1 An Introduction to Demography

WHAT IS DEMOGRAPHY?

This book is an introduction to **demography**. A short definition of demography is the systematic and scientific study of human populations. The word *demography* comes from the Greek words δημος (*demos*) for "population" and γραφια (*graphia*) for "description" or "writing," thus the phrase, "writings about population." The term *demography* was first used in 1855 by the Belgian statistician Achille Guillard in his book *Elements of Human Statistics or Comparative Demography* (Borrie, 1973: 75; Rowland, 2003: 16). Most demographers (Hauser and Duncan, 1959; McFalls, 2007; Micklin and Poston, 2005) agree about the objectives and definition of demography.

Demography is the social science that studies: (1) the size, composition, and distribution of the human population of a given area at a specific point in time; (2) the changes in population size and composition; (3) the components of these changes (**fertility**, **mortality**, and **migration**); (4) the factors that affect these components; and (5) the consequences of changes in population size, composition, and distribution, or in the components themselves. Hence, demography may be more broadly defined as the scientific study of the size, composition, and distribution of human populations and their changes resulting from fertility, mortality, and migration. Demography is concerned with how large (or how small) are the populations; how the populations are composed according to age, sex, race, marital status, and other characteristics; and how the populations are distributed in physical space (e.g., how urban and rural they are) (Bogue, 1969). Demography is also interested in the changes over time in the size, composition, and distribution of human populations, and how these result from the processes of fertility, mortality, and migration. The chapters of this book discuss these topics in much more depth and detail and will provide you with a thorough introduction to demography.

I will start this first chapter with the following point: every one of us, you and I, whether we are aware of it or not, have already contributed, and will continue to contribute throughout our lives, to the subject matter of demography. I will next elaborate on the definition of demography introduced above. I will then consider the so-called demographic equation. Two of the most important variables used by demographers are age and sex; hence, I will then give some examples of the relevance of age and sex to demography and to society. I will next discuss the issue of population distribution and review briefly some of the major sources of demographic data. Finally, I will conclude this first chapter by discussing the phrase "Demography is destiny."

WE ARE ALL POPULATION ACTORS

We are all population actors. This is a major theme of this book. Think about it: your parents performed a demographic act when you were conceived. You, in turn, perform similar demographic acts when you decide to have, or not to have, children. Sometime during your lifetime you will move – once or perhaps numerous times. These, too, are demographic acts. Finally, you will die.

Now, you may think that your dying is not the same kind of demographic act as the decision-making of your parents when you were conceived because you yourself do not really decide how long you will live and when you will die. However, we do indeed have a lot to say about how old we will be when we die. That is, we have many options that may, or may not, extend our lives. These include such behaviors as stopping or never beginning smoking, limiting alcohol intake, eating a healthy diet, and exercising. Another very important behavior that will extend our lives is education, specifically obtaining a college degree.

Let me compare women and men at age 25 with and without a college degree. On average, women with a college degree will live sixty-two additional years (beyond age 25) compared with those with just a high school degree, who will live around fifty-six more years, a difference of six years. At age 25, men with a college degree are expected to live another fifty-seven years compared with another fifty-one years for men who have only completed high school, again a difference of six years (Hummer and Hernandez, 2013; Rostron, Boies, and Arias, 2010).

So, one of the first pieces of important and relevant information for your life and livelihood that you have learned by just reading the first pages of this book is the following: stay in school, graduate from college, and you will add more than just a few years to your life. In summary, we are

all population actors. We are very much involved in demography in our day-to-day lives, even though we may not always realize it.

Demography is the study of some of the most important events in our lives, and we are very much involved in them. Ask yourself: what are the only two times in your life when you will have a very good chance of being identified by name and listed in your local newspapers? When you are born and when you die. These are two of the events that demographers study. Other very important events in the lives of many of us include getting married and, also for some of us, getting divorced. These are two more behaviors studied by demographers. Another really important event that almost every one of us will do at least once, if not many times, in our lives is moving from one residence to another. Demographers also study residential changes. So, as I often tell my students who are enrolled in my "Population and Society" undergraduate course, it is not at all an overstatement to say that demographers study the beginning and the end of our lives, as well as many, if not most, of the really important events that occur in between. Or as the eminent demographer Samuel Preston (1987: 620–621) once stated: "The study of population offers something for everyone: the daily dramas of sex and death, politics and war; the interlacing of individuals in all their . . . (groups); and the confrontations of nature and civilization." In the next chapter, I begin elaborating on these and related points.

