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Surveying Citizens: A Handbook for Municipal Officials Who Want to Know What Their Citizens Think (1995)

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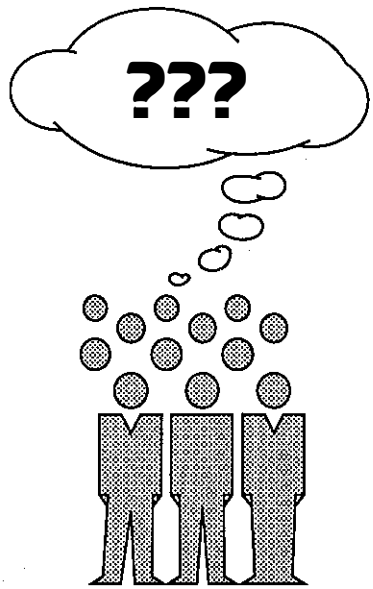

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The University of Tennessee
Municipal Technical Advisory Service
in cooperation with
The Tennessee Municipal League

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Public Opinion Polls

Surveying Citizens

Table of Contents

A little about this publication ...

Doing a citizen survey can be as simple as determining a random sampling and making some phone calls — or it can be a time-consuming and costly project to help decision makers set the direction for your community's future. The approach you take depends on the results you want. Some chapters of this publication are simple and offer easy-to-understand instructions for less-complicated surveys. Other chapters, particularly 5 and 6, offer for those interested much more detail, including statistical explanations and detailed descriptions of software uses. Don't let it throw you if we've got more information here than you need. Simply use what you need — and go do a survey!

Chapter 1
Introduction

What's a Citizen Survey?

What do citizens think about the job we're doing? Will the plan to revitalize the central business district actually lure more shoppers downtown? How many citizens can we count on to take their recyclables to the drop-off sites? Do we need to improve the visibility of local law enforcement or to initiate new patrol strategies? Will citizens support the new zoning ordinance?

There are many ways to learn what people think about these and the multitude of other issues that concern local government. One of the best methods, of course, is to ask people directly. Since local officials have neither the time nor the resources to ask everyone in a city their opinions, attitudes, perceptions, or behaviors, it's necessary to ask questions of a sample or smaller subset of citizens. A citizen survey is the systematic, scientific method for selecting a sample of citizens, collecting information from them, and making generalizations about a population that's too large to observe directly.

Citizen surveys have proven to be an accurate and affordable way to determine what a large group of people think. The results of polls and surveys appear regularly in the media as well as academic journals. As a local official, you may have completed or participated in several surveys yourself. Many cities conduct them regularly to help identify budget priorities and for feedback from citizens on services, programs, or issues. Their prevalence is one indicator of their popularity and potential applications, but not all surveys are of equal quality. Some meet the highest standards of scientific rigor while others need substantial improvement to be of any value to decision makers.

Correctly designed and implemented citizen surveys can reveal much about who thinks what, and why. Prepared incorrectly, they can mislead, misrepresent, and confound decision making. That's why it is imperative to understand how to prepare and implement a scientifically valid and reliable survey.

The Purpose of This Handbook

This handbook describes the process for getting valid and reliable information from a citizen survey. It's intended for readers who don't have a substantial background in survey research or statistics.

The basic premise is simple: Do it right or don't bother to do it at all. The necessary steps to "do it right" allow for few shortcuts in planning, designing, and implementing a high-quality citizen survey or in analyzing responses. Following the

procedures and suggestions described here should yield questions that are **valid** (measures what you want to measure), **reliable** (consistent), and **useful** (results that relate to the survey objectives).

The key to success — a survey that's valid, reliable, and useful — is careful attention to the details of questionnaire construction and implementation, coupled with the allocation of sufficient resources to do the job right. Scores of communities successfully conduct surveys with just in-house personnel, and perhaps some occasional technical assistance from consultants. Following the prescriptions in this handbook should yield a good return for the resources invested. In case additional help is needed, the Appendix lists several sources where you can get advice or recommendations.

Why do a Citizen Survey?

Carefully crafted surveys can yield an abundance of useful information to help you make more informed decisions and better policy choices, and to offer services more responsive to citizen preferences and needs. Thus, surveys can be useful tools for decision makers at virtually every stage of the policy-making process — whether formulation, implementation, or evaluation. Also, opinion surveys potentially may broaden citizen participation in the decisions that most directly affect them.

Policy Formulation

Policy formulation involves deciding what to do or how to proceed. Surveys can be used to determine what people perceive, need, prefer, or want for their community and from their government. This is the kind of information that can help local officials make difficult choices, set needed priorities, and design more effective programs and projects. Examples of possible questions regarding local policy choices are listed in Figure 1-1.

Policy Implementation

Surveys can also help local officials with policy implementation issues. A variety of questions can be asked about what people think are the major problems or issues facing their community, what they think are the most important service or facility needs in their neighborhood, or what type of issues most concern them.

As Figure 1-2 on page 4 indicates, questions can assess what people think about various goals, projects, or proposals. Armed with information about what citizens think about the city's reliance on various taxes, fees, or funding strategies, and whether they support various policies or incentives to attract economic growth, or proposals to reorganize government, local officials can devise implementation strategies that address citizen concerns and preferences.

Policy Evaluation

Evaluation of public policy is perhaps the most common use of citizen surveys. In the business of local

Figure 1-1. Survey Questions on Policy Formulation Issues

1. Should city council annex the territory known as the "Galyon Farm" located adjacent to the northwestern boundary of Loudon?

   1 NO
   2 YES
   3 DON'T KNOW / NOT SURE

2. Which of the following actions do you think will contribute the **most** to the beautification of Union City? (Circle the number of your choice.)

   1 STRICTER CODE ENFORCEMENT
   2 PLANT TREES AND SHRUBS ALONG MAIN STREET
   3 CLEAR BRUSH ALONG STREETS
   4 IMPLEMENT NEIGHBORHOOD ANTI-LITTER CAMPAIGNS
   5 CONSTRUCT BICYCLE AND WALKING TRAILS

3. To what extent, if at all, is each of the following a problem in your neighborhood? (Circle the number corresponding to your rating of each item.)

Condition	No Problem	Minor Problem	Major Problem
Unmown vacant lots	1	2	3
Houses in disrepair	1	2	3
Sidewalks in disrepair	1	2	3
Noisy animals	1	2	3
Discarded litter/trash	1	2	3
Abandoned vehicles	1	2	3
Traffic congestion	1	2	3

4. Recycling requires that some materials be separated from non-reusable materials. If a container for reusable waste was provided to you at no cost and was collected at your curb weekly, would you be willing to separate your recyclable materials? Would you say that you are:

   1 STRONGLY UNWILLING
   2 UNWILLING
   3 WILLING
   4 STRONGLY WILLING
   5 DON'T KNOW / NOT SURE

service delivery, perception is reality. Therefore, even the most efficient department isn't doing its job well if citizens aren't satisfied with the quality, timeliness, level, or accuracy of the service. Delivering services that are both responsive and efficient is, of course, the dual challenge that confronts local managers.

Survey results from consumers are invaluable because they identify areas of strength, weakness, and needed improvement. Questions can be designed to ascertain:

- how citizens rate the quality of services overall and individually,
- who uses the services,
- how frequently they're used, and

Figure 1-2. Survey Questions on Policy Implementation Issues

1. What do you think is the most serious problem facing the city of Jackson?

   _____

   _____

2. If the city were forced to reduce expenditures to achieve a balanced budget, which of the following city services or programs do you think should be reduced in funding **first**? (Circle the number of your choice.)

   1 FIRE PROTECTION
   2 POLICE PROTECTION
   3 PUBLIC EDUCATION
   4 PARKS AND RECREATION
   5 STREET MAINTENANCE
   6 SOLID WASTE COLLECTION

3. A property tax increase of 30 cents per $100 of assessed value would bring in $250,000 of new revenue for the city. Would you support this property tax increase if **all** of this new revenue would be spent on: [READ CHOICES]

	No	Yes	Don't Know/ Not Sure
Teacher salaries	1	2	3
School facilities	1	2	3
Road and bridge improvements	1	2	3
Attracting new industries	1	2	3
Downtown revitalization	1	2	3
Building a new city hall	1	2	3
Expanding the city library	1	2	3

4. Do you oppose or favor the proposal to create a metropolitan (single) government for Knoxville and Knox County?

   1 STRONGLY OPPOSE
   2 OPPOSE
   3 NEITHER OPPOSE NOR FAVOR
   4 FAVOR
   5 STRONGLY FAVOR

- what specific improvements are suggested.

Adjustments can be made before problems become crises and underused services can be publicized. Figure 1-3 offers examples of evaluative questions.

Surveys as a Participation Mechanism

Surveys can help broaden the scope of citizen participation in government decision making. As you well know, citizens who play a part in a policy, program, or project are more likely to feel they have a stake in its outcome. Through surveys, the voice of those who don't typi-

Figure 1-3. Survey Questions on Service Evaluation Issues

1. Overall, how satisfied are you with the services provided by the city of Lake City? (Circle the number of your choice.)

   1 VERY DISSATISFIED
   2 DISSATISFIED
   3 NEITHER SATISFIED NOR DISSATISFIED
   4 SATISFIED
   5 VERY SATISFIED

2. Overall, do you think that your neighborhood receives the same quality of city services as other neighborhoods in the city of Springfield?

   1 NO
   2 YES
   3 NOT SURE / DON'T KNOW

3. During 1993, did you call the Oak Ridge city police department to request an officer's assistance?

   1 NO
   2 YES
   → If YES, how satisfied were you with the length of time it took the officer to arrive?
   1 VERY DISSATISFIED
   2 DISSATISFIED
   3 NEITHER SATISFIED NOR DISSATISFIED
   4 SATISFIED
   5 VERY SATISFIED

4. For 1993, how would you rate the quality of each of the following services that Hendersonville provided in your neighborhood? (Please circle the number.)

Service	Very Poor	Poor	Neither Good Nor Poor	Good	Excellent
Pothole patching	1	2	3	4	5
Garbage collection	1	2	3	4	5
Park maintenance	1	2	3	4	5
Leaf collection	1	2	3	4	5
Speed limit enforcement	1	2	3	4	5

cally show up at community meetings can be heard. And citizens feel that local officials care about and consider their views before action is taken.

So, citizen surveys have the potential to enhance the quality of democratic governance in your city. This potential can be realized, however, only if the purpose of the survey project and its results are publicized and complemented by other community outreach efforts.

Inappropriate Uses of Citizen Surveys

While the information potential of surveys is substantial, there are several instances when surveys aren't the answer. Sample surveys, for instance, should never be substituted for popular votes. Opinion polls always have some margin of error, so the results may not be decisive or conclusive if popular opinion is evenly divided.

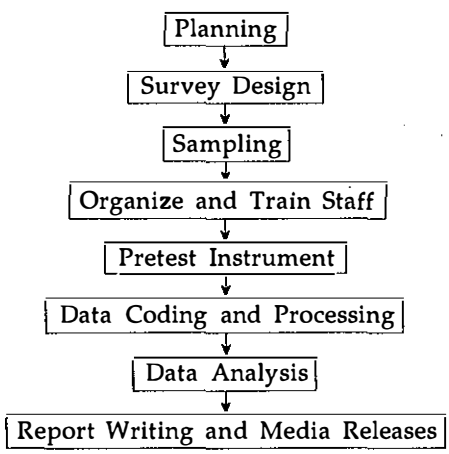
Surveys should never be used to get ammunition for or against a particular cause or action. Surveys motivated by such a purpose almost always contain "loaded" or biased questions. Citizens aren't stupid. Most are able to detect questions that just don't sound right or that are slanted to obtain a desired response. While the results of some surveys are inevitably used by different groups to reinforce their views, those who design and write the survey questions must never bring preconceived notions, biases, or hidden agendas to the task.

Finally, questions that seek information already available from other sources generally shouldn't be included in a local opinion survey. If you need to know the number of automobiles per household, home values, hook-ups to sanitary sewer systems or public water systems, availability of cable TV service, or annual visits to the library, such information may already exist from the census, property assessor, utilities, cable companies, or the library. Generally, it's much cheaper to unearth data elsewhere than to add such questions to a survey.

An Overview of the Survey Research Process

This handbook describes the eight stages of the survey research process. Some of these stages, such as sampling and survey design, can occur simultaneously depending upon staff resources and experience. The general sequence of these stages is illustrated in Figure 1-4.

Figure 1-4.
Stages of the Survey Research Process



1. **Planning**: This is among the most important activities. For survey success, you need to agree on:
   - the survey's purposes,
   - what types of information will be obtained,
   - how the information will be used,
   - who will be surveyed,
   - what type of survey (mail, telephone, or personal interview) is best or most feasible,
   - how many follow-up mailings or calls will be made, and
   - what personnel and other resources will be needed to

design, manage, and implement the survey.

2. **Survey Design**: The design stage is the most challenging aspect of survey research. It's when you decide what question type and wording will produce the kind of information needed to meet the survey's objectives. Ultimately, the validity, reliability, and response rate of the survey depend on good decisions about question type, format, wording, order, number, coding, instructions, sequence, and appearance. In the design stage, you also prepare a cover letter for a mail survey or an introductory spiel for a telephone interview.

3. **Sampling**: How do you choose a sample of the population to survey? Essentially, random selection assures that every person in that population has an equal chance of being included. Then you will be able to say within a certain margin of error and confidence interval that the information obtained from the survey is representative of the population.

   Sampling is one of the most rigorous aspects of survey research and it must be done precisely to be unbiased. An unbiased sample is one in which no group or class of individuals is systematically under-represented or over-represented. The quality of a survey generally can be distinguished by how the sample of a larger population is obtained.

4. **Staff Organization and Training**: Deciding who does what, when, and how with a mail or telephone survey is fundamental to effective administration, implementation, and analysis. Training interviewers, stuffing envelopes, entering data, and analyzing data are tasks that require care, consistency, skill, and patience. Monitoring and oversight of the staff is crucial for survey quality control.

5. **Pretesting**: Changing questions once the survey is under way will seriously diminish the validity and reliability of the results. Asking questions of a small group of the larger sample **prior** to launching the project will help to detect any problems in question clarity, meaning, order, or interviewer instructions. Nothing is more frustrating than to obtain responses from people who have misinterpreted the meaning of a question. If there could be a general commandment for conducting survey research, it would be to PRETEST THE QUESTIONNAIRE. Any ambiguity in question meaning directly affects the question's validity. A question about the volume of solid waste produced, for instance, should not be worded in such a way that respondents think the question refers to how much noise a garbage truck makes.

6. **Data Coding and Processing**: Coding refers to the way questions and responses are reduced to numerical terms associated with each respondent. Processing responses refers to the procedures used to create a data set so that the raw data can be transformed into useable information. Typically, a data file is

created by a computer software program so that analysis of a large number of responses can be accomplished swiftly and accurately.

7. **Data Analysis**: How the survey results are analyzed depends on the survey's objectives, but every analysis should include frequency distributions and properly constructed tables. Univariate statistics describe and summarize the responses to survey questions. Exploring **who** thinks what and why involves bivariate or multivariate analysis. Knowledge about when to use certain statistics and what they mean is important for understanding these relationships.

8. **Report Writing and Media Releases**: This final stage involves summarizing the survey findings and identifying their implications. Writing succinct, informative executive summaries for media releases is always important. These releases should contain several key points: how and why the survey was conducted, how the sample was drawn, how many individuals were contacted in a telephone survey or what the response rate was to the mail questionnaire, and the confidence level and sampling error of the results.

Chapter 2
Planning the Survey

Identify the Survey's Objectives

Surveys are expensive, but well-planned projects will minimize costs. Before the first question is written, it is imperative to know the survey's purpose, how the information obtained will be used, and who will be responsible for managing the survey project. This chapter describes the types of decisions that must be made before writing the first question.

The sponsors and intended users of the survey must agree on what it's supposed to accomplish. Without this consensus, it will be difficult to know what to ask the public, how to frame questions, and how to interpret the results. Very simply, decide what you want to know and why you want to know it. In actuality, this is the first step of the survey design process. Only after you know what kind of information is needed can you choose the best type of question structure and then properly phrase the questions.

Survey objectives vary considerably. The primary interest may be policy formulation, implementation, or evaluation. The survey's purpose may be to enhance citizen participation in decision making. Or it may be to identify perceptions about community development needs or priorities, to document retail buying patterns for economic development planning, or to gather information about household income levels, size, ages, sex, race, national origin, or handicap status.

It's always tempting to ask a large number of questions about a wide variety of issues. Covering a wide breadth is quite possible, but there must be some criteria to determine which questions to leave in and which to delete. Otherwise, response rates to mail surveys may be less than desired and telephone interviewers will hear their share of premature clicks from the other end of the line. The general rule is to keep mail surveys to a maximum of 12 pages and telephone interviews to 20 minutes or less. The best way to design a survey within these parameters is to justify each question. Which ones really will produce the information needed to meet the survey's objectives?

Typical survey objectives include:

- assessing community needs, problems, and goals;
- determining what policies, programs, plans, or budget options are preferred or favored, who supports them, and why;
- evaluating the performance of — or demand for — various community services, facilities, functions, events, and activities;
- understanding various experiences, behaviors, attitudes, opinions, and characteristics of individuals, groups, and neighborhoods, and how these

may change over time; and
- comparing the attitudes, opinions, beliefs, and behaviors of different groups of people in the community.

Why certain information may be needed also varies by locality. Questionnaire results may be used to plan and improve programs, to prepare and justify budgets, to motivate program staff, or to monitor the performance of employees or contractors. Reaching agreement on why certain information is needed will help to clarify exactly what needs to be asked in the questionnaire.

What Can Citizen Surveys Tell Us?

Before decisions about question type and wording are made, first decide whether a questionnaire is indeed capable of measuring the information you desire. Sponsors of public opinion surveys need to recognize that issues of central importance to them may not necessarily be the hot topic of discussion at the local feed store, church, or grill. Therefore, knowledge of what surveys *can* measure should be tempered by an understanding that some citizens may be unfamiliar with or have no opinion about a particular matter.

This problem of "non-attitudes" — or getting responses that are just superficial reactions to the interviewer or the questionnaire — should be a serious concern for those who design the questionnaire. As illustrated later, this problem can be minimized by using **screen** or **filter** questions that specifically ask whether people have knowledge about or experience with a particular matter. Another strategy is to include a "don't know" or "no opinion" response alternative, making it socially acceptable for the respondent to be in the dark on an issue. Normally, the target population should be at least somewhat familiar with the subjects on a questionnaire; otherwise, researchers can expect a large proportion of "don't know" or "no opinion" responses. Exceptions might include questions that specifically try to measure the extent of public knowledge about or awareness of a particular program or service.

Surveys can provide local officials with four types of information from individuals:
1. opinions or attitudes,
2. beliefs or perceptions,
3. behavior, and
4. facts and attributes.

Opinions and Attitudes

These are statements about what people think or feel about issues, events, problems, or policies. Opinion or attitude questions are evaluative, reflecting likes or dislikes and perhaps how strongly people feel.

Typically, local officials are interested in knowing citizens' preferences, judgments, or evaluations of service quality or performance, alternative policies or actions, problems facing the community, or how resources should be allocated or spent. What proportion of citizens

Figure 2-1. Questions that Elicit Opinions and Attitudes

1. Do you think that the city police department is doing enough to prevent crime in the city's public housing projects?

   1 NO
   2 YES
   3 DON'T KNOW / NOT SURE

2. The city police commissioner has proposed a bicycle patrol program for each of the city's public housing projects. Would you say that you strongly oppose, oppose, neither oppose nor favor, favor, or strongly favor this idea of establishing a bicycle patrol program in the city's public housing projects?

   1 STRONGLY OPPOSE
   2 OPPOSE
   3 NEITHER OPPOSE NOR FAVOR
   4 FAVOR
   5 STRONGLY FAVOR
   6 DON'T KNOW / NOT SURE

3. Would you be willing to pay an additional **3 cents** on the property tax rate for a bicycle patrol program in the city's public housing projects?

   1 NO
   2 YES
   3 DON'T KNOW / NOT SURE

   → [If NO, ask:] 3a. Would you be willing to pay an additional **2 cents** on the property tax rate for a reduced-level bicycle patrol program in the city's public housing projects?

   1 NO
   2 YES
   3 DON'T KNOW / NOT SURE

4. Do you tend to agree or disagree with this statement: "Parents of school-age children should be given vouchers by the state that can be used to pay for the cost of educating their children at any school, public or private, that the parents choose."

   1 STRONGLY DISAGREE
   2 DISAGREE
   3 NEITHER AGREE NOR DISAGREE
   4 AGREE
   5 STRONGLY AGREE

favors or opposes, agrees or disagrees, is satisfied or unsatisfied? Examples of questions that elicit opinions and attitudes are illustrated in Figure 2-1.

Beliefs and Perceptions

Beliefs and perceptions are assessments of what a person thinks is true or untrue, or what exists or doesn't exist. Belief questions are often designed to elicit people's perception of reality — either past,

present, or future. Statements such as "The city council intends to raise the property tax to pay for increased costs of school bus transportation" may be true or untrue. What's important is whether the respondent thinks it's true.

Surveys are quite appropriate for discovering what people think will happen. Predictions about the future, such as might be obtained from a question about whether the new auto assembly plant will produce a large number of jobs for local residents, may or may not turn out to be accurate. But it's frequently useful to know what people expect.

Measuring beliefs is appropriate when local officials are interested in what people think is true. Questions may be phrased to test people's knowledge about specific facts. Asking citizens to indicate when and how often they think leaves and brush are picked up in their neighborhood may indicate, for instance, whether a community needs to publicize its pick-up schedule more effectively.

Likewise, local officials are often interested in measuring the importance people attach to things. Asking residents what they perceive to be the most important problem facing the community may guide those who set spending priorities. Conversely, citizen evaluations regarding the relative importance of various services may also help decide where to cut spending. Illustrations of questions that elicit beliefs and perceptions are listed in Figure 2-2.

Behaviors

Behavioral questions elicit information on what people have done in the past, what they are doing, or what they plan to do in the future. Typical behavior questions ask citizens whether they take their recyclables to a drop-off center or to the curbside and how often; whether they use any of the city's recreational facilities and how frequently; and whether they have contacted anyone in city hall during the last six months. Explaining variations in behavior is usually what concerns those interested in this type of information.

