. A 2.2 percent NIR through the twenty-first century would produce a total population of more than 50 billion in 2100.

More than 95 percent of the natural increase is clustered in developing countries (Figure 2-10). The NIR exceeds 2.0 percent in most countries of sub-Saharan Africa, whereas it is negative in Europe, meaning that in the absence of immigrants, population actually is declining. About one-third of the world's population growth during the past decade has been in South Asia, one-fourth in sub-Saharan Africa, and the remainder divided about equally among East Asia, Southeast Asia, Latin America, and Southwest Asia & North Africa.

Regional differences in NIRs mean that most of the world's additional people live in the countries that are least able to maintain them. To explain these variations in growth rates, geographers point to regional differences in fertility and mortality rates.

Pause and Reflect 2.2.1

The United States has an NIR of 0.6. Does that mean the doubling time is more than 54 years or less?



▲ **FIGURE 2-10 NATURAL INCREASE RATE** The world average is currently about 1.2 percent. The countries with the highest NIRs are concentrated in Africa and Southwest Asia.

FERTILITY

Learning Outcome 2.2.2

Understand how to measure births and deaths through CBR and CDR.

The world map of CBR (Figure 2-11) mirrors the distribution of NIR. As was the case with NIRs, the highest CBRs are in sub-Saharan Africa, and the lowest are in Europe. Many sub-Saharan African countries have a CBR over 40, whereas many European countries have a CBR below 10.

Geographers also use the **total fertility rate (TFR)** to measure the number of births in a society (Figure 2-12). The TFR is the average number of children a woman will have throughout her childbearing years (roughly ages 15 through 49). To compute the TFR, demographers assume that a woman reaching a particular age in the future will be just as likely to have a child as are women of that age today. Thus, the CBR provides a picture of a society as a whole in a given year, whereas the TFR attempts to predict the future behavior of individual women in a world of rapid cultural change.

The TFR for the world as a whole is 2.5, and, again, the figures vary between developed and developing countries. The TFR exceeds 5.0 in sub-Saharan Africa, compared to 2 or less in nearly all European countries.

Pause and Reflect 2.2.2

How does the TFR in your family compare to the overall figure for North America?