DEFINITION OF DEMOGRAPHY

I have already defined demography at the start of this chapter as the systematic and scientific study of human populations. I return now to a fuller consideration. Demography is the study of three basic processes: fertility, migration, and mortality. These are referred to as the **demographic processes**. In an important sense, that is really all there is to demography. When populations change in size, composition, or distribution, the changes depend solely on one or more of these three demographic processes. Hence, a discussion of the three demographic processes will comprise a major portion of this text.

THE DEMOGRAPHIC EQUATION

It should be clear to you that the size of a population can change only through the processes of fertility, mortality, and migration. There are only two ways of entering a population – being born, or moving into it. There are also two, and only two, ways of leaving a population – dying, or moving out of it. One of the fundamental facts about population change, therefore,

is that populations can only change by way of a limited, countable number of events.

For example, consider the population size of a country. Suppose that this country at time t contains P_t persons, and that one year later it contains P_{t+1} persons. We may write this as the following equation:

$$P_{t+1} = P_t + B_{t\ to\ t+1} - D_{t\ to\ t+1} + I_{t\ to\ t+1} - E_{t\ to\ t+1} \tag{1.1}$$

where $B_{t\ to\ t+1}$ and $D_{t\ to\ t+1}$ are, respectively, the number of births and deaths occurring in the population between times t and $t+1$; and $I_{t\ to\ t+1}$ and $E_{t\ to\ t+1}$ are, respectively, the number of immigrants (or in-migrants) to and emigrants (or out-migrants) from the population between times t and $t+1$. Equation (1.1) is known as the basic **demographic equation**, or sometimes as the demographic balancing or accounting equation. It states that the size of an area's population can change because of only three types of event: births, deaths, and migrations. These three events are known as the components of demographic change and also as the three demographic processes.

The quantity ($B_{t\ to\ t+1} - D_{t\ to\ t+1}$) is the difference between the number of births and the number of deaths that occurred during the time period t **to** $t+1$ and is known as **natural increase**; if $B_{t\ to\ t+1} < D_{t\ to\ t+1}$, then the number of deaths exceeds the number of births during the interval t **to** $t+1$, meaning negative natural increase, that is, **natural decrease**. The quantity ($I_{t\ to\ t+1} - E_{t\ to\ t+1}$) refers to the difference between the number of immigrants (persons who enter a country) and the number of emigrants (persons who leave a country) during the time period, and is known as net international migration (or, in the case of **in-migration** minus **out-migration**, net internal migration). If $I_{t\ to\ t+1} < E_{t\ to\ t+1}$, then more persons leave (emigrate from) the area than enter (immigrate into) the area, and the quantity is known as negative net international migration. Finally, if the quantity $I_{t\ to\ t+1} > E_{t\ to\ t+1}$, then we have positive net international migration.

In the United States, we almost always have positive net international migration because it is the situation in the United States and in most developed countries that $I_{t\ to\ t+1} > E_{t\ to\ t+1}$. The United States is, thus, a receiving country when it comes to international migration. In many developing countries, there is very frequently negative net international migration because $I_{t\ to\ t+1} < E_{t\ to\ t+1}$. Countries such as Mexico, China, India, and the Philippines are referred to as sending countries; they have more people leave their countries than enter and are hence characterized by negative net international migration. The Philippines sends around 1.5 million persons abroad every year, including 300,000 who work on ships around the world. Around 10 percent of the country's population lives abroad (Martin, 2013).

Within countries, however, there is usually a lot of significant variation in the demographic equation. Large older cities often have net out-migration. If the extent of natural increase does not surpass the level of out-migration, then the city loses population. The Detroit–Dearborn–Levonia, Michigan metropolitan area is an example with such a demographic pattern. Between 2010 and 2012, its total population fell by 29,045 inhabitants. Yet it had a natural increase of 12,980 persons (52,969 births minus 39,989 deaths). However, 42,025 more people moved out of the Detroit metropolitan area than moved into it. Hence, this net out-migration of 42,025 more than offset the natural increase of 12,980.

