

Data Collection Methods



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Introduction

This document is a compilation of resources gathered from an extensive literature review; much of the information is verbatim from the various web sites. The goal is to familiarize readers with the terms associated with data collection tools, methodology, and sampling.

It is important to note that while quantitative and qualitative data collection methods are different (cost, time, sample size, etc.), each has value.

Quantitative data collection methods

<http://people.uwec.edu/piercech/researchmethods/data%20collection%20methods/data%20collection%20methods.htm>

Quantitative data collection methods rely on random sampling and structured data collection instruments that fit diverse experiences into predetermined response categories. They produce results that are easy to summarize, compare, and generalize.

Quantitative research is concerned with testing hypotheses derived from theory and/or being able to estimate the size of a phenomenon of interest. Depending on the research question, participants may be randomly assigned to different treatments. If this is not feasible, the researcher may collect data on participant and situational characteristics in order to statistically control for their influence on the dependent, or outcome, variable. If the intent is to generalize from the research participants to a larger population, the researcher will employ probability sampling to select participants.

A **probability sampling** method is any method of sampling that utilizes some form of *random selection* (<http://www.socialresearchmethods.net/kb/sampprob.php>). In order to have a random selection method, you must set up some process or procedure that assures that the different units in your population have equal probabilities of being chosen. Simple examples of random selection are picking a name out of a hat or choosing the short straw. Computers are used for generating random selection in more complex projects.

Typical quantitative data gathering strategies include:

- Administering surveys with closed-ended questions (e.g., face-to face and telephone interviews, mail questionnaires, etc.)
(http://www.achrn.org/quantitative_methods.htm)
- Experiments/clinical trials.
- Observing and recording well-defined events (e.g., counting the number of patients waiting in emergency at specified times of the day).
- Obtaining relevant data from management information systems.

INTERVIEWS

In Quantitative research (survey research), interviews are more structured than in Qualitative research. <http://www.stat.ncsu.edu/info/srms/survpamphlet.html>

In a structured interview, the researcher asks a standard set of questions and nothing more. (Leedy and Ormrod, 2001)

Telephone interviews

Advantages:

- Less time consuming
- Less expensive
- Researcher has ready access to anyone who has a landline telephone.
- Higher response rate than the mail questionnaire.
- Can be fully automated using CATI (Computer Assisted Telephone Interviewing) saving data processing time.

Disadvantages:

- The response rate is not as high as the face-to-face interview.
- The sample may be biased as only those people who have landline phones are contacted (excludes people who do not have a phone, or only have cell phones).

Face-to-face interviews (Leedy and Ormrod, 2001)

Advantages:

- Enables the researcher to establish rapport with potential participants and therefore gain their cooperation.
- Yields the highest response rates in survey research.
- Allows the researcher to clarify ambiguous answers and when appropriate, seek follow-up information.

Disadvantages:

- Impractical when large samples are involved
- Can be time consuming and expensive.

Computer Assisted Personal Interviewing (CAPI): is a form of personal interviewing, but instead of completing a questionnaire, the interviewer brings along a laptop or hand-held computer to enter the information directly into the database.

Advantages:

- Saves time involved in processing the data.
- Saves the interviewer from carrying around hundreds of questionnaires.

Disadvantages:

- Can be expensive to set up.
- Requires that interviewers have computer and typing skills.

QUESTIONNAIRES

Questionnaires often make use of checklist and rating scales. These devices help simplify and quantify people's behaviors and attitudes. A **checklist** is a list of behaviors, characteristics, or other entities the researcher is looking for. Either the researcher or survey participant simply checks whether each item on the list is observed, present or true or vice versa. A **rating scale** is

more useful when a behavior needs to be evaluated on a continuum. They are also known as Likert scales. (Leedy and Ormrod, 2001)

Mail questionnaires

Advantages:

- Can be sent to a large number of people.
- Saves the researcher time and money compared to interviewing.
- People are more truthful while responding to the questionnaires regarding controversial issues in particular due to the fact that their responses are anonymous.
- Allow the respondent to answer at their leisure.

Disadvantages:

- In most cases, the majority of people who receive questionnaires don't return them.
Therefore:
 - Over-sampling may be necessary if doing a one-time mail out in order to get enough completed questionnaires to be generalizable to the population.
 - Follow-up reminders to participants encouraging them to complete the questionnaire may be necessary, thereby increasing the time and cost to conduct the study.
 - May need to offer incentives to increase response rate.
- Time – mail surveys take longer than other types of surveys.