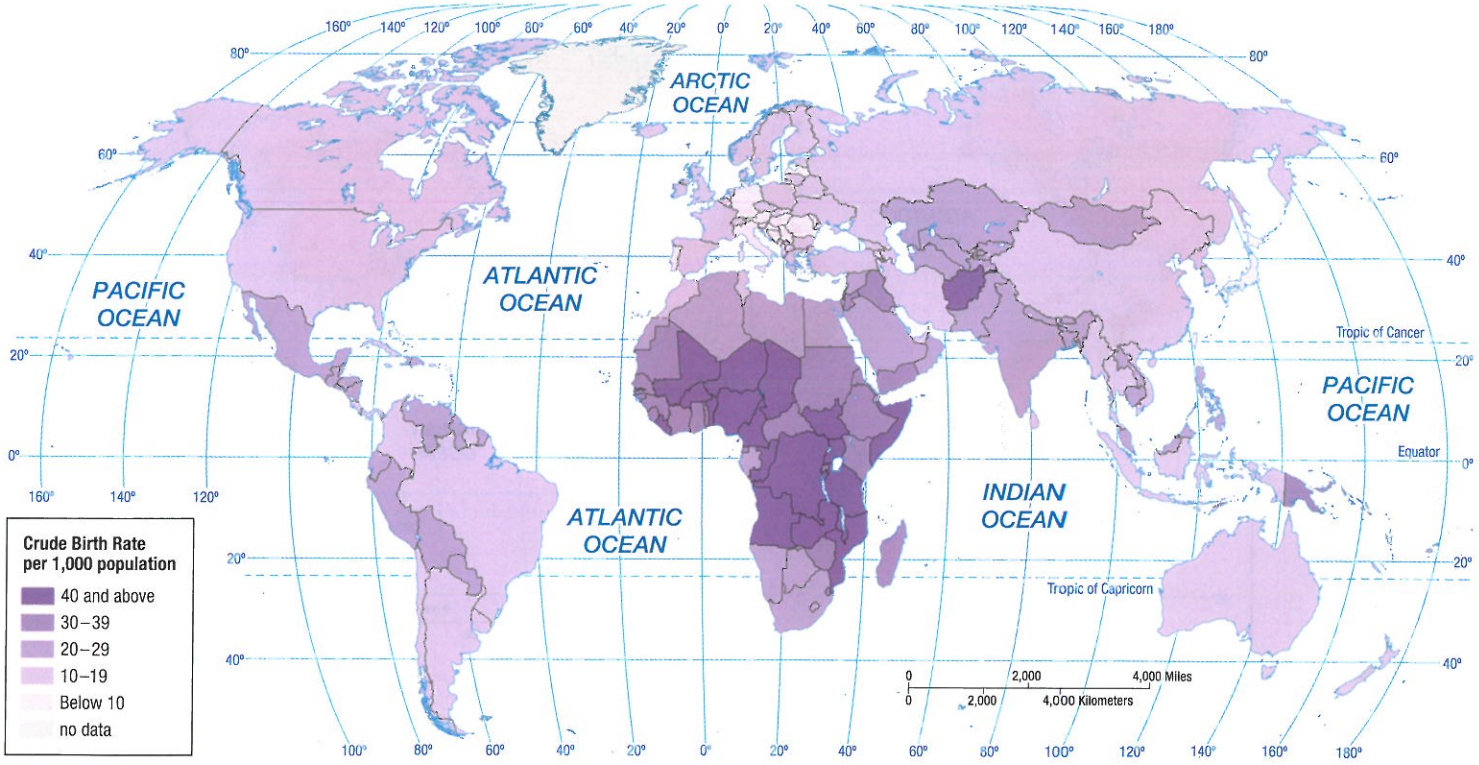
MORTALITY

Natural increase, crude birth, total fertility, the descriptions have become repetitive because their distributions follow similar patterns. Developed countries have lower rates of natural increase, crude birth, and total fertility, whereas developing countries have higher rates of natural increase, crude birth, and total fertility.

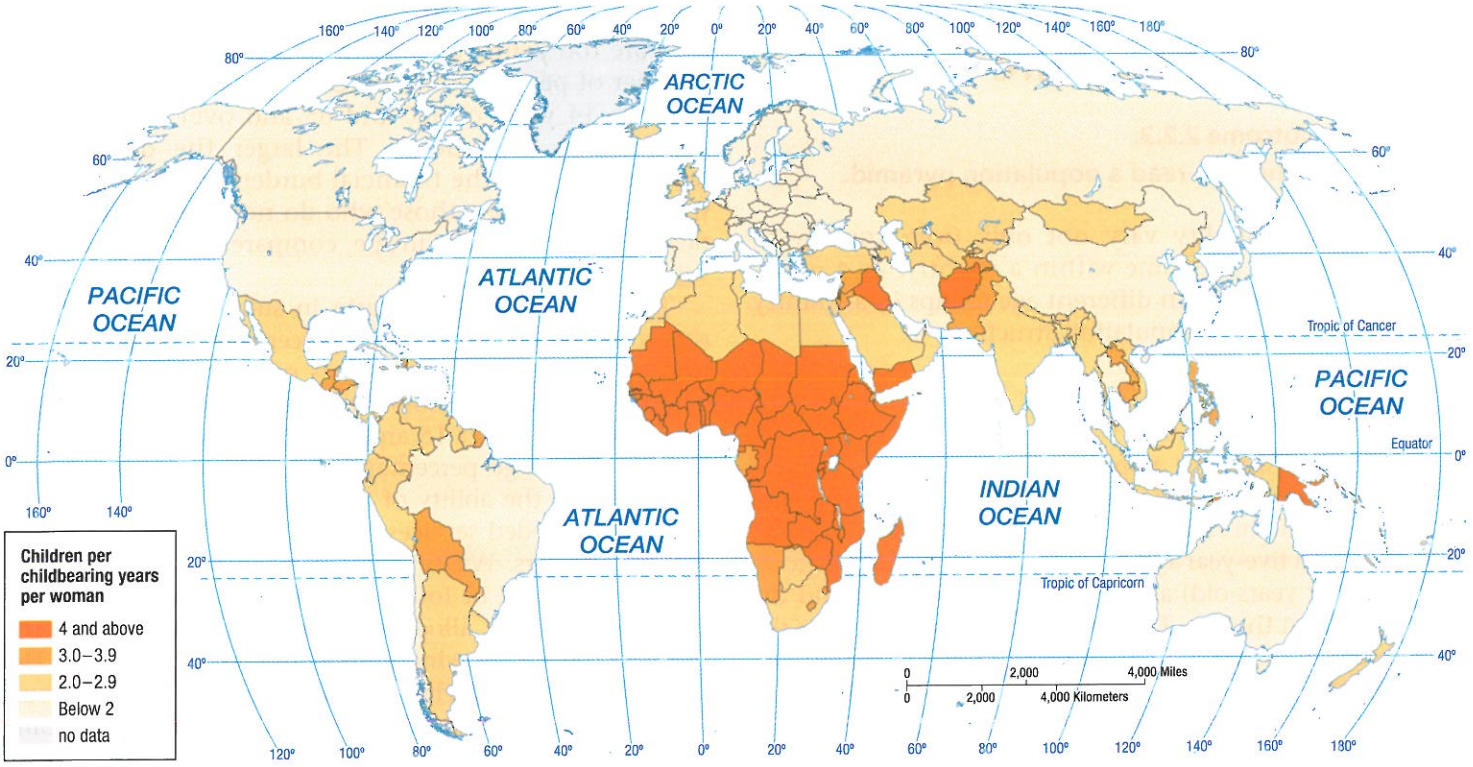
The final world map of demographic variables—CDR—does not follow the familiar pattern (Figure 2-13). The combined CDR for all developing countries is actually lower than the combined rate for all developed countries (Table 2-2). Furthermore, the variation between the world's highest and lowest CDRs is much less extreme than the variation in CBRs. The highest CDR in the world is 17 per 1,000, and the lowest is 1—a difference of 16—whereas