When people are asked about their behavior, their responses may be colored by many factors, including:

- how well they recollect their past actions or non-actions,
- the perceived social desirability of certain kinds of behavior (such as voting or recycling),
- the sensitivity of the question's topic, and
- when the question is asked.

Survey researchers must at least consider how these factors may affect the rate, quality, and interpretation of responses.

Questions that are excessively demanding — such as, "How many times did you play golf at the city course in 1993?" — may be made less so by offering the respondents frequency ranges to choose from.

Generally, most people will not be reluctant to discuss sensitive topics if they believe that their responses will remain confidential. Assurances to this effect, and the credibility and reputation of who's

Figure 2-2.
Examples of Questions that Elicit Beliefs and Perceptions

1. Which of the following do you believe is the single **most** serious problem confronting the city of Tullahoma? (Please circle your choice.)

   1 CRIME
   2 UNEMPLOYMENT
   3 TRAFFIC CONGESTION
   4 INADEQUATE SCHOOL FACILITIES
   5 EXCESSIVE LOCAL TAXES

2. How important to you are each of the following factors in improving the quality of life in the city of Paris? (Please circle the number of your rating for each factor.)

Factor	Not Important	Somewhat Important	Very Important
Raising teacher salaries	1	2	3
Stricter land-use controls	1	2	3
Preserving historic buildings	1	2	3
Developing more parks and open space	1	2	3
Revitalizing the downtown business district	1	2	3
Attracting more industrial development	1	2	3
Holding the line on local taxes	1	2	3
Increasing the variety of the housing stock	1	2	3
Reducing crime	1	2	3

3. For each of the following services or programs provided by the city of Germantown in 1993, do you think the city spent too little, too much, or about the right amount? (Please circle your choice.)

Service	Too Little	About Right	Too Much
Public safety	1	2	3
Economic development	1	2	3
Public education	1	2	3
Street maintenance	1	2	3
Sanitation services	1	2	3

conducting the survey, are therefore paramount.

Survey designers also must be sensitive to circumstances and events that may produce results dramatically different from normal expectations. Asking citizens whether they participate in a car or van pool shortly after the town's major employer has laid off a substantial proportion of the local work force will likely yield an inaccurate or at least unrepresentative indicator of behavior. Figure 2-3 illustrates questions that ask about behaviors.

Facts and Attributes

In virtually every survey conducted by local government, it's imperative to know **who** thinks or believes what, or who behaves the way they do. Thus, questions that elicit key

Figure 2-3. Examples of Questions About Citizen Behaviors

1. Did you play the city's Lakeview Golf Course during 1994?

   1 NO (Please go to Question 2.)
   2 YES
   3 NOT SURE / DON'T REMEMBER (Please go to Question 2.)

   → 1a. About how many times did you play golf there during that year?
   1 ONCE OR TWICE
   2 THREE OR FOUR TIMES
   3 FIVE OR SIX TIMES
   4 MORE THAN SIX TIMES

   1b. About how many times did you rent a cart during that year?
   1 ONCE OR TWICE
   2 THREE OR FOUR TIMES
   3 FIVE OR SIX TIMES
   4 MORE THAN SIX TIMES

2. Does your household participate in the city of Johnson City's curbside recycling program?

   1 NO (Please skip to Question 3.)
   2 YES
   3 NOT SURE / DON'T KNOW (Please skip to question 3.)

   → 2a. About how often does your household set out the recycling bin at the curb?
   1 WEEKLY
   2 EVERY 2 WEEKS
   3 EVERY 3 WEEKS
   4 MONTHLY
   5 NOT SURE / DON'T KNOW

3. In talking to people in Kingsport about the last city election, we found that some people didn't vote because they weren't registered, were ill, or just didn't have the time. How about you? Did you vote in the last city election held in August 1993?

   1 NO
   2 YES
   3 NOT SURE / DON'T REMEMBER

characteristics and facts about respondents should be included in **every** citizen survey. This information markedly enhances the survey's utility to decision makers, enabling them to move beyond simple reports of response distributions.

While it's useful to know, for instance, that 70 percent of respondents are willing to take their recyclables to a drop-off recycling center, it's even more important to know who may **not** be willing to participate. With this information, local officials then can decide how to encourage their participation. For example, with data on income, age, and residence, it's possible to determine that low-income elderly in public housing would have a lower participation rate, perhaps because they're unable to transport their materials to a drop-off site. So, decision makers could consider the feasibility of a satellite drop-off facility in the area — a strategy that might never have been suggested without factual knowledge about the respondents and their characteristics.

Attribute questions are known as "independent" variables that may explain varying responses to "dependent" variables (usually opinions, attitudes, beliefs, and behavior). As explained more fully in the chapter on statistical analysis, the relationships that may emerge between these independent and dependent variables enable surveyors to understand more completely not only **who** thinks, believes, or behaves the way they do, but also **why**. Consequently, including attribute questions in your survey is extremely prudent.

Useful questions about respondents measure their SES, socioeconomic status. Typically these questions ask about income, education level, occupation, and whether respondents own or rent their home. Other useful attribute questions ask about race and ethnicity; place of residence such as voting district, zip code, or neighborhood; and age, gender, household size, number of children under 18, and length of residence in the city. Examples of typical attribute questions are found in Figure 2-4 on the next page.

Another reason to ask about the characteristics and background of respondents is to determine whether the sample is representative of the population. By comparing the profile of respondents with that of the larger population, you can ascertain how closely the two profiles match. If there are no large differences between a sample's profile and that of the larger population (which is usually obtained from the most recent U.S. census data), then that sample is representative.

Obtaining representative samples doesn't happen automatically. Chapter 3 describes methods to maximize the likelihood of obtaining a sample with attributes proportionately matching those of the larger population. Getting results representative of the larger population also is greatly affected by the rate of return. Accordingly, several methods for maximizing the return rate are presented. For telephone surveys, screen questions help select respondents from a household in a way that minimizes the typical problem of under-representation of certain groups, such as males.

Figure 2-4. Examples of Attribute and Background Questions

Finally, we need to ask you a few questions so that your responses can be compared to other citizens in Maryville. Remember that all of your answers will remain completely confidential.

1. What is your age? [READ CATEGORIES]

   1 18-25
   2 26-35
   3 36-45
   4 46-55
   5 56-65
   6 OVER 65

2. Which of the following best describes the highest level of formal education that you have completed? [READ CATEGORIES]

   1 LESS THAN HIGH SCHOOL
   2 HIGH SCHOOL GRADUATE
   3 SOME COLLEGE
   4 COLLEGE GRADUATE (BACHELOR'S)
   5 GRADUATE SCHOOL DEGREE

3. What are the last two digits of your zip code?

   _____

4. How many people live in your household?

   1 ONE
   2 TWO
   3 THREE
   4 FOUR
   5 FIVE
   6 SIX
   7 MORE THAN SIX

5. What is your race? Are you black, white, or some other race?

   1 BLACK
   2 WHITE
   3 OTHER

6. Finally, which of the following categories best describes your total household income for 1994?

   1 UNDER $15,000
   2 $15,000 - $25,000
   3 $25,001 - $35,000
   4 $35,001 - $45,000
   5 $45,001 - $55,000
   6 $55,001 - $65,000
   7 OVER $65,000

Why Distinguish Between Types of Information?

It's important to understand exactly what type of information is wanted from respondents to meet the survey's objectives. If the purpose of a battery of questions is to gain an understanding of people's actual behavior, yet the questions measure attitudes, then the aims of the survey won't be met. If you need to know, for instance, what materials people actually recycle, but the question is phrased in a way that asks whether they think recycling plastics, aluminum, and newspaper conserves natural resources, then what is measured is a respondent's opinion, not behavior.

Some questions are more sensitive to wording than others. Attitude questions in particular are extremely sensitive to wording variations. Asking people, for instance, whether they think it's important for local government to ensure that downtown developments conform to a historical architectural theme, or whether they support a policy requiring developers to submit plans for approval by a historic district commission, is likely to yield significantly different responses.

The point is that survey designers should always be clear on the objective of a question and the type of information it seeks to elicit. Slight wording changes can alter results. A general rule of good survey design is to specify the type of information needed before writing a question. Then, if complex concepts are involved, several questions can be prepared to fully measure all of the important dimensions of that opinion, attitude, belief, perception, or behavior.

Determine the Target Population

Your target population normally will be the individuals or households in your municipality. Depending on the survey's purpose, it could be any group for which geographic, membership, or time referents can be defined. For instance, the target population could be all users of the city park facilities or all persons who used the drop-off recycling facilities during 1993. The target population is the population to which you want to generalize the results of the survey. This seems simple enough, but as Miller and Miller (1991) point out: "One of the most common mistakes made in citizen surveys is asking the wrong people the right questions."

The survey objectives should drive the design of the questionnaire, but remember: Questions should be asked of individuals who are likely to have some knowledge, exposure, or experience with the topic, service, or issue that's the object of the query. Asking all residents, for instance, to evaluate the building inspector's office is likely to yield a high proportion of "don't know" or "no opinion" responses since only a small proportion of the population uses the services of this office. Conversely, most everyone is likely to have an opinion about their neighborhood's safety. Very specific questions about the performance of the police department,

however, should only be asked of residents who have had some direct interaction with or observation of the police.

Distinguish questions everyone could reasonably have an opinion on from those that could and should be answered only by recipients or users of a service or program. Screen questions can do this. Screen questions direct some, but not all, respondents to skip one or more questions, depending on their answer. For example, asking "Have you had any direct contact with the building inspector's office in the last 12 months?" would direct the "yes" respondents to answer more queries. Special instructions are always required for screen questions. The previous figures provide several examples. A screen question on a mail questionnaire can usually be recognized by the arrows leading from it. Special instructions are needed in the case of a telephone interview.

The use of screen questions is critical in other instances. Chief among these is when the purpose of the survey is to target residents with particular characteristics, such as citizens residing just within the city limits, residents over 65, crime victims, voters, or users of the city recreation centers.

The services most local residents could reasonably be expected to know something about from personal experience or observation include street repair, street cleaning, trash hauling, parks, water quality and reliability, ease of travel by car or foot, and snow removal (Miller and Miller 1991). Questions about other local government services provided to all residents — brush removal, recycling, property assessment, utilities, and electoral representation — may reasonably be directed to everyone in the sample.

Consequently, it's important in the planning stage to identify both the target population and any specific groups that may be familiar with the service or program under scrutiny. Then, questions can be directed to the appropriate groups in the population.

Defining the target population is also important because of the practical considerations in drawing a sample. A way must exist to identify and select the cases (individuals, households, or group members) in the target population. As Chapter 3 explains, the researcher must construct a *sampling frame*. Technically, a sampling frame isn't a sample; rather, it's the operational definition of the population that provides the basis for sampling.

The sampling frame is a listing of all cases in the target population or the cases that satisfy some type of membership criteria. In a mail survey, for example, an address list of all city residents can be purchased from an address listing service. This list would be the sampling frame. In a phone survey, the sampling frame could be the city phone book (a listing) or a set of telephone numbers with certain exchanges (a "membership" criteria).

Oftentimes, a list of the population of interest doesn't exist; then criteria for selecting respondents must be devised. If you want to survey users of the city's parks or of those drop-off recycling facilities, criteria can be established for sites, days,

times, and seasons to identify and select cases to be interviewed. As long as the cases can be identified, it's usually possible to define a procedure for finding and selecting them. At any rate, it's useful during the planning stage to think about how easy or difficult it will be to construct the sampling frame for the target population. Chapter 3 offers more guidance on this topic.

Choosing the Type of Survey: Advantages and disadvantages of mail, telephone, and face to face

Selecting the type of survey method — mail, telephone, or face to face — is an important decision in the planning stage. Which one is best? The answer is: It all depends! Each method has advantages and disadvantages and they may not apply equally — or perhaps at all — to every survey proposed by local governments. Dillman (1978) explained it best when he wrote: "... until the attributes of each method are considered in relation to the study topic, the population to be surveyed, and the precise survey objectives, the question of which is best cannot be answered."

Selection of a method should be guided by one main consideration: to design the best possible survey to accomplish your purpose within the limitations imposed by time, money, personnel, equipment, and other constraints. In this context, "the best possible survey" means one that is as accurate as possible.

Accuracy in survey research is the touchstone of quality. Having an accurate survey means the respondents and the results represent the larger target population. Quick and inexpensive survey results are always desirable, but if the results can't be generalized to the target population then the survey is worthless! Thus, whatever citizen survey method is selected, achieving the maximum possible accuracy within time and resource constraints should be the overriding concern.

To help you make an informed judgment about which survey method is best for your project, cost, personnel requirements, implementation time, and accuracy considerations for each method are evaluated in Figure 2-5 on the next page.

Most local officials usually choose either a mail or a telephone survey. The International City/County Management Association (1991) reports that the most popular means of contacting residents is a mail survey (43 percent), followed by telephone surveys (40 percent). Only 3 percent conducted face-to-face interviews, and about 6 percent used some combination of methods. Mail surveys are probably the easiest and least expensive method. Phone interviews are the quickest way to complete a survey and can also be relatively inexpensive if toll charges can be avoided. Personal interviews may yield the richest data if cities can afford the higher costs and if reliable interviewers can be found.

Cost Considerations

Frey (1989) identifies three factors most important when calculating survey costs and comparing methods: sample size, geographic dispersion of the sample, and the length of the interview or questionnaire. Variations in wage rates, telephone charges, supply prices, professional time, and sampling expenses also will affect price.

Sample size: Larger samples require more postage and supplies for a mail survey, and more hours of interviewing for telephone and face-to-face surveys.

Figure 2-5. Comparing the Relative Merits of Mail, Telephone, and Face-to-Face Surveys

Criteria	Mail	Telephone	Face to Face
Low cost	1	2	3
Personnel requirements minimized	1	2	3
Fastest implementation time	2	1	3
Ease in obtaining population list	3	2	1
Control over selection of respondent	3	2	1
Response rate higher	3	2	1
Avoids interviewer bias	1	2	3
Permits longer questionnaires	3	2	1
Handles complex questions well	2	3	1
Handles open-ended questions well	3	2	1
Avoids respondent skipping questions	3	1	1
Mean Scores	2.27	1.91	1.73

1 = most satisfactory performance
2 = satisfactory performance
3 = least satisfactory performance, compared to the other methods

Geographic dispersion: Samples that are more geographically dispersed drive up the costs primarily for face-to-face and potentially for telephone surveys. It's simply more expensive to get interviewers to and from sites that are spread out. Making return trips to individuals or household members who were unavailable also adds considerably to the face-to-face survey budget. If there's a need to survey individuals outside the local calling area, expenses for telephone surveys may also increase dramatically. Dispersion and distance features of a sample don't substantially affect the costs of either mail surveys or telephone surveys with numbers that are all within a local calling area.

Length: Interview or questionnaire length may also affect survey costs. For mail surveys, printing and postage costs will vary with the number of pages and the weight of the mail-out. Every effort should be made to design a mail questionnaire booklet that conforms to the standards described in this handbook since both response rate and costs are at stake. Printing and postage costs will increase if the questionnaire exceeds 12 pages (three, folded 8 1/2 x 11 sheets with two staples in the spine), a cover letter, and a postage-paid return envelope.

Time is money. Longer interviews increase the personnel costs for face-to-face and telephone surveys, fatigue the respondents, and decrease the completion rate of interviews. Longer interview require more time to complete and respondents may end the interview prematurely.

In addition, the structure of the questions affects the time it takes to complete the interview. Open-ended questions consume more time. Respondents have to think about an answer when the interviewer offers no response choices. The number of open-ended questions doesn't affect the direct cost of a mail survey. However, if too many are included, the more difficult and challenging nature of open-ended questions increases the costs (in time) to the recipients and to those who must later tabulate and/or categorize the responses. This may indirectly increase total costs due to a larger number of follow-up mailings.

When comparing costs of survey methods, the advantage usually goes to a mail survey. It's the least expensive to administer to a dispersed population because of standardized postage rates and low labor requirements. Printing costs of mail questionnaires can be minimized with access to a laser printer and high-quality photocopier that can reproduce two-sided copies. The basic costs are for postage, paper, envelopes, supplies, and labor. Personnel will have to prepare the questionnaire booklet, type a mail merge file in a word processing program for names and addresses, and, finally, stuff the envelopes.

On average, the costs per person for a mail survey involve postage costs of 64 cents (at the current 32-cent rate) multiplied by the sample size, **plus** the number of follow-up reminders and mailings required. Labor, supplies, and printing costs per person can also be calculated. A rule of thumb is to budget at least twice the cost of the original

postage to allow for follow-up mailings to non-respondents.

The most expensive type of survey is the face-to-face survey, which partially explains why so few communities do them. Depending upon sample size and geographic distribution of the sample, these projects may be twice as expensive per completed interview than telephone surveys. Costs for training, supervising, travel, and labor are the major financial considerations.

The cost of telephone surveys usually falls somewhere in between mail and face to face. For a sample of 600 numbers in a local calling area, consultants may charge $10 to $15 per completed interview, depending on the length of the survey, the need to screen for certain types or groups of respondents, personnel costs, and costs of supervising and training the callers. The use of in-house personnel for interviews will cut costs dramatically.

Personnel Requirements

Mail surveys actually require few personnel. Employees with clerical skills can stuff envelopes according to instructions, track mailings, record returns, and send out follow-up mailings. The designers of the survey will prepare the questionnaire, cover letter, and procedures for follow-up mailings. Thus, mail surveys are considerably less labor intensive than either face-to-face or telephone surveys.

Telephone interview projects typically don't require callers with independent decision-making skills since close supervision in a centralized location "makes it less likely that these interviewers will have to make significant decisions without input from a supervisor" (Frey 1989). Nonetheless, considerable training and skill are required on the part of callers to persuade people to participate, to follow instructions for screen questions, and to get through items in a long list without breaking the "rhythm" of the interview. The demands on supervisors are even greater. They must be able to track eight or more interviewers simultaneously, and resolve problems and questions quickly.

Local face-to-face surveys require at least eight to 10 interviewers and one supervisor. The individuals on the survey crew must have sufficient social skills to establish almost instant rapport with respondents and must be able to work during the day and evenings. More extensive training is required to deal with a variety of situations encountered in the field that requires independent decision making. The supervisor may also have to go into the field to deal with difficult situations or problems that may arise. Consequently, labor costs tend to be highest for face-to-face projects.

Implementation Time

A well-trained, experienced caller can complete about four, five-minute interviews an hour depending upon the contact and cooperation rates. Therefore, during a three-hour calling session, eight well-trained or experienced callers may complete about 96 calls. A sample size of 600 would take the team about 19 hours normally spread over three to four days. Consequently, telephone surveys have a distinct time advantage.

The results from telephone interviews can be entered into a computer while other calls are being completed. New software for CATI (computer-assisted telephone interviewing) enables many surveys to be completed even faster. At any rate, it's not unusual for an entire telephone survey to be conducted, processed, and analyzed in less than a week. Turn-around time will probably average about eight or nine work days.

Face-to-face surveys take longer to implement. Recruiting and training personnel, locating respondents, and follow-up visits to non-respondents increase the time and therefore the cost.

Like face-to-face projects, mail surveys are more time consuming. Depending on the number of follow-up mailings required, it may take more than two months. The most important consideration is to obtain an acceptable response rate — no matter how long it takes. Otherwise, all your money will be wasted.

Accuracy Considerations

A survey is accurate to the extent that the respondents and results obtained represent the larger population. Chapter 3 describes the sampling strategies to get a representative sample, but not every citizen or household in a random sample will return the mail questionnaire or consent to be interviewed. The objective is to get the highest possible response rate since surveys with a higher response more likely represent the population to which you want to generalize. The **response rate** refers to the number of completions compared to the number of eligibles in the sample.

A number of factors affect the response rate. That's why considerable care and thought should be invested in decisions about the type, order, wording, number, appearance, instructions, and assurances of confidentiality associated with the questionnaire. All these factors, as well as which of the three survey methods is used, affect the response rate.

Generally, the response rate to face-to-face surveys is higher than telephone and mail surveys, although the gap isn't as large as in the past. Typically, refusal rates are on the rise for all types of surveys. Why? Fear of answering the door for a strange visitor, inundation of survey requests, or the perceived insignificance of the questionnaire topic. Face-to-face interviewers usually can attain about an 85 percent response rate. A good response rate for a telephone survey is 75 to 80 percent, with 70 percent considered minimally adequate. (The replacement techniques discussed in the next chapter will enable the researcher to attain 100 percent of the desired sample size for a telephone survey.) Response rates for mail surveys are often about 20 percent lower than those for telephone interviews. A well-designed mail survey can usually net a response rate between 60 and 70 percent. These response rates assume four to five call-back attempts at different times of the day or week for telephone and personal interviews and at least three follow-up mailings for questionnaires.

The differences in the average response rates for the three meth-

ods aren't large enough to suggest the clear superiority of any one method. Of more importance is whether the non-responses bias the survey results.

How to Deal with Non-responses

The key dilemma that can't always be resolved satisfactorily is whether the people who choose not to respond to a survey differ much from those who do. The higher the refusal rate, the more important it is to determine whether refusals bias results. In the interests of accuracy, the researcher should do everything possible to avoid this source of bias and try to determine whether opinion differences *may* exist that affect the quality of the survey.

Several strategies can help identify possible non-response bias. First, are non-responses concentrated in any particular group in the city? To answer this question, compare the demographics of the sample with the most recent available city census data. How representative is the sample of the target population? Examine the major SES factors and other independent variables in your survey with the census data on gender, race, income, education, home ownership, age, employment status, etc. for your city. If one or more of these variables differ by more than just a few percentage points, the potential for bias exists. But don't stop here! Determine (through analysis techniques such as a difference of means test) whether significant differences exist in the opinions, attitudes, behaviors, or beliefs among whites or blacks, rich or poor, males or females, or for any other demographic factor that's under-represented.

Non-responses usually can be ignored if there are no large differences (more than a few percentage points) in how the different groups rate, evaluate, or think about the important dependent concepts in the survey. If large differences in opinions do occur between different groups, the representation of certain groups may have to be increased by drawing a separate sample of a subgroup in the population or by statistically weighting the sample. Procedures for statistically weighting data are beyond the scope of this handbook, but clear explanations are offered in several statistics texts such as Babbie (1992) and others listed in the references.

