Lecture Notes

# Chapter 10: Sampling in Quantitative, Qualitative, and Mixed Research

## Learning Objectives

* 1. Explain the difference between a sample and a census.
	2. Define the key terms used in sampling (*representative sample, generalize, element, statistic, parameter*, and so forth).
	3. Compare and contrast the different random sampling techniques.
	4. Know which sampling techniques are equal probability of selection methods.
	5. Draw a simple random sample.
	6. Draw a systematic sample.
	7. Explain the difference between proportional and disproportional stratified sampling.
	8. Explain the characteristics of one-stage and two-stage cluster sampling.
	9. List and explain the characteristics of the different nonrandom sampling techniques.
	10. Explain the difference between random selection and random assignment.
	11. List the factors that you should consider when determining the appropriate sample size to be selected when using random sampling.
	12. Discuss sampling in qualitative research and compare and contrast the different sampling techniques used in qualitative research.
	13. Explain the two criteria that produce the 10 methods of sampling in mixed research.

## Chapter Summary

Chapter 10 covers sampling in quantitative, qualitative, and mixed research. Sampling is the process through which participants are selected to be part of empirical research studies.

## Annotated Chapter Outline

1. Introduction
	1. **Sampling** is the process of drawing a sample from the population. We use the sample to understand the larger group or population. Findings from the sample are used to **generalize** (to make statements about a population based on sample data) to the population. A sample differs from a census that is a study based on data from the whole population rather than a sample.
	2. The usual goal in sampling is to produce a **representative sample** (i.e., a sample that resembles the population on all characteristics, except that it includes fewer people because it is a sample rather than the complete population). Metaphorically, a perfectly representative sample would be a “mirror image” of the population from which it was selected (again, except that it would include fewer people). **Biased samples** are samples that are systematically different from the population.
	3. Random samples are frequently used in survey research (a nonexperimental research method bases on questionnaires or interviews for data collection). They are almost always more representative than nonrandom samples.
	4. Discussion Question: Discuss the role of sampling in empirical research.
2. Terminology Used in Sampling: Key point
	1. **Sample**: a set of elements taken from a larger population
	2. **Element:** the basic unit that is selected from the population
	3. ***N***: the population size
	4. ***N***: the sample size
	5. **Population**: The large group to which a researcher wants to generalize the sample results.
		1. The sample is a subset of the population that is the full set of elements or people from which you are sampling.
		2. A sample is used to generalize or make statements about a phenomenon in the population without including the entire population.
	6. A **statistic** is a numerical characteristic of a sample.
	7. A **parameter** is a numerical characteristic of population.
		1. We use the statistic from the sample to estimate the value of the population parameter.
		2. They are usually close but not the same.
	8. **Sampling error** refers to the difference between the value of a sample statistic (such as the sample mean) and the true value of the population parameter (such as the population mean).
		1. Some error is always present in sampling. With random sampling methods, however, the error is random rather than systematic or biased.
	9. When beginning to draw a sample, a **sampling frame** (a list of all the elements in a population) is constructed. The researcher draws the sample from the sampling frame using a sampling method. After the sample is drawn, the sample members are contacted and asked whether they will participate.
	10. The **response rate** is the percentage of people in a sample who participate in a research study.
		1. Ideal response rates are 70% or higher but still may be biased.
3. Random Sampling Techniques
	1. **Simple Random Sampling**: A sample drawn by a procedure in which every member of the population has an equal chance of being selected.
		1. It is the most basic type of random sampling.
		2. It is an equal probability sampling method (which is abbreviated by EPSEM).
		3. Remember that EPSEM means “everyone in the sampling frame has an equal chance of being in the final sample.”
		4. Using an EPSEM is important because that is what produces “representative” samples (i.e., samples that represent the populations from which they are selected).
		5. Note: Sampling experts recommend random sampling “without replacement” rather than random sampling “with replacement” because the former is a little more efficient in producing representative samples (i.e., it requires slightly fewer people and is therefore a little cheaper).
		6. Drawing a simple random sample
			1. Put all the names from your population onto pieces of paper, put them in a hat, and select a subset (e.g., pull out 100 names from the hat).