TABLE 2–2 COMPARING DEMOGRAPHIC FACTORS IN DEVELOPED AND DEVELOPING COUNTRIES

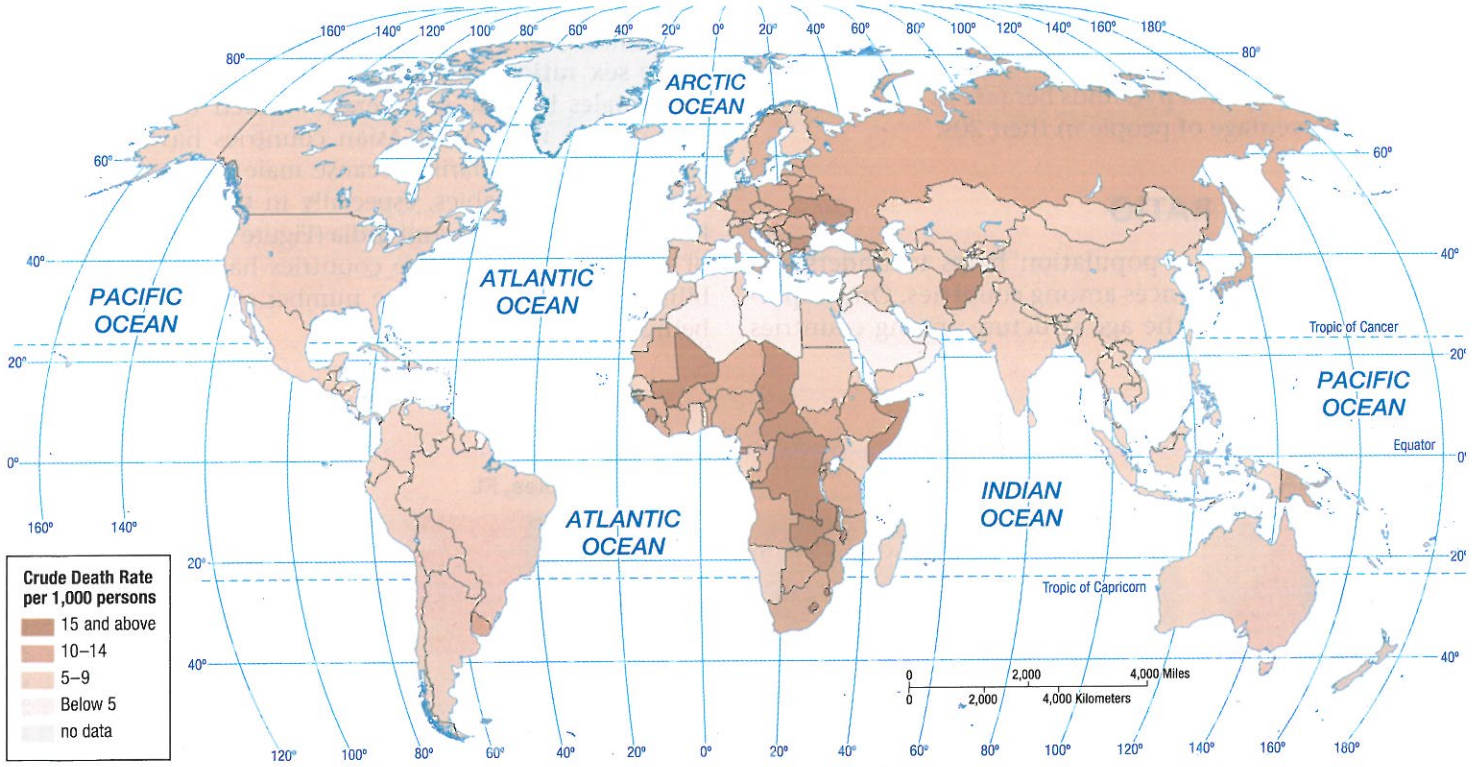
	Developed Countries	Developing Countries
Natural increase rate	0.2	1.4
Crude birth rate	11	22
Total fertility rate	1.7	2.6
Infant mortality rate	5	48
Life expectancy (years)	78	68
Crude death rate	10	8
Under age 15 (percent)	16	29
Age 65 (percent) and above	16	6



