approve. Construct a set of hypotheses regarding alternative causes of attitudes toward violence in general and interracial violence in particular. How would you define violence?

2. What research designs would be suited to testing your hypotheses? Would experiments be useful in studying attitudes toward violence? How could surveys be used? How would you define your target population for a survey? Would it be valid to interview only those who have participated in violent acts? What about interviewing only men or only city dwellers? Would you use only questions on interracial violence, or would you want to see if attitudes on interracial violence differed from attitudes on other types of violence?

3

Sampling Procedures

Many researchers who conduct surveys do so in order to understand the attitudes, behavior, or beliefs of a large group of people such as the entire population of the United States. However, it would be prohibitively expensive for every researcher to interview every one of the 220 million citizens in this country. Fortunately, accurate estimates of the nation's attitudes may be obtained by interviewing a sample of a few thousand carefully selected respondents. The technique by which survey researchers choose respondents is called sampling.

Sampling is widely used in the sciences, and an extensive body of statistical theory has been developed to guide its application. Many different sampling procedures can be used to generate samples that are representative of a population. Implementing them correctly requires strict adherence to certain logical principles. In this chapter we describe some of the sampling procedures that are frequently used in the social sciences.

SAMPLING METHODS

As described in Chapter 2, the first step is to define the relevant population. If the population we are interested in is so small that we can easily interview the entire population, we need not sample at all. For example, we could easily interview everyone on an eleven-person city council. But let us assume that the population comprises millions of people and that sampling is essential. How can we obtain a representative sample?

Once the population of interest is defined, it is necessary to determine the *sampling frame*—the list of units from which the sample will be drawn. Ideally the sampling frame would be identical to the population of interest, but often that is not possible. For example, one might want to take a sample of all eligible voters (the population of interest), but doing so from the voter registration list (the sampling frame) would lead to some problems, since the voter registration list might be old and incomplete. Similarly, one might want to take a sample of all residents of a city (the population of interest), but doing so by interviewing people who walk by a particular corner (the sampling frame) inadvertently modifies the nature of the sample. Strictly speaking, sampling can generalize only to the sampling frame from which the sample was drawn rather than to the full population, so one should try to use a sampling frame that corresponds as closely as possible to the population.

Nonprobability Sampling Methods

One important distinction to be made is between nonprobability sampling procedures and probability sampling procedures. We begin by describing some nonprobability procedures so that the advantages of probability sampling can be shown.

Typical People. We could seek people who seem to be *typical* of the population in social and economic terms. However, there is no guarantee that people with typical social and economic characteristics have attitudes that are representative of the entire population. Indeed, such people may actually have very distinctive attitudes that are not at all like those of sizable groups in the population, so that such a sample would not be representative.

This is where probability sampling procedures come to our aid. They will permit us to select a group that is similar to the population in its composition, though of a much smaller and more manageable size. The classical procedure used for this purpose is known as *randomization.* As we shall see below, randomization is a procedure that gives everyone in the sampling frame an equal chance of being part of the sample: by doing this, randomization eliminates the possibility that any portion of the sampling frame will be overrepresented or underrepresented in the sample.

Purposive Samples. Another nonprobability approach is to choose some cases to study purposively. In studying the elite decision makers in a community, one might get advice as to who the major decision makers are and then seek to interview them. At best the success of this procedure depends on how carefully the people are selected. Even if the people are carefully selected, however, there always remains a possibility that some key decision makers were omitted. Purposive sampling often works well, but it can be tricky and it is hard to prove that one has sampled appropriately.

Volunteer Subjects. Another way of choosing people for a study is to ask for volunteers. Some people will volunteer to participate, and we can ascertain their attitudes, beliefs, and behavior. The problem is that people who volunteer may not be typical. Volunteers usually are more interested in the topic of the study than are the general population, so they are not representative of the larger population.

The most famous example of an interview study using volunteer subjects is the research in the 1950s by the Kinsey Institute at Indiana University on the sexual behavior of the American public. The researchers asked their respondents how many times they had engaged in a long list of sexual activities. The *Kinsey Report* showed that Americans were much more sexually active than had previously been thought. However, the use of volunteers in their study made this conclusion questionable: people who volunteered to participate in a study on their sexual practices are likely to have been more sexually liberated and more sexually active than people who were unwilling to participate in such a study. Thus, the use of volunteer subjects probably biased the results. More generally, volunteers are often likely to differ from the rest of the population, so the use of volunteers can bias a study.

Another example of volunteer subjects is the call-in poll on radio and television that asks people to phone one phone number if they want to vote yes on the issue of the day (such as whether prayer should be allowed in schools) and a different phone number if they want to vote no on that issue. The sample obtained from such a poll consists of volunteer subjects, and as such it measures the views of people who feel strongly enough to call rather than the entire audience of the station. The phone numbers to be called in such polls are often ones that the caller has to pay for calling (such as calling a 900 area code in a national poll for a charge of fifty cents), which means that only people who are willing to pay to record their views will participate. Furthermore, it is easy for an organized group to rig call-in polls by having their supporters phone one of the numbers repeatedly so that it looks like their side commands a majority. All in all, call-in polls should not be taken seriously.

Haphazard Sampling. Another simple sampling procedure is the *haphazard sample*, in which you survey people who can be contacted easily. For example, a professor might use a questionnaire to measure the attitudes of a college class, but their attitudes may not be identical with those of the American public. Haphazard samples can sometimes generate results that are representative of the larger population of interest, if there is no source of bias. For example, the now defunct *Literary Digest* conducted some of the earliest election polls in the 1920s and 1930s. They sampled large numbers of people from telephone books and automobile registrations, and they were quite accurate in predicting the winner of presidential elections.

However, haphazard samples can also generate results that are not representative of the population. In the midst of the Great Depression, the *Digest* poll predicted a Landon victory in the 1936 election and lost its credibility when Franklin Delano Roosevelt won in a landslide. The *Digest* poll had missed the large Democratic vote of poor people who lacked phones and cars during the Depression and who had not been voting in previous elections. Unfortunately, haphazard sampling almost always yields unrepresentative samples. Consequently, this approach is rarely used today, though during presidential election campaigns one still hears of polls based on whether popcorn buyers in movie theaters choose boxes with pictures of elephants or donkeys on them.

Quota Sampling. Another inexpensive means is quota sampling. If the census indicates that half of the country is female and 10 percent is black, then interviewers are told to obtain half of their interviews with women and one-tenth with blacks. The drawback in this approach is that the interviewers will tend to select the people they want to interview. They will tend to choose people they can find easily, people who are particularly willing to be interviewed, and people whom they do not find to be hostile or intimidating. These are usually people who are similar to the interviewers themselves. Since most interviewers are middle-class, the result is typically a middle-class bias with insufficient interviews with working-class people. Although more complex quotas could be imposed, the bias problem cannot be eliminated unless interviewers make none of the decisions regarding whom to interview.

After the *Literary Digest* debacle, the Gallup Poll became the dominant election poll. Then, in 1948, Gallup declared Dewey the president-elect, only to be embarrassed when the American public did not concur. One reason why this happened is that Gallup (and the other

commercial pollsters of that era) used a quota-sampling procedure. Truman's victory that year was correctly forecast only by academic polls using more accurate sampling procedures. Today, pure quota samples are rarely used, though some commercial pollsters continue to use quota samples with careful instructions to interviewers on how to avoid a middle-class bias.

In our discussion of volunteer, haphazard, and quota samples we touched on one of the most important points in sampling: a sampling procedure must avoid bias. Clearly, all of the subgroups, classes, and races in a population must have a chance to be included in the sample. If any group is excluded from the sample, then the sample is biased, and generalizations from the sample to the population may be very inaccurate.