Chapter 3
Sampling

The Goal of Sampling

The primary goal of sampling is to select a subset of the population in a way that enables you to know, with a certain degree of confidence and within a range of sampling error, what people in the entire population think. If the population is very small, such as a nine-member local planning commission, no sample is necessary; each commission member can be asked questions. For larger populations, however, a sample must be chosen in an unbiased way so that no group or stratum in the population is over- or under-represented. The selection procedures described in this chapter will help you get an unbiased, representative sample.

A **representative sample** is one that has every major attribute, in roughly the same proportions, as the larger population. If 47 percent of the city population is male, for example, then about this same proportion of males should be represented in the sample. In reality, it's extremely unlikely that we can obtain a *perfectly* representative sample because we can only compare known population characteristics with the sample's profile. Not every important population characteristic is reported in the census, and if significant change has occurred in the community since the last census was conducted, then meaningful comparisons could be a problem.

This fact means it's *particularly* important to use selection procedures that maximize the probability that the sample will indeed be representative, even though we can't compare sample and population profiles on all important characteristics. In reality, if it were possible to make these comparisons, there would be no reason to conduct surveys since we already would know everything worth knowing about the population. Since this is impossible, the quality of the survey depends very much on how the sample of the larger population is generated.

Sampling design refers to *how* the cases are selected from the sampling frame. The sampling frame, you recall, is the list of the population, or the cases that are identified on the basis of certain criteria or rules. Ideally, a sampling frame contains all members of the target population but, as will be explained, population dynamics and the dated nature of most population lists, such as telephone directories, make this a very difficult goal to achieve in practice.

The best sampling designs employ **random selection,** the process for choosing cases from the sampling frame so all members of the population have an equal (or at least known) opportunity of being selected. What this means is the

characteristics of cases (individuals in the population) should be unrelated to the selection process.

Random selection eliminates any conscious or unconscious bias on the part of the researcher in choosing cases for the sample. It also enables the researcher to employ probability theory, which is the basis for determining sampling error and confidence levels for samples of certain sizes. **Probability sampling** always requires the random selection of cases at some stage of the sampling process. Thus, random selection — the hallmark of scientific survey research — is what's recommended in this handbook.

Probability vs. Non-probability Sampling

It's critical for local officials to distinguish the differences between a probability sample and a non-probability sample and to be extremely wary of surveys that use the latter method. Non-probability sampling methods have severe limitations because the individuals surveyed aren't randomly selected. Thus it's impossible to determine the accuracy of inferences or generalizations about the larger population! **Money spent on a survey using non-probability sampling methods is usually money wasted.**

An example of a non-probability sample is to ask citizens to complete a questionnaire published in a local newspaper or magazine. Why is this a problem? Not everyone in the city may read or subscribe to the newspaper or magazine. This violates a major principle: Everyone in the population should have an equal chance to be included in the survey.

Perhaps the most famous illustration of the disastrous use of non-probability sampling occurred in connection with political polling in 1936. *The Literary Digest,* a popular news magazine of the time, sent 10 million postcard ballots to people listed in telephone directories and on lists of automobile owners across the United States, asking them to indicate who they would vote for in the presidential election — the incumbent Franklin Roosevelt or the Republican contender Alf Landon. More than 2 million people responded. The survey reported that Alf Landon received a stunning 57 percent of voters' support to Roosevelt's 43 percent. Two weeks later in the actual election, voters re-elected Roosevelt to a second term in office with 61 percent of the vote, the largest landslide in history. The magazine's credibility was so greatly diminished that it was forced to cease publication shortly thereafter.

What went wrong? How could such a large sample be so inaccurate? Quite simply, the poll used a biased sample. In the Depression year of 1936, less affluent Americans, those most likely to be Democrats and Roosevelt supporters, couldn't afford telephones and automobiles. The poll was biased toward more affluent Americans, who tended to be Republicans. They could still afford phones and cars, but the poorer people who supported Roosevelt's New Deal were systematically excluded from the sampling frame. The consequence

was a highly inaccurate reflection of the voting population's likely behavior.

Ask for volunteers to participate in a study and you're engaging in another type of non-probability sampling. Volunteers are typically more interested in the topic(s) of a survey than are citizens in the general population, so they aren't likely to represent the larger population. Moreover, volunteers are frequently different from the rest of the public — more likely to have higher incomes, more education, and more leisure time.

A variation of asking for volunteers is the "person on the street" interview. If interviewers just stand on one or two downtown street corners during an afternoon, it's highly unlikely the results will represent what all downtown shoppers think about parking, shopping opportunities, or personal safety, for instance. Without devising a much more elaborate sampling strategy that adequately covers different locations, times, and days of the week, the accuracy of any "quick pulse of the public" strategy is highly suspect.

Another way to waste your money is to buy into a call-in radio or television survey. Typically, to call 1-900-555-0001 for "favor" or 1-900-500-0002 for "oppose" costs something and just attracts people who can afford the call and feel strongly enough about an issue to waste their money. This is just another poll of self-selected volunteers and, as such, can't represent the opinions of an entire population.

Still another type of non-probability sampling is quota sampling. Quota sampling begins with a matrix that describes the characteristics of the target population that are important to the study and identifies the proportions that fall into various categories such as age, race, ethnicity, education, income, and so forth. For instance, one might need to know what proportion of the population is white, employed, female, under 40, and head of household. Each "cell" of the matrix is then assigned a weight proportionate to its portion of the total population. When all of the sample elements are so weighted, the overall data are *supposed* to represent the total population's profile. Screen questions identify the respondents with the desired attributes, and then questions are asked of these individuals.

The most famous illustration of the dangers in using quota sampling is the Gallop Poll's use of it to predict that New York Governor Tom Dewey would defeat President Harry Truman in the 1948 presidential election. George Gallop selected his sample to ensure a "correct" proportion of respondents in each SES level and geographic area, based on the 1940 census. The problem was that World War II caused a massive shift in the population from rural to urban areas, which radically changed the population's characteristics compared to the 1940 census data.

Gallop based his quota sample, albeit on the best data available, on an unrepresentative distribution of the population's characteristics. Urban dwellers, for example, were much more likely to vote Democratic. The under-representation of urban voters and the over-representation of rural citizens translated

into inaccurate generalizations about how the entire population would vote. As everyone knows, Truman won by a slim margin of 4.4 percent (49.4 percent to 45.1 percent).

It's easy to see that when public opinion is almost evenly split on issues, programs, or even presidential candidates, any bias in sampling can result in more pie on the face than on the plate of pollsters. Moreover, the accuracy of quota sampling depends on getting precise, up-to-date population proportions. Since this information is difficult to obtain when a survey is years removed from a census, accurate generalizations about the larger population are virtually impossible; the quotas used to draw the sample are inaccurate. The lesson is to avoid quota sampling unless very accurate profile data exists on the population of interest.

In sum, non-probability samples might be cheap and quick, but they lead to inaccurate and therefore useless survey results. Always employ probability sampling because it has the most potential to resist bias.

Probability Sampling Methods

There are several ways to randomly select cases for a sample. We'll review the merits of five of the most commonly employed types of probability sampling: simple random, systematic selection, stratified, cluster, and multistage sampling. Most of the list-based methods are suitable for mail and personal interview survey projects. Simple random and stratified random sampling are incorporated into random digit dialing, which is the preferred method for developing a sampling pool for telephone surveys. Illustrations in later sections indicate how the different methods can be used in conjunction with mail, telephone, and personal interview surveys.

Simple Random Samples

Simple random samples are one of the most basic methods for drawing a probability sample. It's "simple" because there is only one step in the selection of sample cases once all the cases in the sampling frame have been numbered. The process is also straightforward, if somewhat laborious in practice:

1. Obtain a complete list of the population.
2. Assign each case in the population a number.
3. Use a table of random numbers to select enough cases for the desired sample size (see page 32 for more information on determining desired sample size).

Updated population lists can be purchased from a mailing list company. (See the Appendix for a list of some companies.) A current list of people or housing units in the city might also be obtained from the local utility board's billing list, a 911 computer file, a recent city directory, or a reverse directory.

Ideally, the list should be as current and accurate as possible. Check to be sure newly annexed addresses are included. Do any addresses on the list appear to be located outside the city? Having both names

and addresses is desirable since this would enable the cover letter for a mail survey to be personalized, but an accurate list of names is often difficult to get. People move, die, and change their names. Addresses are more permanent.

The quality of any citywide survey depends on getting an accurate list of all city addresses. Remember, true random selection means every household or resident has an equal chance of being selected. If the list from which you draw a sample is defective because it's seriously out-of-date or incomplete, the survey results will be unrepresentative of the total population.

Now, it's rare that a list of the population will ever be *perfectly* accurate. Typically, directories and purchased lists of the city's residences exclude people living in nursing homes, hospitals, college dormitories, motels, or military facilities. They also exclude people who have no address such as migrant workers or the homeless who reside in shelters or under bridges. These are the practical limitations of a sampling frame that's defined by a listing method. Survey researchers simply have to live with these limitations unless a special effort to identify these individuals is necessary to achieve some specific survey objective. City officials may want to know, for example, what elderly nursing home residents think about some service or program for which they're eligible. Then, you'd have to visit the facility for a current roster. The objective is to obtain a reasonably accurate list, which is defined as the most current and complete one possible.

Simple random sampling is most likely to be used for mail or personal interview surveys. Choosing a random sample for a telephone survey presents other unique challenges, discussed in a later section on random digit dialing.

To illustrate how one would draw a simple random sample for a mail survey, assume you have a current list of the 2,900 residences in your city. Each residential unit is numbered 1 to 2,900. A table of random numbers is used to select, in an unbiased way, the case numbers to be included in the sample. (Random number tables are included in the Appendix.) The integers in these tables are simply mechanically generated random numbers.

To use the random numbers table, start by closing your eyes and placing a pencil point on the table of random numbers. Begin with the number where the pencil landed. Since the population total (2,900) is four digits, look at the first or last four digits of that number. Looking at the random number table, let's say your pencil landed on the 11th number of the second column. This number is 17767. Using the first four digits, case 1776 would be included in the sample. Moving down the column, the next case is 0543. The next number is 9963. Neither this number nor the following two numbers (4020 and 6734) are in the sampling frame since there are only 2,900 housing units in the city. Keep moving down the column until a number is reached that *is* included. This is case 1767. Continue in this fashion until you reach the desired sample size.

A much quicker method than manually numbering each case is to order a random sample of addresses from a mailing list company. Typically, these firms have computer software that performs the selection task.

Systematic Selection Procedure

A systematic selection procedure is a common variation of a simple random sample. It's an approximation of a truly random sample and is typically used with larger populations for which a current population list exists. Instead of numbering every case in the population, as in simple random samples, you decide the desired sample size (explained later) and then calculate an interval that will run through the list to produce the right sample size. Systematic selection works as follows:

1. Divide the number of cases in the population by the desired sample size to determine "k." This "k" is the interval between cases, so you will select every k^{th} case.
2. Use a random number table to select a case number in the range 1 to k.
3. Proceed through the population list and select every k^{th} case until you get the desired sample size.

To illustrate, suppose there are 20,000 households in your city. A sample of 400 is desired. The "k" interval equals 50 (20,000/400=50). Using a table of random numbers, blindly place your pencil point at a starting place and select the first two numbers that are between 01 and 50. Assume you find the number 24. Select the 24^{th} case on the list and then every 50^{th} case thereafter (which is the 74th, the 124th, and the 174th case, etc.) until 400 cases are selected from the list of 20,000 households.

There's a potential problem with this procedure. It's called **periodicity**. Sometimes a population list might be ordered in a non-random way that would bias the sample. For example, one might wish to survey participants in a housing subsidy program, but if participants are listed by any defining factors such as amount of assistance received, income, or neighborhood then you could get an unrepresentative sample if the interval skips participants with certain levels of assistance. Such sampling frames should be randomized if it's convenient to do so; obviously, phone books and city directories are usually too large to do this.

Stratified Random Samples

Stratified random samples classify the sampling frame into subgroups deemed important to the study before the sample is drawn. "Micro-samples" are selected proportionately from each stratum or subgroup. If it's important, for example, that each neighborhood's residents be represented in the sample in proportion to their composition of the total population, then stratifying the sample is appropriate as long as you have a fairly accurate estimate of the number of residents or households in each neighborhood.

For example, assume a city has 10,000 households and five neighborhoods, each of which comprises 20 percent of all households. Assume a sample size of 1,000 is desired. A random sample of 200 households is selected from each

of the five lists of 2,000 households, producing a sample stratified by neighborhood. The same procedure can be used for other strata such as precincts, zip codes, or type of residence.

Stratification reduces sampling error by assuring that important population subgroups are represented proportionately in the sample selected. Stratifying a sample is different from quota sampling since the researcher is *not* choosing, through a series of screen questions, whom to interview, such as Hispanic, unemployed males living in a particular community. In stratified samples, the selection of the respondent is still random within the geographic area, neighborhood, or stratum.

Cluster Sampling

A cluster sampling procedure is used when a list of the entire target population is impossible or impractical to compile. It's popular because it reduces the costs of data collection. Clusters are usually geographic units such as precincts, blocks, or census tracts. Unlike stratified sampling, which draws cases from *every* stratum, cluster sampling just draws cases from *certain* clusters randomly selected for the sample.

To use cluster sampling for a city, you need maps showing city (or census) blocks and the number of housing units (the sampling unit) in each block. Then, randomly select clusters or city blocks until you get the desired sample size. All cases in each sampled cluster are mailed the questionnaire or interviewed. Before questionnaires can be mailed however, addresses for all of the housing units in the *selected* clusters would have to be identified, but this is still less expensive than trying to compile a list of the entire population.

Cluster sampling is more efficient because it requires less listing. It's easier to construct an address list for selected blocks than for the entire population. You simply identify all city blocks, randomly select blocks for the sample, and then create a list of residential addresses just for the blocks chosen.

To assure that a sufficient number of clusters or blocks are selected from each of the identifiable communities or geographic areas of the city, the sample also can be stratified. In other words, you can randomly select a number of blocks, proportionate to the population in the north, south, east, and west sides of the community. This assures that residents of a particular area of the city wouldn't be excluded from the sample, a chance that one takes with simple random sampling.

For example, suppose your city has 4,000 housing units on 52 identifiable census blocks. Assume for purposes of illustration that each block has about 77 housing units in it. You have decided to sample 870 units which, as will be explained later, would yield a margin of error of plus or minus 3 percent at a 95 percent confidence level. Use simple random selection procedures to choose 12 census blocks (12 x 77 = 924) to get a large enough sample. If the city has a high vacancy rate, 13 blocks may need to be selected to get the 870 minimum desired interviews.

One possible drawback of this method is that groups in the community might be under-represented in the sample if there's a high correlation between the group and where they live. Large blocks of residents might be missed altogether. Consequently, it's advisable to stratify the sample so that each area of the city is represented proportionately.

Multistage Cluster Sampling

Multistage cluster sampling is a more sophisticated form of cluster sampling used in many large-scale surveys. Several stages of sampling occur, hence the label for this method. First, clusters or city blocks are identified (and perhaps stratified for sampling), then blocks are randomly selected, and then individual housing units in each block are randomly chosen either by a simple random or systematic selection process. Then screen questions might be used to select certain individuals in each household. This latter stage really only works well with telephone and personal interviews since there's really no control over *who* in the household responds to a mail questionnaire. A cover letter may request that certain types of individuals complete it, but there's no assurance that's what will happen.

The general guideline for cluster sampling is to maximize the number of blocks (or clusters) selected while decreasing the number of units within each block. The rationale is that the elements *within* each cluster or block are usually more homogeneous than are all the elements that compose the entire population. So, relatively fewer elements may be needed to adequately represent a given cluster. What this means is that a block is given a chance of selection proportionate to the number of housing units in it. Within each cluster in each region, however, a fixed number of elements is selected.

This is "probability proportionate to size," a strategy that may be necessary for larger cities with a diversity of socioeconomic groupings that tend to be concentrated within certain blocks. Most survey projects in Tennessee cities probably won't require such elaborate sampling. However, if it's thought necessary to achieve the survey's goals, readers are encouraged to consult Babbie (1992) and contact one of the individuals or technical assistance organizations listed in the Appendix. Figure 3-1 on the next page summarizes the merits of each of the sampling strategies.

Determining Sample Size

You've defined the target population, obtained an accurate sampling frame, and devised an appropriate sampling design. The next task is to determine the sample size. How large does it need to be? What factors should be considered? The answer can get rather technical, but the quickest way to get an idea on size is to examine the same tables that most researchers consult. Figures 3-2 on page 34 and 3-3 on page 35 indicate the required sample sizes for populations at different levels of sampling error for 95 percent and 99.7 percent confidence intervals.

Figure 3-1. The Merits of Probability Sampling Strategies

Sampling Strategy	Advantages	Disadvantages
Simple Random Sampling	Accuracy and sampling error can be easily estimated. Requires minimum advance knowledge of population characteristics. Excellent sampling strategy.	Complete list required. Can be expensive, especially for personal or face-to-face interviews.
Systematic Selection Procedure	Convenient, easy, quick way to obtain a sample from a large list.	Periodicity; requires list of entire population. Also expensive for face-to-face surveys.
Stratified Random Samples	Assures representation of various groups in the population.	Requires accurate info on the proportion of the population in each stratum.
Cluster Sampling	Lower costs if the clusters are geographically defined.	Less accurate.
Multistage Cluster Sampling	Lower costs than simple random samples for larger populations. Less error than cluster sampling.	More error than simplerandom sample. More costly than cluster sampling.

Sources: Hessler (1992) and Weisberg, Krosnick, and Bowen (1989).

To use these tables, decide first if you want to be 95 or 99.7 percent sure that the sample is in fact representative of the larger population. (Most researchers select 95 percent.) Then, select a column that indicates the level of error you can tolerate and move down that column to the row with the population closest to the target population for your survey. Since your target population probably lies between one of the 5,000 population intervals, simply extrapolate the sample size for the desired level of precision.

For example, assume you want to be 95 percent sure that the actual or true opinions of the population will be represented in the sample. Also assume you'll tolerate a sampling error of plus or minus 3 percent. Assume that the size of your target population is 22,500. Since 22,500 is exactly halfway between 20,000 and 25,000, you know the sample size must be 1,059, halfway between 1,053 and 1,064. What this means is that a sample size of 1,059 is required for a target population of 22,500 to be 95 percent sure that any measurement of an attribute or opinion in the sample will be within 3 percentage points above or below the *true* distribution of the same attribute or opinion in the larger population.

Figure 3-2. Sample Sizes for Specified Levels of Precision, 95 percent Confidence Interval

Population	+-1%	+-2%	+-3%	+-4%	+-5%
500	*	*	*	*	222
1,000	*	*	*	385	286
1,500	*	*	638	441	316
2,000	*	*	714	476	333
2,500	*	1,250	769	500	345
3,000	*	1,364	811	517	353
3,500	*	1,485	843	530	359
4,000	*	1,538	870	541	364
4,500	*	1,607	891	549	367
5,000	*	1,667	909	556	370
6,000	*	1,765	938	566	375
7,000	*	1,842	959	574	378
8,000	*	1,905	976	580	381
9,000	*	1,957	989	584	383
10,000	5,000	2,000	1,000	588	385
15,000	6,000	2,143	1,034	600	390
20,000	6,667	2,222	1,053	606	392
25,000	7,143	2,273	1,064	610	394
50,000	8,333	2,381	1,087	617	397
100,000	9,091	2,439	1,099	621	398
100,000+	10,000	2,500	1,111	625	400

* = Sample size should be 50 percent of the population.

Source: Manheim and Rich (1991).

It's obvious from the tables that a researcher needs to consider the level of precision desired as well as available resources. Samples with a 99.7 percent confidence level and a small sampling error, such as 1 or 2 percent, are very expensive because much larger samples are required. For example, consider the difference in sample size required for a population of 22,500 at a 99.7 percent confidence interval with a 2 percent margin of error, vs. the sample size required for the same population at the 95 percent level with a 3 percent margin of error: The first scenario requires a sample size of 4,491 and the second scenario requires 1,059 cases to be sampled. With the first sample more than four times larger, there's a definite price to pay for higher precision levels.

The typical citywide opinion survey usually has a sample size of about 600. This is because most surveys will tolerate a 95 percent confidence interval and accept a sampling error of plus or minus 4 percent. These parameters are acceptable for most survey research in the social sciences. **Resist** any proposition to save money by reducing the sample size so that the confidence level and sampling error are below these levels.

Figure 3-3. Sample Sizes for Specified Levels of Precision, 99.7 percent Confidence Interval

Population	+-1%	+-2%	+-3%	+-4%	+-5%
500	*	*	*	*	*
1,000	*	*	*	*	474
1,500	*	*	*	726	563
2,000	*	*	*	826	621
2,500	*	*	*	900	662
3,000	*	*	1,364	958	692
3,500	*	*	1,458	1,003	716
4,000	*	*	1,539	1,041	735
4,500	*	*	1,607	1,071	750
5,000	*	*	1,667	1,098	763
6,000	*	2,903	1,765	1,139	783
7,000	*	3,119	1,842	1,171	798
8,000	*	3,303	1,905	1,196	809
9,000	*	3,462	1,957	1,216	818
10,000	*	3,600	2,000	1,233	826
15,000	*	4,091	2,143	1,286	849
20,000	*	4,390	2,222	1,314	861
25,000	11,842	4,592	2,273	1,331	869
50,000	15,517	5,056	2,381	1,368	884
100,000	18,367	5,325	2,439	1,387	892
100,000+	22,500	5,625	2,500	1,406	900

* = Sample size should be 50 percent of the population.

Source: Manheim and Rich (1991).

Confidence level and **margin of error** are important concepts. **Together they constitute sampling error.** Confidence level refers to the likelihood that the sample is indeed representative of the larger population. A 95 percent confidence level means if you conduct 100 samples of the target population, the actual opinions of the population will be measured in 95 of the 100 samples. Likewise, a confidence level of 99.7 percent means the chances any sample will achieve the desired level of accuracy (the margin of error) are about 99 to 1. Of course, only one sample will be drawn, so you always hope the sample selected is one of the 95 percent (or 99.7 percent) rather than one of the 5 percent (or .3 percent). Technically, this means we take a 5 percent (or .3 percent) chance of drawing a faulty conclusion.