▲ **FIGURE 2-11 CRUDE BIRTH RATE (CBR)** The global distribution of CBRs parallels that of NIRs. The countries with the highest CBRs are concentrated in Africa and Southwest Asia.



▲ **FIGURE 2-12 TOTAL FERTILITY RATE (TFR)**
As with NIRs and CBRs, the countries with the highest TFRs are concentrated in Africa and Southwest Asia.



▲ **FIGURE 2-13 CRUDE DEATH RATE (CDR)** The global pattern of CDRs varies from those for the other demographic variables already mapped in this chapter. The demographic transition helps to explain the distinctive distribution of CDRs.

CBRs for individual countries range from 7 per 1,000 to 52, a spread of 45.

Why does Denmark, one of the world's wealthiest countries, have a higher CDR than Cape Verde, one of the poorest? Why does the United States, with its extensive system of hospitals and physicians, have a higher CDR than Mexico and nearly every country in Latin America? The answer is that the populations of different countries are at various stages in an important process known as the demographic transition, discussed later in this chapter.

Population Structure

Learning Outcome 2.2.3:
Understand how to read a population pyramid.

Fertility and mortality vary not only from country to country but also over time within a country. As a result, the number of people in different age groups in a country forms a pattern—the population structure.

POPULATION PYRAMIDS

A country's distinctive population structure can be displayed on a bar graph called a **population pyramid.** A population pyramid normally shows the percentage of the total population in five-year age groups, with the youngest group (zero to four years old) at the base of the pyramid and the oldest group at the top. The length of the bar represents the percentage of the total population contained in that group. By convention, males are usually shown on the left side of the pyramid and females on the right (Figure 2-14).

Population pyramids vary widely within the United States. For example, Laredo, Texas, which has a large Hispanic population, has a relatively broad pyramid, indicating a large percentage of children, whereas Naples, Florida, has a "reverse" pyramid, indicating a large percentage of elderly people. College towns, such as Lawrence, Kansas, have unusually shaped pyramids because of the exceptionally high percentage of people in their 20s.

