

Research Population & Sampling

Final Project

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Lecture 5



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By the end of this chapter, you will be able to understand the following knowledge:

- Identify the concept of both the population and the study sample.
- Recognize the need to use the sampling method.
- Identify the types of random and non-random samples.
- Learn how to determine the sample size.

Contents

By the end of this chapter, you will possess the following Skills:

- The ability to define the framework of the study population.
- The ability to distinguish and compare different types of samples.
- The ability to choose the appropriate sample according to the nature and objectives of the research and the study population.
- The ability to estimate the appropriate size of the study sample.

Introduction

- ❑ The stage of defining the research community and selecting the appropriate sample for research represents an essential stage in the scientific research process, whereby the tools that will be used in collecting the data are determined, as well as the methods of analyzing these data that are collected, whether from the research community or the sample, and the generalizability of the results obtained.

Introduction

- ❑ In some cases, the researcher may not have sufficient skills to help him identify the research Population, which leads the researcher to a wrong choice of the sample used, which entails the inadequacy of the tools employed to analyze the data collected, and then the lack of The credibility of the results obtained

Introduction

- ❑ In this chapter, we will try to address some of the concepts of the research Population, the types of samples that the researcher can use, the skills that help the researcher in choosing the appropriate sample for his research, and how to determine the sample size, to reach data with a high degree of accuracy and then the credibility of the research results. That is reached.

Study Population & Sample

❑ Study Population

The study population is a subset of the target population from which the sample is actually selected.

❑ Sample

"A subgroup of the study population that the researcher chooses according to certain bases to collect data from them that enable him to study the phenomenon under research and test hypotheses, and then the possibility of generalizing the results to the study population."