Web-based questionnaires:

A new and inevitably growing methodology is the use of Internet based research. This would mean receiving an e-mail on which you would click on an address that would take you to a secure web-site to fill in a questionnaire.

Advantages:

- This type of research is often quicker and less detailed.
- Very cost effective.

Disadvantages:

- Excludes people who do not have a computer or are unable to access a computer.
- Need to have access to email addresses.
- Many worksites have screening mechanisms in place blocking access to employee emails.
- The validity of such surveys may be in question as people might be in a hurry to complete it and so might not give accurate responses.

(<http://www.statcan.ca/english/edu/power/ch2/methods/methods.htm>)

Qualitative data collection methods

<http://people.uwec.edu/piercech/researchmethods/data%20collection%20methods/data%20collection%20methods.htm>

Qualitative data collection methods play an important role in impact evaluation by providing information useful to understand the processes behind observed results and assess changes in people's perceptions of their well-being. Furthermore, qualitative methods can be used to improve the quality of survey-based quantitative evaluations by helping generate evaluation hypothesis; strengthening the design of survey questionnaires and expanding or clarifying quantitative evaluation findings. These methods are characterized by the following attributes:

- They tend to be open-ended and have less structured protocols (i.e., researchers may change the data collection strategy by adding, refining, or dropping techniques or informants).
- They rely more heavily on interactive interviews; respondents may be interviewed several times to follow up on a particular issue, clarify concepts or check the reliability of data.
- They use triangulation to increase the credibility of their findings (i.e., researchers rely on multiple data collection methods to check the authenticity of their results).
- Generally their findings are not generalizable to any specific population; rather each case study produces a single piece of evidence that can be used to seek general patterns among different studies of the same issue.

Regardless of the kinds of data involved, data collection in a qualitative study takes a great deal of time. The researcher needs to record any potentially useful data thoroughly, accurately, and systematically, using field notes, sketches, audiotapes, photographs and other suitable means. The data collection methods must observe the ethical principles of research.

The qualitative methods most commonly used in evaluation can be classified in three broad categories:

- In-depth interview
- Observation methods
- Document review

In-depth interviews:

In-depth interviews are a useful qualitative data collection technique that can be used for a variety of purposes, including needs assessment, program refinement, issue identification, and strategic planning. In-depth interviews are most appropriate for situations in which you want to ask open-ended questions that elicit depth of information from relatively few people (as opposed to surveys, which tend to be more quantitative and are conducted with larger numbers of people). <http://edis.ifas.ufl.edu/fy393>

Observation methods:

One of the most common methods for qualitative data collection, participant observation is also one of the most demanding. It requires that the researcher become a participant in the culture or context being observed. Participant observation often requires months or years of intensive work because the researcher needs to become accepted as a natural part of the culture in order to assure that the observations are of the natural phenomenon.

<http://www.socialresearchmethods.net/kb/qualmeth.php>

Document review:

Document review is a way of collecting data by reviewing existing documents. The documents may be internal to a program or organization (such as records of what components of an asthma management program were implemented in schools) or may be external (such as records of emergency room visits by students served by an asthma management program).

<http://www.cdc.gov/healthyyouth/evaluation/pdf/brief18.pdf>

Focus groups:

A focus group is a group interview of approximately six to twelve people who share similar characteristics or common interests. A facilitator guides the group based on a predetermined set of topics. The facilitator creates an environment that encourages participants to share their perceptions and points of view. Focus groups are a qualitative data collection method, meaning that the data is descriptive and cannot be measured numerically.

<http://www.cdc.gov/healthyyouth/evaluation/pdf/brief13.pdf>

Advantages:

- Quick and relatively easy to set up.
- The group dynamic can provide useful information that individual data collection does not provide.
- Is useful in gaining insight into a topic that may be more difficult to gather through other data collection methods.

Disadvantages:

- Susceptible to facilitator bias.
- The discussion can be dominated or sidetracked by a few individuals.
- Data analysis is time consuming and needs to be well planned in advance.
- Does not provide valid information at the individual level.
- The information is not representative of other groups.

Summary of Survey Methods

<http://www.surveysystem.com/sdesign.htm>

<i>If your need is...</i>	<i>Consider using...</i>
Speed	Email and Web page surveys are the fastest methods, followed by telephone interviewing. Mail surveys are the slowest.
Cost	Personal interviews are the most expensive followed by telephone and then mail. Email and Web page surveys are the least expensive for large samples.
Internet Usage	Web page and Email surveys offer significant advantages, but you may not be able to generalize their results to the population as a whole.
Literacy Levels	People who lack literacy skill and are less educated are less likely to respond to mail surveys.
Sensitive Questions	People are more likely to answer sensitive questions when interviewed directly by a computer in one form or another.
Video, Sound, Graphics	A need to get reactions to video, music, or a picture limits your options. You can play a video on a Web page, in a computer-direct interview, or in person. You can play music when using these methods or over a telephone. You can show pictures in those first methods and in a mail survey.

