HOW DO WE CONDUCT RESEARCH ON AGING?

One of the interesting features of aging research is that it seeks to answer a dazzling array of questions, ranging from the aging of cells to the variations in the aging of the world's populations. What is it like to be old? What, if anything, does aging "do" to us physically, emotionally, or socially? How do different cultures or societies treat people differently on the basis of age? How, why, and in what ways does age make a difference in our lives? What are the costs and impacts of programs and policies serving older people? How do families adjust to the changes throughout the life course, including the onset of disability and need for help from older family members? Each of these broad areas of curiosity could lead to a seemingly endless list of possible research questions.

Adding to the range of possibilities is the micro–macro continuum discussed in Chapter 1. Often the same topic can be addressed using many different levels of analysis. For example, the social dimensions of retirement can be examined at the micro level with the individual as the unit of analysis (addressing questions such as the effects of retirement on economic well-being, friendship patterns, or marital satisfaction); at a midlevel, group level of employers (how does retirement affect the performance or size of the company's labor force?); or on the macro, societal level (how are the economies of societies affected when there is large-scale retirement or large numbers of retirees?). So the first step in any research process is to think through exactly what we want to explore. Before researchers can work through the details of how to design and conduct a study, they must be very clear about the scope, level, and unit of analysis implied in their question. One of the unique challenges in aging research is specifying exactly why and how we are including age in our study.

Age as a Variable

As was discussed in Chapter 1, age can have many different meanings. Similarly, when we say that we want to study aging, we can be referring to very different kinds of questions. Consider these three related examples: (a) a study of the impact of aging on physical health; (b) a study of effectiveness of fitness training for older people through a structured exercise program; and (c) a study asking whether an exercise program has the same effects for older people as for younger people. While all of these topics are similar, the role that age would play in the research would be very different. In the first study, where we want to know about the ways in which age affects health, we are treating age as an independent variable. An **independent variable** is assumed to cause or have a connection to another variable (the **dependent variable**). In the second study, we want to see if participating in an exercise program has a positive effect on the health of older people. In this case, age is simply a selection variable—we are choosing to study older adults rather than some other age group or all age groups. The independent variable in this second study is not age, it is participation in the exercise program and the dependent variable is health. In the third study, we are again treating the exercise program as the independent variable, looking for the impact it has on physical health. However, in this research, we want to compare the effects of the exercise

program across people of all ages. In this case, we are treating age as a **control variable**, which might influence the findings of our study but is not the focus of attention; for example, the exercise program might work better for older rather than younger participants in improving fitness.

The role that age plays in any study—as an independent variable, a control variable, a dependent variable, or a selection variable (among others)—is an important decision that has implications for how the study is conducted. Measuring age might seem like quite a simple matter: we can just ask people how old they are or when they were born. In fact, much research on aging does just that. However, it is important to consider whether we want to know about the impact of every single year of age, or whether the age group of the person is most important (for example, old vs. not old; middle age vs. old age; member of the baby boom generation or another age group). These decisions are connected to why we think age matters for the topic we want to study. Depending on the particular research question, age may be referring to the passage of time, as in the case of our first hypothetical study which focused on the impact of aging on health. In this situation, we might indeed want to track changes by single years of age. Age may also be used to define membership in a group—a generation such as the target population for a service or program such as Medicare—or to mark the boundaries of a life stage such as retirement. In these cases, a person's exact age does not matter, and our research will not be focusing on the impact of every passing year.

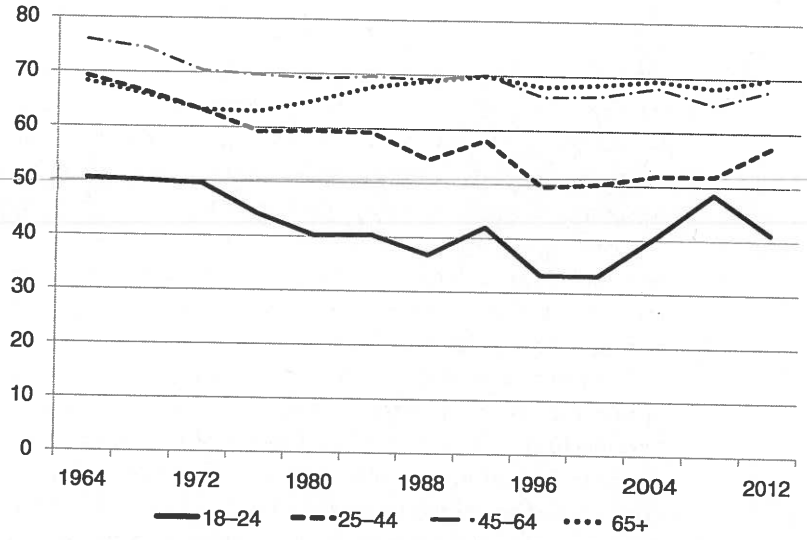
Separating Age, Period, and Cohort Effects