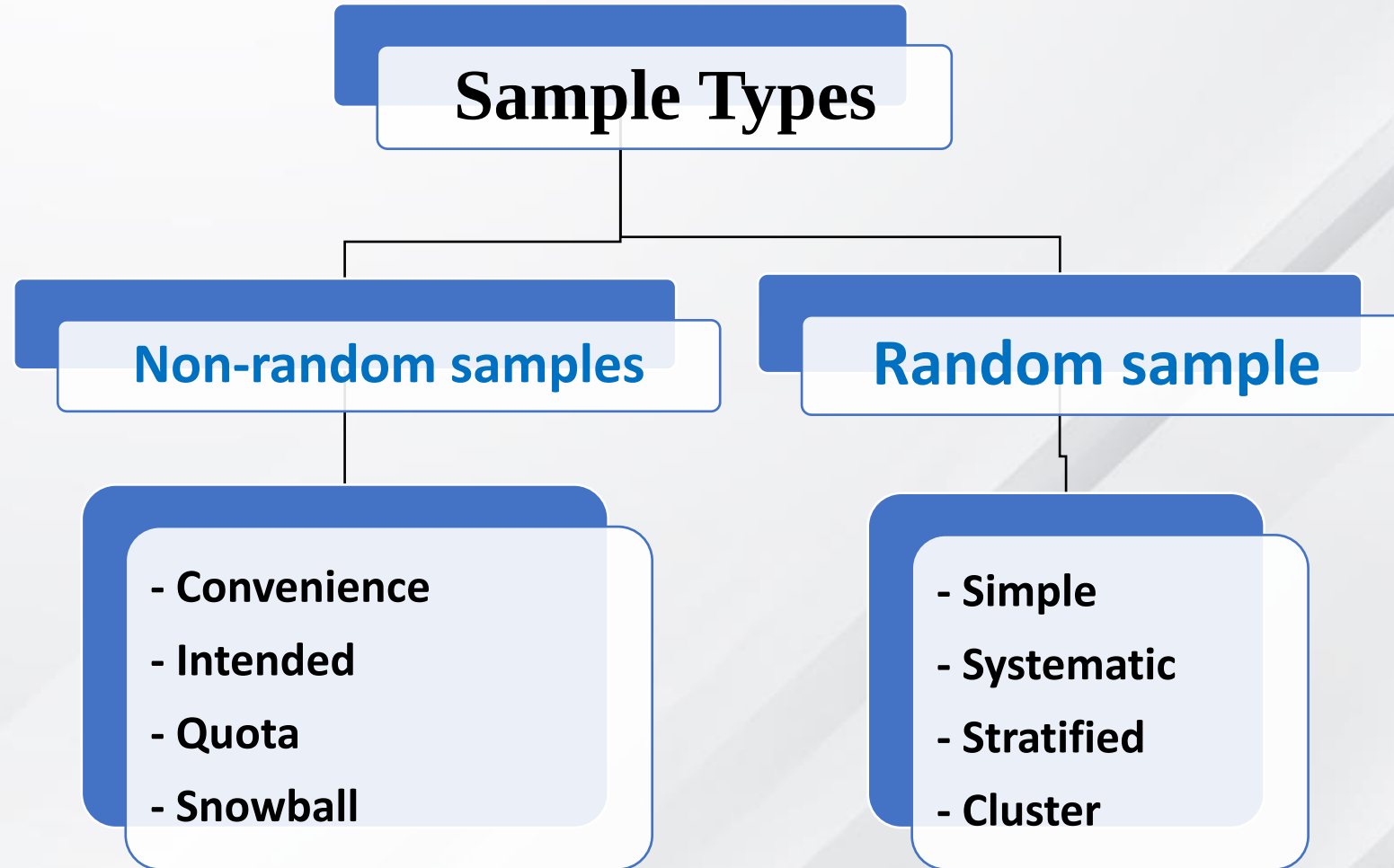
Study Population & Sample

The study population is the operational definition of the target population (Henry, 1990; Bickman & Rog, 1998). Researchers are seldom in a position to study the entire target population, which is not always readily accessible. Instead, only part of it—respondents who are both eligible for the study. (Hu, S., 2014)

Reasons for using the sample method

- Geographical spread of the study population
- Difficulty identifying the study population
- Time factor
- Cost element
- Changes in the study population
- control and supervision
- The extent of the homogeneity of the Study Population

Sample Types



1. Random (Probability) Samples

- ❑ It depends on the equality of the probabilities of choosing any member of the original community.
- ❑ Randomness is the researcher's way of achieving parity between individuals.
- ❑ The researcher is given a representative sample of its population at a lower cost while avoiding the researcher's selection bias and the resulting problems that question the validity of the results.
- ❑ The probability samples participate in defining the study population, preparing a list of its components, and then choosing a sample of sufficient size to represent the characteristics of the population.

1.1 Simple Random Samples

- A simple random sample is a technique for selecting a subgroup of a population where the prospect of getting selected is equal for all the population members.
- Since the sample is selected randomly or by chance, a simple random sample fairly represents the characteristics of the population under study.
- A simple random sample can be chosen randomly from any defined population, assuming that every member is eligible to be picked.

1.1 Simple Random Samples

Lottery method

When the population list is prepared, each member of the population is marked with a number. The numbers are drawn randomly from the box to select samples. In our example, the researcher must choose 300 students from 15,000. All the students are assigned a number. The researcher will randomly draw 300 numbers out of a box filled with numbers from 1 to 15,000.

1.1 Advantages of Simple Random Samples

- Study Population items have equal chances of selection.
- Don't be bound by a specific order or planned system.
- No prior knowledge of the study population is required.
- Due to its reliance on the law of probability, it avoids bias.
- The sample can be pulled easily from lists that include data on the study population.
- Low sampling error as it requires the homogeneity of the study population.
- Using computer programs for selection can save time, effort, and money.

Disadvantages of Simple Random Samples

- Tables of random numbers are tedious, especially if the sample is large.
- Advanced lists are not available for the study community, and if they are, they are usually inaccurate
- In the case of uncertainty about the homogeneity of the study population, the results obtained may lead to errors.

1.2 Systematic Sample

- In which the individual is selected from the sample randomly, then the researcher proceeds to choose the rest of the cases on regular or equal numerical dimensions between the cases so that the distance between any two successive units is fixed in all cases k .

1.2 Systematic Sample

❑ We follow the following steps:

- 1- Determine the original community (N)
- 2- Determine the desired sample size (n)
- 3- Determining the skip interval (the distance between the sample members) through $K = N/n$
- 4- Randomly choose a number between (1 and the value of K)
- 5- Add to the chosen number the value of K regularly to get the sample you want

1.2 Systematic Sample

Example: If the original population consists of (100) units, and we want to obtain a sample of (20) units, how can you achieve this using regular random sampling?

$$K = N/n$$

$$N=100 \text{ \& } n=20$$

$$K=100/20=5$$

Now choose a number between (1 and 5), let it be (4), and that is random, and we make the number (4) the starting point, and we add (5) to it constantly and regularly, so that the size of the selected sample becomes (20) individuals.

1.2 Systematic Sample

knowing that :

1. The first case was randomly selected, which is (4)
2. Second case = First case + $K = 4 + 5 = 9$
3. 3rd case = 2nd case + $K = 9 + 5 = 14$
4. Fourth case = Third case + $K = 14 + 5 = 19$

Thus, it becomes clear that to determine any unit, we must know the unit number that precedes it and then add to it the length of the category

1.2 Advantages Systematic Sample

- Easy to Execute and Understand.
- Control and Sense of Process.
- Clustered Selection Eliminated.
- Low-Risk Factor.
- Assumes the Size of the Population Can Be Determined.
- Need for a Natural Degree of Randomness.
- Greater Risk of Data Manipulation

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1.3 Stratified Random Sample

- Stratified random sampling allows researchers to obtain a sample population that best represents the studied population by dividing it into **subgroups called strata**.
- To increase the probability of representing the characteristics of the population in the sample, we resort to **stratified random sampling**.
- It is another type of random sampling, but it deals with a **heterogeneous population**.

1.3 Stratified Random Sample

- 1- Identification of the Whole Population.
- 2- Determining the sub-population based on the characteristics of the population.
- 3- Determine the sample size
- 4- Classify the members of society according to the previously defined sub-classes so that each individual belongs to **only one group**.
- 5- Choosing a simple random sample from each sub-layer.