A margin of error of 4 percent, for instance, means that any measurement we might make in the survey of an opinion, attitude, attribute, etc., will be within 4 percentage points above or below the true distribution of that same factor in the larger population. For example, assume it's possible to know for certain that 65 percent of local residents are "very satisfied" with the road surface conditions in their neighborhoods. We draw a sample

large enough to be 95 percent certain that the distribution we obtain on this question will be within plus or minus 4 percent of the real population proportion. Assume we tabulate the survey responses to a question about satisfaction with road surface conditions and find that 61 percent of the households sampled are "very satisfied." We know, in this case, that our sample is one of the 95 percent representative of the population since the sample proportion is in fact within 4 percentage points, albeit on the low side, of the actual opinion distribution in the population.

Maximum confidence and minimum error are always desirable, but this doesn't mean every survey project needs to have the same level of precision, nor even the highest possible level of precision you can buy. The very highest level of precision, of course, only can be obtained by asking the survey questions of everyone in the population. Since this is too costly and time consuming, we settle for sampling some fraction of the larger population.

Sample size doesn't need to be enormous to achieve fairly precise results. When we draw a sample, there will *always* be some chance that the sample won't represent the larger population and the estimates made of the characteristics and opinions of the larger population will include *some* error. That's why it's always proper to report the confidence level and margin of error when summarizing the results of a sample survey.

In addition to cost, other factors should be considered when deciding an appropriate sample size:

- the variability or heterogeneity of the population with respect to the characteristics and issues being studied, and
- the type of sampling design selected, particularly whether the objectives of the survey require results to be reported for any subgroups of the population.

The more heterogeneous the population, the larger the sample required to represent it. Conversely, the more homogeneous the population, the smaller the sample required. This has implications primarily for stratified sampling. Strata are more alike than the overall population. Therefore, samples of that strata can be smaller and still be representative. This is the logic behind the discussion in the previous section of sampling more clusters and fewer respondents in each cluster.

What does all this mean? If you want to make generalizations about a specific subgroup of the population, such as low-income, black females, reliance on a sample of all citizens may yield a number too small for credible analysis. For example, suppose this sample is drawn from all 600 city residents:

- 300 females,
- 45 black females, and
- nine low-income black females.

With only nine cases, making accurate generalizations about what low-income, black females think about a city's public health facility, for instance, is unlikely. If accurate generalizations need to be made about what a particular subgroup of the population thinks about some issue, it's prudent to sample that group or stratum separately. For instance, if the population of the subgroup is less than 500 individuals, the sample size for the stratum

normally should be about 50 percent at the 95 percent confidence level to achieve a margin of error of plus or minus 4 percent. Some estimate of the group's size is often possible with census data. Screen questions in a telephone or personal interview survey would allow you to sample various strata. Since lists of various groups often aren't available, it's difficult to sample various strata by mail.

The major task is to decide how much risk you want to take, and how much error you're willing to accept. Always consider your survey's objectives. If the purpose is to predict the outcome of a close election or determine whether citizens will favor a highly controversial property tax hike, bond proposal, or annexation, then perhaps a fairly high level of confidence and a low margin of error are required. On the other hand, if the issues are much less divisive and controversial, such as what citizens think about the local quality of life or how well they think city officials are performing certain functions and services, then perhaps a smaller sample size will suffice.

The recommended course of action is to consider:

1. the survey's purpose,
2. available resources, and
3. whether various subgroups need to be sampled separately.

A reasonable balance between accuracy and cost is usually possible.

Response Rates

You can readily see the importance of maximizing the response rates; they directly affect the accuracy of the survey results. For example, if you get 240 responses (a 40 percent response rate) to a mail survey sampling 600 residents of a population of 15,000, then the margin of error is about 7 percent at a 95 percent confidence level. This means, of course, that the sample proportion could be 7 percent above or below the actual population mean on a question.

Devote a lot of effort to maximizing response rates — the characteristics and opinions of non-respondents *may* be different from those who agree to be interviewed or who take the time to complete the mail questionnaire. As explained at the end of Chapter 2, a high non-response rate will bias the survey results.

Simply replacing non-respondents with another name *without first* making a diligent effort to get a response from the one randomly selected in the first place may bias the survey. That's why at least two or three follow-up mailings of questionnaires, several return visits to residents who aren't home, and at least four call-backs (at different times and days) to phone numbers are recommended.

If you give up too easily, and simply keep going back to the list for a name or number that results in an easy response, what you end up with is a sample of the "easy to reach" residents. The "hard to get" residents — or those who "don't do surveys" — are systematically excluded. Since these non-responsive residents *may* have opinions different from the easily reached or agreeable individuals, the

survey results may be unrepresentative of the population as a whole.

An increasingly common problem for telephone interviewers is the growing prevalence of answering machines. Intended respondents are harder to reach. Since many people use these machines to screen their calls, the callers need to be trained to handle these cases. Essentially, when answering machines pick up, the recommended practice is to leave a polite message identifying the caller, the organization represented, and the purpose of the call. A promise to call back tells the individual more attempts will be made to get his or her opinions and ideas that are "so valuable and essential for obtaining accurate information about what people like you think about our city's services and programs." If the resident is at home, then they're more likely to pick up the receiver, giving the caller a chance to persuade the respondent to participate in the survey.

Obtaining Samples for Telephone Surveys

Generally there are two sampling designs for telephone surveys: those depending on a list such as a telephone directory and those using some version of random digit dialing (RDD). To some extent, RDD also depends on the telephone directory for the prefixes in use in the city, but generally one or more random digits are substituted for all or a portion of the numbers listed in the directory.

While lists are important for mail and personal interview surveys, they aren't the preferred source for developing a sampling frame for telephone surveys. In fact, there are several problems in the use of phone directories. One of these is unlisted numbers. Some jurisdictions, such as Las Vegas and Los Angeles-Long Beach, have unlisted telephone rates of more than 60 percent! Many smaller jurisdictions have unlisted rates as low as 20 percent. In larger Tennessee cities, such as Knoxville, the rate is 24.5 percent, in Nashville it's 30.6 percent, and in Memphis it's 26.9 percent. If new but unpublished listings for a city are added to this figure, perhaps 40 percent of telephone subscribers, on average, may be omitted from the telephone directory.

The crux of the problem is many characteristics of persons with unlisted phone numbers differ from those with published numbers. Those with unlisted numbers tend to be younger, have lower incomes, live in urban areas, fear crime more, move frequently, and are unmarried women and non-white. Consequently, a sample of numbers in a telephone directory will be biased because some groups may be systematically excluded.

A second shortcoming of phone directories is that they're out-of-date when they're published. The time lag between data collection and publication is often several months. On average, about 1 percent of the listings in phone directories are simply incorrect; the wrong number is printed. For these reasons, directories are often called "dirty" lists. Nonetheless, directories may

be an acceptable method for smaller cities that have slow or no growth and experience little change.

About 95 to 97 percent of the households in America have phones, although this figure may be declining due to the increasing costs of telephone service. On average, the "penetration rate," or the proportion of households that has phones in Tennessee cities, is about 90 percent. Rural, very low-income households and low-income, inner-city, non-white households most likely *don't* have phones. Even though telephone surveys will systematically miss some people, the omission of those who don't have a phone is a problem endemic to this form of citizen contact. Most researchers, however, don't regard the problem as serious enough to reject this kind of survey method (Frey 1989).

Random Digit Dialing

The preferred way to get a sample for phone surveys is random digit dialing (RDD). The technique overcomes the problems of inaccurate and dated directory listings. Theoretically, it offers an equal chance of reaching a household with a phone, regardless of whether the number is listed.

The first step in generating a **sampling pool** (the numbers that will be used to complete a pre-determined number of interviews) is to identify the working three-digit prefixes that ring in the geographic boundaries of the survey area. It's also useful to know the approximate number of telephone access lines in operation for each prefix. This information can be used to generate random telephone numbers in proportion to the number of lines in that prefix. In this way, the sample is stratified by prefix. In smaller cities, only one prefix may be in use, so there's no need to stratify the sample, only to screen residents with the same prefix that may live outside the city.

Information about vacuous banks of suffixes (numerical ranges of telephone numbers that are inoperative or contain no residential lines) is also useful. Reach out and touch someone at the local phone company for this information or, in the case of larger cities, use a reverse directory.

RDD samples can be generated by computer or purchased from commercial vendors in the sampling business. (Names of several vendors are listed in the Appendix.) Perhaps the easiest way to get a random sample of working telephone numbers in your city is to buy it from a private business that generates such lists and checks working telephone numbers. An example of the product such firms sell is in the Appendix. In effect, each call sheet is a micro-random sample and has columns for recording how each call goes.

To generate a random list of telephone numbers manually, you can use a random numbers table. If your city has only two prefixes, 458 and 459 for example, you could randomly select a starting place on the random numbers table to create a sampling pool. For instance, the

random sequence of numbers in a random numbers table might be 1009732533765201. If both 458 and 459 have about the same number of phone lines in the city, then the first four phone numbers in the sample would be 458-1009, 459-7325, 458-3376, 459-5201. You'd continue this process until a sufficient sample size is generated.

If the proportion of numbers in the 458 prefix is 40 percent and the 459 is 60 percent of the households, then you'd add strings of four digits to the prefixes chosen in the following order: 458, 458, 458, 458, 459, 459, 459, 459, 459, 459. This reflects the relative distribution of the prefixes in proportion to their frequency in the city.

Estimating the Size of the Sampling Pool for Telephone Surveys

The size of the sampling pool of telephone numbers can be estimated from a formula derived from Lavrakas (1987):

$$\text{Size of Sampling Pool} = \frac{(\text{FSS})}{(\text{HR})(1-\text{REC})(1-\text{LE})}$$

FSS

The final sample size (FSS) is the number of completed interviews needed for the confidence and accuracy level desired.

HR

The hit rate (HR) is the term that describes the estimate of the proportion of telephone numbers in the sampling pool that is likely to ring at the appropriate location (a residence). Even the most current sample of telephone numbers, including those purchased from polling companies, will contain some non-working and some non-residential numbers. This proportion will vary by jurisdiction and the method used to generate the list. If information is available about working numbers for each prefix and banks of vacuous suffixes, fewer non-working numbers will be called. It's prudent to estimate a hit rate between 40 and 50 percent (.40 or .50 for the formula).

REC

Respondent exclusion criteria (REC) refers to the respondents ruled ineligible due to a number of possible factors. The need to screen any persons or households ineligible to participate in the survey will increase the required sample size. A question such as "Do you reside within the corporate limits of the city of Jackson?" screens respondents who live in the county and have the same telephone prefix as city residents. If the target population is only city residents, and some prefixes cover territory outside the corporate limits, some estimate of the number of these lines will have to be made so the sample will be large enough to reject the county lines and still get the desired number of responses from city residents. Usually the local telephone company can give you some estimate. Maps of the areas covered by various prefixes may also be obtained from cooperative South Central Bell personnel. With dis-

trict level census data, an estimate of the number of households located outside the city with the same prefix as city residents can be made.

The REC might also involve other screen questions. For instance, if female-headed households are the target population, and the census indicates this group comprises 25 percent of all households, then typically three out of every four households contacted won't have such a person living there. In this case, the REC value for this example would be .75 or (1-.25). Obviously, this would be a very expensive survey. Fortunately, it's rare that a survey needs to target such a small group. Most cities direct calls to persons 18 years or older and, for practical reasons then, one can assume the REC to be very small (near zero).

LE

The loss of eligibles (LE) refers to the refusal rate among the individuals in the sampling pool. Even when very experienced and talented interviewers do a telephone survey, the LE value may range from .15 to .25, meaning 15 to 25 percent of the persons contacted refuse to participate. Some of the techniques for minimizing the loss of eligibles are discussed in the chapter on organizing and training personnel.

Application of this sample size formula is straightforward. Assume that the target population of interest is 25,000 and we want to be 95 percent sure that our margin of error is no greater than plus or minus 4 percent. Consulting the sample size table, we find that the FSS or final sample size should be 610. We estimate the hit rate at about 40 percent. The REC value is determined to be .05 since we're interested in interviewing residents 18 years old or older and at least 95 percent of all households are headed by someone who's at least 18 years old. A best guess of the LE or loss of eligibles is .30 since this is a smaller city whose citizens have a mean education level higher than the state average, and thus are likely to be somewhat more cooperative. Using the formula, we calculate:

$$\textbf{Size of Sampling Pool} = \frac{610}{(.40)\ (1-.05)\ (1-.30)} = 2{,}293$$

It's prudent to *add about 10 percent* to the number derived from the formula to assure that the sampling pool will be large enough. So, if you were to buy or generate a random sample of telephone numbers for the city in this example, you should get about 2,522 numbers to complete the 610 interviews desired. The interviewers will continue to call until the desired number of completions is achieved. Non-working numbers, ineligibles, and refusals are eliminated in the process.

Selecting Respondents in Telephone Surveys

The goal of processing the sampling pool in a telephone survey is to get results that are representative of the target population. The target population may be households, all adult citizens, members of particular groups, or *anything* you wish to study. If the **unit of analysis** is the household, any adult member of it may be able to provide the information needed. However, then generalizations can only be made about city households, not all adults in the city population.

It's possible to convert a sample of households into a sample of **all** adult residents if certain screening procedures are used. This screening process is necessary to achieve a probability sample where "the selection of the respondent is not at the discretion of the interviewer or where the most 'convenient' respondent is always chosen" (Frey 1989). If a screening procedure isn't used, the researcher will obtain, in practice, a sample comprised mostly of older residents and females. Younger males in particular would be under-represented based on phone answering behaviors in the United States. In effect, screening procedures can be used to sample individuals *within* households.

Several within-household screening strategies give every member of the adult population a chance to be selected (see Frey 1989 and Lavrakas 1987). The method that's the least obtrusive and among the most successful (in terms of low refusal rates) is the **birthday method**. The "last birthday" or "next birthday" method is a popular, unobtrusive, non-threatening probability technique. It is based on the premise that every adult member of the household has an equal chance of being chosen because of the random nature of the selection.

For example, after the introductory remarks identifying the caller, the purpose of the survey, and the importance of their opinions to the accuracy of the survey (the "introductory spiel"), the interviewer asks:

> *"We need to be sure that we give every adult in (name of the city) a chance to be interviewed for this study. Among those 18 years old or older in your household, I need to speak to the one who had the most recent (or who will have the next) birthday. Would you be that person?"*

If the answer is yes, the interviewer continues with the questions. If no, the interviewer asks to speak with that person. If the eligible respondent isn't available, the interviewer asks for the first name of the individual, and inquires what time would be best to call back so that person can be interviewed. In practice, the "last birthday" method is preferable to the "next birthday" alternative since it's probably easier "to recall the past than to construct the future" (Frey 1989). This birthday method enables the researcher to translate a sample of households into a sample of adults. Then you can make generalizations to the entire adult population.

Processing Sampling Pools

Finally, in a telephone survey, there is a need to establish routines for "releasing" numbers from the sampling pool, and for processing these numbers. The supervisors of the survey should have responsibility for providing interviewers with numbers listed on "call-back sheets" (see Appendix), which are released to each caller a page or two at a time. Supervisors also are responsible for assuring that the phone numbers are successfully processed. At least three call-backs, and preferably four, should be made to numbers that don't answer. No more than two of these call-backs should be made on the same day or evening.

Supervisors should make sure callers understand and properly record each dialing. The date and time of each call and disposition codes for all of the possible outcomes should be recorded on the call-back sheet. Outcomes include ring-no-answer, busy, out-of-order, refusal, completed, answering machine, business or government office, answered by non-resident (such as a baby sitter), and non-eligible.

Less than half of all completed interviews occur on the first dialing. Interviews should be scheduled for the days and times when the target population is most likely to be available. After 5:30 p.m. on weekdays, 10:30 a.m. to 5 p.m. on Saturdays, and 1 p.m. to 9 p.m. on Sundays seem to result in the highest number of completed calls on the first attempt. Holidays, special event days such as UT football Saturdays, and other weather-related events should be considered in scheduling telephone interviews.

The goal for the supervisor is to release the *minimum* number of telephone numbers from the pool needed to obtain the desired sample size. This practice helps to assure that a diligent effort is made to contact residents who are more difficult to reach by phone. The supervisor should also strive to keep to a minimum the number of unresolved calls (rings but no answer).

Summary

The heart of survey research is the process of systematically collecting data from individuals selected in a way that enables the researcher to make inferences or generalizations with a known level of accuracy and confidence about some larger population. The population could be members of a neighborhood, a stratum in the city, or all adult residents. Three major decisions must be made to get useful, valid information from a sample:

1. Decide who should be surveyed (the target population).
2. Decide which type of survey is most appropriate, based at least in part on the availability and accuracy of lists, directories for mail and personal interview projects, or the need to generate or purchase call sheets as part of a random digit dialing telephone survey.
3. Then, decide how large a sample is needed to achieve the desired level of confidence and precision.

Chapter 4
Survey Design

Introduction

Questionnaire design is both an art and a science. As an art, it requires a keen sense of page layout and vertical question flow and an even sharper faculty for writing clear, cogent questions that measure what needs to be measured. Clarity, simplicity, and visual appeal are the hallmarks of a professional, polished product to which people are more likely to respond. As a science, it requires knowledge of how to reduce bias, when to use multiple indicators to measure complex concepts, and how to code and analyze the results. Just like any labor of art or science, many drafts, versions, and trials are required to produce a quality finished product.

Sticking to the essential principles of questionnaire design reviewed in this chapter will help you create a quality survey instrument and get a decent rate of mailed returns or completed telephone interviews. These principles can be distilled to one essential maxim: **Know what you want to ask and why you want to ask it; write clear, simple, and unambiguous questions; keep the survey as short as possible; and have a plan for analyzing the results before you start surveying.**

Question Styles

Once you have an idea of the information you need from the survey, you have some basic writing choices to make. First, the items in a questionnaire can be written as either statements or questions. Using both styles often makes the questionnaire more interesting. Each style has particular advantages.

Questions measure opinions, attitudes, preferences, beliefs, and attributes on non-threatening topics people have some information about. A question such as: "How would you rate the quality of street repair in your neighborhood during the last 12 months?" may have response categories of "excellent, good, fair, poor, and don't know" that are useful for making comparisons between neighborhoods.

Statements can be crafted to discover the intensity of feeling about sensitive topics in a non-personal — and therefore less threatening — fashion. **Likert scales** are particularly useful here. A statement such as: "Flooding of some streets in my neighborhood is a serious problem after most storms" can have five response categories: "agree strongly, agree, neither agree nor disagree, disagree, and disagree strongly." In this way, the intensity of a respondent's feeling can be measured. Examples of topics framed as statements and questions are illustrated in the figures in this chapter.

Question Structures

There are two basic question structures: open-ended and closed-ended. Open-ended questions require a respondent to answer the question in his or her own words. For example, the question: "What do you think is the single most important problem facing the city today?" might yield a variety of responses. If there is a large number of possible or likely responses, use an open-ended structure.

Open-ended questions are more demanding because they require more effort by the respondent. For this reason, they should be used sparingly. Be sure to provide enough lines on the mail questionnaire for the respondent's answer. When used in telephone interviews, follow-up questions can be asked. Asking, for instance, "Why do you think that _____ is the most important problem?" may yield additional useful information.

Open-ended questions can reveal much about what respondents think, the logic (or lack thereof) behind their position, and the strength of their feelings. The biggest advantage of an open-ended question is the freedom given respondents to answer in their own way instead of with words chosen by the researcher. Unexpected responses may change the way local officials think about certain issues.

The major drawback of open-ended questions is coding the diversity of possible responses. For mail questionnaires, it's possible to read all the responses and then develop categories and codes for the range of answers. For telephone or personal interview projects, interviewers must be trained to record accurately the essence of the respondents' comments. Then, researchers must develop the categories and codes for grouping similar answers so they can be analyzed. This process is time-consuming, so for this reason, too, open-ended questions should be used judiciously. Since open-ended questions increase the time and effort required by the respondent, use them only when it's clearly the best structure for the topic.

Closed-ended questions offer a set of response choices from which respondents are asked to choose. There are three variations of a closed-ended question: partially closed-ended, closed-ended with ordered response choices, and closed-ended with unordered response choices. Closed-ended questions are popular because they produce uniform responses that are easily coded. Each response is assigned a specific number.

The responses to a closed-ended question should meet two principles of measurement: exhaustiveness and mutual exclusiveness. Exhaustive response categories include all expected responses. Since this is sometimes difficult, it's often prudent to add an "Other: (please specify:_____)" choice. This is called a "partially closed-ended" question since it allows the respondent to enter a response not listed by the researcher. The most likely answers are listed, but as a hedge include "Other" and "Don't Know" choices.

The responses to closed-ended questions should also meet the criteria of being mutually exclusive. Instructing the respondent to choose the "one best answer" from those listed is helpful in eliminating possible confusion, but there's still no substitute for a set of clear, distinct, mutually exclusive choices. For this reason, don't overlap response choices such as $10,001 to $20,000 and $20,001 to $30,000. Always make sure citizens aren't confused by terms that are close in meaning. For instance, never use "frequently," "sometimes," "occasionally," or "regularly" in the same response set since people interpret these terms differently.

Always reject answer choices that are vague or subject to different interpretations by reasonably intelligent people. In other words, choices shouldn't be so subtle that it's difficult to differentiate between them. Don't use terms such as "usually," "seldom," "often," and "rarely." Instead, offer different frequencies for a specified period of time, such as "once a month" or "twice a week." Respondents should feel that their answer fits one, and *only* one, category.

For telephone and personal interviews, the respondent should be able to remember the range of answers, so limit the choices to about six or seven. Pretesting the questions helps ensure categories are mutually exclusive. If interpretation problems arise, it's infinitely preferable they be discovered in the pretest rather than in the midst of the survey project.