Probability Sampling

Today, most high-quality surveys employ probability sampling, in which the sample is drawn before the survey so that each person in the population has a known probability of being included in the sample. This eliminates the bias inherent in the other sampling procedures.

The Simple Random Sample. One form of probability sampling is done by taking a list of the individuals in a population and randomly selecting people to be surveyed. In principle, this could be done by writing each person's name on a piece of paper, putting all the names in a hat, mixing up the names, and drawing the sample. For larger populations the random selection is performed with a computer. The result is called a *simple random sample*. This is an excellent sampling procedure. However, most probability samples do not use a straight simple random sample but instead use variants of the technique.

The Systematic Selection Procedure. One convenient variant of the simple random sample is the *systematic selection* procedure. This procedure requires a list of everyone in the population. A random number is chosen to choose the first person to be interviewed, and then a specified number of names on the list are skipped to choose the next person, and so on. Say, for example, that you were choosing a sample of students from a university with 20,000 students and that you desired a sample of 400 (a 1-in-50 sample). You could take the student directory and randomly choose one of the first 50 students, using a published table of random numbers. If you picked the number 37, you would interview the 37th person and every 50th person following on the list: the 37th, the 87th, the 137th, the 187th, and so on. Through this procedure, you would obtain a sample of 400 people.

This procedure makes sample selection easy as long as the list corresponds exactly to the population. One would not want to sample from a student directory that lists only students who live on campus if one wanted to develop a sample of all students at a college. A second problem with this procedure is that there could be some periodicity in the list. For example, if the list was of houses, and if one chose the first house and every fifteenth house down the street, one might accidentally obtain a sample containing only houses on corners, which are sometimes more expensive than houses in the middles of blocks. Fortunately, periodicity is rarely a problem, but when using systematic sampling, it is important to be sure that there is no periodicity in the list. A third problem with systematic sampling is that elements adjacent on the list cannot be included in the same sample. Thus, if one were selecting a sample of United Nations delegations to interview, systematic sampling using an alphabetical list of member nations would preclude having interviews with all of the major powers, since Russia (the Union of Soviet Socialist Republics), Britain (the United Kingdom), and the United States would all be in the same part of the alphabet.

In spite of their advantages, simple random sampling and systematic sampling share two significant disadvantages. First, they require a listing of the entire population of interest so that random or systematic selection can be made. This is impossible for a national survey in the United States—there are no lists of all residents, citizens, or voters in this country, and no one could afford to construct such a list. Second, it is too expensive to interview a national face-to-face sample based on such sampling procedures. Most survey budgets do not allow for an interviewer to fly to Snowflake, Arizona, for only one interview and then to Casper, Wyoming, for the next interview—transportation costs for interviewers require that several interviews be physically clustered near one another.

Stratifying the Sample. Several approaches are used to solve these problems. One is *stratifying*—dividing the population up into small, manageable chunks and randomly sampling from each chunk. If you are interested in sampling the population of the United States and know the proportion of the population living in each region, it

makes sense to stratify your sample by region so that the proper proportion of interviews can be taken independently within each region. That way, you can make sure that 25 percent of the interviews are taken in the Midwest, that 30 percent are taken in small towns, and so on. Stratifying helps maximize accuracy in a sample, since it assures that certain known proportions of the population are matched in your sample. Stratifying is especially useful in increasing accuracy when two groups differ widely on the topic being studied, yet members within each group are very similar. For example, if we were interested in contrasting freshmen with seniors in terms of their views on some issue, we could obtain more accurate estimates of each group's views by sampling from them separately than if we sampled the entire college and then compared the lower-division and upper-division students in the sample. Stratifying is useful if the researcher knows what variables are worth stratifying on.

Unfortunately, stratification is often not possible because it requires knowing all population members' status on the stratifying variable prior to the sampling. This is easy to do with regions of the country, for example, but would be much harder to do with religion. There is no easy way to create separate samples of Protestants and Catholics, since there are not separate lists of all members of each religion in the nation and there is not residential segregation by religion. Incidentally, note that stratifying is not the same as quota sampling, since the interviewer is not choosing whom to interview; the selection of exact respondents is still random.

The Cluster Sample. Another approach is to use a *cluster sample*. Since it is too expensive to take each interview in a different neighborhood, one clusters by taking several interviews in one neighborhood. This reduces interviewing costs, since the expenses of paying for interviewers' time and transportation decrease.

Regrettably, accuracy declines in cluster sampling. People who live in the same area tend to be similar, so taking several interviews in the same area yields less information than would be gained by spreading the same number of interviews across a wider area. Most survey organizations believe that some loss of accuracy is acceptable if it permits greatly decreased costs.

Paradoxically, if a cluster sample and a simple random sample *of equal cost* were taken of the same large, geographically dispersed population, the cluster sample would probably be more accurate. The reason for this is that the reduced cost per interview of the cluster sample allows the sample size to be increased sufficiently to offset the increased error from clustering. Of course, one should not go to the extreme of drawing an entire sample from only one or two clusters; as long as there are enough clusters, the error will be within reasonable bounds as well.

Multistage Sampling. Another permutation of probability sampling, *multistage area sampling* first requires sampling a set of geographical areas. Next is to sample a subset of geographical areas within each of those areas, and so on. The chances of an area being included increase with the number of people living in it.

Let's say you begin by randomly selecting 100 towns in the United States. If a particular town is selected, you next randomly choose neighborhoods—maybe one area in the northeast corner, another on the near south side, and a third in a western suburb. At the next stage, a sample of blocks would be chosen within each neighborhood, and than a sample of houses would be chosen on each block. The advantage of multistage area probability sampling is that a complete listing of the population is now unnecessary. All that is required is a list of towns, a list of neighborhoods within the towns selected, a list of blocks within the neighborhoods chosen, and a list of houses on the blocks that are chosen. The clustering inherent in this scheme means that it yields higher error than simple random samples, but this is offset by the ability to sample without a complete listing of the population and by lower costs per interview.

Summary. Typically, sampling for face-to-face interviews combines the several procedures we have mentioned above, which are listed in Table 3.1 along with their advantages and disadvantages. Using only volunteers, taking a haphazard sample, and interviewing through quota techniques are relatively cheap, but accuracy suffers. Probability sampling is required if estimates of the survey's accuracy are desired. The simple random sample is the textbook ideal, but it is expensive—its accuracy requires a listing of all elements in the population as well as interviews in widely scattered locations. Systematic sampling simplifies the sample selection, but it also requires a listing of the population and widely scattered interviews. Multistage sampling permits the listings to be made only in small areas. Clustering cuts transportation costs, though with some increase in error. Stratifying guarantees matching some population proportions to safeguard accuracy. All in all, the accuracy of a survey is significantly affected by

Table 3.1 Types of Samples

Sampling Method	Advantages	Disadvantages
Nonprobability		
Purposive sample	Cheap Uses best available information	No estimates of accuracy May miss important elements
Volunteer subjects	Cooperative respondents	Not representative of population
Haphazard sample	Available sample	No necessary relation to population
Quota sampling	Willing respondents	Middleclass and other biases
Probability		
Simple random sample	Accuracy can be estimated Sampling error can be estimated	Expensive Interviews too dispersed and full list required
Systematic sample	Convenience	Periodicity in list
Stratified	Guarantee adequate representation of groups Usually decreased error	Sometimes requires weighting
Cluster	Decreased cost	Increased error
Multistage	Lower cost than simple random sample for large populations Lower error than cluster	Higher error than simple random sample Higher cost than cluster

its sampling procedures, and the choice of the proper sampling technique is crucial to the success of the survey.

EXAMPLES OF SAMPLES

To illustrate how samples are actually drawn, we will give examples of different strategies you could use to draw a sample from a series of different populations.