1.3 Stratified Random Sample

❑ Stratified random sampling divides the population into smaller groups, or strata, based on shared characteristics. A random sample is taken from each stratum in direct proportion to the stratum's size compared to the population.

❑ Equal Method:

An equal number is taken from each stratum, even if the number of individuals differs.

- There is equality between classes, even in the case of difference.

1.3 Stratified Random Sample

□ Proportional Method :

A number is taken here proportional to the percentage each population stratum represents. If we have a population whose size is (n) and can be divided into several layers with different sizes, we are supposed to choose samples from each.

1.3 Stratified Random Sample

❑ Ideal Method :

This method is one of the most accurate methods, as it does not limit the number to each stratum of the population but rather is concerned with the degree of variance within each layer; if it is large, the number increases, and if the group is homogeneous, the number decreases.

1.3 Stratified Random Sample

❑ The following is an example of stratified random sampling:

Researchers are performing a study designed to evaluate the political leanings of economics students at a major university. The researchers want to ensure the random sample best approximates the student population, including gender, undergraduates, and graduate students.

1.3 Stratified Random Sample

❑ The following is an example of stratified random sampling:

The total population in the study is **1,000** students and from there, subgroups are created as shown below.

- Male undergraduates = 450 students (out of 100) or 45% of the population
- Female undergraduates = 200 students or 20%
- Male graduate students = 200 students or 20%
- Female graduate students = 150 students or 15%

1.3 Stratified Random Sample

❑ The following is an example of stratified random sampling:

The Faculty members' training needs

- Lecturer = $500 * 20\% = 100$
- Assistant Prof = $1000 * 20\% = 200$
- Associate Prof = $300 * 20\% = 60$
- Professor = $100 * 20\% = 20$
- Total = $1900 * 20\% = \mathbf{380}$

1.3 Stratified Random Sample Advantage

Accurately Reflects Population Studied

Stratified random sampling accurately reflects the studied population because researchers are stratifying the entire population before applying random sampling methods. In short, it ensures that each subgroup within the population receives proper representation within the sample.

As a result, stratified random sampling provides better coverage of the population since the researchers control the subgroups to ensure that all of them are represented in the sampling.

(Murphy, 2021)

1.3 Stratified Random Sample Disadvantage

Can't Be Used in All Studies

This method of research cannot be used in every study. Several conditions must be met for it to be used properly. Researchers must identify **every member of a population being studied** and classify each of them into one, and only one, **subpopulation**. As a result, stratified random sampling is disadvantageous when researchers can't confidently classify every member of the population into a subgroup. Also, finding an exhaustive and definitive list of an entire **population** can be challenging.

(Murphy, 2021)

1.4 Cluster Random sampling

- In cluster sampling, researchers divide a population into smaller groups known as **clusters**. They then randomly select among these clusters to form a sample.
- Cluster sampling is a probability sampling method often used to study large populations, particularly those widely dispersed. Researchers usually use pre-existing units such as schools or cities as their clusters.

(Thomas, 2022)

1.4 Cluster Random sampling

Step 1: Define your population

As with other forms of sampling, you must first begin by clearly defining the population you wish to study.

Step 2: Divide your sample into clusters

This is the most essential part of the process. The quality of your clusters and how well they represent the larger population determines the validity of your results.

(Thomas, 2022)

1.4 Cluster Random sampling

Step 3: Randomly select clusters to use as your sample

If each cluster is a mini-representation of the larger population, randomly selecting and sampling from the clusters allows you to imitate simple random sampling, which supports the validity of your results.

Step 4: Collect data from the sample

You then conduct your study and collect data from every unit in the selected clusters.

(Thomas, 2022)

1.4 Cluster Random sampling

A researcher aims to identify the thoughts of primary school teachers about the role of the educational supervisor in the educational process and the community consists of **(5000)** teachers distributed over **(100)** schools, and it wants to obtain a sample of **(500)** teachers. How is this done using cluster randomization?

- 1- The size of the community (5000) teachers.
- 2- The desired sample size (500) teachers.
- 3- The average number of teachers in schools = $5000 \div 100 = 50$ teachers in each school.
- 4- The number of selected clusters (schools) = $500 \div 50 = 10$ schools.
- 5- The researcher randomly selects (10) schools from (100).
- 6- The sample size is all teachers in the selected schools.

1.4 Cluster Random Sampling Advantages

- Cluster sampling is time- and cost-efficient, especially for samples that are widely geographically spread and would be difficult to sample otherwise correctly.
- Because cluster sampling uses randomization if the population is clustered properly, your study will have high external validity because your sample will reflect the characteristics of the larger population.

(Thomas, 2022)

1.4 Cluster Random Sampling Disadvantages

- Internal validity is less strong than with simple random sampling, particularly as you use more stages of clustering.
- If your clusters are not a good mini-representation of the population as a whole, then it is more difficult to rely upon your sample to provide valid results.
- Cluster sampling is much more complex to plan than other forms of sampling.

(Thomas, 2022)



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Thank You