Thinking through what we mean by "age" as a variable is the first very important step in designing a study. Once we have achieved some clarity about why and how we think age matters for the research, it is necessary to address one of the most challenging issues in research on aging: the age-period-cohort problem. When a researcher studying political participation, such as voting, finds that the percentage of the population that votes is higher in upper age groups (Binstock, 2009), what exactly does that tell us? Exhibit 2.2 shows that mature and older adults have consistently voted in higher percentages than young adults over many elections. Does it mean that advancing years make us more politically active or involved? Not necessarily. There are, in fact, three related influences that shape differences across age groups and over time: aging, period, and cohort effects. Understanding these three forces is central to understanding the complexity of aging in a social context.

Many researchers are interested in learning about **aging effects**, the changes that occur as individuals accumulate years and move through the life course. It is common to think first of the physical effects of aging, such as wrinkling of skin or graying of hair. Yet there is clearly a social side to aging as well. As discussed above, chronological age can be a proxy for life stages, and can also be an indicator of social and psychological maturation. So there are reasonable questions about the effects of aging on our social as well as physical lives. For example, we may want to know whether and how aging influences individuals' productivity at work, happiness in marriage, choices in saving or spending money, or religious participation. But answering these questions is not as simple as it first appears. For the example of work productivity, our inclination might be to observe workers

EXHIBIT 2.2

PERCENTAGE VOTING IN PRESIDENTIAL ELECTIONS, 1964–2012



Source: U.S. Census Bureau, Current Population Reports, 1975, 1992, 2008e, 2013b.

of various ages to learn how productive they are at a specific task and then draw comparisons by age. But would differences that appear from this observation be *only*—or even mostly—the result of aging? It is very difficult to isolate the effects of aging in research, because **human aging** does not occur in a vacuum. Instead, the process of aging is surrounded by social, economic, and historical events that influence the lives of individuals and groups differently as they age.

Beyond aging, a second force that is sometimes responsible for differences between age groups derives from historical events and social trends. These **period effects** emerge from the major events or changes that occur in the social world during the time period under study. For example, if we had surveyed a sample of adults 50 years ago and repeated the survey today with the same people and found that they knew much more about HIV/AIDS than they did before, should we conclude that their increased knowledge is a result of aging? Of course not! This kind of difference is due to a period effect, specifically the growing public awareness of HIV/AIDS that has influenced knowledge among individuals of all ages. Because individual aging and period effects are tied together by time, it is important to attempt to separate period effects from those of aging. When we measure knowledge of HIV/AIDS, it is not the fact that the respondents are older that accounts for greater knowledge; instead, this change is evidence of a period effect. Often we think of major wars, economic booms or busts, and dramatic modifications in the social norms of society as shaping people's experiences as they age (Schuman & Scott, 1989). It is important to recognize, however, that more "everyday" period effects—for example, the introduction of new technologies or changing health habits like dietary trends—can also have profound and confounding period effects when we are trying to track aging-related changes over time.

A third explanation for differences we find in aging research relates to birth cohorts, which are groups of individuals born at approximately the same time and sharing historical life experiences (period effects); these cohorts' lives often differ from each other in important ways. **Cohort effects** are the third piece of this puzzle. For example, if a research study found that appreciation of the music of the Rolling Stones was higher among older birth cohorts than among younger ones, would it mean that the younger people would come to like that same music when they grew older? Again, this difference is not an aging effect. Instead, the baby boomers, many of whom came of age during the heyday of the Rolling Stones, have continued to like that music as they have aged. Their preference is an example of a cohort effect. It has moved with them as they aged; the preference was not "caused" by aging. Similar long-term effects may ensue for people who come of age during an economic downturn and may worry about getting/keeping a job and saving money more than people whose cohorts moved into adulthood in a stronger economy (Elder, 1974).