Guidelines for Conducting a Focus Group

<http://www.nationalgangcenter.gov/Content/Documents/Assessment-Guide/Assessment-Guide-Chapter-9.pdf>

Focus group discussions are a popular method of obtaining information and opinions. They can provide insight into issues that cannot be covered through surveys or interviews. Focus groups are a good method to get people involved in this assessment process by having them provide input on a topic.

The following discussion provides a general overview of the focus group process. It is recommended that a person with experience with focus groups (preparing the discussion guide, moderating, and preparing the report) be contacted to assist in the process.

When preparing for the focus group discussions, there are several considerations: What questions will be asked? Who will participate? Where will the discussions be held? Who will conduct the sessions? The first order of business is to develop a discussion guide.

Develop the Discussion Guide

The discussion guide contains the questions that will be posed to participants during the focus group sessions. A limited number of questions should be used for each discussion. Avoid spending too much time on background information and concentrate on the important issues. There are two elements that should be considered when drafting the guide: (1) the information you wish to obtain and (2) from whom it will be obtained.

When developing the questions, keep in mind that all groups should follow the same discussion format. Using a general format for each question allows an analyst to make comparisons among the responses of various groups.

Reserve a Time and Place

Reserving a time and place to conduct the discussion is something that should be done well in advance of the actual date of the discussion sessions. Finding a location quickly will allow time to contact potential participants with the necessary logistical information. Try to find the most convenient and accessible location for the participants.

Provide an Incentive for Participation

Individuals taking part in a focus group session should be compensated for their participation. When contacting potential participants, use an incentive to encourage or persuade them to take part in the discussion session. Various forms of compensation can be used, most commonly a cash payment, lunch, or dinner. Snacks and beverages also may be provided. This

often eases the tension created by the focus group setting and makes participants more open to discussing the topic.

Selection of Focus Group Participants

It is necessary to identify each group that will participate in the discussion sessions; for example, parents, community residents, school personnel. This will provide an indication of the number of discussion groups that will be conducted. Time, money, and the number of potential participants available will determine the number of groups that are feasible for each community.

A good size for a focus group is between six and twelve participants per session (American Statistical Association, 1997). Size is conditioned by two factors: the group must be small enough for everyone to participate and large enough to provide diversity of perceptions. Group participants should be selected because of common characteristics that relate to the focus group topic. For example, to gauge parents' perceptions of physical activity opportunities in school, a focus group might be conducted with parents who have school-aged children.

Moderating the Discussion

An experienced focus group moderator should conduct the sessions. Moderating the discussion is difficult, and effective leadership is essential if the group is to accomplish its purpose. The moderator must not only be in tune with the purpose of the group but also have the necessary skills to effectively guide the group process. If it is not possible to provide an experienced moderator, the following key points should be considered:

- Keep the conversation flowing. The moderator needs to keep control of the discussion session. If participants get off track, it is the role of the moderator to pull the group back together. The moderator should keep the discussion as informal as possible and should encourage all participants to say what is on their minds. The moderator is in charge of the discussion, and it is his or her duty to draw information from the participants.
- Length of discussion. Each session should last approximately 90 minutes. The amount of information participants have and their willingness to participate will most likely dictate the length of the session.
- Be neutral. One benefit of having an outside person moderate the discussion is that the person can be neutral. People may disagree during the discussion, and the moderator must give equal time to all viewpoints. The moderator should not provide information. It is not the moderator's place to offer or convince participants of any particular point of view.

Analysis of the Results

After each focus group, the moderator or a neutral observer should write a report describing the discussion for the Assessment Work Group. The written report should follow the questions contained in the discussion guide. The report can be broken down into the following sections:

- Background and objectives. This section provides basic information regarding the initiative, purpose, and objectives of the assessment.
- Methodology. This section should describe how, when, and where the focus groups were conducted. It should describe the characteristics of the focus group participants and why they were selected. It should inform readers that discussion results are the opinions of a small sample and should be viewed with that consideration in mind.
- Summary. The summary is approximately one or two pages in length and should provide the reader with the important findings. It is suggested that this section be in a bulleted or numbered format.
- Highlights of findings. This section provides the reader with an in-depth analysis of the questions contained in the discussion guide. This is the section in which quotes and comments should be used to support the research findings.

