Research Sampling:
Procedures, Methods, & Issues

Sampling…

- **The process of selecting a number of individuals for a study in such a way that the individuals represent the larger group from which they were selected**

Sample…

…the representatives selected for a study whose characteristics exemplify the larger group from which they were selected

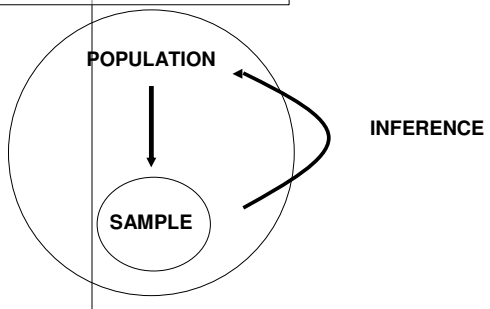
Population…

…the larger group from which individuals are selected to participate in a study

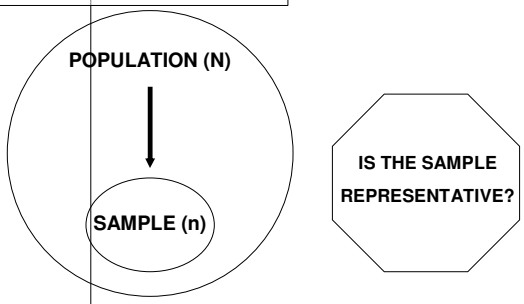
The purpose for sampling…

- **To gather data about the population in order to make an inference that can be generalized to the population**

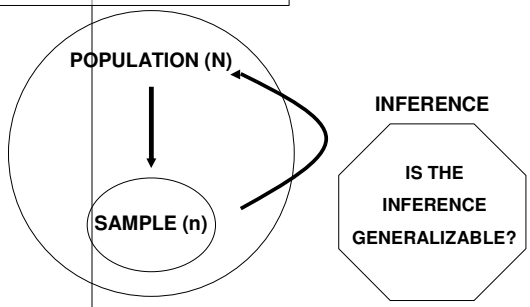
The sampling process…



Regarding the sample…



Regarding the inference…



Mistakes to be conscious of...

1. Sampling error

2. Sampling bias

…which threaten to render a study's findings invalid

Sampling error…

…the chance and random variation in variables that occurs when any sample is selected from the population

…sampling error is to be expected

…to avoid sampling error, a *census* of the entire population must be taken

…to control for sampling error, researchers use various sampling methods

Sampling bias…

…nonrandom differences, generally the fault of the researcher, which cause the sample is over-represent individuals or groups within the population and which lead to invalid findings

…sources of sampling bias include the use of volunteers and available groups

Steps in sampling...

1. **Define population (N) to be sampled**
2. **Determine sample size (n)**
3. **Control for bias and error**
4. **Select sample**

1. Define population to be sampled...

- **Identify the group of interest and its characteristics to which the findings of the study will be generalized**
  - **…called the "target" population (the ideal selection)**
  - **…oftentimes the "accessible" or "available" population must be used (the realistic selection)**

2. Determine the sample size...

- **The size of the sample influences both the representativeness of the sample and the statistical analysis of the data**
  - **…larger samples are more likely to detect a difference between different groups**
  - **…smaller samples are more likely not to be representative**

Rules of thumb for determining the sample size...

1. **The larger the population size, the smaller the percentage of the population required to get a representative sample**
2. **For smaller samples (N ‹ 100), there is little point in sampling. Survey the entire population.**

3. **If the population size is around 500 (give or take 100), 50% should be sampled.**
4. **If the population size is around 1500, 20% should be sampled.**
5. **Beyond a certain point (N = 5000), the population size is almost irrelevant and a sample size of 400 may be adequate.**

3. Control for sampling bias and error...

- **Be aware of the sources of sampling bias and identify how to avoid it**
- **Decide whether the bias is so severe that the results of the study will be seriously affected**
- **In the final report, document awareness of bias, rationale for proceeding, and potential effects**

4. Select the sample...

- **A process by which the researcher attempts to ensure that the sample is representative of the population from which it is to be selected**

  …requires identifying the sampling method that will be used

Advantages

- **It saves time, money and effort**
- **It makes possible the study of large, heterogeneous population**
- **It is more effective**
- **It is faster and cheaper**
- **It gives a more comprehensive information**