Some places have natural decrease because its elderly population comprises a large share of the population. A metropolitan area in Florida, The Villages (located in central Florida midway between the Gulf and Atlantic coasts, about an hour north of Orlando), had a total population in 2013 of over 107,000 persons. Between 2012 and 2013 it was the fastest growing metropolitan area in the entire United States (it was also the fastest growing metro area between 2013 and 2014). In the year between 2012 and 2013, The Villages grew by 3,470 persons. But there were 1,215 deaths in the year and only 442 births, resulting in 773 more deaths than births. To offset that loss, net migration amounted to 4,243. Why the high number of deaths? The in-migration to The Villages primarily consisted of retirees, resulting in a very large elderly population. The Villages is said to be the largest gated retirement community in the United States (Cohen, 2009). There are many of these so-called retirement areas in Arizona, California, Florida, North Carolina, and Texas.

Some populations have both natural decrease and negative net migration. For example, in the Charleston, West Virginia metropolitan area, between 2010 and 2012, there were 5,943 births and 6,456 deaths, and there were 592 more people moving out of the metropolitan area than moving in; so more people died than were born in Charleston, and more people left than entered Charleston. The area's high number of deaths reflects, in part, an older population. However, in The Villages metropolitan area, as I just mentioned above, their natural decrease was offset by a very high net in-migration.

This phenomenon of natural decrease is of increasing importance and relevance in the United States and especially in Europe. To illustrate, in 2008, more than half of all the counties in Europe had more deaths than births. These include almost all the counties of Germany, Hungary, Croatia, Romania and Bulgaria, the Baltic states, Greece, and Italy. "A long-term continuation of natural decrease will result in the continual diminution of the population, and eventually lead to its disappearance, unless the excess

of deaths over births is offset by population increase due to net migration" (Field and Poston, 2013: 2; Johnson, Field, and Poston, 2015).

From these examples, we can see that all three of the demographic processes play important roles in determining not only the size, but also the composition of any population. Changes in the variables themselves are the result of our behavior as population actors. This is the heart of demography: understanding how the many factors that cause changes in demographic behavior and that are the consequences of this behavior are all interrelated.

AGE AND SEX

Changes in any one of the demographic processes yield equally important information about how populations are composed, that is, their structure. The most important characteristics that tell us about population structure are age and sex. These two characteristics are so important to the study of demography and the demographic processes that they are referred to as **the** demographic characteristics.

Let me show you how closely age and sex are tied in with the three demographic processes. With regard to fertility, defined by demographers as the actual production of children, more males are born than females, usually around 105 males for every 100 females. **Fecundity**, that is, the ability to produce children, varies by sex; specifically, the childbearing years of females are, for the most part, between the ages of 15 and 49, and for males they are generally between the ages of around 15 and 79 (Poston, 2005; Zhang, Poston, and Chang, 2014).

Regarding mortality, that is, the frequency with which death occurs in a population, females have lower death rates than males at every age of life. Death rates are high in the first year of life and then drop to very low levels. In modern populations, the death rates do not again reach the level of the first year of life for another five to six decades. Also, cause-specific mortality is often age related. For instance, causes of "mortality such as infanticide, parricide and suicide are . . . age (and sex) related" (Goldscheider 1971: 227; MacKellar, 2003). Two renowned demographers, Jacob Siegel and Henry Shryock, have written that "in view of the very close relation between age and the risk of death, age may be considered the most important demographic variable in the analysis of mortality" (Shryock, Siegel, and Associates, 1976: 224; McGehee, 2004).

Migration also differs by age and sex. Traditionally, males and females have not migrated to the same places in equal numbers. Long-distance migration has tended to favor males, and short-distance migration, females, and this has been especially the case in developing countries. However, with

increases in the degree of gender equity in societies, the migration of females now tends to approximate that of males. In fact, almost half of the international migrants worldwide are now women, and more than half of the legal immigrants to the United States are women (PRB, 2007: 9). Internal migration is also age selective, with the largest numbers of migrants found among young adults (Bernard, Bell, and Charles-Edwards, 2014).

Age and sex are not the only important compositional variables in demography. Other variables are also related to the three demographic processes. Knowing something about marital status, for example, is important when studying fertility. Race is strongly associated with socioeconomic status. On average, blacks, whites, Asians, and Hispanics all have somewhat different lifestyles, and these are related to the basic demographic processes. Education is an especially important variable to consider. In general, the higher the education attained, the lower the fertility and the lower the mortality.

These are just hints of the many compositional variables that demographers consider. The number is large, giving demographers a wide field to study. They are interested in most everything that is related to demographic behavior.