			2. The chapter demonstrates the use of a **table** **of random numbers** (a list of numbers that fall in a random order).
			3. Now, researchers often use computer programs to randomly select their samples. See www.randomizer.org and www.random.org
			4. To use a **random number generator** (a computer program that produces random numbers used in random assignment and random selection), each of the people in the population must be given a number. The program gives a list of randomly selected numbers within the range the researcher provides. After getting the random numbers, identify the people with those selected numbers and try to get them to participate in your research study! An example of using a random number generator is provided in the book.
			5. To use a table of random numbers (such as the one in Table 10.1 in the book), first pick a place to start and then move in one direction (e.g., move down the columns). Use the number of digits in the table that is appropriate for the population size (e.g., if there are 2,500 people in the population then use four digits). Once you get the number of selected numbers needed, find out who those people are and get them to participate in your research study. Note: if you get the same number twice, just ignore it and move on to the next number.
			6. Discussion Question: Explain the procedure for simple random sampling and how it addresses sampling bias.
	2. Systematic Random Sampling
		1. Systematic Sample: a sample obtained by determining the **sampling interval** (the population size divided by the desired sample size which is symbolized by *k*), selecting a random **starting point** between (and including) 1 and *k*, and then selecting every *k*th element. When you get to the end of your sampling frame, you will have all the people to be included in your sample.
		2. One potential (but rarely occurring) problem in systematic sampling is called **periodicity** (the presence of a cyclical pattern in the sampling frame). It can occur when you attach several ordered lists to one another (e.g., if you take lists from multiple teachers who have all ordered their individual class lists according to a variable such as grades or IQ). Stratification like this is not a problem if you have only one list. Basically, if you ever attach multiple lists to one another, there could be a problem. It is better to reorganize all lists into one overall list (i.e., into a new, unordered sampling frame).
		3. Discussion Question: Explain why periodicity is a problem for systematic random sampling and how researchers can deal with periodicity.
	3. **Stratified Random Sampling**
		1. **Stratified Sampling**: dividing the population into mutually exclusive groups and then selecting a random sample from each group. The groups are called the **stratification variable** (the variable on which the population is divided). Two types: proportional stratified sampling and disproportional stratified sampling
		2. **Proportional Stratified Sampling**: type of stratified sampling in which the sample proportions are made to be the same as the population proportions on the stratification variable. Most commonly used form of stratified sampling. Proportional stratified sampling is an equal probability sampling method (i.e., it is EPSEM)
		3. **Disproportional Stratified Sampling**: a type of stratified sampling in which the sample proportions are made to be different from the population proportions on the stratification variable. This is an EPSEM method of sampling
		4. Here is an example showing the difference between proportional and disproportional stratified sampling:
			1. Assume that your population is 75% female and 25% male members. Assume that you want a sample of size 100 and you want to stratify on the variable called gender.
			2. For proportional stratified sampling, you would randomly select 75 females and 25 males from the gender populations.
			3. For disproportional stratified sampling, you might randomly select 50 females and 50 males from the gender populations.
		5. Discussion Question:Discuss situations in which proportional or disproportional stratified sampling should be used.
	4. Cluster Random Sampling:
		1. **Cluster sampling:** Type of sampling in which **clusters** (a collective type of unit that includes multiple elements) are randomly selected. Requires a larger sample size than other methods, is less accurate for a given sample size, but is sometimes preferred. Cluster sampling is an EPSEM only if the clusters are approximately the same size.
		2. Two types of cluster sampling: One-Stage Cluster Sampling and Two-Stage Cluster Sampling
		3. **One-Stage Cluster Sampling:** a set of clusters is randomly selected and all the cases in the selected clusters are included in the sample.
		4. **Two-Stage Cluster Sampling:** a set of clusters is randomly selected, and then a random sample of elements is drawn from each of the clusters selected in Stage 1.
			1. **Probability Proportional to Size:** a type of two-stage cluster sampling in which each cluster’s chance of being selected in Stage 1 depends upon its populations size. If clusters are not equal sized, this method will make the cluster sampling EPSEM.
		5. Discussion Question: Compare and contrast the two methods of cluster sampling.