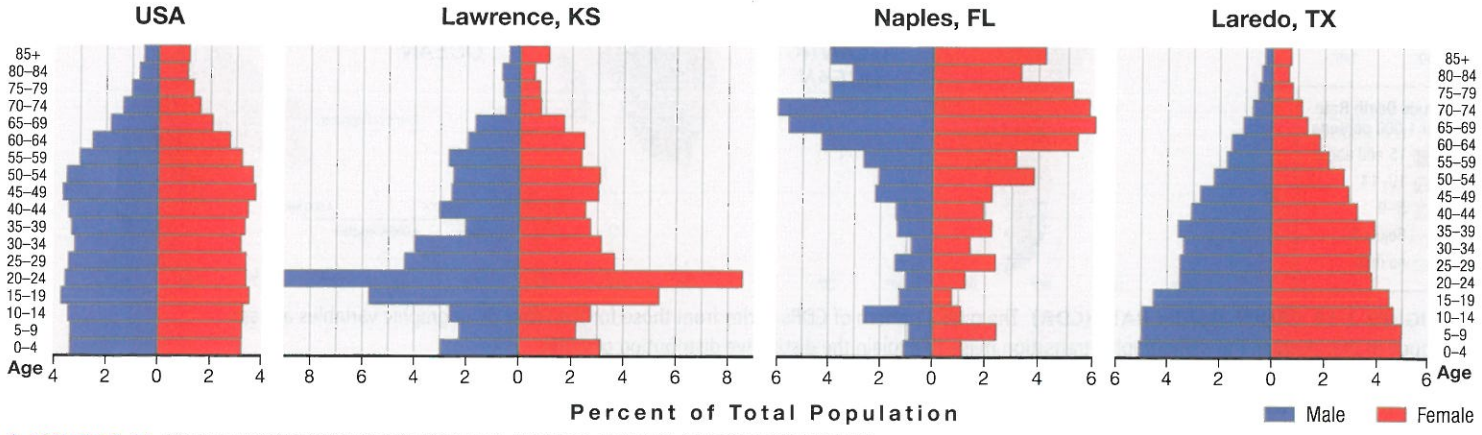
DEPENDENCY RATIO

The age structure of a population helps to understand similarities and differences among countries. One important way to compare the age structure among countries is the **dependency ratio**, which is the number of people who are too young or too old to work, compared to the number of people in their productive years. People who are 0 to 14 years of age and 65 and over are normally classified as dependents. The larger the dependency ratio, the greater the financial burden on those who are working to support those who do not. The dependency ratio is 47 percent in Europe, compared to 85 percent in sub-Saharan Africa.