Sometimes, the researcher may wish to ask the respondent to "circle all that apply," such as in a list of materials they may take to a recycling center or a list of the city recreational facilities they've used in the last six months. This structure is most often used in closed-ended questions with unordered answer choices and is appropriate as long as the plan for coding and data analysis provides for it. Each response choice becomes a variable that can be coded "1=yes" or "0=no" depending upon whether it's circled.

Closed-ended questions can have many types of response formats. The simplest response option is "yes," "no," and "don't know." This option is appropriate for screen questions such as: "Do you currently reside within the city limits of Humbolt?" or "Have you visited the Cookeville library within the last six months?" Often the simplest response choices are the best!

Closed-ended questions with ordered choices are particularly useful for asking a series of questions about attitudes, beliefs, or behaviors. This is especially true when the survey goal is to combine answers on a scale to measure some concept such as public safety, service satisfaction, or civic-mindedness. The answer choices are a gradation. The Likert scale, for instance, consists of the "strongly agree," "agree," "neither agree nor disagree," "disagree," and "strongly disagree" choices and is a common way of measuring attitudes. Evaluative questions also may use rating scales, such as "good," "fair," and "poor."

You can also create scales that ask *how* respondents feel about a service or program. Adverbs are used

to modify the intensity of opinions, for instance, about service satisfaction. Respondents may be "very satisfied," "satisfied," "neither satisfied nor dissatisfied," "dissatisfied," or "very dissatisfied." A numerical rating scale, with labels or verbal ratings for each point on the scale, is another popular option. Still another option is "feeling thermometers," which provide respondents with a visual cue to the response choices. Examples of rating scales for closed-ended questions with ordered choices are in Figure 4-1 below.

Closed-ended questions with unordered response choices don't limit responses to gradations of a single concept. Questions like this are often used to establish priorities or rank among alternatives. Asking respondents to rank more than six or seven items is demanding, so limit the choices. The unordered

Figure 4-1. Examples of Closed-ended Questions with Ordered Choices and Closed-ended Questions with Unordered Choices

Closed-ended, Ordered Choices

1. Are you inclined to agree or disagree with the following statement: "For the local taxes that I pay, the services provided by the city of Gatlinburg are a good bargain."

   1 STRONGLY DISAGREE
   2 DISAGREE
   3 NEITHER DISAGREE NOR AGREE
   4 AGREE
   5 STRONGLY AGREE

2. What kind of job does the city of Hendersonville do with respect to the removal of brush and leaves in your neighborhood?

   1 POOR
   2 FAIR
   3 GOOD
   4 NOT SURE / DON'T KNOW

Closed-ended, Unordered Choices

1. Which of the following best describes the type of structure in which you reside?

   1 SINGLE FAMILY
   2 DUPLEX
   3 APARTMENT IN BUILDING WITH THREE TO FOUR UNITS
   4 APARTMENT IN BUILDING WITH MORE THAN FOUR UNITS
   5 MOBILE HOME

2. Which of the following do you think has the *most* influence on how the city budget gets allocated in Chattanooga?

   1 MAYOR
   2 THE CITY COMMISSION
   3 CITY STAFF
   4 "PUBLIC INTEREST" GROUPS
   5 LOCAL UNION ORGANIZATIONS
   6 LOCAL BUSINESS ORGANIZATIONS

response structure is suitable for acquiring all four types of information (opinions, beliefs, behaviors, and attributes). Examples of unordered response sets are in Figure 4-1, too.

Choosing a Question Structure

Let's review the attributes of open-ended vs. closed-ended questions.

Generally, closed-ended questions are less demanding of respondents, but are more challenging to design for the researcher. The danger always exists that an important choice may be omitted or that the choices presented don't correspond with how respondents really think about an issue. If the options presented aren't exhaustive or mutually exclusive, the respondent is likely to consider the study to be "dumb" and not worth the effort. Considerable effort must be devoted to writing simple, clear, concise, unambiguous questions that have exhaustive and exclusive answer categories.

Open-ended questions are easier to write, but place more demands on respondents to think about the issue and write down or verbally express their thoughts about the topic. Responses also may be more difficult to code consistently. The judicious use of open-ended questions, however, may be highly informative especially when the researcher is uncertain about being able to develop an exhaustive set of response choices. Open-ended questions also foster the perception that local officials genuinely care what respondents have to say. The early use of an open-ended question can help to establish this "consulting" tone for the remainder of the questionnaire or interview.

In sum, the survey objectives, the amount of information respondents are likely to have about a topic, and the motivation of respondents to communicate their experiences and thoughts are important considerations when choosing the best structure. Some combination, usually weighted to closed-ended questions, is the typical approach used in opinion surveys of local residents.

Wording Questions

The main considerations when wording questions are:

- simplicity,
- brevity,
- clarity,
- coherence,
- consistency, and
- symmetry.

Conversely, poorly written questions will have one or more of the following features:

- ambiguity,
- complexity,
- bias,
- double-meaning,
- slang or jargon,
- no common temporal frame of reference, and
- confusing, overlapping, or non-exhaustive response choices.

Simplicity

Keep it simple! Write short, simple questions with only one dimension and a clear time frame. One of the fatal errors in wording questions is to use more words when fewer will do, and to try to accomplish too much with a single question. Words should be selected that a person of average intelligence in the target population will understand. Avoid jargon, slang, acronyms, and abbreviations, and any terms that may cause confusion. Conversely, don't talk down to or patronize the respondents. Use language that a person with at least a high school education will understand. Don't make the questions too demanding. Questions such as: "What is your average net family income per month?" are unnecessarily difficult. Ask instead, "What was your total household income for 1993?"

Sometimes the goals of specificity and simplicity in wording questions are difficult to achieve, but strike a balance. There's no magic formula or shortcut. Drafting scores of possible ways to phrase a question is a typical part of finding the best balance between specificity and simplicity.

The best way to proceed is to consider how a particular draft *could* be misinterpreted or misunderstood. Then, once your best effort is expended in writing elegantly simple questions, pretest them on other city staff, revise, and then pretest again on a small sample of the target population. Most often, this pretesting process will produce the clearest, simplest, and best wording.

Clarity

Whenever you try to load too much information into a question, the risk of creating a **"double-barreled" question** is high. This is among the most common mistakes in citizen surveys. A double-barreled question asks respondents for a single answer to multiple questions. Examples include:

1. "Do you favor increasing the quality of our public school system by spending more local revenue on teacher salaries and computer equipment?"
   1 FAVOR
   2 OPPOSE
   3 DON'T KNOW/NOT SURE

2. "How many times were you or a member of your family a victim of a crime during 1993?"
   1 NOT AT ALL
   2 ONCE
   3 TWICE
   4 THREE OR MORE TIMES
   5 DON'T KNOW/NOT SURE

3. Was the police officer during your most recent contact helpful and courteous?
   1 NO
   2 YES
   3 DON'T KNOW/NOT SURE

These examples present several problems. In the first question, spending more for teacher salaries and spending more for computers are two separate issues. Further, the question is biased. It makes an unproven assumption that higher teacher salaries and more computers increase "school quality" — a term that's the subject of considerable debate. As a general rule, it's desirable to avoid false assumptions. In this instance, two sepa-

rate questions are appropriate, one that asks about support for more spending for salaries and one for computers. A more precise definition of school quality is required, such as "an improvement in reading scores on standardized tests." A revised format might read: "Would you favor spending more on teacher salaries if this resulted in higher average scores on standardized reading tests for secondary school students?"

In the second example, it's clear that more than one response choice could apply to the respondent and to family members. Further, some people might think of "family" as broader than just those living in the immediate household, so validity problems might arise. Again, there's a false assumption made that the respondent has accurate information about other family members' experiences. One sôlution is to ask two questions and to substitute "household" for "family."

Generally, any question that contains the word "and" should be scrutinized to make sure it's not a double-barreled question. Concepts should be clear and distinct. Separate questions are appropriate if their importance to the survey is justified. In the third example, the police officer might have been courteous but not helpful, so revision is needed.

Making **false assumptions** about knowledge possessed by the respondent will also diminish the clarity and specificity of a question. Questions such as: "Do you support the city council's plan to annex the territory adjoining the city?" presume knowledge the respondent may not have. Instead, use a screen question that asks whether the respondent is familiar with the annexation plan, or include an explanatory statement in the preface to the question that describes the elements of the plan.

Question clarity is also marred by **double negatives.** Avoid phrasing a question in negative terms, such as "Don't you agree that the property tax should not be increased this year to cover the projected deficit?" This makes the question complex and subject to misinterpretation. A sizeable number of people will read over the word "not" and circle disagree when they really agree that the tax shouldn't be increased. Also, use of just the word "agree" suggests that people *should* agree. The generally accepted practice is to balance attitudinal questions with phrases such as "agree or disagree, favor or oppose, satisfied or dissatisfied." The question can also be rephrased to read "Do you think that the property tax should be increased to cover the projected deficit?" Then a simple "YES, NO, DON'T KNOW / NOT SURE" response set is sufficient. A rule of thumb is to avoid the word "not" in a question. Consistency in the interpretation of the question is the important objective. Any phrase or words that potentially detract from the clear meaning of a question should be assiduously avoided.

Biased Terms, Loaded Questions, and Socially Desirable Responses

A question is biased if it leads a person to respond in a way that doesn't reflect his or her true opinion or attitude about an issue. Terms, phrases, and clichés that appeal to emotions or evoke some visceral response should be avoided.

These terms could have either a positive or negative connotation. Words such as "cops," "bureaucrats," "government planning," "justice," "welfare," "dump," "liberal," and "conservative" carry emotional or ideological baggage and are just a few examples of terms not to use.

Leading questions suggest that some answers may be more acceptable than others. An example of a leading question is: "Do you favor making our streets safer by expanding the local jail to house the larger number of drunk drivers being convicted in our city?" Phrased like that, it's difficult for many people to oppose a public policy that addresses the serious problem of drunk driving.

Likewise, it's more difficult for people to respond honestly when subtle bias creeps into questions, such as: "Did you vote in the last city election for mayor?" and "Do you conserve natural resources by participating in the city's curbside recycling program?" These survey questions suggest a **social desirability bias**. This bias occurs whenever respondents are unwilling to admit to certain behaviors, such as not voting or not participating in recycling, because such non-participation is generally not socially acceptable.

Questions on "sensitive" topics require special attention. They need to be phrased in a way to make it easy for respondents to be truthful. Weisberg (1989) suggests that the voting behavior question can be handled by assuring people that non-voting can be rational behavior, for instance: "In talking to people about the last city election, we found that some people were not able to vote because they weren't registered, were sick, or just didn't have the time. How about you — did you vote in the last city election?"

The question about recycling can be rephrased to remove any reference to the socially desirable practice of conserving resources:

"Does your household participate in the city's weekly curbside pick-up recycling program?"

1 NO
2 YES
3 DON'T KNOW / NOT SURE

If "YES,"
"About how often does your household set out recyclable materials for pick-up?"
1 EVERY WEEK
2 EVERY TWO WEEKS
3 EVERY THREE WEEKS
4 ONCE A MONTH

Over the years, survey designers have learned how best to word and place sensitive questions to get a higher response. For example, some people are reluctant to report their age, but are more likely to state their birth date or respond if age ranges are provided. More people will respond to a question about annual household income if income ranges are provided (under $15,000, $15,001 to $30,000, $30,001 to $45,000, more than $45,000), rather than just asking them to report their exact annual income.

The most sensitive questions on various topics in the survey should be placed at the end of their respective sections in the questionnaire. Attribute and background questions *always* comprise the last

section. Within it, the most sensitive questions, such as those concerning income, race, or political party identification, should be placed at the end. The rationale is to reduce the risk of respondent refusals before you have their responses to most of the questions in each section.

Time Referents

Including a reference to a specific time frame in a question improves its validity. This is particularly appropriate for questions that solicit information about behaviors. It's common to limit this time frame to a specific six-month or one-year period to reduce the memory burden for respondents. Since mail surveys may require six to eight weeks or more to complete, consider the possible effect on responses if an imprecise period of time is referenced. Respondents may complete mailed surveys at different times over a two-month summer period, for instance. If they're asked, "Did you have an occasion during the last three months to visit the Tennessee Aquarium?" the frame of reference obviously will be different for various respondents who complete the mail questionnaire at different times. A specific year, such as 1993, is always preferable to a more vague reference to "the last 12 months."

Symmetry

One last point about writing questions: balance the response options to the question. There should be as many negative as positive response choices and, where appropriate, a middle category. In other words, resist any temptation to use unbalanced rating scales such as "excellent, good, fair, or poor." In this instance, three of the choices are positive, and only one is clearly negative. Unbiased response choices are *always* symmetrical.

Symmetrical responses include:

- excellent, good, neither good nor poor, poor, very poor;
- increase, stay the same, decrease;
- too much, about right, too little;
- very satisfied, satisfied, neither satisfied nor dissatisfied, dissatisfied, very dissatisfied;
- strongly agree, agree, disagree, strongly disagree;
- high, medium, low;
- desirable, somewhat desirable, somewhat undesirable, undesirable;
- good, neither good nor bad, bad.

Constructing Mail Questionnaires

After several question drafts and pretesting, the actual questionnaire must be assembled. Questions should be grouped by topic, transition statements and instructions should be provided, and each page of the questionnaire should have plenty of "white space" that enables respondents to easily read it and follow the "vertical flow" of the questions. The appearance of a mail questionnaire is especially important. The goal is to make it inviting, pleasing to the eye, and as easy and painless as possible to complete. Abide by the maxim: "Keep it simple!" Accordingly, here are some recommendations:

- Never cram too many questions on a page so it looks cluttered.
- Never exceed 12 pages.
- Never continue a question on the next page.
- Never lead off with a difficult, boring question.
- Never ask a long series of yes/no or agree/disagree questions. They bore people and incline them to answer all questions in the same way just to get through them as fast as possible.
- Always try to lead off with an interesting, easy to answer question that's clearly related to the purpose of the survey, as explained in the cover letter. An open-ended question may be a good choice here.
- Always try to minimize the number of pages.
- Always number the questions and response choices. Numbers for the answer categories should be on the left.
- Always ask respondents to circle the number of their response for close-ended questions.
- Always use a clear type, large enough to read easily. Use capital letters for the response choices.
- Always allow sufficient space between questions and response choices.
- Always establish a vertical flow for the questions. Arrange the response choices vertically so no choices or questions will be skipped and to give the respondent the positive psychological effect of making quick progress down the page. This technique also helps to assure plenty of "white space" on the questionnaire.
- Always group questions by topic and use transition statements between topics or sections to enhance the flow and continuity.
- Always place the most objectionable questions near the end.
- Always put attribute and background questions in the final section.
- Always thank the respondent for taking the time to complete the questionnaire.
- Always pretest the questionnaire on a small sample of the target population.
- Always place an identification number on the survey (usually in the upper right-hand corner).

An example of a page from a mail questionnaire that meets the criteria listed above is Figure 4-2 on the next page.

Since questionnaire construction is really more art than science, it's very useful to get a feel for how well the audience receives the product of your creative talents. Try it out on a few high school English teachers and then pretest with a dozen or so people in the target population to make sure it's clear. Examine the responses closely to see if there's any unexpected confusion or whether the same questions remain unanswered. Use volunteers to see how long the survey takes to complete.

Question Order

The order of questions is another one of those very important details that affects the quality of responses. To stimulate maximum interest, always try to begin the question-

Figure 4-2. Mail Questionnaire Page Format

For each of the following questions about services and taxes, please circle the number of your choice.

1. Overall, how satisfied are you with the services provided by the city of Cleveland?

   1 VERY DISSATISFIED
   2 DISSATISFIED
   3 NEITHER SATISFIED NOR DISSATISFIED
   4 SATISFIED
   5 VERY SATISFIED

2. Considering the services provided by Bristol, do you think that your property taxes are:

   1 TOO LOW
   2 ABOUT RIGHT
   3 TOO HIGH
   4 NOT SURE

3. If the city of Murfreesboro had any additional money to spend at the end of the fiscal year, how do you think that money should be spent? (Please circle only one.)

   1 EQUIPMENT NEEDS OF THE PUBLIC SCHOOLS
   2 STREET MAINTENANCE AND POTHOLE PATCHING
   3 DEVELOPMENT OF A DOWNTOWN PARK
   4 TRAINING AND HIRING OF MORE POLICE OFFICERS
   5 PURCHASING LAND FOR A NEW INDUSTRIAL PARK
   6 PURCHASING LAND FOR A NEW AIRPORT
   7 TRAINING AND HIRING MORE FIREFIGHTERS

Next, we need to know what you think about the quality of some of the services provided by the city. Please circle the number of your rating.

4. Please indicate how you rate the quality of each of the following Jonesborough services:

Service	Very Good	Good	Neither Good nor Poor	Poor	Very Poor	Don't Know
Traffic enforcement	1	2	3	4	5	6
Fire protection	1	2	3	4	5	6
Pothole patching	1	2	3	4	5	6
Garbage collection	1	2	3	4	5	6

naire with the most interesting set of questions. The idea is that potential respondents will scan these items and want to respond to them. This is easier said than done. Sometimes there's a tendency for survey designers to save the "good stuff" for later, but try to launch with the fairly easy, most interesting topics or issues that abide by the purpose of the survey. Leading off with a straightforward, open-ended question often is a good tactic.

Think very carefully about whether *early* questions might direct later answers. Order questions within topical areas so respondents won't be predisposed to answer later questions in a way they *think* the researcher wants. In reality, there's no perfect way to handle this problem, but try to think about how prior questions *might* influence responses to later questions. For example, you wouldn't want to ask a series of questions about local crime and perceived threats to public safety, then ask respondents to rank in order of importance five problems — and one is "the local crime rate." To avoid sensitizing respondents, general questions asking citizens to rank or rate problems, goals, issues, services, or programs should precede specific questions about them.

Cover Letters

The wording of a cover letter will largely determine whether the questionnaire is completed or tossed in the trash. Dillman (1978) offers good advice on how to compose a cover letter. A summary of his recommendations is listed below:

- Keep it short and snappy, no more than four brief paragraphs.
- Always use official city stationery, date the letter, and place the signature (not stamped) of the city's chief executive or sponsor after the complimentary close.
- The first paragraph should explain what the study is about and convince the respondent that it's important and useful.
- Avoid the following stock phrases that turn off respondents, such as:
  "Enclosed is a questionnaire..."
  "This is a survey ..."
  "I am conducting research ..."
  "You are important to our study ..."
- Avoid injecting any bias for or against current or former city officials or organizations.
- The second paragraph should convince respondents that city officials need their ideas about [fill in the blank].
- The third paragraph should promise their responses will remain *completely* confidential, meaning that responses will never be identified with any names or addresses. The survey should *not* be anonymous. The researcher will want to know who returned the questionnaire; anonymity means even the researcher never knows the names of respondents. Explain that the number in the right-hand corner is to simply check their name off the mailing list so they won't be bothered by follow-up mailings.
- The final paragraph of the cover letter should thank the citizens very much for taking their valuable time to help the city. If the budget permits, it's

useful to offer to send them a summary of the survey results. (Ask them to check the space provided on the questionnaire and remind them not to put their name or address on the questionnaire itself.) No reference is needed to the self-addressed, metered return envelope. Respondents can figure out what to do with the survey when they complete it.

An example of a cover letter that complies with these recommendations is Figure 4-3.

Figure 4-3. Cover Letter Example for a Mail Questionnaire

Dear Mr./Ms. _____ :

Your city council is beginning to develop the budget for next year and we need your help! What you think about the quality of city services and how the city spends *your* money will help us to provide the kind of services that you want for the price you are willing to pay.

So, please take a few minutes from your busy schedule to tell us what you think about the city's services, performance, and how we might be able to serve you better. Your household is one of a small number randomly selected to participate in this project in a way similar to a lottery. But instead of winning a cash prize, you have an opportunity to help us set budget priorities and improve the way city government works.

All of your responses will remain completely confidential. No names or addresses will ever be connected with them. The identification number in the upper right-hand corner only helps us to confirm that you have responded so you won't be bothered with follow-up mailings.

Thank you so much, in advance, for helping us with this project. Your participation will help to make Elizabethton an even better place to live. If you would like a copy of the results, just check the box on the back of the booklet, and I'll see that a copy is sent to you. Thanks again so much for your help.

Sincerely,

Mayor
City of Elizabethton

The Mail Questionnaire Booklet

Prepare the questionnaire in the form of a booklet to reduce the number of pages needed, and then print or reproduce it on recycled paper, if possible. "WordPerfect," "Word," and many other word processing programs have a landscape orientation that enables copies to be printed lengthwise on 8 1/2-by-11-inch pages. (You may use a very high-quality dot-matrix printer, but a laser printer is preferable.) A high-quality photocopy on the front and back of the page is acceptable if the finished product is attractive. Use off-white, light blue, or light

green paper so the type is displayed clearly. Avoid dark or brightly colored paper since it's less pleasing to the eye.

With a practice mock-up, you'll be able to figure out which numerical pages should be located on which page faces (what results when the page is folded in half so a 5 1/2-by-8 1/2-inch booklet results). For example, if you need three sheets of paper for all of the questions in the survey, you'll have 12 page faces. The front cover may contain the title of the survey, the city seal, or an attractive, polished design considered germane to the purpose of the survey. This leaves 11 pages for questions. With two staples in the spine, open the booklet; the bottom sheet will have the cover face and page 11 on the back side, and page 1 and page 10 on the front. The sheet in the middle will have 2 and 9 on the back, and pages 3 and 8 on the front. The top sheet will have pages 4 and 7 on the back, and pages 5 and 6 on the front. Follow the same logic for shorter questionnaires that require two sheets.

To minimize respondent fatigue, the mail survey shouldn't exceed 12 pages. More pages will also increase mailing costs.

Implementing the Mail-out

Each questionnaire booklet should have an identification number on it. **Al**ways record this number next to the name and address of the household or individual on the master list of the sampling frame. When the questionnaire is returned, record its receipt on this list.

The mail-out package should consist of the cover letter, the questionnaire booklet, and a metered (not stamped) self-addressed return envelope large enough to accommodate the booklet. Mail-outs should be sent early in the week and all on the same day. Avoid holidays and the entire month of December when mail is heaviest and people are most likely not to bother with the additional burden of a survey. The use of metered return envelopes means that the post office will only charge your account for the questionnaires actually returned. It also eliminates the temptation for individuals to peel off the stamp and toss the questionnaire away.