A National Sample for Face-to-Face Interviewing

How are national samples for face-to-face interviewing drawn? Simple random sampling cannot be used because of the size and dispersion of the population, so multistage samples with clustering and stratifying are used instead. For purposes of illustration, we will describe the sampling procedures used by the University of Michigan's Survey Research Center (SRC) and by the University of Chicago's Na-

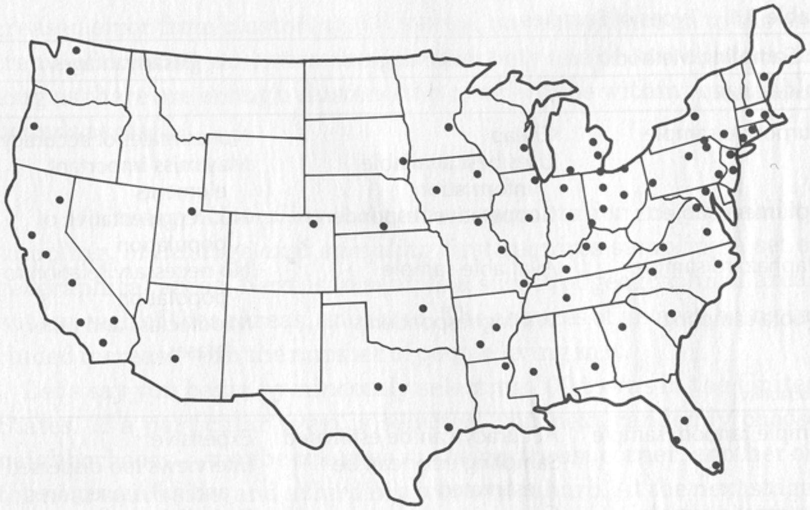

Figure 3.1
Survey Research Center Primary Sampling Units
(Adapted from Leslie Kish and Irene Hess, "The Survey Research Center's National Sample of Dwellings," Institute for Social Research, University of Michigan, 1965. Reprinted by permission of Leslie Kish.)

tional Opinion Research Center, which now does its sampling jointly with the SRC.

Choosing Where to Interview. The first stage consists of sampling a number of *primary sampling units*, or *psu's*. A *psu* is an area, a Standard Metropolitan Statistical Area (the Census Bureau's designation for the largest cities along with the rest of their county and adjacent urban counties), a county, or a set of adjacent small counties. The *psu*'s are stratified by region as well as by the size of their largest cities. The resulting sample of *psu*'s might include the Syracuse area, a farm area in eastern Kansas, and so on. The largest sixteen metropolitan areas are typically represented in every sample, so interviews are always taken in New York City, Chicago, Los Angeles, Houston, and other big cities. SRC and NORC choose a sample of about 100 *psu*'s after each census (Figure 3.1), and use those *psu*'s for as many of their surveys as possible during the next ten years. People who live in those psu's are hired as interviewers for that decade in order to have stable, experienced field staffs.

For a national survey the researchers must first decide how many interviews are to be conducted. This is usually determined by the amount of money available, since the bigger the sample, the better. The number of interviews to be assigned in each region of the country is

determined by the percentage of the population living in each region. A similar logic is used to determine the number of interviews to take in each psu. Next, smaller areas are chosen within each psu. If the Syracuse area is a psu, for example, then the populations of the city, the suburbs, other towns in the county, and rural townships are determined using the United States Census Bureau's data. These figures are used to estimate how many interviews should be conducted within each *sample place*. Because it contains most of the population in the psu, the city of Syracuse would most likely be chosen as one of the sample places within its county. Then, a list of blocks in the city (or other chunks in nonurban areas) is obtained. A random sample of the city blocks (or chunks) is chosen, so that interviews are taken on the 1500 block of Ontario Street, the 2400 block of Superior Avenue, and so on. List of houses or apartments on the blocks or segments in the sample are obtained, and random samples of the houses are drawn. Interviewers are then told which houses and apartments to visit. Figure 3.2 illustrates this multistage sampling procedure.

Choosing Whom to Interview. Rather than let the interviewer make a subjective choice of respondents, objective procedures have been developed to choose the resident at each dwelling unit to be interviewed. Table 3.2 reproduces part of the *cover sheet* given to the interviewer. The interviewer checks to see whether there is more than one housing unit at the address (as when a two-story house contains two apartments). If so, extra housing units are added to the sample.

For each dwelling unit, the interviewer records the name, gender, and age of each person living in the household. The interviewer numbers these persons sequentially, using *1* for the oldest eligible male, *2* for the next oldest eligible male, and so on until all the eligible males have been numbered; the oldest eligible female is given the next number, the next oldest eligible female the next number, and so on. The interviewer then looks at a selection table to see which person to interview. In the example shown in Table 3.2, if there are one or two people over eighteen in the household, then person number *1* (the oldest male if there is one) is interviewed; if there are three or four people over eighteen, then person number *2* is interviewed; and if there are five or more people over eighteen, then person number *3* is interviewed. Different selection tables are used in different households so as to randomize the selection of individuals within households. This might result in the interviewing of the oldest male in one house, the youngest female in the next, the second oldest female in the third, and so on. This selection procedure is used rather than just interviewing whoever an-

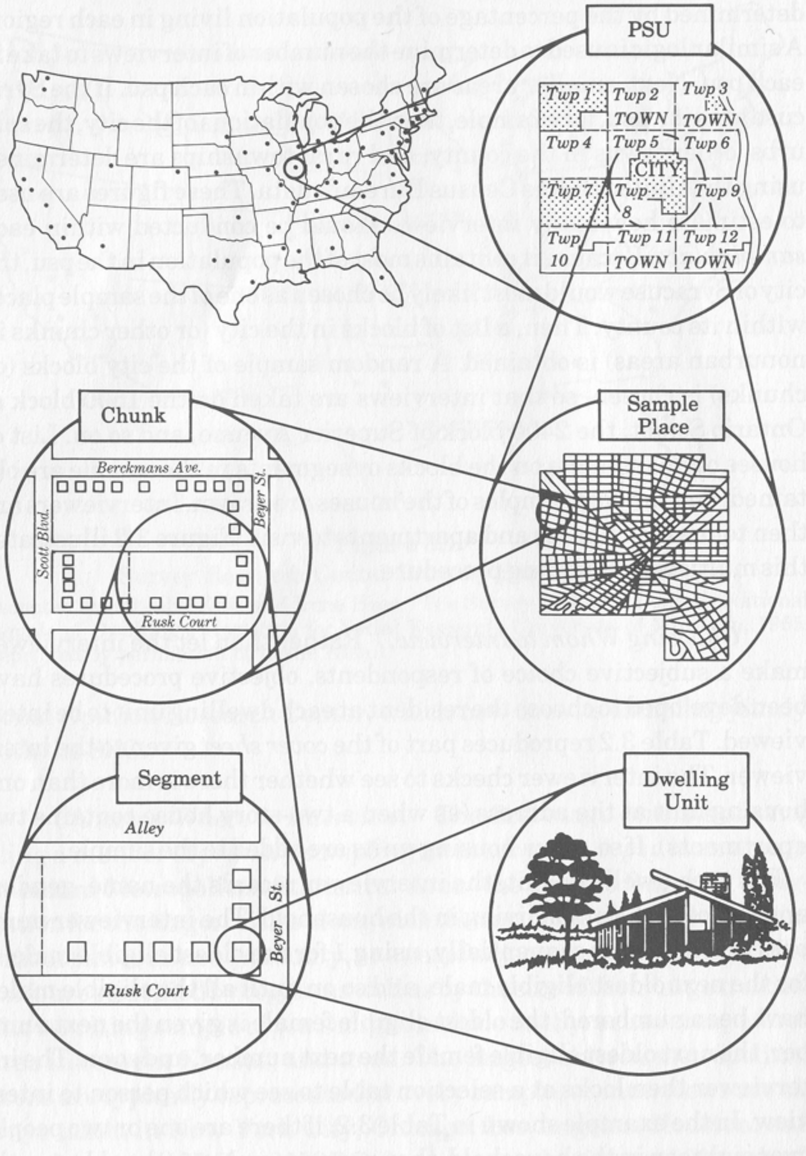

Figure 3.2
Survey Research Center Sampling Method
(From the Survey Research Center's *Interviewer's Manual.* [Ann Arbor, MI: Institute for Social Research, The University of Michigan, copyright 1969]. Reprinted by permission of the Institute for Social Research.)

swers the door in order to avoid any biases as to which types of people are most likely to be home. For example, young males tend not to be at home as much as other members of a family, but this selection procedure obtains the proper proportion of young males as designated respondents.