4. Nonrandom Sampling Techniques: The other major type of sampling used in quantitative research is nonrandom sampling. In nonrandom sampling, you do not use a random sampling technique. There are four types of nonrandom sampling.
	1. **Convenience Sampling:** including people who are available, volunteer, or can be easily recruited in the sample
		1. Cannot generalize to the population
		2. Description of the sample is important.
		3. Most research is based on convenience samples, however
		4. Discussion Question: Discuss the difficulty faced with generalizing from research based on convenience samples.
	2. **Quota Sampling:** The researcher determines the appropriate sample sizes or quotas for the groups identified as important and takes convenience samples from those groups.
		1. For example: A set of quotas might be as follows: find 25 African American males, 25 European American males, 25 African American females, and 25 European American females. You use convenience sampling to find the people; the key is to make sure you have the right number of people for each group quota.
		2. Discussion Question: When might it be a good idea to use quota sampling?
	3. **Purposive Sampling**: The researcher specifies the characteristics of the population of interest and locates individuals with those characteristics.
		1. For example, you might decide that you want to only include “boys who are in the seventh grade and have been diagnosed with ADHD” in your research study. You might try to find 50 students who meet your “inclusion criteria” and include them in your research study.
		2. Also known as judgmental sampling
		3. Discussion Question: Under what conditions might purposive sampling be used?
	4. **Snowball Sampling:** Each research participant is asked to identify other potential research participants.
		1. You start with one or a few participants, ask them for more potential participants of a certain type, find those, ask them for some more, and continue this process until you have a sufficient sample size. This technique is used for selecting hard to find populations (e.g., where no sampling frame exists). For example, you might use snowball sampling if you want to do a study of people in your city who have a lot of power in the area of educational policymaking (in addition to the well-known positions of power such as school board members and the superintendent).
		2. Discussion Question: Describe the pros and cons of snowball sampling.
5. Random Selection and Random Assignment: random selection and random assignment are different, and the difference must be understood.
	1. In **random selection** (randomly selecting a group of people from a population), the researcher selects a sample from a population using one of the random sampling techniques discussed earlier.
		1. The purpose is to obtain a sample that represents the population so the researcher can make generalizations from the sample to the population.
		2. If an EPSEM technique is used, the resulting sample will be like a “mirror image” of the population, except for chance differences.
		3. For example, if you randomly select (e.g., using simple random sampling) 1,000 people from the adult population in Ann Arbor, MI, the sample will look like the adult population of Ann Arbor.
	2. In **random assignment** (randomly assigning a set of people to different groups), you start with a set of people (you already have a sample obtained from any sampling method) and then you randomly divide that sample into two or more groups (i.e., you take the full set and randomly divide it into subsets).
		1. Your purpose it to produce two or more groups that are similar to each other on all characteristics.
		2. You are taking a set of people and randomly “assigning” them to two or more groups.
		3. Assign them to two groups of 50 people, the two groups will be “equivalent” on all known and unknown variables.
		4. Random assignment generates similar groups; it is used in experimental research to produce the strongest experimental research designs.
	3. Discussion Question: Discuss the importance of random selection and random assignment, individually and together, impact research conclusions and generalization.
6. Determining the Sample Size When Random Sampling Is Used: the larger the sample size the better because larger samples have smaller sampling errors which means the sample statistics will be more similar to the population parameters.
	1. If the population is only100 people or fewer, then include the entire population in study rather than taking a sample (i.e., do not take a sample, include everyone).
	2. For an exact number of people to sample, just look at Table 10.5 that shows recommended sample sizes.
	3. The more homogeneous a population the smaller the sample size can be.
	4. The more categories or breakdowns you want to look at in analyzing data, larger sample sizes will be needed.
	5. The larger the sample size, the greater the precision of statements about the population based on the sample.
	6. If you expect a weak relationship between variables, larger sample sizes are needed.
	7. The more efficient the random sampling methods, the smaller the sample size needs to be.
	8. Oversample because some people will refuse to participate.
	9. Discussion Question: Summarize the authors’ suggestions about how big a sample size researchers should have.
7. Sampling in Qualitative Research