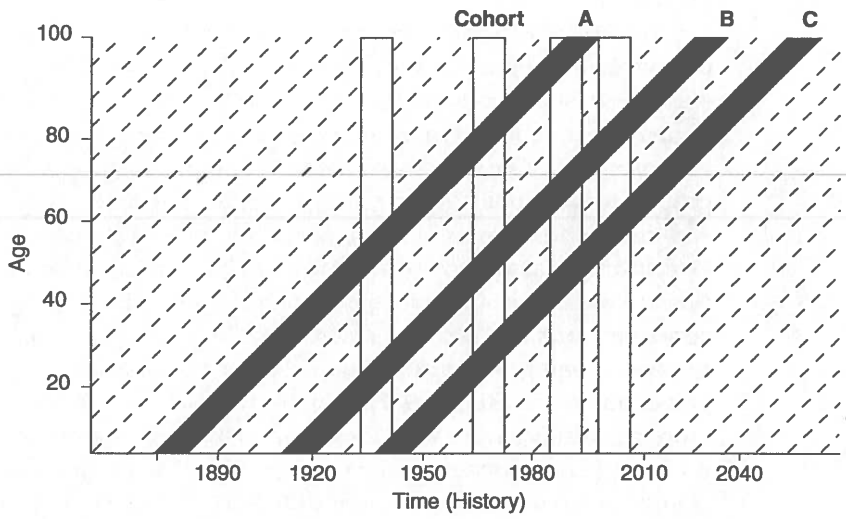
Norman Ryder (1965) identified the critical nature of cohorts in understanding aging and social change in society. Paralleling some of Mannheim's ideas about "generation" discussed in Chapter 1, Ryder identified the flow of birth cohorts (people born at approximately the same time) through society over time as both created and solidified by social change. "Each cohort has a distinctive composition and character, reflecting the circumstances of its unique origination and history" (p. 845). Members of a cohort share a distinct slice of history and the social and cultural influences of their time, differentiating them from cohorts that preceded them or those that follow. Cohort traits such as size or ethnic composition also influence outcomes for the larger society and may shape the opportunities available to individuals in the cohort (Easterlin, 1987).

The diagram in Exhibit 2.3 is a graphic depiction of the triple forces of aging, period, and cohort by Riley et al. (1987, 1994). In this diagram, time is represented by the movement from left to right on the bottom, horizontal axis, and age is represented on the vertical axis. The diagram shows three birth cohorts (A, B, and C), each born at a different point in history. For each cohort, the bar starts at their year of birth on the horizontal axis and moves diagonally upward as two things happen simultaneously: time/history passes and each group ages. Thus, the diagonal black bars represent the aging component for each cohort. The white vertical bars represent period effects, the first being World War II, the second perhaps the Vietnam War, and the third could be the widespread adoption of personal computers into daily life. The fourth could represent the economic downturn that started in 2008.

The graph shows that the cohorts intersect several period events, but each cohort does so at different ages and stages of their lives. For members of the oldest cohort, World War II occurred when they were in their 50s, old enough to be parents of soldiers. Members of the next cohort, born in 1920, were young adults, likely to be heavily involved in actual fighting or other war work. The 1950 cohort did not experience that war, but was undoubtedly influenced by its aftermath. For them the second event, the Vietnam War, fell at about the same ages (their early 20s), as World War II did for the 1920 cohort. In contrast, the Vietnam War was too late to have much effect on the surviving members of the cohort born in 1890, who were by then about age 80. Thus, different cohorts encounter these

EXHIBIT 2.3

CHANGING LIVES AND SOCIOCULTURAL CHANGE



Source: Riley, 1994.

same historical events at different stages of the life course, and therefore are affected differently by them. Such period effects may influence these cohorts as a collectivity in ways that may persist throughout their lifetimes (Elder, 1974; Riley, 1987).