If the person to be interviewed is not at home when the interviewer visits, SRC interviewers make an appointment to stop back and interview the designated respondent. If that person is not at home when the interviewer stops back, the interviewer is instructed to call back two or three more times to find the designated respondent. If these attempts fail, the person is dropped from the sample. The interviewer cannot just pick someone else in the household or a neighbor. Commercial pollsters instead allow their interviewers to interview anyone who is at home or instruct their interviewers to talk to a neighbor if the designated respondent is not at home, since repeated call-backs are expensive. The quality of the data collected is unlikely to be hurt by this unless the not-at-homes differ significantly from their neighbors.

Telephone Samples

Telephone interviewing has become an important means of conducting surveys, and sampling for telephone interviewing raises unique problems.

Choosing Phone Numbers. One way to obtain a sample for phone interviews is to take a random selection of numbers in local telephone directories and phone those numbers. Unfortunately, there are two serious problems with this approach. First, some people who have phones do not list their numbers in directories. Second, phone directories are a few months out of date by the time they are published and become increasingly out of date as time passes. Because of these factors, in many localities more than 20 percent of residential phones are not listed in phone directories.

A slight modification of the use of phone directories is the *add-a-digit* approach. In this procedure, a set of random phone numbers is selected from the telephone directory (using simple random sampling or systematic sampling of every *n*th number in the directory) and then adding one to that number. For example, if the number 292-6446 is obtained from the directory, the value 1 is added so that the number to be dialed for the interview is 292-6447. A variant of this approach is to add a random digit from 0 to 9 to the directory number. These add-a-digit procedures make it possible to call unlisted numbers as well as

Table 3.2 Part of a Cover Sheet (Items 1–14, 16–20)

FOR OFFICE USE ONLY

NATIONAL ELECTION STUDY
Coversheet for Listed and Selected HU
Labeled Coversheet--FORM B

B

495827
P. 27
Fall 1986

1. SAMPLE LABEL

2. Interviewer's Label

1a. IF YOU ALTERED ANY INFORMATION ON THE SAMPLE LABEL, INDICATE REASON FOR CHANGE:

- SAMPLE LABEL IS A DESCRIPTION: IWER SUPPLIED HU STREET ADDRESS
- SEGMENT FOLDER REPORTS DIFFERENT HU ADDRESS: IWER UPDATED SAMPLE LABEL & NOTIFIED SUPV
- OTHER, SPECIFY: ______

3. Iwer ID ____ ____ ____ ____
4. Your Iw No. ____ ____
5. Date of Iw ______________
6. Length of Iw ______________ Minutes
7. Length of Pre-Edit:_____MIN Post-Edit:_____MIN
8. Persuasion letter requested?
   NO YES --> ______________ Date Requested
9. Total Calls (Call # of Final Call) ______
10. Date of Final Call ______________
11. Final Call Result Code: ______________

12. THE ADDRESS OR DESCRIPTION ON THE SAMPLE LABEL ABOVE WAS FOUND TO HAVE: (CHECK ONE)

1 HU | 2 HU's | 3 HU's | 4 HU's | 5 OR MORE HU's --> Do not attempt any interviews. Obtain HU locations within the structure and call your supervisor.

HU 1 is uniquely described by adding to the sample address on the label the following description about the location of HU 1 in the structure:

____

The unique and complete address or description for each of the additional HU's is (use street address/description and location of HU in the structure).

	SAMPLE ID:	FORM
HU2: ______________	□□-□□-□□□-2	B
HU3: ______________	□□-□□-□□□-3	B
HU4: ______________	□□-□□-□□□-4	B

Make out an unlabelled coversheet for each of the additional HU's. Attempt an interview at HU1 and at each of the additional HU's.

Call your supervisor later to obtain a Sample ID for each of the additional HU's. Record the ID's on the respective lines above. Enter the appropriate ID in Box O of the unlabelled coversheet(s) for each additional HU.

13. Hello, my name is _______, and I work for The University of Michigan's Survey Research Center. Here is my identification (SHOW ID). The University is conducting a study throughout the nation, asking the American people about their feelings on a variety of topics, things like feelings about the economy, the recent congressional elections, and some of the important issues facing the country these days. This address was selected as part of the study's national sample, and I would like to interview a member of this household.-->TURN TO P. 4, ITEM 16, "HOUSEHOLD LISTING"

14. CALL RECORD

CALL #	a. DATE	b. DAY OF WEEK	c. TIME AM/PM	d. MODE TEL/FTF	e. IWER ID#	f. RESULT CODE	g. COMPLETE DESCRIPTION OF CONTACT:

new numbers, though many calls are made to numbers not in service. This is still a reasonable sampling procedure, especially when studying a single community with only one telephone directory. It is feasible even when studying a single state where all the state's directories can be obtained, but it is unmanageable when conducting a national sur-

Table 3.2 Part of a Cover Sheet (Items 1–14, 16–20) (*continued*)

16(a)-(c). In order to determine who to interview, I need to know who lives here at this address--not their names, just their ages and their relationship to you and whether any of the persons is not an American citizen. Let's start with you--how old are you?
Now I'd like the sex and age and relationship to you of each of the other members of this household who are 18 years of age or older.

16(d). (IF 18 YEARS OF AGE) Was (PERSON) 18 years old on or before November 4?

16(e). Are all of these people U.S. citizens? (Who is not a U.S. Citizen?)

PERSONS 18 YEARS OLD OR OLDER	(a) Household Member's Relationship to Informant	(b) Age	(c) Sex	(d) 18 by Nov. 4? YES/NO	(e) U.S. Citizen YES/NO	(f) Eligible Person "√"	(g) Person Number	(h) Selected Respondent "R"
M			M					
A			M					
L			M					
E			M					
S			M					
F			F					
E			F					
M			F					
A			F					
L			F					
E			F					
S			F					

17. Now I'd like the sex and age and relationship to you of each of the members of this household who are 17 years of age or younger.

	(a) Household Member	(b) Age	(c) Sex
PERSONS			
17			
YEARS			
OLD			
OR			
YOUNGER			

SELECTION TABLE A

If the number of eligible persons is:	Interview the person numbered:
1	1
2	1
3	2
4	2
5	3
6 or more	3

18. You've said there are (REPEAT LISTING); does that include everyone living here at the present time? (IF NO, CORRECT ABOVE.) [Now I will use a selection procedure--I'm going to number the persons in this household to determine whom we need to interview--(it will take a second...)]

19. □ NO ELIGIBLE RESPONDENT (NO ADULTS 18 BY NOV. 4 OR NO U.S.CITIZENS)-->SEND IN COVERSHEET WITHOUT NONINTERVIEW FORM. CODE RESULT "NER".

RESPONDENT SELECTION

16f. Enter a check mark (√) in column (f) for each person eligible for selection. Eligible persons are U.S. citizens who were 18 on or before Nov. 4. In other words, if (d) is "NO" and/or (e) is "NO", do not enter a check mark in (f).