Validity and Reliability

<http://writing.colostate.edu/guides/research/relval/pop2b.cfm>

Validity

Validity refers to the degree to which a study accurately reflects or assesses the specific concept that the researcher is attempting to measure. While reliability is concerned with the accuracy of the actual measuring instrument or procedure, validity is concerned with the study's success at measuring what the researchers set out to measure.

Researchers should be concerned with both *external* and *internal* validity. External validity refers to the extent to which the results of a study are generalizable or transferable. (Most discussions of external validity focus solely on generalizability; see Campbell and Stanley, 1966. We include a reference here to transferability because many qualitative research studies are not designed to be generalized.)

Internal validity refers to (1) the rigor with which the study was conducted (e.g., the study's design, the care taken to conduct measurements, and decisions concerning what was and wasn't measured) and (2) the extent to which the designers of a study have taken into account alternative explanations for any causal relationships they explore (Huitt, 1998). In studies that do not explore causal relationships, only the first of these definitions should be considered when assessing internal validity.

Reliability

Reliability is the extent to which an experiment, test, or any measuring procedure yields the same result on repeated trials. Without the agreement of independent observers able to replicate research procedures, or the ability to use research tools and procedures that yield consistent measurements, researchers would be unable to satisfactorily draw conclusions, formulate theories, or make claims about the generalizability of their research. In addition to its important role in research, reliability is critical for many parts of our lives, including manufacturing, medicine, and sports.

Margin of Error

http://www.whatisasurvey.info/downloads/pamphlet_current.pdf

Nonsampling and Sampling Error

Surveys are typically designed to provide an estimate of the true value of one or more characteristics of a population at a given time. The target of a survey might be:

- The average value of a measurable quantity, such as annual 2010 income or SAT scores for a particular group.
- A proportion, such as the proportion of likely voters having a certain viewpoint in a mayoral election.
- The percentage of children under three years of age immunized for polio in 2000.

An estimate from a survey is unlikely to exactly equal the true population quantity of interest for a variety of reasons. For one thing, the questions may be badly worded. For another, some people who are supposed to be in the sample may not be at home, or if they are, they may refuse to answer the survey or may not tell the truth. These are sources of *nonsampling error*. *Sampling error*, on the other hand, refers to the results in the sample differing from a target population quantity simply due to the “luck of the draw.”

Margin of Error Defined

The margin of error is a common summary of sampling error which quantifies uncertainty about a survey result. The margin of error can be interpreted by making use of ideas from the laws of probability or the “laws of chance” as they are sometimes called.

Surveys are often conducted by starting out with a list (known as the sampling frame) of all units in the population and choosing a sample. In opinion polls, this list often consists of all possible phone numbers in a certain geographic area.

In a scientific survey, every unit in the population has some known positive probability of being selected for the sample, and the probability of any particular sample being chosen can be calculated. The beauty of a probability sample is twofold. Not only does it avoid biases that might arise if sample were selected based on the whims of the interviewer, but it also provides a basis for estimating the extent of sampling error. This latter property is what enables investigators to calculate a “margin of error.” The laws of probability make it possible to calculate intervals of the form estimate \pm margin of error.

Such intervals are sometimes called 95 percent confidence intervals and would be expected to contain the true value of the target quantity (in the absence of nonsampling errors) at least 95 percent of the time. An important factor in determining the margin of error is the size of the sample. Larger samples are more likely to yield results close to the target population quantity and thus have smaller margins of error than more modest-sized samples (see next section “Strategies for Determining Sample Size”).

What Affects Margin of Error

Three things that affect the margin of error are sample size, the type of sampling done, and the size of the population.

Sample size: The sample size is a crucial factor affecting the margin of error. In sampling, to try and estimate a population proportion, a sample size of 100 will produce a margin of error of no more than about 10 percent. A sample size of 500 will produce a margin of error of no more than about 4.5 percent, and a sample size of 1,000 will produce a margin of error of no more than about 3 percent. This illustrates that there are diminishing returns when trying to reduce the margin of error by increasing the sample size.

Type of Sampling: Three common types of probability sampling designs are simple random sampling, random digit dialing, and stratified sampling.

- Simple random sampling design is one in which every sample of a given size is equally likely to be chosen.
- Telephone surveys that attempt to reach not only people with listed phone numbers but also people with unlisted numbers often rely on the technique of random digit dialing.
- Stratified sampling designs involve defining groups, or strata, based on characteristics known for everyone in the population, and then taking independent samples within each stratum.