	1. **Comprehensive Sampling:** including all cases in the research study
	2. **Maximum Variation Sampling:** purposively selecting a wide range of cases
	3. **Homogeneous Sample Selection:** selecting a small and homogeneous case or set of cases for intensive study
	4. **Extreme-Case Sampling:** identifying the extremes or poles of some characteristic and then selecting cases representing these extremes for examination
	5. **Typical-Case Sampling:** selecting what are believed to be average cases
	6. **Critical-Case Sampling:** selecting what are believed to be particularly important cases
	7. **Negative-Case Sampling:** selecting cases that are expected to disconfirm the researcher’s expectations and generalizations
	8. **Opportunistic Sampling:** selecting cases when the opportunity occurs
	9. **Theoretical Sampling:** The researcher continues to collect additional (usually interview) data over time that should help in developing a good theoretical explanation about the phenomenon being studied.
		1. **Theoretical saturation:** when the asking of new questions and collection of additional data no longer seem to call for modifications to the researcher’s theory/explanation and conclusions.
	10. **Mixed Purposeful Sampling:** the mixing of more than one sampling strategy
	11. Discussion Question: Compare and contrast the different sampling methods used in qualitative research.
8. Sampling in Mixed Research: choose sampling scheme and sample size for quantitative and qualitative components.
	1. Mixed sampling designs are classified according to two major criteria:
		1. **Time orientation criterion**: refers to whether the samples are taken concurrently or sequentially
			1. In a concurrent time orientation, the data are collected for the quantitative and qualitative phases of the study at approximately the same time. Both sets of data are interpreted during data analysis and interpretation.
			2. In a sequential time orientation, the data obtained in stages; the data from the first stage are used to shape selection of data in the second stage.
		2. **Sample relationship criterion:** refers to whether the samples, taken in combination, are identical, parallel, nonparallel, nested, or multilevel.
			1. In an identical sample relation, the same people participate in the quantitative and qualitative phases of your study.
			2. In a parallel sample relation, separate quantitative and qualitative samples are drawn from the same population and they participate in your study.
			3. In a nonparallel sample relation, the samples are drawn from different populations.
			4. In a nested sample relation, the participants selected for one phase are a subset of the participants selected for the other phase.
			5. In a multilevel sample relation, the quantitative and qualitative samples are selected from different levels of a population.
		3. Result in 10 **mixed sampling designs** (the 10 sampling designs that result from crossing the time orientation criterion and the sample relationship criterion).
			1. In an identical sequential sampling design, quantitative and qualitative data are collected from the same people (identical) in stages (sequential).
			2. In a parallel concurrent sampling design, separate quantitative and qualitative samples are selected from the same population (parallel), and data are collected at approximately the same time (concurrently).
			3. In a parallel sequential sampling design, separate quantitative and qualitative samples are selected from the same population (parallel), and data are collected from these two samples in stages (sequentially).
			4. In a nonparallel concurrent sampling design, separate quantitative and qualitative samples are selected from different populations (nonparallel) and data are collected at approximately the same time (concurrently).
			5. In a nonparallel sequential sampling design, separate quantitative and qualitative samples are selected from different populations (nonparallel), and data are collected from these two populations in stages (sequentially).
			6. In a nested concurrent sampling design, the participants selected for one phase are a subset of the participants selected for the other phase (nested), and data are collected at approximately the same time (concurrently).
			7. In a nested sequential sampling design, the participants selected for one phase are a subset of the participants selected for the other phase (nested), and data are collected from these two samples in stages (sequentially).
			8. In a multilevel concurrent sampling design, the quantitative and qualitative samples are selected from different levels of a population (multilevel), and data are collected at approximately the same time (concurrently).
			9. In a multilevel sequential sampling design, the quantitative and qualitative samples are selected from different levels of a population (multilevel), and data are collected from these two samples in stages (sequentially).
		4. Once you have selected one of the mixed sampling designs, you select the sampling method and sample size for both the quantitative and qualitative phases.
			1. For the quantitative phase, use one of the quantitative sampling methods discussed earlier in the chapter.
			2. For the qualitative phase, use one of the qualitative sampling methods discussed earlier in the chapter.