16g. In column (g) assign a sequential number to each eligible person checked in column (f). First number checked MALES from oldest to youngest and then continue the numbering with checked FEMALES, again from oldest to youngest.

16h. Use the selection table above to select a respondent. In the first column circle the total number of eligible persons (the highest number assigned in column (g)). The corresponding number in the second column of the selection table denotes the person selected to be interviewed. Enter "R" in column (h) for this person.

20. IF NO INTERVIEW WAS OBTAINED AND THE HU IS OCCUPIED: Were you able to list all adults (18 years or older) residing in this household?

1. YES, ALL ADULTS LISTED | 2. YES, PROBABLY ALL ADULTS LISTED | 3. NO, ADULT LIST IS INCOMPLETE OR DK

SOURCE: Reprinted by permission of National Election Studies.

vey. Strictly speaking, this is not a probability sample, since the likelihood of each household being selected is not a known nonzero value, so it can produce biased estimates of population values.[1]

[1]Graham Kalton, *Introduction to Survey Sampling* (Beverly Hills: Sage, 1983), 87.

A commonly used alternative procedure is *random digit dialing* (RDD). This approach uses computers to make up phone numbers randomly. It is used in many phone polls, such as the *New York Times*/CBS News poll. In most areas of the country, many phone exchanges are not used, so completely random dialing would result in large numbers of wasted phone calls to nonexistent exchanges. As a result, RDD is generally limited to exchanges that are in use.

Phone numbers in the United States are composed of three parts. In the number (614) 292-6446, for example, 614 is the area code, 292 is the central office code, and 6446 is the suffix. It is possible to find out which central office codes are used in a particular area code, either from the local phone company or from national directories. One can then randomly choose a set of area code–central office codes and add random suffixes to them. In samples from a single community, the local phone company may be able to provide information as to the number of residential phones per central office code, and then one can stratify by central office code using that information. There are usually many unused suffixes within each central office code, so it is necessary to sample many phone numbers for each desired interview. A 5-to-1 ratio is necessary, since generally only one-fifth of the numbers turn out to be working residential phones. Phone calls are placed until the desired number of interviews is obtained. This is a probability sampling procedure, but it is inefficient because so many numbers are not working residential numbers.

A commonly used variant of this technique that involves fewer wasted calls is known as the Waksberg method. The four-digit phone number suffixes (6446 in the above example) can be thought of as having two parts: the first two numbers (64) and the last two numbers (46). Within an area code–central office code combination, randomly choose several banks of first two numbers (64 could be one). Within each of those banks, select one phone number randomly (say 46 is chosen so as to get 6446). Dial that number. If that number is not a residential number, then reject that bank and dial no more numbers from it. If that number is a residential number, get a specified number of interviews from that bank. One might keep calling numbers in that bank until, say, eight interviews are taken with working residential numbers. With this system, two-thirds of the phone calls are placed to working residential phones. This is considered a two-stage probability sampling procedure with clustering. The University of Michigan's Survey Research Center is one of the many polling operations using this method for telephone sampling.

There is tremendous diversity in the procedures used for selecting

phone numbers. The Waksberg procedure is highly regarded, but it is complicated to explain. As a result, many polling companies prefer to use straight random digit dialing, since they find it easier to justify to their clients.

There are several possible outcomes of survey phone calis. There can be no answer, a busy signal, or an immediate hang-up, in which cases the number can be tried again later. On the other hand, the number is set aside if it is a disconnected number, a business, or outside of the intended geographic area, or if it does not have an eligible respondent. If the call is answered by a nonresident, one can try phoning back later to see if someone else answers, which also can be done if the person answering the phone refuses to cooperate. In addition, study directors have to decide how to handle special situations, such as answering machines and when the phone is answered by someone who does not speak English. Finally, designated respondents must be dropped if they are out of town throughout the interviewing period or too handicapped to be interviewed. Careful record keeping is required during the phone calling to keep track of what numbers to try again and to keep statistics on response rates.

When a phone number does not answer, academic polling operations tend to have interviewers call the number back repeatedly in case the people return home. Some studies show that repeated call-backs over a period of days are effective, although there is little gain after six call-backs. Commercial polling operations are more likely to substitute other numbers for numbers that do not answer. Call-backs are important if the people who are home less often differ in relevant ways from those who are home most of the time.

Screening Questions. Some problems with phone samples can be handled by asking the person who answers the phone some screening questions. First, if one wishes to sample a particular city, the sampling procedures described above are likely to yield some calls to homes that are not in the city. Therefore, the person answering the phone must be asked whether he or she lives in the desired area rather than an adjoining suburb.

Another problem involves multiple phone lines. A family with two phone lines has twice as great a chance of being included in a sample as a family with just one line. This problem is handled by asking the respondents how many phone lines they have. Respondents with two phone lines are given a *weight* of one-half, meaning that their data are only counted for half of that of respondents with just one phone line so as to compensate for their greater chance of selection in the sampling.

Screening questions are also used to select the respondent in a household. Studies of households sometimes accept any adult who answers the phone even though that means more interviews with women and older people, but most surveys instead use random selection of respondents. Early phone researchers tried asking people for the full listing of members of the household that is obtained for face-to-face interviews (Table 3.2), but they soon found that many people would not disclose that information on the phone.

Several alternatives have been developed. One, known as the Troldahl-Carter-Bryant method, asks the person answering the phone how many adults are in the household and how many adult females are in the household. The interviewer then consults a chart (chosen randomly from a set of charts) to decide which person to interview. This method also encounters problems, since many people are still unwilling to cooperate with interviewers asking about the composition of the household. A less obtrusive method, the Hagen-Collier method, is randomly to ask to speak to one of four types of people—the youngest woman over eighteen, the oldest woman over that age, the youngest man over that age, or the oldest man over that age. If there is no person of the designated sex in the household, then the interviewer randomly asks to speak to either the youngest or oldest person of the opposite sex. A final system now used frequently is the *next birthday method*. The interviewer simply asks for the person in the household who will have the next birthday, and that person is the designated respondent. These last two methods both seem to get lower refusal rates than the other methods.

A Sample of Students at a University

How could you draw a sample from the population of students at a university? You could use all the students who are taking a particular course for your sample, but they would not necessarily be representative of the total population. A single course would be a haphazard sample rather than a probability sample, since students do not all have known chances of being included. A probability sample would be preferable.

For conducting a probability sample, you must first obtain a list of all the university students. An up-to-date student directory is perfect for this purpose. If you can gain access to a computerized version of that directory, you can use a computer program to draw a simple random sample. Alternatively, a systematic sample based on the student directory would give a good sample of the student body. You could stratify the sample in order to guarantee proper coverage in the freshman, sophomore, junior, and senior classes, if you can find a separate listing of each class.

In this example, the list of students (your sampling frame) must match the population of university students as closely as possible. If there is a bias in the list, certain types of students will be missing from the sample. For example, a list of students who live in the dormitories would miss students who live off campus. In this case it would be important to locate many different student lists, investigate the biases of each, and then choose the list that provides the most complete coverage.

Finally, it is important to keep in mind that the population for this study is from a single university, so the results can be generalized only to that university. One should not generalize from results on one campus to the population of college students. The university studied would constitute a haphazard sample of all universities, so generalizations should be limited to that campus.

A Sample of Residents of a City

The sampling problem is somewhat more complicated for a city. You could use a city directory for the listing of the population, but directories are always somewhat out of date by the time they are published. Similarly, if you wanted to interview voters a few months before an election, you could sample from the voter registration lists, but the voter registration lists miss people who register just before the election.