About three weeks after the original mailing, send a second mailing to the non-respondents. Revise the cover letter to indicate the new date, and courteously remind the citizens, in a shorter letter, that their responses, which are vital to the study's accuracy, haven't been received.

About six to seven weeks after the first mailing, send a third mailing with a cover letter that underscores how important their participation is to the city and how much their cooperation would be appreciated. Offer once again to send them a copy of the results. Then hope for the best. The time, effort, and attention to detail should pay off in a decent rate of return — perhaps as high as 75 percent.

Design Considerations in Telephone Surveys

Good mail questionnaires do *not* make good telephone interview questionnaires. While many of the same guidelines about clarity, simplicity, consistency, question order, and pretesting apply, designing telephone surveys requires attention to the needs of *three* audiences: the respondent, the interviewer, and the data entry personnel.

Since all communication with respondents is verbal, the clarity of instructions, concepts, vocabulary, and diction is paramount. In the phone survey, respondents don't get to read a cover letter, examine the questions, and then decide whether to respond. Consequently, many details of constructing mail surveys, such as visual attractiveness and vertical flow, are irrelevant.

Nonetheless, the design of the telephone survey is probably an even more rigorous process. The respondent is totally dependent upon the interviewer to explain the purpose of the survey. The citizen must be persuaded to participate by an "introductory spiel" that legitimizes the purposes of the survey, builds trust that the responses will be confidential, describes what and why certain information is needed, and perhaps suggests the benefits of their participation.

Because of the respondent's dependency upon the caller for instructions, questions, and response choices, less complex questions with fewer response categories are a must. Using more screen or "stem" questions will help. And more liberal use of transition statements and ultra-clear instructions are essential. The glue that makes this oral exchange successful is the ability of the caller to establish credibility and rapport with the citizen.

The interviewers need questions that are easy to read and easy to follow visually, especially if some responses "branch" to follow-up questions. Therefore, the caller requires unambiguous instructions, smooth transitions, and consistent page placement of questions and response choices to reduce human error. The layout of a telephone questionnaire is designed for the caller's easy use; it must be easy to mark with adequate space for open-ended questions.

The interviewers themselves must sound friendly, polite, and sincere. Patience, professionalism, empathy, and assertiveness are desirable traits. Moreover, they must read all questions precisely as they're written. No variations in wording or phrasing of questions should be allowed. Reading the questions slowly gives the respondent time to think. Incorporating a "keyword" summary of the response choices after a statement, as indicated in question #2 in Figure 4-4, builds in redundancy that helps respondents mentally organize the question. Clearly, the tasks of callers are formidable, and fatigue is a factor to consider. If callers can complete four 10-minute interviews an hour, their productivity is very good.

The personnel responsible for entering the responses in a data file for later statistical analysis must have a clear coding scheme — a numerical code printed on the form

Training Callers and Implementing the Telephone Survey

The time it takes to complete the telephone survey depends on:

- the size of the sample desired,
- the number of callers available,
- the number of phones available in a central location,
- the questionnaire length, and
- the skill and experience of the callers.

Calling is usually done when respondents are most likely to be reached. The following time slots seem to work best:

- 5:30 to 9 p.m., Monday through Thursday;
- 10:30 a.m. to 5 p.m. on Saturdays; and
- 1 p.m. to 9 p.m. on Sundays.

Other times tend to produce low "hit rates." Some call-backs may be scheduled for time slots other than those listed if they're more convenient for the respondent. Estimate about three completed interviews per hour, per caller, which accounts for time lost with busy signals, answering machines, non-residential numbers, refusals, and appointments for call-backs. Several screen questions may further reduce the number of completions possible per hour.

An "in-house" telephone survey can employ volunteers (either city employees or others) as long as they are reliable people who have a pleasant demeanor and phone voice. Telephone interviewing is fairly demanding work, and attracting or retaining good callers requires fair compensation — more than just minimum wage.

Training the callers is imperative. They must know the purpose of the interview and how to:

- remain non-directive and unbiased when reading questions,
- handle all screen and branching questions, and
- record the answers of the respondent on the interview sheets.

Callers must understand the protocol for making call-backs, recording the disposition of the attempted contact on the call sheets, and how to answer respondent questions, which typically include: "Who's paying for the survey?"; "Who's in charge of the survey?"; "How did you get my number or name?"; "How can I be sure my answers will be confidential?"; and "Can I get a copy of the results?"

Most city halls have enough telephones so the supervisor can monitor interviewer performance and answer questions. Permitting callers to conduct interviews from their home telephones is *not* recommended.

With experience, the supervisor will learn how many call sheets to distribute to each interviewer for each work shift. It's prudent to distribute fewer call sheets than they might be able to complete during a session — it gives the callers a sense of progress and enables the supervisor to track the disposition and progress of calls. It's also an opportunity for the supervisor to inspect the accuracy and readability of the caller's completed questionnaires. Prompt, thorough oversight by a supervisor helps reduce, and perhaps eliminate, human error in data collection. Callers should put their names on the call sheets so the supervisor can talk

to the appropriate person if a problem or question arises.

Training personnel for telephone interviewing is similar to training for face-to-face interviews. Reading questions precisely, making sure respondents understand the question, and neutral but persistent probing on open-ended questions are important skills to acquire (Dillman 1978). A good training strategy is to explain the purpose, process, and instructions for the survey, and then to conduct mock interview sessions with supervisory personnel assuming the roles of caller and respondent. Then, the callers can practice interviewing with the supervisor as the respondent. It's an opportunity for the callers to experience all or most of the typical curves that will come their way during actual calls — refusals, misunderstandings of questions, abusive attitudes, and unclear or incoherent responses to open-ended questions.

The investment of a couple of hours in this type of training will yield large dividends. Callers should have more confidence and enthusiasm, make fewer mistakes in filling out the questionnaires, understand the importance of speaking clearly and slowly, and appreciate how vital it is to try to obtain cooperation from reluctant citizens.

Chapter 5
Coding and Data Entry

Manual tabulation of more than 600 survey responses — a typical sample size for most projects — is not only a cumbersome and time-consuming task, it also limits the ability to manipulate data mathematically. Thus, important findings would remain obscure without converting questionnaire responses to numbers.

Statistical software reads numbers, not language. For instance, it can read a "1," but not a "very satisfied" response. Coding is simply the process of assigning numbers to represent the survey answers.

The Codebook

A codebook lists each variable or question, the possible responses, and the numerical value for each possible response. Figure 5-1 on the next page illustrates portions of a codebook for a telephone survey asking about recycling behaviors, opinions, and attitudes of city residents. It records:

- the question,
- the question's variable name,
- the response choices,
- the numerical value (code) of these responses,
- the value (code) for missing data in case the respondent refused to answer or the question was mistakenly skipped by the caller, and
- the specific column location of this data on a code sheet ruled off in 80 columns.

Coding Procedure

Coding of closed-ended questions involves the straightforward task of assigning the value corresponding to a particular answer. In Figure 5-1, for instance, the first question has the variable name of "CURBPICK" (limited to eight characters), a value of 1 for "YES," 2 for "NO," 3 for "NOT SURE," and 9 for "Missing." This value will always be located in the fourth column of the data file.

Question 3c (DROPLOC) was a partially closed-ended question. The most likely responses of "Supermarket," "Elementary school," "Local church," and "Recreation center" were assigned codes of 01 through 04, respectively. The question originally had a fifth "Other" category. Questionnaires with these responses were pulled from the stack of 600+ questionnaires, and values were assigned to the responses offered by the respondents. Two digits were allocated for the codes to this variable just in case respondents offered more than nine "other" responses. The codebook indicates the numerical value for each of the other suggestions offered by the respondents. Missing values for this variable are coded "99." The coded values for

Figure 5-1. Excerpts from a Codebook for a Recycling Survey of City Households

Variable	Variable Name	Value Codes	Column(s)
ID Number	**ID**	001-624	1-3
1. "Is curbside pick-up available at your residence?"	**CURBPICK**	1=NO 2=YES 9=Missing	4
2. "Does your household currently participate in the city's curbside recycling program?"	**CURBPART**	1=NO 2=YES 9=Missing	5
3a. "Does your household currently particpate in the city's **drop-off** recycling program?"	**DOPARTIC**	1=NO 2=YES 9=Missing	6
3b. "Right now, only some neighborhoods get their recyclables picked-up at the curb as part of a pilot program. If this pilot program were discontinued, would you be willing to take your recyclables to a drop-off facility in your neighborhood?"	**WILLDROP**	1=STRONGLY WILL. 2=WILLING 3=NOT SURE/D.K. 4=UNWILLING 5=STRONGLY UNWILL. 9=Missing	7
3c. "What location for a drop-off center would you prefer most?"	**DROPLOC**	01=Supermarket 02=Elementary school 03=Local church 04=Recreation center 05=Fire station 06=Day-care center 07=High school 08=Vacant lots 09=Library 10=Community center 99=Missing	8-9
3d. "What suggestions do you have for improving the drop-off recycling facility you use?"	**DOIMPROV**	1=Increase collec. freq. 2=Clean-up spills/ improve cleanliness 3=Add more bins 4=Mark bins more clearly 5=Bins for alum. need larger openings 6=Spray for bees/wasps 9=Missing	10
3e. "Would you be willing to take any of the following materials at least monthly to a drop-off?"		0=NO 1=YES 9=Missing	
	NEWS		11
	PLASTIC		12
	ALUM		13
	STEEL		14
	GLASS		15
	MIXEDPAP		16
	CARDBD		17
	MAGAZS		18
	USEDOIL		19
	BATTERS		20

the variable DROPLOC will always be entered in columns 8 and 9 of the data file.

Clearly, coding of open-ended questions is a more challenging task. Typically, a researcher scans all the responses and develops appropriate categories for them. Then, each category is assigned a numerical value. Consider Question 3d in Figure 5-1: "What suggestions do you have for improving the drop-off recycling facility that you use?" After inspecting all the suggestions from respondents, categories were developed that covered their range and type. The challenge for the researcher is to devise a comprehensive yet lean coding scheme. The solution for this question created enough categories to provide meaningful distinctions without creating so many codes that generalizations become difficult to make about how to improve the facilities. The responses to this open-ended question were grouped in categories and coded as illustrated in Figure 5-1.

Occasionally, a question contains a list of items, each of which requires its own code, such as Question 3e in Figure 5-1. In this case, each of the material types in the question constitutes a separate variable with a possible "NO" or "YES" response. Thus, the NEWS variable is coded 0 for "NO" and 1 for "YES." The same scheme applies to PLASTIC, ALUM, and the other materials in the question. Each of the variables is in a different column in the data file.

Code Sheets or Direct Data Entry

Once the codebook is created, the researcher must record all responses in a form that can be processed by the computer. There are two basic methods for accomplishing this: transfer the coded responses onto code sheets before entry into a data file, or directly enter the coded responses into the data file. Code sheets are traditionally ruled off in 80 columns that correspond to the number of columns in old keypunch cards, but now reflect screen width of the typical video display on computers. Old Fortran sheets are useful for this purpose.

These columns are important because they define, for the statistical software, the location of all of the responses to each of the variables. The data list command in SPSS, a commonly used statistical software, will specify the column location of data for each variable. Thus, in Figure 5-1, the computer will "know" that the case number for a questionnaire will always be found in the first three columns (1 through 3) of the data file, that CURBPICK answers will always be found in column 4, and that the remaining responses will be found in the specified columns.

Transcribing responses from questionnaires to code sheets to a data file in the computer software program is helpful for inexperienced data processors, ensuring the requisite number of columns is reserved and defined for each of the study variables. If transcription of a line of data for a particular case exceeds the rectangular "box" of specified columns, then this error can

be detected immediately, by visually scanning the data, as follows:

...00112221
...002220231
...00312121.

The code sheets, rather than the original questionnaire, are used to key-in data to the computer file for later analysis.

If questionnaires and codebooks have been adequately designed, it's possible to enter data directly from the questionnaire into a computer data file. Newer computer programs for statistical analysis, such as SPSS for Windows or the Macintosh version of the same program, facilitate this task by prompting you for the data for each variable you define.

Another traditional method of building a data file is to create a DOS file in WordPerfect. The requisite SPSS-PC+ data definition commands are followed by the lines of data for each case, and then the file is saved in DOS text format by pressing CTRL-F5, DOS text (1), and SAVE (1). Then, this file can be copied to the statistical applications software.

As a practical matter, the data entry process is much faster if the information can be taken directly from the questionnaire itself. For the partially closed-ended questions and the open-ended questions, the codes for the various responses should be placed in the left-hand margin of the questionnaire by the supervisor. This accelerates the process and assures consistency in coding of open-ended questions among data entry personnel.

Computer-assisted Telephone Interviewing

If the researcher has access to a **Computer-assisted Telephone Interviewing** (CATI) system, data entry is performed by the callers during the interview. Software for desktop computers, such as the "C13" program developed by Sawtooth Software, Inc., enables the caller to dial a telephone number, talk to the respondents on a microphone headset (much like operators wear), and to enter responses directly in a data file by typing the response codes or answers on the computer keyboard.

Codes for closed-ended questions are keyed-in while the responses for open-ended questions are typed verbatim. The software is programmed to accept only certain codes for a particular question, so data entry errors are minimized. After responses are entered, the program automatically displays the next question and the codes for each of the possible responses. The program also prompts callers with the next appropriate question for any screen or filter questions that are included in the survey. The "keystrokes" entered by the callers are stored on floppy disks in each of the individual PCs or they can be stored in a file in a central computer memory if the PCs are networked.

This technology even makes it possible for interviewers to use laptop computers for face-to-face interviews. The interviewers can

enter responses during the course of the interview. The interviewers may also be able to show respondents various graphics or illustrations related to specific questions in the survey. The people being interviewed also may be asked to enter their responses using the laptap PC's keyboard in a method known as CAPI or **Computer-assisted Personal Interviews.** This method would be most appropriate for smaller focus groups, but in the future, it is expected that this technology could be used for personal interviews in the field as well.

"Cleaning" the Data

Once all the responses are processed (entered into a data file), the next task is to "clean" the data. A few data entry errors are inevitable no matter how much care is taken. "Cleaning" refers to the detection and correction of these errors. You find erroneously entered codes by running a frequency distribution (a simple statistical procedure explained in the next chapter) for each of the variables in the study. By examining the print-out or output from this procedure, you can easily see whether any codes appear that aren't listed in the codebook. A code of "0" that appears for a variable that can only have a 1 for "NO," a 2 for "YES," and a 9 for "Missing" means an erroneous keystroke. By using a simple "process if" command, the case number of the variable improperly recorded can be identified. Then you can re-examine the original questionnaire to determine the correct entry. The line containing this case can be corrected in the original data file, or a data transformation command can be included that corrects the error.

Data cleaning is an essential step prior to the data analysis stage. Examples of the various commands to accomplish data cleaning appear in the next chapter.

Chapter 6
Elementary Data Analysis and Computers

Statistical analysis is sometimes considered to be a daunting task, but actually it is among the most enjoyable aspects of the entire survey research process. Its purpose is to make sense of all the collected data. Statistics can help you to detect any patterns or trends among responses so that more informed policy decisions can be made.

Which kind of statistical analysis to perform depends on what you want to know. Normally, you'll need to prepare tables and charts that show the distribution of responses to all key questions. In addition, you'll want to report any relationships that help explain who thinks what. Once this has been decided, it is a simple matter of instructing the computer to carry out the functions that yield the needed information.

A Statistical Primer

Statistics help researchers summarize and understand a lot of numbers or data. **Descriptive** statistics reduce a large number of observations or responses to different questions to one or two numbers that enable the researcher to comprehend and describe the survey results so that some meaningful conclusions (findings) can be made. **Inferential** statistics use quantitative techniques to generalize from a sample to the larger population. The discussion about sampling in Chapter 3 introduced the ideas of sampling error and statistical significance. In this section, you'll see how the logic of random sampling is intimately linked to the ability to make generalizations with inferential statistics about a larger population.

Statistical analysis can be distinguished further by the number of variables involved. Statistics that describe the results of just one variable are called **univariate**. When relationships between two variables are examined, **bivariate** statistics are appropriate. When researchers want to investigate how three or more variables are related, **multivariate** statistics are employed.

To select the correct statistic to use for data analysis, the researcher must identify the level of measurement of the variable. Certain statistics are appropriate only for variables at a particular level of measurement. Variables are measured at the **nominal, ordinal, interval,** or **ratio** level.

A variable at the **nominal** level of measurement is comprised of mutually exclusive classes. Examples include variables such as race, gender, religious affiliation, marital status, preferred drop-off location, or YES and NO responses to a question. There is no order or ranking implied in nominal variables. An individual is either black or white, female or male, or married or not.

An **ordinal** level of measurement has categories that indicate "more or less" of something, but not precisely how much in between cases. For example, a satisfaction index measures only relative satisfaction, not *precisely* how much more or less satisfied a person is about an issue. Only a rank ordering of cases is possible at the ordinal level of measurement. The absolute "distance" between cases cannot be calculated. A person with a college degree, for instance, has more formal education than someone with a high school degree, but we cannot say that the person with the college education is *twice* as educated as the person with a high school diploma. However, if we know exactly how many years of formal education a person has had, precise comparisons among cases are possible.

Interval and ratio variables enable the researcher to determine the precise distance between responses. Ratio variables have a meaningful zero point while interval variables don't. For example, a person can have zero income, but a temperature of zero does not mean the absence of temperature. The same statistics are appropriate for both types of measurement, so no further distinction is made. Age, income, distance, weight, and household size are examples of variables that can be measured in some standard unit. Percentage of minority residents, crime rate, and years of residence are additional examples. Interval and ratio level measures convey the most information about a variable since they allow the researcher to classify, order, and array values along a clearly delineated common scale or standard. The precise distance between cases can be calculated by using a commonly accepted standard of measurement (i.e., years, dollars, pounds, percent).

Occasionally, the level of measurement of a variable can be a little difficult to discern, especially if you *only* think about the units in which a variable is typically measured. Income is usually measured in dollars, but it may or may not be measured at the interval level in a questionnaire. An open-ended question about total household income for 1994 will yield a specific interval level dollar amount. However, when only *ranges* are offered, these income categories only indicate "more or less," not precisely how much income is earned. In this instance, income is measured at the ordinal level.

Some special circumstances should be noted about the level of measurement of variables. Variables that are dichotomous or, in other words, have only two categories, can be considered as nominal *or* ordinal for purposes of statistical analysis. In addition, dichotomous nominal independent variables can be coded as 0 and 1, which enables the researcher to use Pearson's correlation (a statistical procedure) for an analysis of an interval level dependent variable.

To decide which statistic is appropriate for particular data, it is helpful to answer the following questions:

1. Do you want to describe the data or make inferences to a larger population?
2. How many variables are involved in the specific analysis?
3. What is the level of measurement of the variable(s)?

Univariate Descriptive Statistics

To describe and summarize the responses to one variable, a **frequency distribution** shows the data grouped by the number of responses in each category. For example, the results of a survey of the number of tons of waste recycled by 400 cities can be illustrated as in Table 6-1.

Table 6-1. A Frequency Distribution

Tons of Waste Recycled in 1994 for a Sample of 400 Cities in the South

Tons Recycled	Number of Cities
Under 50	45
50-100	58
101-150	39
151-200	89
201-250	44
251-300	22
301-350	43
351-400	30
Over 400	30
Total	**400**

A **percentage distribution** shows the percentage of cases or observations in each category and the total number of cases or observations on which the percentages are based. Clearly, percentages are easier to understand than frequencies. For this reason, percentage distributions are the preferred format for reporting responses. For example, findings are more easily understood if the researcher reports that 60 percent of city residents favor and 40 percent oppose consolidation, rather than reporting that 360 respondents favor and 240 oppose. Table 6-2 on the next page illustrates a percentage distribution. Tables that report frequency or percentage distributions always have a clear, descriptive title, labels for the columns and rows, and information on the total number of cases.

In addition to frequency and percentage distributions, it's often useful to present graphic illustrations that visually summarize information for decision makers. The type of charts used must be appropriate for the type of information that the researcher wants to convey. The basic rule is to keep the chart simple and clear. Too much information crammed into a chart detracts from its purpose, which is to highlight some noteworthy finding. A chart in a survey research report should have a clear, descriptive title; axis titles (for bar and line charts); legends that identify any data series; or labels that identify pie slices.

Table 6-2. A Percentage Distribution

Tons of Waste Recycled in 1994 for a Sample of 400 Cities in the South

Tons Recycled	Percent of Cities
Under 50	11.25
50-100	14.50
101-150	9.75
151-200	22.25
201-250	11.00
251-300	5.50
301-350	10.75
351-400	7.50
Over 400	7.50
Total	**100%**

(**N**=400)

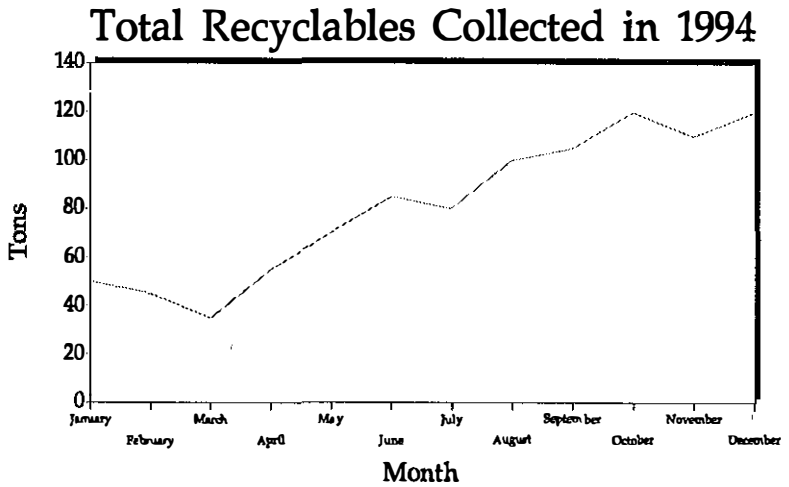
Many types of line, bar, and pie charts can be created with various graphics software programs. Line charts are useful for describing or comparing trends over time. They are especially appropriate when change is dramatic. Bar charts, on the other hand, compare specific items such as recyclable materials or revenue sources, rather than changes over time. Pie charts emphasize parts of a whole, with cuts or "exploded" slices to draw attention to some particularly interesting feature. Figure 6-1 on page 75 illustrates several types of charts that summarize survey results.