Disadvantages

- **Sample data involve more care in preparing detailed subclassifications because of a small number of subjects.**
- **If the sampling plan is not correctly designed and followed, the results may be misleading.**
- **Sampling requires an expert to conduct the study in an area. If this is lacking, the results could be erroneous.**
- **The characteristic to be observed may occur rarely in a population.**
- **Complicated sampling plans are laborious to prepare.**

Guidelines

- When the universe or population is more or less homogenous and only the typical, normal, or average is desired to be known, a smaller sample is enough. However, if differences are desired to be known, a larger sample is needed.
- When the population is more or less heterogeneous and only the typical, normal or average is desired to be known, a larger sample is needed. However, if only their differences are desired to be known. A smaller sample is sufficient.

Guidelines

- The size of a sample varies inversely as the size of the population . A larger proportion is required of a smaller population and a smaller proportion may do for a larger population. For a population of five thousand, a sample of 10 percent may do but for a population of five hundred, a proportion of 30 percent may be required.
- For a greater accuracy and reliability of results, a greater sample is desirable.

Guidelines

- In biological and chemical experiments such as testing the effects of drugs and other substances, the use of a few persons is more suitable in determining the effects of the said drugs and substances to human subjects.
- When the research design is likely to destroy the subject, it is more feasible to use non-humans such as animals.

Determination of Sample Size (Slovin's Formula)

$$n = \frac{N}{1 + Ne^2}$$

Where: n = a sample size
N = population size
e = desired margin of error (percent allowance for non-precision because of the use of the sample instead of the population)

For instance, in your research, if the population is 9,000 and the margin of error you allow is 2%, what is your representative sample? Though computation, your obtained sample size will be 1,957. This is attained through the computation below:

$$n = \frac{N}{1 + Ne^2}$$

$$= \frac{9,000}{1 + 9,000(.02)^2}$$

$$= \frac{9,000}{1 + 9,000(.0004)}$$

$$= \frac{9,000}{1 + 3.6}$$

$$= \frac{9,000}{4.6}$$

$$= 1,957$$

Always remember that the assumption of a normal distribution of the population should be considered. When the normal approximation of your population is small or poor, this sample size formula does not apply.

	Margins of Error					
Population	± 1%	± 2%	± 3%	± 4%	± 5%	± 10%
500	*	*	*	*	222	83
1,500	*	*	638	441	316	94
2,500	*	1250	769	500	345	96
3,000	*	1364	811	517	353	97
4,000	*	1538	870	541	364	98
5,000	*	1667	909	556	370	98
6,000	*	1765	938	566	375	98
7,000	*	1842	959	574	378	99
8,000	*	1905	976	580	381	99
9,000	*	1957	989	584	383	99
10,000	5000	2000	1000	588	385	99
15,000	8333	2381	1087	617	387	100

Minimum Acceptable Sizes

- **Descriptive research** – 10 percent of the population. For smaller populations, a minimum of 20 percent may be required.
- **Correlational research** – 30 subjects.
- **Ex post facto or casual comparative research** – 15 subjects per group.
- **Experimental research** – 15 subjects per group. Some authorities believe that 30 per group should be considered minimum.

Approaches to quantitative sampling...

1. **Random: allows a procedure governed by chance to select the sample; controls for sampling bias**
2. **Nonrandom ("nonprobability"): does not have random sampling at any state of the sample selection; increases probability of sampling bias**

Random sampling methods...

1. **Simple random sampling**
2. **Stratified sampling**
3. **Cluster sampling**
4. **Systematic sampling**

1. **Simple random sampling: the process of selecting a sample that allows individual in the defined population to have an equal and independent chance of being selected for the sample**

Steps in random sampling...