The best procedure for selecting a sample for face-to-face interviews would be the multistage approach described above. Obtain lists of neighborhoods of the city and sample those. For each neighborhood in the sample, obtain lists of blocks and sample those. Finally, list the houses and apartments in the blocks that have been chosen and randomly sample those. This procedure guarantees a high-quality sample, though it is so difficult to perform that using directories and/or registration lists is often more convenient regardless of their drawbacks.

Another possibility is conducting telephone interviews. A sample of numbers from the telephone book can be drawn, adding one to each number in order to be able to locate unlisted numbers. In many cities there are also *reverse directories*, which list houses geographically in order of their addresses and then give the corresponding phone numbers, and samples can be drawn from these reverse directories. Alternatively, the local phone company can provide a listing of residential central office codes, and a computer can be used to randomly choose central office codes and four-digit suffixes.

A Sample from a Rare Population

Sometimes a researcher is interested in a specialized population, such as of Jews or disabled people. These are fairly small groups, and it would be very expensive to phone the general population until one accumulated enough people in these groups. Membership lists of organizations are sometimes useful in locating such people, but this would still miss people who are not members of organized groups. Polling operations that regularly conduct surveys handle this problem by looking through their past surveys to locate respondents who fall into these groups and then recontacting those respondents.

Election Exit Polls

One type of poll that involves unusual sampling procedures is the survey taken by a television network on election day to predict the winners of elections as early as possible. These are generally statewide polls, since most American elections are state elections. Each network decides which states to poll. The networks generally want to give early predictions of the results in the large states, but they often are willing to ignore the small states.

In states in which they are polling, the networks draw a sample of the voting precincts. At one extreme this could be a simple random sample drawn from the list of all the voting precincts in the state, but that would allow a sample that would be too urban or too rural. At the opposite extreme the networks could construct a purposive sample of precincts with known properties (such as precincts that usually go with the election winner or a quota sample with the right proportion of black and white precincts), but such nonprobability samples can contain unsuspected biases. The actual sampling procedures generally are stratified random samples, with stratification on urban versus rural precincts and parts of the state (such as upstate versus downstate in such states as New York and Illinois). Voting patterns in the sample precincts are examined to make sure that the sample has been representative of statewide trends in the past.

In these sample precincts the networks conduct *exit polls* with voters leaving the polling places. Interviewers might be instructed to take interviews with the fifth person leaving the polls after each quarter of an hour (6:00, 6:15, 6:30, and so on). The results of these exit polls are phoned in throughout election day so that network analysts can spot trends long before the polls close. The networks use these exit polls to project election winners as well as to provide insights into the attitudes of voters.

When the polling places close, interviewers phone in the official returns for the precinct as soon as they are available. The network analysts sum up those returns for the state, which provides another means of projecting the vote in the state before the official returns for the whole state are available.

These examples of polling procedures should demonstrate that sampling is a very practical operation. Mathematical theory guides sampling, but taking a sample requires knowledge of what problems are likely to occur. The sampling procedure chosen must handle those likely problems.

PROBLEMS IN SAMPLING

The procedures for taking probability samples are complicated, but it is possible to design probability sampling procedures that do not bias the results and that keep costs reasonable. Generally, so long as (1) the interviewer cannot select the respondent, (2) the sample is large, and (3) there are enough clusters, samples will be highly representative of the population. An occasional sample may by chance be far from representative, but such a bad sample can often be detected if one checks to make sure that the sample approximately matches the percentages for each sex, race, and educational level given by the latest data from the Census Bureau. Still, some potential problems require attention.

Noncoverage Error

One of the complicating problems in sampling is noncoverage error—the omission of part of the intended population. Soldiers, students living on campuses, people living in hospitals, prisoners, and residents of Alaska and Hawaii are typically excluded from national samples, as are hoboes and others without identifying addresses. These discrepancies are unlikely to affect national results by more than 1 percent, and in some cases they are viewed as completely irrelevant, as in election surveys, since many of these groups have very low turnout rates.

The Wrong Population Is Sampled

One must always be sure that the group being sampled is drawn from the population that one wishes to generalize about. For example, one should not draw a sample of college students if one wants to generalize about all college-aged persons. A similar problem might arise if city officials were to survey swimmers at the city pool to determine whether the admission price is so high as to discourage use of the pool. The problem with sampling the swimmers is that the officials intend to make a generalization about all potential users, but those potential users who have already found the price too high will not be among the swimmers.

The Response Rate

We have already mentioned the problem that some people are never at home when the interviewer calls or visits. A related problem is that some people in a sample refuse to be interviewed because they are ill, are too busy, or simply don't trust the interviewer. Interviewers employ many kinds of persuasive arguments to get their cooperation, but in the end many people still refuse. In the 1950s response rates of about 90 percent were typical. However, today people seem less trusting of interviewers, so that response rates are in the 70 percent range.

Response rates for phone interviews are also in the range of 70 percent of the answered phones. This requires three to five call-backs at different times of the day and week to numbers that do not answer. About 5 percent of interviews are not completed because the respondent hangs up in the middle, a higher noncompletion rate than for face-to-face interviews. These response rate figures vary by area, with lower rates in large cities for both face-to-face and phone surveys.

When telephone interviewing was first being attempted, researchers were concerned because many Americans did not have telephones and would therefore be omitted from survey samples. This became a less serious problem when phone ownership in the United States reached the 90 percent level in the 1970s. Response rates in face-to-

face interviews fell at that same time, making the lack of complete coverage of telephones less serious.

A national experiment by Groves and Kahn compared demographic characteristics of respondents in face-to-face interviews with those of respondents in a comparable phone interview.[2] They found telephone respondents to be younger and to have somewhat higher income and education, but the differences were not large and do not necessarily signify an unacceptable bias in phone samples. Instead, they reflect reasonable differences in getting people to be interviewed by the two different approaches. For example, young people are generally at home less and at more erratic hours than older people, so phoning back several times may be more effective at contacting them than call-back procedures for face-to-face interviews. Similarly, people with higher socioeconomic status might feel more threatened by letting interviewers into their houses. They might therefore be more likely to refuse face-to-face interviews but be more approachable by phone interviews. Thus the few demographic differences that emerge between face-to-face and phone interviews may indicate problems with face-to-face interviews as much as problems with phone coverage.

This does not mean that researchers can be entirely sanguine about the demographics of phone interviewing. As society changes, phone interviewing may not remain as successful as it was in the early 1980s. For one thing, the breakup of the American Telephone and Telegraph Company (AT&T) has meant higher phone costs for many people, which could cause poorer people to drop or lose their phone service. In fact, a 1987 survey of households with incomes under $15,000 found one-quarter without phones.[3] For another, the increasingly common practice of companies phoning people and pretending to conduct a survey as a ruse to sell them a product (known as *sugging*—selling under the guise of a survey) makes people wary of cooperating with phone surveys. More people are using telephone-answering machines to screen their phone calls, which makes it harder for polling operations to get through to their intended respondents. If these developments continue, nonresponse with telephone interviews may become so serious as to make that procedure less attractive.

[2] Robert M. Groves and Robert L. Kahn, *Surveys by Telephone: A National Comparison with Personal Interviews* (New York: Academic, 1979).

[3] This is based on a survey of 816 low-income households conducted by the U.S. Public Interest Research Group, as reported in "Many Poor Say Phone Too Costly," *Columbus Dispatch*, Feb. 1, 1987, 10A.

Nonresponse can be a problem, though people who refuse to respond usually do not differ much from those who do respond (other than being less cooperative). The higher the refusal rate, the more important it is to ascertain whether the refusals are concentrated among a certain group. If, for example, there is some reason to fear that Democrats are less willing to be interviewed than Republicans (and we know of no reason to believe this is happening today), then a survey's results should be adjusted to compensate for the unequal coverage. The demographics of the sample can often be compared with census data in order to determine how representative the sample is, and the data can be adjusted if need be. Usually, though, nonresponse can be ignored.