Size of Population: One factor that generally has little influence on the margin of error is the size of the population. That is, a sample size of 100 in a population of 10,000 will have almost the same margin of error as a sample size of 100 in a population of 10 million.

Interpreting the Margin of Error

In practice, nonsampling errors occur that can make the margin of error reported for a poll smaller than it should be if it reflected all sources of uncertainty. For example, some respondents to a political survey may not have been eligible to vote but may have answered the survey anyway, while others may have misled the interviewer about their preferences.

Some things that help assess nonsampling uncertainties include the percentage of respondents who answer “don’t know” or “undecided.” Be wary when these quantities are not given. Almost always there are people who have not made up their mind. How these cases are handled can make a big difference. Simply splitting them in proportion to the views of those who gave an opinion can be misleading in some settings.

It is important to learn if the survey results are actually from a probability sample at all. Many media surveys are based on what are called quota samples, and although margins of error are reported from them, they do not strictly apply.

Overall, nonresponse in surveys has been growing in recent years and is increasingly a consideration in the interpretation of reported results. Media stories typically do not provide the response rate, even though these can be well under 50 percent.

Strategies for Determining Sample Size

<http://edis.ifas.ufl.edu/pd006>

There are several approaches to determining the sample size. These include using a census for small populations, imitating a sample size of similar studies, using published tables, and applying formulas to calculate a sample size. Each strategy is discussed below.

Using a Census For Small Populations

One approach is to use the entire population as the sample. Although cost considerations make this impossible for large populations, a census is attractive for small populations (e.g., 200 or less). A census greatly reduces sampling error and provides data on all the individuals in the population. In addition, some costs such as questionnaire design and developing the sampling frame are "fixed," that is, they will be the same for samples of 50 or 200. Finally, virtually the entire population would have to be sampled in small populations to achieve a desirable level of precision.

Using a Sample Size Of a Similar Study

Another approach is to use the same sample size as those of studies similar to the one you plan. Without reviewing the procedures employed in these studies you may run the risk of repeating errors that were made in determining the sample size for another study. However, a review of the literature in your discipline can provide guidance about "typical" sample sizes which are used.

Using Published Tables

A third way to determine sample size is to rely on published tables which provide the sample size for a given set of criteria. [Table 1](#) and [Table 2](#) present sample sizes that would be necessary for given combinations of precision, confidence levels, and variability. Please note two things. First, these sample sizes reflect the number of *obtained* responses, and not necessarily the number of surveys mailed or interviews planned (this number is often increased to compensate for nonresponse). Second, the sample sizes in [Table 1](#) presume that the attributes being measured are distributed normally or nearly so. If this assumption cannot be met, then the entire population may need to be surveyed.

Table 1. Sample size for $\pm 5\%$, $\pm 7\%$ and $\pm 10\%$ Precision Levels Where Confidence Level is 95% and $P=.5$.			
Size of population	Sample Size (n) for Precision (e) of:		
	$\pm 5\%$	$\pm 7\%$	$\pm 10\%$
100	81	67	51
125	96	78	56
150	110	86	61
175	122	94	64
200	134	101	67
225	144	107	70
250	154	112	72
275	163	117	74
300	172	121	76
325	180	125	77
350	187	129	78
375	194	132	80
400	201	135	81
425	207	138	82
450	212	140	82

Table 2. Sample size for $\pm 3\%$, $\pm 5\%$, $\pm 7\%$ and $\pm 10\%$ Precision Levels Where Confidence Level is 95% and $P=.5$

Size of population	Sample Size (n) for Precision (e) of:			
	$\pm 3\%$	$\pm 5\%$	$\pm 7\%$	$\pm 10\%$
500	a	222	145	83
600	a	240	152	86
700	a	255	158	88
800	a	267	163	89
900	a	277	166	90
1,000	a	286	169	91
2,000	714	333	185	95
3,000	811	353	191	97
4,000	870	364	194	98
5,000	909	370	196	98
6,000	938	375	197	98
7,000	959	378	198	99
8,000	976	381	199	99
9,000	989	383	200	99
10,000	1,000	385	200	99
15,000	1,034	390	201	99
20,000	1,053	392	204	100
25,000	1,064	394	204	100
50,000	1,087	397	204	100
100,000	1,099	398	204	100
>100,000	1,111	400	204	100

a = Assumption of normal population is poor (Yamane, 1967). The entire population should be sampled.