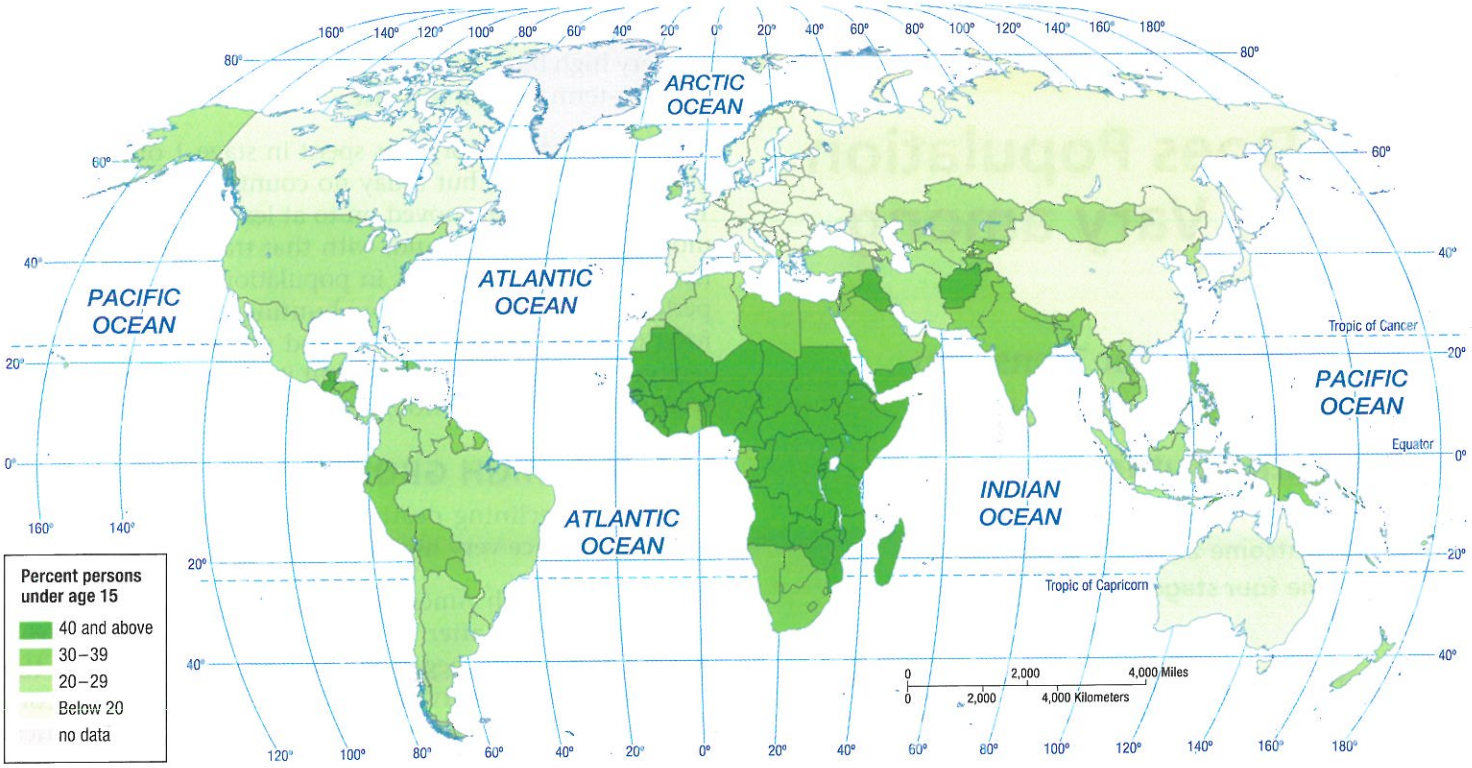
The high dependency ratio in sub-Saharan Africa derives from having a very high percentage of young people (Figure 2-15). Young dependents outnumber elderly ones by more than 14:1 in sub-Saharan Africa, whereas the numbers of people under 15 and over 65 are roughly equal in Europe. The large percentage of children in sub-Saharan Africa strains the ability of these relatively poor countries to provide needed services such as schools, hospitals, and day-care centers. When children reach the age of leaving school, jobs must be found for them, but the government must continue to allocate scarce resources to meet the needs of the still growing number of young people. On the other hand, the "graying" of the population places a burden on developed countries to meet their needs for income and medical care after they retire from jobs.

SEX RATIO

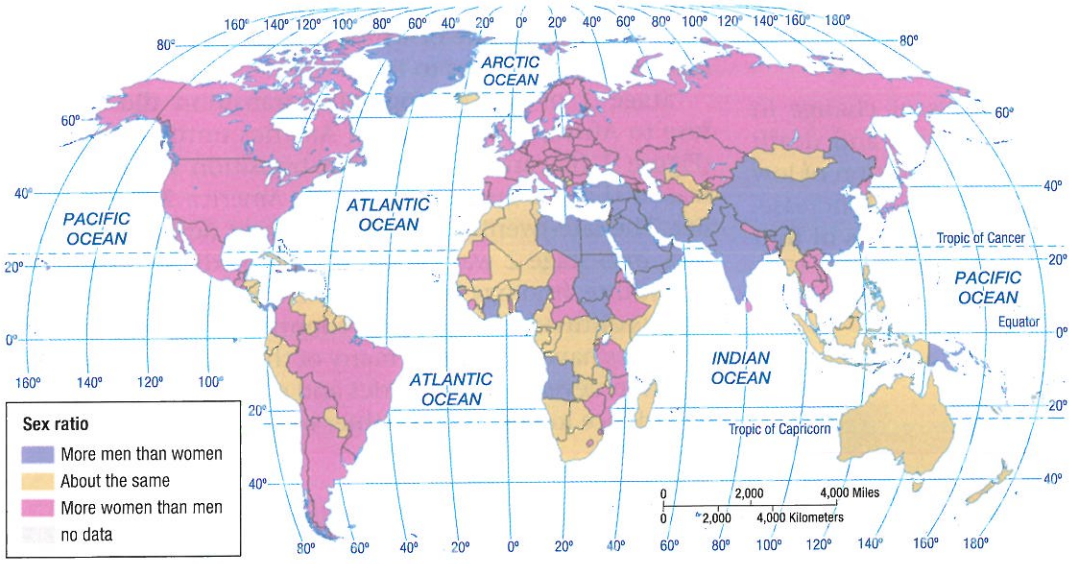
The number of males per 100 females in the population is the **sex ratio.** Developed countries have more females than males because on average women live seven years longer than men. Most Asian countries have more men than women, primarily because male babies greatly outnumber female babies, especially in the two most populous countries, China and India (Figure 2-16). The shortage of female babies in these countries has raised the possibility that a relatively large number of female fetuses are being aborted.