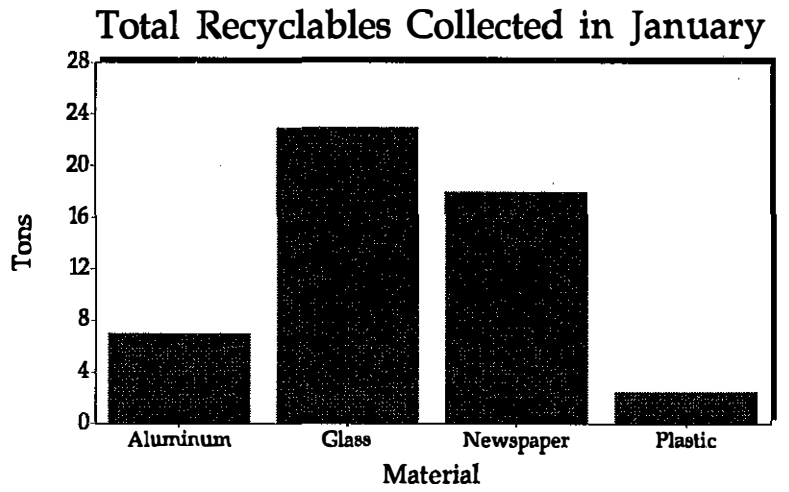
The two major types of univariate descriptive statistics are measures of **central tendency** and of **dispersion**. The measures of central tendency include the **mean, median,** and **mode.** The most common measures of dispersion are the **range** and the **standard deviation.** The level of measurement of a variable determines which univariate statistic can be used. Table 6-3 indicates when each measure is applicable.

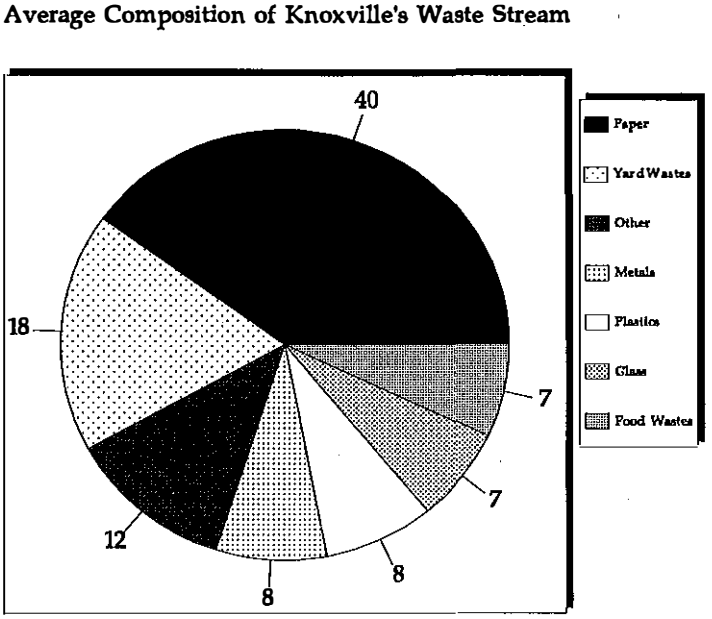
Table 6-3. Levels of Measurement and Statistics for Centrality and Variability

Variable's Level of Measurement	Measures of Centrality	Measures of Variability
Nominal	Mode	
Ordinal	Mode, Median	
Interval or Ratio	Mode, Median, Mean	Range,Standard deviation

Figure 6-1. Summarizing Data with Line, Bar, and Pie Charts







The **mode** is the most common value for a variable. It is the most "typical" case since it occurs the most frequently. In the following number set (23, 12, 10, 12, 11, 12), the mode is 12. The **median** is the midpoint, or the middle number in an array of values arranged from highest to lowest (order of magnitude). If there is an even number of values, the median is the mean of the two middle values. In the following array of numbers (6, 7, 7, 10, 14, 19, 33, 42), the median is 12, which is the mean of 10 and 14, the two middle numbers. Half the scores are above and half are below the median. The **mean** is the arithmetic average calculated by adding the values of a distribution and dividing by the total number of values. Because the mean is sensitive to extreme scores, the median is sometimes a better measure of central tendency or the most "typical" case of a distribution.

Measures of dispersion indicate whether data cluster about the mean. The **range** is the largest value less the smallest value and indicates the spread of values in a distribution. Since it is based only on two scores, it measures only the spread of the scores. The **standard deviation** is the primary measure of dispersion that indicates how good the mean is as a measure of central tendency. The *higher* the value of the standard deviation, the *less* useful the mean is as an indicator of the average score. Extreme cases, such as the 79 and 100 test scores in the following number set (21, 22, 23, 24, 24, 79, 100), skew the mean. The mean is 41.85 for these numbers, but clearly it doesn't convey that most scores were much lower than this figure.

In a large group of numbers that can't be scanned easily, it helps to know how typical the mean is as a measure of central tendency for interval level variables. The greater the dispersion, the less typical the mean. Conversely, the less dispersion there is, the better the mean describes the distribution of scores. The standard deviation indicates how well the mean conveys centrality. It is calculated by squaring *each* score's deviation from the mean and adding them to get a sum of squares that is divided by the *N* or number of scores. The square root of this value is the standard deviation, as indicated by the formula:

$$S = \frac{\Sigma(X - \bar{X})^2}{\sqrt{N}}$$

For the number set 21, 22, 23, 24, 24, 79, 100, the standard deviation is 30.66, which suggests that there is a good deal of variation in test scores around the mean of 41.85. In this example, the mean score of 70 is not a very good measure of central tendency since most of the scores are spread out over a wide distance from the mean. The modal or median score might be a better measure of centrality when the standard deviation indicates a wide dispersion of scores around the mean.

The standard deviation is an important statistic. It is especially useful when linked to the concept of a "normal" curve or distribution, which is important for computing the accuracy of a sample's estimate of a population mean as part of inferential statistics.

Statistical Inference

How can a few hundred individuals represent the opinions of a city

of several thousand people? Inferential statistics can help answer this question frequently asked by citizens. These statistics can estimate the extent to which the findings from a sample can be generalized to the larger population. Inferential statistics for single variables, such as the standard error of the mean, are used to estimate the extent to which the sample estimates (a mean or a proportion) will be distributed around the actual population parameters. Other inferential statistics, such as tests of statistical significance, determine the probability that an observed relationship among variables in a sample population would be observed in the entire population.

The basic idea of statistical inference is to establish the criteria by which we can decide whether a particular outcome obtained from a random sample accurately represents the larger population. However, these estimates can only be made if the method of sampling is random!

Probability theory is the basis for determining the accuracy of a sample's estimate of a population mean, even when the true population mean is unknown. The special mathematical properties of a normal distribution are particularly important to probability sampling. A normal distribution is a symmetrical, bell-shaped frequency curve in which the mean, median, and mode all coincide at the peak of the curve. If we drew a large number of samples of a certain size, the distribution of the means of these samples will resemble the normal curve and the mean of all the sample means will be equal to the mean of the *actual* population. This sampling distribution, which is normally distributed, is the basis for calculating the probability of obtaining a single sample mean. It enables us to compute a "standard error," which is the standard deviation of the distribution of sample means around the population mean. The standard error is used to estimate the mean of the actual population based on the sample information.

A fixed proportion of cases in a normal distribution will lie between the mean and any distance from it, measured in standard deviations. Based on the logic of the normal curve, we know that about 68 percent of the cases fall within plus or minus one standard deviation of the mean, 95.46 percent of the scores fall within two standard deviations (plus or minus) of the mean score, and 99.7 percent fall within three standard deviations, plus or minus, of the mean (Johnson and Josyln 1991).

To apply all of this in a practical example, assume that the mean income of a random sample of 400 citizens from the city of Milford is $14,000 and that the standard deviation is $45. How certain are we that this sample estimate of the entire population's income is accurate? Mathematically, we substitute the sample standard deviation ($45) for the unknown population standard deviation in the formula for the standard error, which is:

$$\text{S.E.} = s/\sqrt{N}$$

where s equals the standard deviation of the sample.

The standard error in this example is $2.25. Therefore, we can say that

we are 95 percent certain that the mean income of the actual population is between $13,995 and $14,005 ($14,000 plus or minus 2 standard errors, which is 2.25 x 2 or $5). In this way, the properties of the normal distribution can be used to estimate the accuracy of a randomly selected sample.

Bivariate Statistics

The three principal concerns of bivariate analyses are to determine:

1. whether an independent variable is associated with a dependent variable,
2. the strength and direction of the relationship, and
3. whether the observed association is statistically significant.

A relationship between two variables exists when change in the independent variable is associated with change in the dependent variable. If the two variables vary together, either in the same or opposite directions, an association or relationship exists between them. For decision makers, knowing who thinks what is often very useful for making more informed policy or implementation decisions. Therefore, it's important for the researcher to investigate all *relevant and meaningful* relationships among variables in a survey.

Researchers should be wary not to fall victim to the rapture of data analysis. A strong, statistically significant relationship isn't necessarily substantively important to the objectives of the survey. Researchers have to think about and be able to explain why statistically significant relationships are important and germane to the survey. Otherwise, their work is likely to collect dust instead of applause. Your discussion of relationships among variables should be able to answer the "So what?" question that concerns consumers of the survey. In other words, why is it important to know, for instance, that residents who live in neighborhoods on the east side of town are significantly less satisfied with police services than residents of other neighborhoods? Is this a function of higher crime rates, less frequent patrols, or the perceptions of a distinct minority group?

A **crosstabulation** examines two variables in a table that displays the categories of the dependent variable in the rows and the categories of the independent variables in the columns. Crosstab tables are appropriate for variables measured at the nominal or ordinal level. Table 6-4 on the next page illustrates a crosstabulation of support for expanding curbside recycling among respondents with different levels of formal education. Only the percentages are reported in the cells of the table. The number of cases for each column is enclosed in parentheses. Generally, if the column percentages differ substantially across the rows, the variables are related. If the column percentages are virtually identical across the rows, no relationship exists. The data in Table 6-4 suggests that the proposal to expand curbside recycling increases in popularity as the independent variable (education level) increases. To examine the strength of an observed relationship between two variables, the researcher must select a measure of association appropriate for the level of measurement of the variables.

Table 6-4. Contingency Table for Variables

Popular support in June 1995 for a proposal to expand curbside recycling among city households by education (in percents)

	Level of Education				
Response	**Some H.S.**	**H.S.**	**Some Col.**	**Col.**	**Grad./Prof.**
Favor	72.7	84.2	86.8	90.0	96.5
Oppose	12.1	9.7	4.6	4.0	1.8
Not Sure	15.2	6.1	8.6	6.0	1.7
Total Percent	100.0	100.0	100.0	100.0	100.0
Number	(66)	(164)	(174)	(143)	(58)

A measure of association is a statistic that indicates the strength of the relationship. For ordinal and interval level data, the statistic may also indicate the direction of the relationship. There are many statistics that can be used to analyze relationships for variables at the nominal, ordinal, and interval/ratio level, but the ones employed most commonly are illustrated in Table 6-5.

Table 6-5. Statistics for Bivariate Analyses

Nominal Level Variables	**Values**
Lambda	0 to 1
Cramer's V	0 to 1
Ordinal Level Variables	
Gamma	-1 to +1
Tau-b	-1 to +1
Tau-c	-1 to +1
Nominal or Ordinal Independent and **Interval/Ratio Dependent Variables**	
Difference of Means	
Analysis of Variance or Eta^2	0 to 1
Interval Level Variables	
Pearson's r	-1 to +1

values, this table indicates the probability that a chi-square value of that magnitude would be observed *if* the two variables were unrelated. The researcher selects the level of statistical significance, or the probability of error that can be tolerated in making an inference from the sample crosstabulation to the entire population. Normally, .05 is selected. This means that there's a 5 percent chance that the researcher will reject the null hypothesis when, in fact, the null is true. Turning to the table, we find the chi-square threshold to be 9.49. Since 69.43 is well above this value, we can infer that a statistically significant relationship exists between income and support for the state health care plan. In fact, since the X^2 value is so large, we can say that the chance of error is very small since the threshold for 4 *df* at the .005 level of significance is 14.86. The strength of the relationship would be indicated by Cramer's V.

Fortunately, researchers don't have to manually calculate chi-square, other tests of statistical significance, or the statistical measures of association. Programs such as *SPSS* compute these and indicate the precise probability that an observed relationship would occur by chance and would not be found in the larger population.

It's important to underscore that the researcher establishes the level of statistical significance. This level is usually .05. Based on the logic of the various tests of statistical significance, relationships are more likely to attain this level of significance in large samples than in smaller samples. An association of .09 may be statistically significant simply because it is less likely that a relationship is the result of sampling error in larger samples. However, the researcher must judge whether such a statistically significant relationship has *substantive* importance for decision makers.

Ordinal Level Statistics

Nominal measures of association can be used to supplement the statistics that are appropriate for ordinal level data, but gamma, *tau*-b, and *tau*-c are preferred because they convey direction as well as strength of the relationship between two variables. **Gamma** is based on the logic of proportionally reducing error. Gamma represents the proportion of paired or concordant observations minus the number of discordant pairs divided by the number of concordant pairs plus the number of discordant pairs. The formula is:

$$\text{Gamma} = \frac{\text{Concordant} - \text{Discordant}}{\text{Concordant} + \text{Discordant}}$$

This formula computes the number of pairs with the same ranking on the two variables and the number of cases that has an opposite ranking on the two variables. In effect, gamma represents the difference between the number of consistently ordered pairs and the number of inconsistently ordered pairs. If the number of consistent pairs exceeds the number of inconsistent ones, the relationship is positive. Conversely, if the number of discordant or inconsistent pairs is the most numerous, the relationship is negative. The larger the difference, the stronger the relationship.

An example illustrates this logic. Suppose the following data on pro-

ductivity and experience were collected for a sample of 120 employees:

Frequency Distribution of Productivity and Experience Levels of Employees

Productivity	Experience Level	
	Low	High
Below Average	50	20
Above Average	10	40
Totals	60	60

The number of concordant pairs is 50 x 40 = 2000. The number of discordant pairs is 10 x 20 = 200. Since the number of concordant pairs exceeds the number of discordant ones, the relationship is positive. The gamma value is:

$$\frac{2000 - 200}{2000 + 200} = \frac{1800}{2200} = .818$$

Obviously, employees with a high level of experience are much more likely to have an above average level of productivity. A gamma of .818 represents a very strong positive association. The statistical significance of the relationship can be determined by calculating the chi-square and df.

Other measures of association for ordinal level data include **Kendall's *tau*-b** and **Kendall's *tau*-c**. They differ somewhat from gamma in that they take into account (in the denominator of their formulas) the number of pairs that are tied. For example, one employee may have a low experience level and a low productivity level while another employee has a low experience level but a high productivity level. In this instance, both employees have the same "tied" value or rank on experience. Meyer and Brudney (1993, p. 237) explain that a contingency table usually has tied pairs, and therefore the value of gamma "will always be greater than *tau*-b, *tau*-c ..."

Tau-b is used for square contingency tables (when the table has an equal number of rows and columns). *Tau*-c is used for non-square tables that have a different number of rows and columns. Either gamma or one of the *tau* measures can assess the strength of the relationship, but the latter yields more conservative estimates of the strength of the relationship and is usually the preferred measure of association for that reason.

Difference of Means and Analysis of Variance

When an independent variable is measured at the nominal or ordinal level and a dependent variable is measured at the interval or ratio level, it's possible to compare the means or proportions of the different groups and to compute **eta-squared,** which is a measure of how much variance in the dependent variable is explained by the independent variable. An interval dependent variable can't be displayed in a crosstabulation efficiently because each value would be a separate row. If it's collapsed into categories, precision is sacrificed. So it makes sense to use statistics that permit a straightforward analysis of data measured at these levels.

Public administrators often want to know whether the means for two different groups in the same sample are statistically different, or whether the means for groups in two sepa-

rate samples are different. For example, a manager may be interested in whether a new customer service policy really has boosted the approval rating of the building permit department. In other words, are the differences in public approval or satisfaction significant at the .05 level? Suppose that surveys of 400 citizens conducted before and after the implementation of the new policy produce the following results:

	Before	After
Approval Rating		
Mean	55%	60%
Standard Deviation	.45	.50

Using the formula for computing a Z score that makes use of the normal distribution, we can determine whether we can reject the null hypothesis that there is no statistically significant difference between the two proportions. The formula is:

$$Z = \frac{X_1 - X_2}{\sqrt{o_1^2 / N_1 + o_2^2 / N_2}}$$

This formula simply measures the difference between the means in terms of standard error units, taking into account the size of the samples. Substituting the data in the formula, we have:

$.60 - .55 / \sqrt{.45^2 / 400 + .5^2 / 400}$, or
$.05 / .0335 = 1.49.$

Looking up the value of 1.49 in the normal distribution (see Appendix), we find a value of .4319. Subtracting this value from .5 results in .068, just outside the critical region of < .05, which is necessary to reject the null hypothesis. We can then say that there is **no** statistically significant difference at the .05 level in the public's approval rating after the implementation of the new customer service policy.

Eta-squared is a statistic that can be interpreted as the proportion of the total variation in the dependent variable that is accounted for by knowing the values of the independent variable. The closer eta-squared is to 0, the weaker the relationship, and the closer it is to 1, the stronger the relationship. The logic of eta^2 is similar to lambda. The statistical significance of the relationship can be ascertained by a statistic called an F-ratio. *SPSS* computes eta^2 and its level of significance.

Interval/Ratio Level Statistics

Pearson's product-moment correlation (r) measures the strength and direction of a relationship between two interval or ratio level variables. Correlation is based on the logic of linear regression analysis, in which a straight line is computed using the formula: $y = a + b(X)$. This formula permits the researcher to estimate and predict the values of Y' with knowledge of the values of X. The intercept (a) and slope (b) of the line are calculated to minimize the differences between the actual values of Y and predicted values of Y'. The sum of the squared errors between the actual and estimated values of Y is the unexplained variance. Explained variance is the remainder of the total variation minus the unexplained variation. The correlation r is obtained by dividing the explained variation by the total variation.

This statistic can range from -1 to +1 and can be interpreted as a PRE (proportional reduction in error) estimate. When several correlation

analyses are performed, the convention is to present the results in a correlation matrix as illustrated in Table 6-6 below.

The square of r, or r^2, is the percentage of the variation in Y that can be explained by the variation in X. Suppose, for example, that an analysis of respondents' income and their frequency of visits to the local public health clinic yields a Pearson's correlation of -.45, a fairly strong negative relationship. In other words, as income increases, visits to the local public health clinic decrease. The square of r equals .20, which means that 20 percent of the variation in visits to the public health clinic is explained by knowing the respondent's income. The level of statistical significance of the relationship is indicated by "p=" value in the *SPSS* output. If p is less than .05, the relationship is statistically significant.

Table 6-6. Correlation Matrix

	County Health Clinic Visits	Income	Age	Gender
Clinic Visits	1.0	-.45*	.58*	.23*
Income		1.0	.34*	.03
Age			1.0	.07
Gender (0=males, 1= females)				1.0

* p < .05

These bivariate analyses are the basis for further investigation. For example, the inquisitive researcher would want to know what accounts for the variation *not* explained by these factors. Multiple regression is the technique that enables you to examine *several* independent variables simultaneously to measure the effects on the dependent variable, controlling for the effects of all of the others. That discussion, however, is beyond the scope of this brief statistical primer.

Using SPSS for Windows

Several statistical analysis software programs are available, but one of the more popular is SPSS (Statistical Package for the Social Sciences) for Windows for IBM or compatible personal computers. By learning a few English-like SPSS commands, you will be able to create a data file and perform analyses that summarize the survey results and examine relationships among variables. The output from these analyses will help you produce tables and charts to communicate the survey results to others.

The data analysis examples assume that the user has access to an SPSS software package and an IBM hard disk personal computer, or a 100 percent IBM-compatible with at least 15 megabytes of free hard disk memory. A little practice with the "How to Use SPSS" and the other

subjects in the "Help" menu is sufficient to perform the procedures described in this section. A basic proficiency with Windows-based environments also is necessary.

This section reviews some of the basic commands of SPSS that will help you to:

- create a data file,
- check its accuracy,
- produce frequency distributions,
- generate descriptive statistics, and
- analyze relationships among variables.

Extracting useful findings, discovering interesting relationships, and exploring the implications of the survey's findings are the responsibilities of the individual researcher. Technical advice and help with these tasks are available from the sources listed in the Appendix.

Creating the Data File

In general, the person responsible for data entry uses the spreadsheet format of the SPSS program to name each of the variables, specify their value labels, and define the missing value for each variable. The data for each case are then entered under variable headings in each of the appropriate columns of the spreadsheet.

For example, to create a new data file, select NEW from the "File" menu and specify DATA as the type of window to open. Then, label and define all of the variables in your study. To accomplish this, select DEFINE VARIABLE from the "Data" menu. Type in the name that you assigned to the variable in your codebook. This name can be up to eight characters in length. Then click the left mouse button on LABELS. Type in the values of the variable from your codebook and the label that you assigned to each. For example, referring to the variables in Figure 5-1, CURBPICK has a value of 1 for "NO" and 2 for "YES." Assign the missing value code for this variable. Proceed in this fashion until all of the variables are defined. Then enter all of the values for each of the cases in the appropriate column. Once this is accomplished, save the data file and assign it a name with a ".sav" extension.

Even the most careful data entry staff members are likely to make a few errors in the tedious process of entering data from hundreds of cases. It's the researcher's responsibility to detect and correct any errors. Two techniques for checking the integrity of data are the LIST VARIABLES command and the FREQUENCIES VARIABLES command. From the "Statistics" menu, select SUMMARIZE and then LIST CASES or FREQUENCIES. Select all of the variables and then inspect the output either on the screen or a printed copy. The LIST CASES procedure reports the variable names and the values for all of the cases for each variable. A visual scan will indicate any erroneous values for variables (those not listed in the codebook).