Any large-scale event, such as a lengthy war or a significant economic downturn, is likely to have an impact on everyone in the society, but the effects are different based on cohort. Young adult cohorts, those most likely to be called upon to fight in the event of war or most negatively impacted when jobs are scarce, are more likely to experience a life-changing effect. At the same time, older cohorts, while doubtless affected by these events, are less likely to feel the same type or magnitude of impact (Pavalko & Elder, 1990). More mundane examples also apply. Certainly being a teenager in the 2010s is different from having been one in the 1940s, even though some issues of aging/maturation faced by teenagers remain the same. Accumulated differences throughout life make persons of those two cohorts very different when they reach their third or eighth decade of life.

Because they are so closely interrelated, these three factors (aging, period, and cohort) are extremely difficult to disentangle in research (Firebaugh & Chen, 1995). In fact, age, period, and cohort are "exact linear functions of each other because Age = Period – Cohort" (Winship & Harding, 2004). In other words, an individual's age can be known by subtracting the year of birth (cohort) from the year of the study, making it empirically and conceptually difficult to identify the unique impacts of age, cohort, and societal changes that occur during the time of the study. Scholars continue to develop research designs and statistical models to untangle the influences of each of these three factors. More complicated research designs,

such as some described later in this chapter, can assist in separating one type of effect (for example, a cohort effect) from the other two, but it remains challenging for researchers to distinguish the relative inputs from each of these three factors of this vexing puzzle (George, 1995; Schaie & Hertzog, 1982; Winship & Harding, 2008).

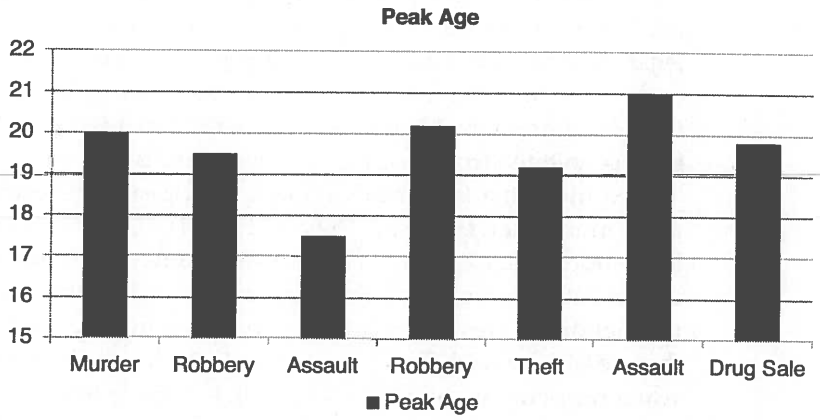
To return to our earlier example in Exhibit 2.2 of variations by age in voting behavior, it is not apparent from this comparison whether aging, period, or cohort effects—or some combination—is at work. The graph suggests some degree of period effect, reflected in an increase in voting percentages for three of the four age groups in 1992. The data also show differences in voting percentages among the age groups at every point in time, suggesting at least an age difference. But it isn't clear whether this difference is related to aging, or to differences in cohort experiences. Concluding that all of the difference is due to aging would be misguided. This particular kind of mistake of interpretation is called a **life course fallacy**—interpreting age differences in data collected at one time as if the differences were *caused by* the process of aging, without ruling out other possibilities, such as cohort differences or period effects (Riley, 1987). Although it may be the case that adults do become more politically aware with the accumulation of experience (aging), and therefore act upon that awareness in the voting booth, this interpretation is not the only possibility. A second explanation for differences by age may relate to cohorts and their experience. Older cohorts today, reared at a time when patriotism was emphasized and World War II would have affected them directly, may feel a greater duty to vote. They may have voted at higher rates all of their lives when compared with baby boomer and later cohorts. The age difference in voting, therefore, could also be a cohort effect. A third possibility is a period effect, where a political event, issue, or candidate could increase or decrease the voter turnout or voter registration rates (Firebaugh & Chen, 1995). Some contend that the increased voting rate among young adults in 2008 represented a specific, positive reaction to the Obama campaign, a reaction that was not repeated in 2012. Finally, it is quite possible that the pattern of voting behavior is a result of some combination of aging, cohort, and period effects. Despite the difficulties in disentangling these three forces, below are three examples of instances where researchers were able to do so.