▲ **FIGURE 2-14 POPULATION PYRAMIDS FOR THE UNITED STATES AND SELECTED U.S. COMMUNITIES** Laredo has a broad pyramid, indicating higher percentages of young people and fertility rates. Lawrence has a high percentage of people in their twenties because it is the home of the University of Kansas. Naples has a high percentage of elderly people, especially women, so its pyramid is upside down.



▲ **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?

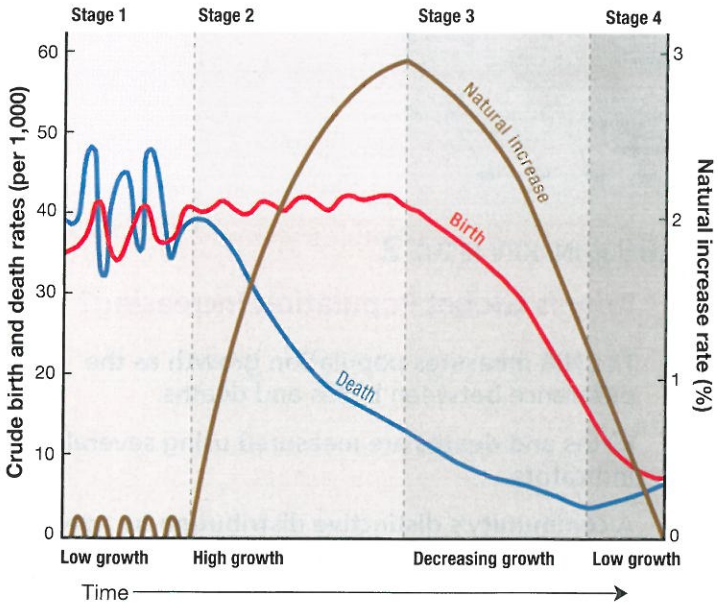
- The Demographic Transition
- Malthus on Overpopulation
- Population Futures

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.

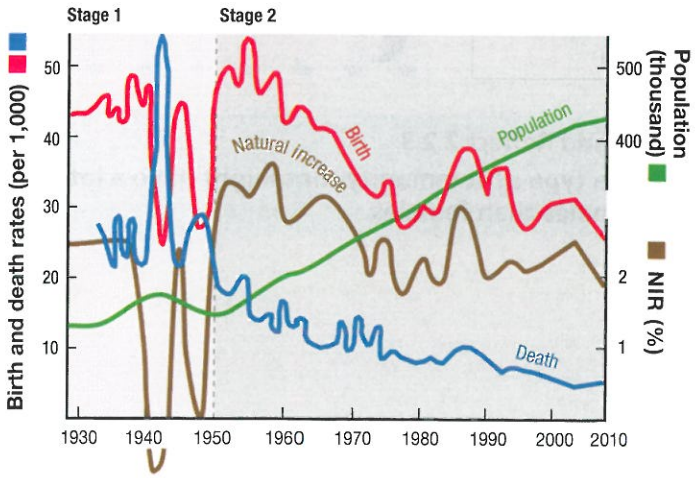
Most of human history was spent in stage 1 of the demographic transition, but today no country remains in stage 1. Every nation has moved on to at least stage 2 of the demographic transition, and, with that transition, has experienced profound changes in population. For most of this period, people depended 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.