Finally, compositional variables are both the cause and the effect of population change. In turn, demographic changes can affect the compositional variables. I will have much more to say about this issue later.

AGE COMPOSITION: AN EXAMPLE

I now consider an example that illustrates well the central importance in demography of **age composition**. It is an example that will be mentioned and discussed later in our book. It is the famous **baby boom**, which began in the United States and in some other Western countries around 1946 at the conclusion of the Second World War and lasted until about 1964. Right after the end of the Second World War, the young adults of that period decided to have more children than those in previous generations. This resulted in a "bulge" in the age composition – a bulge, as I will note later, that resulted in numerous challenges for every institution in US society. The bulge is easy to see in Figure 1.1, which is an age and sex population pyramid for the United States in 2010. A **population pyramid** is a graph showing the numbers of males and females according to their ages. I will cover these in greater detail in Chapter 10.

Have a look at the pyramid in Figure 1.1. The baby boom bulge is most evident in the 45–54-year age groups; and many of the babies of the baby boom babies, that is, the children of the baby boomers, are evident in the 15–24-year age groups. In future decades, the baby boom bulge will be

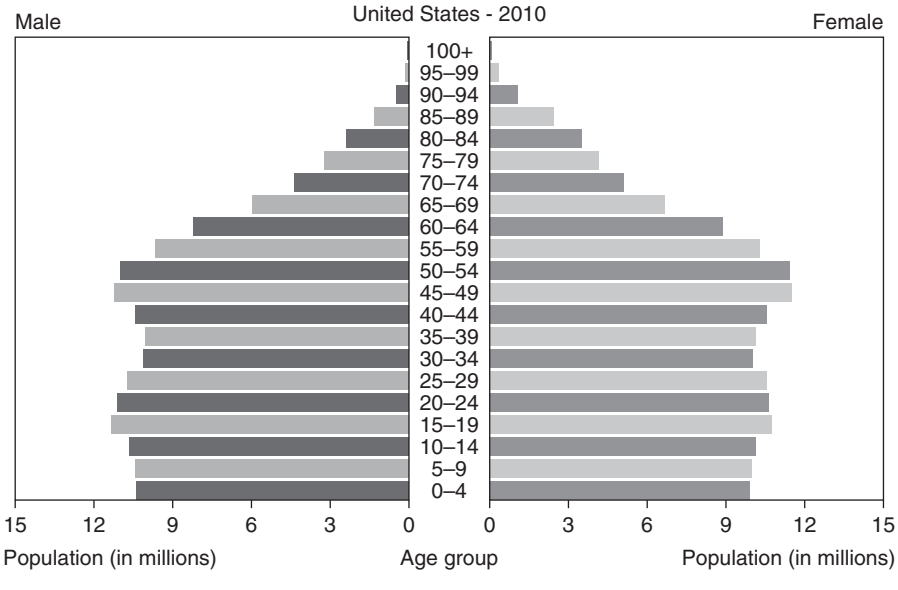

Figure 1.1 Population by Age and Sex
Source: US Census Bureau, International Data Base, available at: www.census.gov/population/international/data/idb/region.php?N=%20Results%20&T=12&A=separate&RT=0&Y=2010&R=-1&C=US, last accessed April 29, 2016.

visible higher and higher up in the country's pyramid. McFalls, Gallagher, and Jones (1986) have noted that we can think, figuratively, of the people born during the baby boom period as a group, that is, a **cohort** that passes through the population from the youngest ages to the oldest ages, as a pig that has been swallowed by a python.

Those people born from the mid-1940s to the mid-1960s are known as baby boom babies, or baby boomers, because there were so many of them compared with the numbers of babies born before them and after them. The baby boomers have experienced problems throughout their lives. Their attendance at elementary and secondary school and at college was often marked by overcrowded classrooms and a shortage of teachers. When they entered the labor market, many of them discovered that there were not enough jobs to go around. Housing for many of them has been scarce. The older members, most of whom have now reached retirement age, are finding that their demands on the US social security system are producing and will continue to produce strains between the financial demands of their large cohort and the smaller number of younger workers who must finance the system. These are examples of some of the problems that are likely to occur when one age group is considerably larger than groups before it or after it (Carlson, 2008).