AGING EFFECTS: CRIMINAL BEHAVIOR BY AGE

Research has clearly established that not all citizens are equally likely to commit crimes. Exhibit 2.4 shows that the most typical ages when many crimes are committed fall in the period of late adolescence and young adulthood. Peak ages for commission of these crimes have remained consistent or declined slightly since the 1940s (Steffensmeier, Allan, Harer, & Streifel, 1989; U.S. Department of Justice, 2007). Teenagers and young adults are arrested for substantially more crimes than are children or more mature adults. Why do we think this is an aging effect? In large measure the answer rests on the fact that similar age-related patterns of criminal behavior have been reported in many different societies and in different historical eras, diminishing the potency of explanations based on period or cohort effects. Although the amount of age difference in crime and the degree of difference in arrests with advancing age vary for different offenses (e.g., fraud versus assault), many crimes show this pattern of peaking in late teens or early 20s and then dropping with increasing age (Steffensmeier et al., 1989). When a pattern

EXHIBIT 2.4

PEAK AGES FOR ARRESTS FOR VARIOUS CRIMES



Source: U.S. Department of Justice, 2007

as consistent as this appears, we cautiously conclude that there is a negative aging effect on committing crime and being arrested.

But how is aging likely to influence crime? Certainly criminal activity may be somewhat related to physical fitness, in that some crimes require strength, speed, or agility. More plausible, however, are the social explanations for crime: "Society at large is faced perennially with an invasion of barbarians . . . [and] every adult generation is faced with the task of civilizing those barbarians" (Ryder, 1965, p. 845). The barbarians to whom Ryder refers are, of course, the youthful cohorts, not yet fully socialized into the ways of society and their roles as responsible adults. With limited integration into the social world (fewer responsibilities toward work or family) and incomplete socialization and maturation, teenagers and young adults face fewer disincentives to committing crimes than do their older counterparts. This explanation suggests that as people mature, they gain more responsibilities and connections to the social order (that is, increase their **social integration**); at that point, the personal costs of committing a crime rapidly begin to outweigh its benefits and discourage criminal behavior with advancing age (Laub, Nagin, & Sampson, 1998; Steffensmeier et al., 1989).

COHORT EFFECTS: THE CASE OF VOTING AMONG WOMEN AFTER THE 19TH AMENDMENT

Although it is typically very difficult to sort out age, period, and cohort effects, sometimes social life provides a "natural experiment" enabling researchers to clearly identify the consequences of cohort membership. In one such study, Firebaugh and Chen (1995) examined the changes in voting behavior of women after the passage of the 19th Amendment to the Constitution, giving women the right to vote. The researchers noted that the voting rates of women just after passage of the amendment remained much lower than those for men, but that this gap gradually narrowed over the years and then disappeared. Why didn't women immediately vote at the same rate as men?

To examine the issue, the researchers compared the voting behavior of three 10-year birth cohorts of White women: those born before 1896, who were still denied the right to vote in young adulthood; those born between 1896 and 1905, who spent their childhoods before women could vote, but were permitted to vote by the time they came of age; and those born between 1906 and 1915, who began adulthood after women were voters. Firebaugh and Chen argued that lacking the legal right to vote would have a lasting cohort effect on the first group, and that each of the later two cohorts would be more likely to vote than the first, because this oldest group had been taught to believe that women should not vote and had been prohibited from doing so as young adults.

To make the test even stronger, the researchers examined voting that took place much later, between 1952 and 1988. Their analysis showed clear and enduring cohort effects linked to the 19th Amendment. Women from the earliest cohort, as predicted, were less likely than either of the other two later cohorts to vote throughout the rest of their lives. Even though they could legally vote as soon as they reached adulthood, the women in the second cohort, raised during the era when women could not vote, were still less likely to do so 30 years later compared to their even younger counterparts, raised after women had the vote. Thus, the critical experience of youth lasted throughout life and differentiated these three cohorts of women in their voting behavior even decades later.