The FREQUENCIES command produces a table of values for each variable. Any errors appear as a non-valid code or value. For example, if a value of "6" appears for the variable WILLDROP, you know that the wrong value has been entered since the codebook (see Figure 5-1) specifies that the valid range of values is only 1 through 5.

To correct any data entry errors, you may choose SELECT CASES from the "Data" menu and instruct SPSS to select the identification number of the case that has a value of "6," or the variable WILLDROP. (This is why it is prudent always to include an identification number for each case in the data set.) This procedure enables the researcher to go back into the data set, find that case (an easy task if cases are entered sequentially), and make the necessary change once the original questionnaire is inspected for the correct response.

Another way to make this correction is to recode the erroneous value(s) for the cases in question. If the correct value for a case's response to the WILLDROP variable is supposed to be "5" instead of "6," make this change by choosing the RECODE command from the "Transform" menu. This procedure permanently changes all values of "6" for WILLDROP to "5." Be sure that this change doesn't conflict with any other corrections that might need to be made for other cases, such as changing a "6" to a "4." If these are necessary, use the first method suggested for making corrections to the data set.

Frequency Distributions

After data entry errors are corrected, run a frequency distribution of the responses to all of the questions (variables). A frequency distribution indicates the number and percent of cases that have a particular value on a variable. SPSS summarizes this information in a table, but it's the researcher's responsibility to add a descriptive title, columns for the number and valid percent of cases, and clear labels before such information is presented in a report.

From the "Statistics" menu, select SUMMARIZE, and then FREQUENCIES for the variables of interest. Normally, a frequency distribution is prepared for each variable. Figure 6-2 on pages 88 and 89 is an example of the output from a frequencies command for hypothetical data for the variables listed in Figure 5-1. Use the valid percent data to prepare percent distribution tables.

Bivariate Analysis

Another frequently used command in SPSS is CROSSTABS. It produces a table listing each variable, the number of cases for each value of each variable, and the number and percent of cases in each "cell" in the table. This command enables you to examine the relationships between two variables. It also permits you to examine a bivariate association while holding "constant" the effects of a third variable. In other words, the original two variables are examined for the categories of a third variable.

For example, a crosstabulation is appropriate if you are interested in whether a relationship exists between education and support for a proposed ordinance to prohibit smoking in public facilities such as an airport, public buildings, or restaurants. Education (EDUC) might be measured on a five-point scale (1=less than h.s., 2=h.s. grad., 3=some college, 4=coll. grad., 5= grad./prof. degree). The variable SMOKE might consist of responses to the question:

continued on page 90

Figure 6-2. FREQUENCIES Output from SPSS-PC+

```
Freq Vars=all
/statistics=all.
```

CURBPICK

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
NO	1	5	50.0	50.0	50.0
YES	2	5	50.0	50.0	100.0
	TOTAL	10	100.0	100.0	

Mean	1.500	Std Err	.167	Median	1.500
Mode	1.000	Std Dev	.527	Variance	.278
Kurtosis	-2.571	S E Kurt	1.334	Skewness	.000
S E Skew	.687	Range	1.000	Minimum	1.000
Maximum	2.000	Sum	15.000		

Valid Cases 10 Missing Cases 0

CURBPART

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
NO	1	5	50.0	50.0	50.0
YES	2	5	50.0	50.0	100.0
	TOTAL	10	100.0	100.0	

Mean	1.500	Std Err	.167	Median	1.500
Mode	1.000	Std Dev	.527	Variance	.278
Kurtosis	-2.571	S E Kurt	1.334	Skewness	.000
S E Skew	.687	Range	1.000	Minimum	1.000
Maximum	2.000	Sum	15.000		

Valid Cases 10 Missing Cases 0

DOPARTIC

Value Label	Value	Frequency	Percent	Percent	Percent
NO	1	8	80.0	80.0	80.0
YES	2	2	20.0	20.0	100.0
	TOTAL	10	100.0	100.0	

Mean	1.200	Std Err	.133	Median	1.000
Mode	1.000	Std Dev	.422	Variance	.178
Kurtosis	1.406	S E Kurt	1.334	Skewness	1.779
S E Skew	.687	Range	1.000	Minimum	1.000
Maximum	2.000	Sum	12.000		

Valid Cases 10 Missing Cases 0

WILLDROP

Value Label	Value	Frequency	Percent	Percent	Percent
Strongly willing	1	3	30.0	30.0	30.0
Willing	2	3	30.0	30.0	60.0
Not sure or DK	3	3	30.0	90.0	
Unwilling	4	1	10.0	10.0	100.0
	TOTAL	10	100.0	100.0	

Mean	2.200	Std Err	.327	Median	2.000
Mode	1.000	Std Dev	1.033	Variance	1.067
Kurtosis	-.896	S E Kurt	1.334	Skewness	.272
S E Skew	.687	Range	3.000	Minimum	1.000
Maximum	4.000	Sum	22.000		

Valid Cases 10 Missing Cases 0

DROPLOC

Value Label	Value	Frequency	Percent	Percent	Percent
Supermarket	1	7	77.8	77.8	30.0
Elementary school	2	1	10.0	11.1	88.9
Vacant lots	8	1	10.0	11.1	100.0
Unwilling	99	1	10.0	MISSING	
	TOTAL	10	100.0	100.0	

Mean	1.889	Std Err	.772	Median	1.000
Mode	1.000	Std Dev	2.315	Variance	5.361
Kurtosis	8.467	S E Kurt	1.400	Skewness	2.891
S E Skew	.717	Range	7.000	Minimum	1.000
Maximum	8.000	Sum	17.000		

Valid Cases 9 Missing Cases 1

NEWS

Value Label	Value	Frequency	Percent	Valid Percent	Cum Percent
YES	1	9	90.0	100.0	100.0
	9	1	10.0	MISSING	
	TOTAL	10	100.0	100.0	

Mean	1.000	Std Err	.000	Median	1.000
Mode	1.000	Std Dev	.000	Variance	.000
Range	.000	Minimum	1.000	Maximum	1.000
Sum	9.000				

Valid Cases 9 Missing Cases 1

FINISH.

"The city is considering an ordinance that would prohibit smoking entirely in all government buildings and other enclosed spaces accessible to the general public such as airports, restaurants, and malls. Do you favor or oppose this ordinance?"

1 OPPOSE
2 FAVOR
3 NOT SURE/ DON'T KNOW

To determine whether a relationship exists between education and support for the ordinance, select CROSSTABS from the "Statistics" menu and identify the dependent and independent variable names. Remember that the dependent variable is placed in the row and the independent variable is located in the column. In the CROSSTABS window, click on the "Statistics" button to select the statistics that you want the program to calculate for the analysis. The output will be similar to Figure 6-3.

Figure 6-3. Table Prepared from CROSSTABS SPSS Output

Percent Support for the Proposed Non-Smoking Ordinance By Level of Respondents' Formal Education, July 1993 (N=621)

Opinion	Education Level					
	Less than High School	High School Degree	Some College	College Degree	Grad. Degree	Totals
Oppose	66	51	42	32	20	47.5
Favor	29	44	55	64	78	48.0
Don't Know/ Not Sure	5	5	3	4	2	4.5
Total	100 (140)	100 (240)	100 (98)	100 (95)	100 (48)	100 (621)

Lambda = .19
Chi-square = 6.91
Cramer's V = .22

Since the variable SMOKE is measured at the nominal level, and the EDUC variable is ordinal, you may use lambda, Cramer's V and chi-square statistics to analyze the relationship. For instance, if Cramer's V = .38 and chi-square indicates a statistically significant association at the .05 level, we can conclude that a fairly strong, statistically significant relationship exists between education and support for the non-smoking ordinance. That is, people with higher education levels are more likely to favor passage of the ordinance.

Based on your knowledge of the community and the subject of the question, you may speculate that a third variable, such as occupational status, might be related to both education and support for the ordinance. If your community is located in an area where tobacco farming is important to the local economy, you might speculate that this factor will have something to do with

the nature of the original relationship. If the questionnaire contains an attribute question about the respondent's occupation, it's possible to recode that variable into two categories, farming and nonfarming occupations, by "collapsing" the coded categories of the responses following the selections from the "Transform" menu. Then, you can analyze the nature of the relationship between education and ordinance support while holding the effects of occupational status constant or invariant.

Examining the association among two variables while controlling for the effects of a third is part of a process called **elaboration modeling**. It is one of the basic types of multivariate analysis. Four possible outcomes may occur when a third variable is introduced: replication, explanation, interpretation, and specification. If the relationship between the original two variables remains basically unchanged (indicated by the measure of association) when a third variable is controlled, the term **replication** is assigned to the result. In other words, the "control" variable has no effect on the nature of the relationship between education and support for the ordinance.

If the original relationship is explained away when the third variable is introduced, the relationship was spurious. The term **explanation** applies in this case. In other words, the control variable is related to both of the other two variables and accounts for all of their apparent covariation. A spurious relationship can be distinguished from an "interpretation" outcome by determining the time order of the control variable. If the measures of association for both "partial" tables are close to zero, and the control variable *precedes* the other two variables, then the relationship is spurious. If the control variable intervenes between the other two variables, it is a case of **interpretation,** which clarifies the process through which the independent variable has an effect on the dependent. Finally, if one partial table has a measure of association that is greater than the original bivariate association and the other partial table has a much smaller or near zero association, **specification** is the result. This case is called statistical interaction since the size of the effects of the independent variable depends upon the category of the control variable.

Summary

Data analysis requires good detective skills to reveal the respondents' patterns of behavior, opinions, or preferences that may have policy implications for decision makers. It's the job of the analyst to be the "Survey Sherlock" for the sponsors of the project. To fully exploit all the possible interesting findings "hidden" in the data, a firm grasp of basic descriptive statistics should be complemented by an understanding of the more powerful multivariate techniques, such as elaboration modeling and multiple regression. These methods are described in the basic statistics texts listed in the references. The reader is urged to consult these sources and contact one or more of the technical assistance organizations listed in the Appendix for help.

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Chapter 7
Preparing the Report and Releases

The written report of the citizen survey should summarize succinctly the survey's purpose and objectives, the methodology used to obtain the data, the major findings (and non-findings) of the research, and the major implications of the findings for the goals of the study. The report needs to be written for the audience that's expected to read and use it. The length of the report should be governed by the readers' particular information needs and the extent to which the survey offers useful information about the topics and issues that interested its sponsors in the first place. As a general rule, the quality of what's on the page is more important than the quantity of pages. Consequently, good reports can be five or 25 pages long. Brief, written, executive summaries supplemented by charts and tables for overhead display at the council meeting are often useful for local government officials.

Press Releases

Press releases based on the survey report *always* should reflect the professionalism and care with which the survey was designed and conducted. The best media releases provide the most information about how the study was done (Weisberg 1989). Sample size, sample error, confidence level, response rate, time period of the survey, and method of acquiring the information are important elements of the methodology. Such information helps readers determine the accuracy of the findings reported.

Unfortunately, this is an age when too many polls have only the thinnest of scientific veneers. Accordingly, public mistrust and suspicion of polls are growing. The credibility and legitimacy of *your* survey can be established if you incorporate a complete description of its methods, findings, and limitations. Any media reports of the survey results should include this information.

The Report

Survey Objectives

If the survey is planned according to the prescriptions recommended in Chapter 2, the report's first section on the survey's purpose and objectives is virtually complete already. A recapitulation of the reasons for doing the survey, what you expected to learn from it, and how the results can provide information to improve deliberations, decisions, or actions is very important information to those who may not have been involved in these initial discussions.

Methodology

The next section of the report explains its methodology. It should include how the information was gathered, when it was collected, what the response rate was to the questionnaire or telephone interview, and what the confidence level and margin of error mean in the context of the response rate. Attach a complete copy of the questionnaire as an addendum to the executive summary or an appendix to the report so readers know precisely how questions were worded. Any particular problems that arose in respondent misinterpretations of questions should be honestly reported.

In the methodology section, the objective isn't to impress the reader with your command of sampling jargon, but to present a thorough, accurate, and honest description of what you did, how you did it, and what the response means in terms of accuracy. This approach is the hallmark of a quality research effort. A well-written, methodological summary helps the next survey team replicate and/or refine your work in future citizen surveys.

Major Findings

The third section of the report summarizes the major findings of the project. Present only those findings that are most salient for the objectives. Resist any temptation to include every possible table. Readers will be more impressed with the clarity of your analysis than by the number of tables. Begin this section with your most interesting, surprising, or informative findings. Don't save these for a spectacular ending. Then, briefly summarize other results that are less dramatic, but still interesting. If little or no variation in opinion occurs for a particular question or issue, and you had reason to expect otherwise, this finding should be emphasized and explained.

Finally, prepare graphic illustrations to highlight the most dramatic or important findings. The references and technical resources listed in this handbook will offer suggestions about the best software for creating graphics and the best type of illustrations to use for the type of information you want to summarize.

Implications of the Findings

The most important section of the report describes the implications of the survey findings. Deductions should relate to, impact upon, or be relevant to the most important survey objectives. Take a mental step away from the numbers and statistics and consider how the findings relate to one or more aspects of what the city does and how it does it.

Be advised that several relationships attaining statistical significance does *not* mean they have any *substantive* importance. Statistical significance and substantive importance are entirely different! The former specifies the likelihood that the relationship observed in your sample is not due to sampling error; the latter refers to whether the relationship is of any consequence. Substantive importance is the golden yardstick of value for decision makers. There's no statistic for computing this. The analyst is responsible for determining the import of findings based on the knowl-

edge, insight, and experience gained in practice. Therefore, the implications should be written to respond to the "So what?" question.

For example, it's *not* sufficient to report that several statistically significant relationships exist between such independent variables as income, race, education, and neighborhood and such dependent variables as citizen ratings of service quality, citizen satisfaction with various programs, or support for various proposals or programs. So what? The implications of these findings need to address what these relationships mean for the political calculus of local policy, program, and managerial decision making.

Based on evidence, the implications may point out what's being done right, what's not, and how particular change might improve, enhance, or affect the quality, usefulness, or responsiveness of the policy, program, or service. In some cases, the implications may consist of little more than the need to conduct other types of investigations or evaluations to more fully understand popular preferences or concerns.

Whatever is gleaned from the survey results, the inferences must be based on the evidence — tempered always by an understanding of the limits of survey research. This is why survey research shouldn't be viewed as a magic bullet for evaluation purposes. A single survey at best is only a "snapshot" of reality. Annual surveys offer a more realistic "moving" picture over time and provide local officials with a more robust information base for better decision making.

Appendix

Where to go for Help

University of Tennessee Resources

Robert P. Schwartz
U.T. Municipal Technical Advisory Service
600 Henley Street, Suite 120
Knoxville, TN 37996-4105
(615) 974-0411
Fax (615) 974-0423

Professor Bill Lyons
U.T. Social Science Research Institute
410 Aconda Court
Knoxville, TN 37996-0641
(615) 974-2819

Professor David Folz
U.T. Department of Political Science
1001 McClung Tower
Knoxville, TN 37996-0410
(615) 974-2261
Fax (615) 974-7037

Examples of Telephone/Mailing List Companies

Survey Sampling
One Post Road
Fairfield, CT 06430
(203) 255-4200

MegaSample
200 Carleton Ave.
East Islip, NY 11730
(516)277-7000

Random Numbers Table

10097	32533	76520	13586	34673	54876	80959	09117	39292	74945
37542	04805	64894	74296	24805	24037	20636	10402	00822	91665
08422	68953	19645	09303	23209	02560	15953	34764	35080	33606
99019	02529	09376	70715	38311	31165	88676	74397	04436	27659
12807	99970	80157	36147	64032	36653	98951	16877	12171	76833
66065	74717	34072	76850	36697	36170	65813	39885	11199	29170
31060	10805	45571	82406	35303	42614	86799	07439	23403	09732
85269	77602	02051	65692	68665	74818	73053	85247	18623	88579
63573	32135	05325	47048	90553	57548	28468	28709	83491	25624
73796	45753	03529	64778	35808	34282	60935	20344	35273	88435
98520	17767	14905	68607	22109	40558	60970	93433	50500	73998
11805	05431	39808	27732	50725	68248	29405	24201	52775	67851
83452	99634	06288	98083	13746	70078	18475	40610	68711	77817
88685	40200	86507	58401	36766	67951	90364	76493	29609	11062
99594	67348	87517	64969	91826	08928	93785	61368	23478	34113
65481	17674	17468	50950	58047	76974	73039	57186	40218	16544
80124	35635	17727	08015	45318	22374	21115	78253	14385	53763
74350	99817	77402	77214	43236	00210	45521	64237	96286	02655
69916	26803	66252	29148	36936	87203	76621	13990	94400	56418
09893	20505	14225	68514	46427	56788	96297	78822	54382	14598
91499	14523	68479	27686	46162	83554	94750	89923	37089	20048
80336	94598	26940	36858	70297	34135	53140	33340	42050	82341
44104	81949	85157	47954	32979	26575	57600	40881	22222	06413
12550	73742	11100	02040	12860	74697	96644	89439	28707	25815
63606	49329	16505	34484	40219	52563	43651	77082	07207	31790
61196	90446	26457	47774	51924	33729	65394	59593	42582	60527
15474	45266	95270	79953	59367	83848	82396	10118	33211	59466
94557	28573	67897	54387	54622	44431	91190	42592	92927	45973
42481	16213	97344	08721	16868	48767	03071	12059	25701	46670
23523	78317	73208	89837	68935	91416	26252	29663	05522	82562
04493	52494	75246	33824	45862	51025	61962	79335	65337	12472
00549	97654	64051	88159	96119	63896	54692	82391	23287	29529
35963	15307	26898	09354	33351	35462	77974	50024	90103	39333
59808	08391	45427	26842	83609	49700	13021	24892	78565	20106
46058	85236	01390	92286	77281	44077	93910	83647	70617	42941

Example of Call-back Sheet

DATE:
CODE#:

FIRM:
SAMPLE AREA:
PROJECT:

REP:
PAGE:

	1st ATTEMPT DATE	1st ATTEMPT TIME	DISP	2nd ATTEMPT DATE	2nd ATTEMPT TIME	DISP	3rd ATTEMPT DATE	3rd ATTEMPT TIME	DISP	4th ATTEMPT DATE	4th ATTEMPT TIME	DISP	COMMENTS
522-		am pm			am pm			am pm			am pm		
522-		am pm			am pm			am pm			am pm		
523-		am pm			am pm			am pm			am pm		
523-		am pm			am pm			am pm			am pm		
524-		am pm			am pm			am pm			am pm		
524-		am pm			am pm			am pm			am pm		
525-		am pm			am pm			am pm			am pm		
546-		am pm			am pm			am pm			am pm		
573-		am pm			am pm			am pm			am pm		
577-		am pm			am pm			am pm			am pm		
584-		am pm			am pm			am pm			am pm		
584-		am pm			am pm			am pm			am pm		
588-		am pm			am pm			am pm			am pm		
588-		am pm			am pm			am pm			am pm		
595-		am pm			am pm			am pm			am pm		
637-		am pm			am pm			am pm			am pm		
673-		am pm			am pm			am pm			am pm		
687-		am pm			am pm			am pm			am pm		
687-		am pm			am pm			am pm			am pm		
688-		am pm			am pm			am pm			am pm		
688-		am pm			am pm			am pm			am pm		
688-		am pm			am pm			am pm			am pm		
689-		am pm			am pm			am pm			am pm		
690-		am pm			am pm			am pm			am pm		
693-		am pm			am pm			am pm			am pm		
INTERVIEWER INITIALS													

DISPOSITIONS

- NA - NO ANSWER
- BZ - BUSY
- CB - CALL BACK
- RF - REFUSAL
- DS - DISCONNECTED
- BG - BUSINESS/GOVT OFFICE
- DL - DEAF/LANGUAGE BARRIER
- TM# - TERMINATED
- OQ - OVER QUOTA
- CM - COMPLETED

The Normal Distribution

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2518	0.2549
0.7	0.2580	0.2612	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4986	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3.2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998	0.4998
3.5	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998
3.6	0.4998	0.4998	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.7	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.8	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.5000	0.5000	0.5000
3.9	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000

Source: Meier, Kenneth and Jeffery Brudney, 1993. **Applied Statistics For Public Administration.** (Belmont, California: Wadsworth Publishing Company), p. 433-434.

Table of Chi-square Values

Degree of Freedom (df)	*0.10*	*0.05*	*0.02*	*0.01*
1	2.706	3.841	5.412	6.635
2	4.605	5.991	7.824	9.210
3	6.251	7.815	9.837	11.341
4	7.779	9.488	11.668	13.277
5	9.236	11.070	13.388	15.086
6	10.645	12.592	15.033	16.812
7	12.017	14.067	16.622	18.475
8	13.362	15.507	18.168	20.090
9	14.684	16.919	19.679	21.666
10	15.987	18.307	21.161	23.209
11	17.275	19.675	22.618	24.725
12	18.549	21.026	24.054	26.217
13	19.812	22.362	25.472	27.688
14	21.064	23.685	26.873	29.141
15	22.307	24.996	28.259	30.578
16	23.542	26.296	29.633	32.000
17	24.769	27.587	30.995	33.409
18	25.989	28.869	32.346	34.805
19	27.204	30.144	33.687	36.191
20	28.412	31.410	35.020	37.566
21	29.615	32.671	36.343	38.932
22	30.813	33.924	37.659	40.289
23	32.007	35.172	38.968	41.638
24	33.196	36.415	40.270	42.980
25	34.382	37.652	41.566	44.314
26	35.563	38.885	42.856	45.642
27	36.741	40.113	44.140	46.963
28	37.916	41.337	45.419	48.278
29	39.087	42.557	46.693	49.588
30	40.256	43.773	47.962	50.892

Source: Johnson, Janet and Richard Joslyn, 1991. **Political Science Research Methods.** (Washington DC.: C Q Press), p. 395.

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SYSTEMS ANALYSIS OF MTAS LIBRARY

A TERM PROJECT

PREPARED FOR

DR. COX

IN PARTIAL FULFILLMENT

OF THE REQUIREMENTS FOR LS 5380

by

Beverly G. Freuler
Frances Huffman

December 2, 1968