Sampling Error

A more basic type of error is sampling error—the error that arises from trying to represent a population with a sample. Inevitably, samples differ from populations. Consequently, we should not take sample results as absolutes but rather as approximations. If we find that 67 percent of a sample favors some program, we have learned that the odds are very high that the proportion favoring the program is near 67 percent.

The chances of error cannot be calculated for nonprobability samples, but they can be estimated for probability samples. Say, for example, that there are 200 people (100 women and 100 men) in a population, and we draw a sample of 50. There are many different 50-person samples that could be drawn, and not all would have the same sex ratio. Most of the samples would have sex ratios that are close to the sex ratio of the total population. We might draw an all-male sample, but that would be very unlikely.

Simple random sampling permits precision about the representativeness of the sample. If the true proportion of men is 50 percent, then a sample of 50 people would be expected to have a sex ratio (that is, would have a sex ratio most of the time) within 14 percent of that value. More precisely, given a 14 percent sampling error, 95 percent of the samples would have between 36 percent (18) and 64 percent (32) men. The 14 percent error is called sampling error and can be determined for probability samples.

To state this technically, if repeated samples of 50 were taken with replacement from a population with a 50:50 sex ratio, the percentage of males for 95 percent of the samples would be between 36 percent and

64 percent. This is known as the *95 percent confidence interval*.[4] Of course, we take only one sample, but we hope that our sample is one of the 95 percent rather than one of the 5 percent. A statistician would say that we are taking a 5 percent chance of drawing a faulty conclusion —and 95:5 isn't bad betting odds.

As an example of a simple random sample with sampling error, it is worth conducting an experiment. Starting with 200 cards, write red numbers on half and blue numbers (1-100) on the other half. Shuffle them well. Draw a card. Record its color. Put it back in the deck. Shuffle again. Draw another card. Replace it, shuffle, and draw again. Keep doing this until you have drawn 50 cards. You may begin with a run of same-color cards, but you will probably end up with approximately 25 cards of each color. Figure 3.3 shows the probability of having a given number of blue cards in your sample. Since half of the cards are blue, the most frequent result will be to have 25 blue cards; the next most frequent results will be to have 24 or 26 blue cards, and the least frequent results will be to have 0 or 50 blue cards. If you add up the probabilities of getting 18 blue cards, 19 blue cards, 20, and so on through 32 blue cards, the total should be about 95 percent.

Note that Figure 3.3 shows a normal curve. If one drew a large number of samples from the same population and calculated the mean of each sample (such as the sex ratio or the number of blue cards in the examples above), the distribution of the sample means has a normal distribution around the population mean. Values near the population mean are most likely, while values far from the population mean are unlikely. Of course, a researcher only takes one sample, but the odds are that its mean is close to the population mean. According to published tables, 95 percent of the area under the normal curve is within a known distance from its mean, and that is used to generate the sampling error range.

Of course, with unusual luck, your sample might be 50 blue cards, but that should not stop you from believing in sampling theory. Just take 99 more samples of 50 and you will find that such eccentric samples will occur in only about 5 of them. Sampling is not done by magic —mathematical theory assures that notwithstanding the chances of

[4]To simplify this example, we are assuming the sample is with replacement. After we draw a name, that name is thrown back into the pool so that all drawings have identical probabilities. Sampling with replacement is unusual. However, when the population of interest is large relative to the sample, the chance of drawing the same person twice is negligible, so the effect is the same as sampling with replacement.

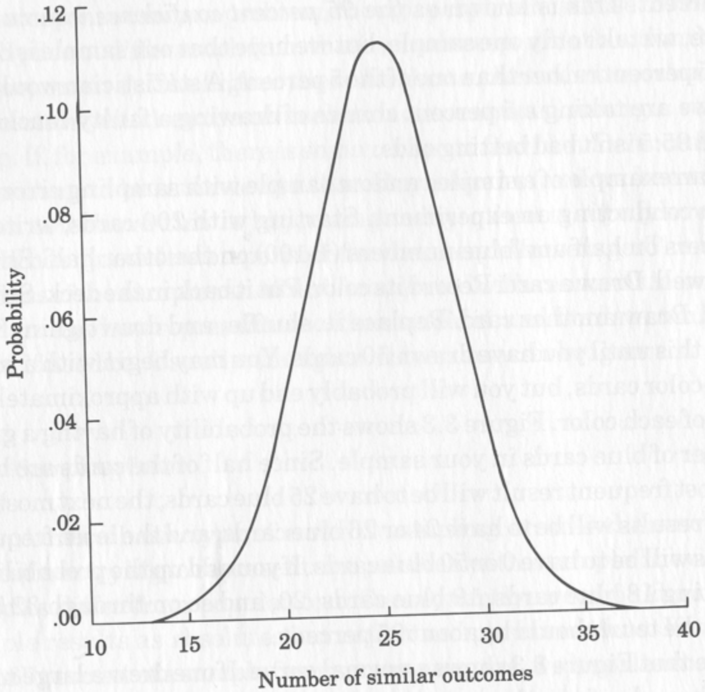

Figure 3.3
Sampling Distribution for Binomial With Fifty-Case Sample
(Based on Harry G. Romig, *50–100 Binomial Tables* [New York: Wiley Copyright 1947] p. 15. Reprinted by permission of the publisher.)

getting a bad sample now and then, almost all results will be on target. Fortunately, researchers are not entirely at the mercy of bad samples. If one knows from past surveys what results to expect, one does not trust a poll that departs radically from them. Thus, if one poll predicts a Republican landslide, while every other poll taken that year predicts a Democratic victory, one should be suspicious of the inconsistent poll.

Sample Size. The 14 percent sampling error in this example is high, but we could cut it by taking a larger sample. The key ingredient in determining the sampling error for a simple random sample is the sample size. The more people who are interviewed, the smaller the error. Actually, quadrupling the sample cuts the error rate in half.[5] Surveys generally take more than 100 interviews, since the error rate for samples that size would be too high. But as one increases the number of interviews, one also increases the cost of the study. There is some point at which added precision is not worth the extra cost. Most national samples use about 1,500 interviews. The sampling error with that size multistage sample is generally about 3 percent. To cut a 3 percent sampling error to 1.5 percent would require not 1,500 interviews but 6,000 and the extra expense would not be justified. Elections can be safely predicted with a 3 percent to 4 percent error rate, since most are decided by at least that large a margin. We rarely need accuracy of 1 percent.

The Sampling Fraction. The sampling error is also affected by the sampling fraction—the percentage of the population that is being interviewed. When the sampling fraction is above 30 percent, enough of the population has been sampled so public attitudes are likely to be very similar to those of the sample. The sampling error then is less than it would have been for samples of the same size from a larger population. Usually, though, the sampling fraction is very small; few samples include more than 1,500 interviews even when there are millions of people in the population for national samples or hundreds of thousands in the population for surveys of major cities. Thus, the sampling fraction is typically less than 1 percent, which is too small to matter.[6]

If 1,500 interviews are needed for a representative sample of the 220

[5] The sampling error is $\pm t\sqrt{p(1-p)/(N-1)}\sqrt{1-f}$, where t approaches 1.96 for the 95 percent confidence interval with large samples (at least 120 cases); f is the sampling fraction (sample size divided by population size); p is the sample proportion; and N is the sample size. The term $\sqrt{1-f}$ is ignored when sampling with replacement. The term t is larger than 1.96 for small samples: for example, 2.01 for a sample size of 50, 2.09 for a sample of size 20, 2.26 for a sample of size 10, and 2.77 for a sample of size 5.