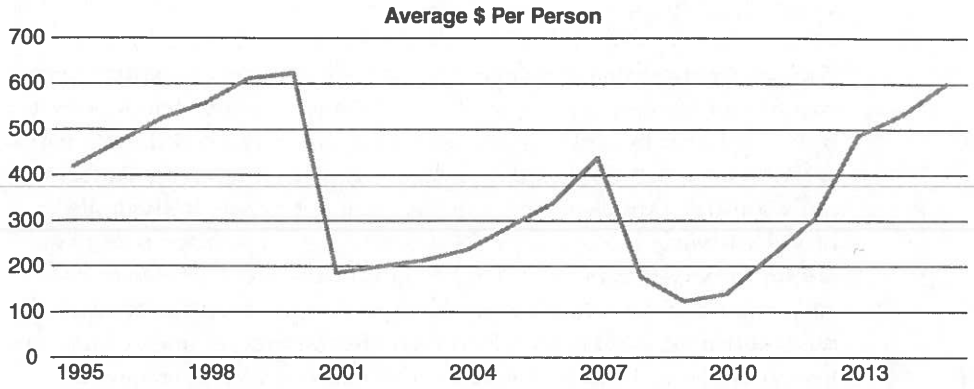
This long lasting cohort effect also offers an explanation as to why the gender gap in voting (higher voting rates among men than women) shrank gradually over time. This pattern resulted from changes in the composition of the female voting population. As the older cohorts of women, who were less likely to vote, died and were replaced by women of later cohorts (i.e., cohorts more likely to vote), the gap between women and men in voting systematically declined. This change mostly came from the **cohort composition effect**, rather than from changes in the voting behavior of particular individuals. As cohorts age and their members eventually die, they are replaced in the population (here, the voting-age population) by younger cohorts, whose behaviors and attitudes may differ. This gradual shift in the composition of the voting population, the cohort composition effect, accounts for the disappearance of the voting gap between women and men.

PERIOD EFFECTS: A HYPOTHETICAL EXAMPLE OF CONSUMER SPENDING OVER TIME

As businesses anticipate the needs and desires of aging baby boomers, they might want to track consumer spending, looking for changes in the way people spend their money as they age. Imagine that hypothetical Company T (a travel and resort company) conducts some research on this topic, wanting to know more about how these patterns might change in an aging society. Remember, age effects are not just physical; we can be interested in physical, psychological, or social maturation. Company T assumes that consumer expenditures for travel may change because of life stage, hypothesizing that middle and later life will be marked by greater availability of income and leisure time to travel once children are grown and retirement arrives. To test this question of change with age, they conduct a longitudinal study, tracking the same people over time as they age. Exhibit 2.5 shows the hypothetical data resulting from this study.

EXHIBIT 2.5

HYPOTHETICAL TRAVELING SPENDING



As Company T expected, those in the sample were gradually increasing the amount of money they were spending on travel as they moved through middle age. The increase continued until a precipitous drop in 2001. There was a subsequent modest growth in spending, but not a rapid return to earlier spending patterns; another dip in the pattern occurred around 2008. Was this pattern an aging effect? Did these study participants suddenly reduce the money they spent on travel when they retired or began receiving Social Security? Was there some other age-based event resulting in these changes? Unlikely! Instead, two significant period effects occurred during the time of this study: the 2001 attacks on the World Trade Center and the Pentagon, and the major economic downturn starting in 2008. It is much more likely that the pattern of rapid drop in consumer spending on travel was due to these two period effects, not related to aging or life stage of study participants. It is widely known that the travel industry suffered tremendous losses following the 9/11 attacks and again during the recession. These examples of period effects illustrate how a significant historical event or social change can influence the results of a study that might be designed to help us understand aging. Without doubt, studies of all types of consumers, not just aging baby boomers, would also show this period effect of a drop in travel spending. In this case, period effects made it especially difficult for Company T to project behaviors of baby boomers, whose behaviors were being reshaped as they aged by unanticipated period effects.

METHODS TARGETED TO RESEARCH ON AGING

As you can see, research on aging includes many unique challenges, including the use and measurement of age and aging, and sorting out age, period, and cohort effects. There are some research designs that are especially suited to these unique

concerns of gerontology researchers. These designs focus on who is studied, how data are collected, and how the influences of age, period, and cohort can be distinguished.