1. **Identify and define the population.**
2. **Determine the desired sample size.**
3. **List all members of the population.**
4. **Assign all individuals on the list a consecutive number from zero to the required number. Each individual must have the same number of digits as each other individual.**

5. **Select an arbitrary number in the table of random numbers.**
6. **For the selected number, look only at the number of digits assigned to each population member.**

7. **If the number corresponds to the number assigned to any of the individuals in the population, then that individual is included in the sample.**
8. **Go to the next number in the column and repeat step #7 until the desired number of individuals has been selected for the sample.**

advantages…

…easy to conduct

…strategy requires minimum knowledge of the population to be sampled

disadvantages…

…need names of all population members

…may over- represent or under- estimate sample members

…there is difficulty in reaching all selected in the sample

2. Stratified sampling: the process of selecting a sample that allows identified subgroups in the defined population to be represented in the same proportion that they exist in the population

Steps in stratified sampling...

1. **Identify and define the population.**
2. **Determine the desired sample size.**
3. **Identify the variable and subgroups (strata) for which you want to guarantee appropriate, equal representation.**

4. **Classify all members of the population as members of one identified subgroup.**
5. **Randomly select, using a table of random numbers) an "*appropriate*" number of individuals from each of the subgroups, appropriate meaning *an equal number of individuals***

advantages…

…more precise sample

…can be used for both proportions and stratification sampling

…sample represents the desired strata

disadvantages…

…need names of all population members

…there is difficulty in reaching all selected in the sample

3. Cluster sampling: the process of randomly selecting intact groups, not individuals, within the defined population sharing similar characteristics

Steps in cluster sampling...

1. **Identify and define the population.**
2. **Determine the desired sample size.**
3. **Identify and define a logical cluster.**
4. **List all clusters (or obtain a list) that make up the population of clusters.**
5. **Estimate the average number of population members per cluster.**
6. **Determine the number of clusters needed by dividing the sample size by the estimated size of a cluster.**
7. **Randomly select the needed number of clusters by using a table of random numbers.**
8. **Include in your study all population members in each selected cluster.**

advantages…

…efficient

…researcher doesn't need names of all population members

…reduces travel to site

…useful for educational research

disadvantages…

…fewer sampling points make it less like that the sample is representative

4. Systematic sampling: the process of selecting individuals within the defined population from a list by taking every *K*th name.

Steps in systematic sampling...

1. **Identify and define the population.**
2. **Determine the desired sample size.**
3. **Obtain a list of the population.**
4. **Determine what *K* is equal to by dividing the size of the population by the desired sample size.**

5. Start at some random place in the population list. Close you eyes and point your finger to a name.
6. Starting at that point, take every *K*th name on the list until the desired sample size is reached.
7. If the end of the list is reached before the desired sample is reached, go back to the top of the list.

advantages…

…sample selection is simple

disadvantages…

…all members of the population do not have an equal chance of being selected

…the *K*th person may be related to a periodical order in the population list, producing unrepresentativeness in the sample

Nonrandom sampling methods...

1. Convenience sampling
2. Purposive sampling
3. Quota sampling

1. Convenience sampling: the process of including whoever happens to be available at the time
   - …called "accidental" or "haphazard" sampling

disadvantages…

…difficulty in determining how much of the effect (dependent variable) results from the cause (independent variable)

2. Purposive sampling: the process whereby the researcher selects a sample based on experience or knowledge of the group to be sampled

…called "judgment" sampling

disadvantages…

…potential for inaccuracy in the researcher's criteria and resulting sample selections

3. Quota sampling: the process whereby a researcher gathers data from individuals possessing identified characteristics and quotas

disadvantages…

…people who are less accessible (more difficult to contact, more reluctant to participate) are under-represented

Approaches to qualitative sampling...

…qualitative research is characterized by in-depth inquiry, immersion in a setting, emphasis on context, concern with participants' perspectives, and description of a single setting, not generalization to many settings

…because samples need to be small and many potential participants are unwilling to undergo the demands of participation, most qualitative research samples are purposive

…representativeness is secondary to the quality of the participants' ability to provide the desired information about self and setting

1. Intensity sampling: selecting participants who permit study of different levels of the research topic
2. Homogeneous sampling: selecting participants who are very similar in experience, perspective, or outlook

3. Criterion sampling: selecting all cases that meet some pre-defined characteristic
4. Snowball sampling: selecting a few individuals who can identify other individuals who can identify still other individuals who might be good participants for a study

5. Random purposive sampling: with a small sample, selecting by random means participants who were purposively selected and are too numerous to include all in the study

The next module will focus on...

instruments

...the tools researchers use to gather data for a study