To illustrate the formula, let us return to the example above of selecting 50 cards from a deck of cards; however, it requires that we phrase the problem slightly differently. If we took a sample (with replacement) of 50 cards and found 25 to be blue (the proportion of blue cards, p = 0.5), how much confidence could we have in that number? The formula is

$$\pm 2.01\sqrt{\frac{p(1-p)}{N-1}} = \pm 2.01\sqrt{\frac{.5(1-.5)}{50-1}} = \pm 2.01\sqrt{\frac{.25}{49}} = \pm .14$$

Hence, there is a 95 percent chance that the population proportion is .5 ± .14, or between .36 and .64, so the number of blue cards is between (.36 × 50) = 18 and (.64 × 50) = 32. Note that the sampling fraction is omitted because the sampling is with replacement.

[6] The sampling error depends upon the sample size, the sampling fraction if it is large, and the amount of variation in the variable being measured. Throughout this discussion we have assumed there is some variation of the variable. If there were no variation (such as if everyone's party were the same), a sample of one would be sufficient, and there would be no error. However, most of the variables that social scientists deal with have considerable variation. The confidence interval and sampling error figures in the text assume a population proportion of 0.5, which yields the maximum error.

million residents of the United States, most people would expect that a sample of 500 or 1,000 respondents would suffice for a sample of the 9 million residents of Florida or of the 600,000 residents of San Francisco County. However, since the sampling fraction generally has little effect on the sampling error, a big change in population size does not produce a big change in needed sample size. You need as large a sample to study the attitudes of San Francisco County residents or Florida citizens as for the entire United States. If you use a smaller sample for studying a smaller area, the sampling error will be higher.

Determining Sampling Error When Stratifying and Clustering Are Used. Note that when stratifying and clustering are used, one can still determine the probability of error. Clustering increases the sampling error, but stratifying reduces it. The sampling error for such a design is greater than is the case for a simple random sample, but the multistage sample is considered preferable, since it is much less expensive than a national simple random sample. In the SRC's samples, the sampling error for typical variables is about 3 percent for a multistage stratified and clustered 1,500-person sample. That is, if they find that 67 percent of the sample favors a proposal for government medical assistance, then the true population proportion is likely to be within 3 percentage points of 67 percent. More precisely, in 95 out of every 100 samples, the sample value should be within 3 percentage points of the true population value. The odds that the true population value here is between 64 percent (67 − 3) and 70 percent (67 + 3) are 95:5.

Table 3.3 shows the sampling errors for various sizes of samples and different sampling procedures.[7] The sampling error is always lowest with simple random sampling, but the Gallup and SRC procedures are designed to provide more economical samples with sampling error still within reasonable limits. The total survey error is inevitably greater than these sampling errors, but it is impossible to estimate the magnitude of the other sources of error in a survey.

Choosing a Sample Size. How does one choose a sample size for a survey? A primary consideration is the degree of sampling error that is tolerable. If you consider a 5 percent sampling error reasonable, that suggests a particular sample size. The sampling procedure is also relevant in that the sampling error is smaller with simple random sampling than with some other procedures. Additionally, you should consider the sampling error for subgroups that are of particular importance. If you are primarily interested in political participation by women and how it differs from participation by men, you would look at the sampling error for women and men as subgroups. A sample of 400 gives an overall sampling error of 5 percent, but if about half the sample is female, then any conclusions about women have a sampling error of 7 percent. If you want only a 5 percent sampling error for your statements about women, you will require a sample of 800.

The other major consideration in deciding the size of the sample is the budget. More interviews cost more money, and studies conduct only as many interviews as they can afford. From this perspective, what size sampling error is tolerable depends on the purposes of the study. If you are trying to predict a landslide election, the 7 percent sampling error of a simple random sample with 200 interviews could suffice. If you are trying to predict a hard-fought election, even the 3 percent sampling error with 1,500 interviews may be too large to declare a winner, which is why polls often declare an election to be "too close to call." If you want to measure public attitudes on a matter of public policy, the 5 percent sampling error with 400 interviews might be adequate.

[7]The sampling error in cluster samples can be much larger (three or four times these values) for geographical variables related to the clustering— such as the rural-urban variable.

Table 3.3 Maximum Sampling Error for Samples of Various Sizes

	Sampling Procedure		
Sample Size	Sample Random Sample	Gallup Poll	Survey Research Center Survey
2,000	2.2	3	3
1,500	2.6	3	
1,000	3.2	4	4
750	3.6	5	—
700	3.8	5	5
600	4.1	5	—
500	4.5	6	6
400	5.0	6	—
300	5.8	8	8
200	7.2	9	—
100	10.3	13	14

NOTE: These are *maximum* sampling errors, since sampling errors depend on the proportion being estimated. Sampling errors are maximal in estimating proportions around 50 percent. There is less error in estimating proportions less than 30 percent or above 70 percent, particularly in estimating proportions less than 10 percent or above 90 percent. Yet, in any event, the sampling errors are not greater than those shown in the table.

SOURCES: The figures in the second column are exact binomial values. The figures in the third column are taken from *Gallup Opinion Index*, August 1987, report 263, p. 32. Reprinted by permission. The figures in the fourth column are taken from Leslie Kish, *Survey Sampling* (New York; Wiley, 1965), Table 14.1.I, p. 576; the latter figures are based on the 1963 Survey of Consumer Finances and may differ from survey to survey. Reprinted by permission of the publisher.

SUMMARY

The quality of a survey is determined largely by its sampling procedures. Nonprobability samples can give biased results. Probability samples are required for good polls. With such samples it is possible to estimate statistically the error that results from the sampling. There are other sources of errors in surveys, but sampling error is particularly important, since it can be estimated mathematically.

Questions

1. If the sampling error is 1 percent and you find that the proportion of respondents favoring government restrictions on abortion is 45 percent, the findings mean that:
   a. The true proportion is probably between 43 percent and 47 percent.
   b. The true proportion is probably between 44 percent and 46 percent.
   c. There is only a 1 percent chance that the population proportion is not 45 percent.
   d. You have made a 1 percent error in your sampling, so the true proportion is 44 percent.
2. According to your analysis of a survey, there is only 25 percent support for government health insurance among the eight Southern college-educated white respondents with income over $15,000. What do you conclude from this?
3. Sampling error is most affected by the:
   a. Proportion of the population sampled.
   b. Response rate.
   c. Number of people sampled.
   d. Size of the population.
4. Cluster sampling is used rather than simple random sampling in order to:
   a. Increase precision of surveys.
   b. Cut transportation costs.
   c. Get better estimates of attitudes in neighborhoods.
   d. Get the proper representation of different regions of the country.
5. Sampling error is caused by which of the following (circle all correct answers):
   a. Refusal of some people to be interviewed.
   b. Differences between the sampling frame and the intended population.
   c. Interviewing the wrong respondent.
   d. Trying to describe a population with only a sample.
6. The sampling error with 1,500 interviews using the Survey Research Center or Gallup sampling procedure is about ________ percent.

4

Questionnaire Construction

The preceding chapter addressed the issue of whom to ask; now we shall take up the issue of what to ask. What forms should questions take? How should questions be worded? What response choices should be offered? In what sequence should the questions be asked? In order to conduct a survey, these practical matters must be settled.

Survey questions should be directly related to the theory and concepts that you are investigating. Great care must be exercised in writing questions in order to get the information you are seeking. Naturally, the first step in writing questions is to spell out precisely what it is you would like to learn from each question or set of questions. Once this is done, a researcher constructs the questionnaire.

QUESTION FORM

When constructing a questionnaire, the first decision to make is what form of question will be used to measure each variable. There are two basic forms, closed-ended and open-ended. *Closed-ended questions* offer a series of alternative answers among which the respondent must choose, like a multiple-choice examination question. *Open-ended questions* allow people to answer in their own words—like an essay examination question.