Longitudinal/Panel Studies

Longitudinal studies, also called panel studies, attempt to isolate aging from cohort effects by following a sample of respondents to observe how they remain stable or change over time. To understand what happens over the life course, it makes sense to see what remains the same or changes with the passage of time. The type of longitudinal study most often used is one in which individuals in a sample are repeatedly surveyed over a period of years or even decades, using many of the same questions or measurements. This design allows researchers to track changes within each individual (or other unit) as they age. Longitudinal designs are contrasted with **cross-sectional studies**, in which data are collected at one point in time, generating a snapshot of differences between people of different ages and birth cohorts. Cross-sectional studies can tell us how age groups may differ from each other, but they cannot tell us the extent to which those differences are due to the effects of aging and movement through the life course. Findings in cross-sectional studies risk mixing together aging effects and cohort effects. To illustrate, consider the question of whether people become more religious as they grow older. A cross-sectional study would allow us to compare the religiosity of today's 80 year olds with today's 60, 40, and 20 year olds. If the older groups are more religious (e.g., attend church or pray more often), it is not possible to determine how much (if any) of that difference is due to aging, and how much might be due to the fact that different cohorts grew up in eras with different emphasis on religious practices. Longitudinal designs, following people over time, help us to sort out aging effects from cohort effects; because we follow a sample over time, as they age, we are comparing individuals' religiosity at later ages to their own earlier behavior, allowing us to avoid confusing aging effects with differences between cohorts.

Although it is not a panacea for all of the analytical problems we have been discussing, the use of longitudinal data drawn from a sample over time is generally deemed a necessity in the study of social dimensions of the life course (Ferraro & Kelly-Moore, 2003). However, longitudinal research also has drawbacks and limitations. A substantial commitment of time (sometimes decades) is needed, generating high costs in both money and effort, and the knowledge gained may not be seen for years (Campbell & O'Rand, 1985). Other challenges include keeping participants involved in a study that spans many years and the discovery of new research techniques, which force choices between keeping older procedures/measurements versus using improved techniques when a change makes over-time comparison more difficult (Lawton & Herzog, 1989). Finally, longitudinal studies typically follow people from a relatively small number of cohorts, limiting our ability to generalize to other cohorts' experiences.

Yet longitudinal data are critical to disentangling the effects of age and cohort on the interacting processes of individual aging and social change. In recent years, researchers have begun to make more active use of long-span panel data, finding effects of early life influences on specific outcomes in later life. For example, studies have shown that midlife financial strain influences health decline decades later (Shippee, Wilkinson, & Ferraro, 2012), and that childhood advantage or disadvantage (e.g.,

poverty, education, abuse) in both Chinese and Americans influenced outcomes such as cognitive performance, functional health, and life satisfaction many decades later (Kasper et al., 2008; Schafer, Ferraro, & Mustillo, 2011; Zhang, Gu, & Hayward, 2008). Such results encourage us to take a very long view of the numerous factors that may influence outcomes in later life aside from just aging (Settersten, 1999).

Especially useful are longitudinal studies that follow multiple cohorts as they age—a **cohort sequential design**. Exhibit 2.6 shows a hypothetical cohort sequential design, following three cohorts over four time periods. Each group is reinterviewed at 5-year intervals. This design makes it possible to compare cohorts as they age. For example, we can compare the age changes that cohort 1 and cohort 2 go through as they move from ages 40 to 50; even though they will go through these ages at slightly different historical times, knowing whether an age change observed for one cohort holds true for another gives us greater confidence in our conclusions about the effect of aging. Following more than one cohort longitudinally enables to simultaneously examine cohort differences and aging effects. One study, for example, included 15 birth cohorts (every 3 years between 1916 and 1958) and collected data annually for 11 years, providing a substantial amount of information to sort out age and cohort effects about disease and disability (Reynolds, Crimmins, & Saito, 1998). In the earlier example of women's voting patterns following ratification of the 19th Amendment, the researchers used a cohort sequential design to clearly isolate cohort effects from age effects by comparing three different cohorts across a long age span.

Secondary Analysis

One way around the demands and costs of conducting longitudinal studies is to use existing data. **Secondary analysis** "refers to the study of existing data initially collected for another purpose" (Liang & Lawrence, 1989, p. 31). Many valuable contributions to our knowledge of aging have involved secondary analysis of existing longitudinal surveys.

EXHIBIT 2.6

COHORT SEQUENTIAL DESIGN