In contrast, the babies born after the baby boomers, say, those born in the 1970s, have had a much easier time during their lives. In the 1970s, there were 33 million babies born in the United States, a figure 10 million fewer than the number born in the ten years between 1955 and 1964, the latter part of the period when most of the baby boom babies were born. The babies born after the baby boom, starting in the mid-1960s through the early 1980s, are referred to as the **baby bust** cohort, and also as the "Generation X" cohort (Carlson, 2008). They followed the enormously large group of baby boomers and have been in a much more favored position during their lives. Education facilities have been more than adequate for them, and many more jobs have been available for them than for the baby boomers who preceded them. But the Generation X babies will have a big responsibility financing the retirement of the baby boomers.

I was born in 1940, before the start of the baby boom. My cohort, often referred to as the Lucky Few cohort, extends from around 1929 through 1945. There were many fewer of us compared with the large number of baby boomers, around 41 million "Lucky Few" versus 78 million baby boomers (Carlson, 2008). We enjoyed higher employment rates and a greater variety of social opportunities than Americans in the preceding or in the following generations; and much of this was due to our small population size.

Clearly, being a member of the Lucky Few, or the baby boom, or Generation X, can have a significant impact on one's chances of success in life. I am not suggesting a form of demographic determinism. Indeed, individuals can and do succeed on their own. But it goes without saying that being born as a member of a large or a small cohort does in fact alter one's odds for later success in life (Carlson, 2008). Our generational location has a big influence on our life and our life chances. I will discuss this issue in greater detail in Chapter 10.

I have noted here the importance of age and age composition in demography and also some of the ways in which the size of one's age cohort can influence many aspects of one's life and livelihood. I turn now to a consideration of sex and **sex composition**.

SEX COMPOSITION: AN EXAMPLE

I mentioned earlier that most societies in the world have **sex ratios at birth** (SRBs) of around 105, that is, 105 boys are born for every 100 girls. (And around 110 or so males are conceived for every 100 females.) The so-called biologically normal SRB level of about 105 is likely an evolutionary adaptation to the fact that females have higher survival probabilities

at every age than do males. Since at every year of life more males die than females, around 105 or so males are required at birth per every 100 females for there to be approximately equal numbers of males and females when the two groups reach the marriageable ages (although there are often slightly more males than females at the beginning of the marriageable ages).

Later in this book, I will discuss in more detail the sex ratio at birth. But I note here that since the mid-1980s and the 1990s, several countries, for example, China, South Korea, Taiwan, India, and a few others have been having SRBs (i.e., the number of male births per 100 female births) that are much higher than the biological average of around 105 (Hudson and den Boer, 2002, 2004; Jha et al., 2006; Poston and Glover, 2005; Poston and Morrison, 2005; Poston, Conde, and DeSalvo, 2011). Indeed, in 2012, China had an SRB of 119; this means that in 2012 in China, there were 119 baby boys born for every 100 baby girls. The SRBs in China between 2005 and 2011 have hovered around 120.

My students, Eugenia Conde and Bethany DeSalvo, and I, have estimated that there have likely been born in China more than 41 million Chinese boys who, when they reach their mid-twenties and are looking for brides, will not be able to find Chinese girls to marry. Our numbers do not take into account the likelihood of some daughters at birth being underreported (Goodkind, 2011), so the figure of over 40 million may be a little high. Nevertheless, there will be many millions of extra boys in the country. What might be some of the outcomes?

The Chinese government could well turn to a more authoritarian form of government so as to be better able to control these millions of excess bachelors. Sociological research has shown that when large numbers of men do not marry, they are often more prone to crime than if they were married (Laub and Sampson, 2006; Sampson and Laub, 1990). Banditry, violence, and revolutions could occur in areas with large numbers of excess males (Hudson and den Boer, 2002).

Another implication of this unbalanced sex ratio at birth is the potential for an HIV/AIDS epidemic of a scale previously unimagined. This will occur if many of the excess Chinese bachelors move to the big cities in China, and if China's commercial sex markets in the cities expand to accommodate the many millions of surplus males (Parish et al., 2003; Tucker et al., 2005). The numbers of HIV cases in China in the next decade and later, owing to the bachelors and other factors (e.g., China's extremely large floating population – a topic I will cover in Chapter 8) could well rival the HIV numbers in sub-Saharan Africa. In 2013, in sub-Saharan Africa, there were 24.7 million adults infected with HIV, which is almost 71 percent of the