Sampling Designs

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Sampling is a way of getting a representative portion of the target population.

Regardless of the research design (descriptive or experimental) used by a researcher, sampling is needed for practical reasons especially when the population is very large. A total population of 100 or less may not need to be sampled but more than this, sampling is desirable for effectiveness, efficiency and economy in data gathering.

Population and Sample

Population and sample are two important concepts in research particularly in determining the sources of data. Population refers to the total number of people a researcher wants to study. Sample refers to the people chosen to represent the population.

Sampling is needed in a research involving a large population that may be limited by human resources, money, materials and machinery. According to Calmorin and Calmorin (2012), the use of total population is advisable for a population of a hundred or less. More than a hundred requires sampling. The strengths and weaknesses of sampling are enumerated by Calmorin and Calmorin (2012).

Strengths:

Time, money, and effort are minimized. By sampling, the number of respondents, subjects or items to be studied becomes small yet they represent the population. As such, data collection, analysis and interpretation are lessened.

Sampling is more effective. Since every individual in the population is given a chance to be selected through sampling, data are scientifically gathered, analyzed and interpreted.

Research is made faster and cheaper. By selecting a small portion of the population as representative, collection, analysis, and interpretation of data are faster and cheaper.

Sampling makes research more accurate. Because of the small size of the data collected from a small number of sources, collection, tabulation, presentation, analysis, and interpretation have fewer errors as compared to voluminous data from the whole population.

Sampling gives more comprehensive information. With a small sample representing a big population, a thoroughly investigated study can yield results that give more comprehensive information that allows generalization and conclusions.

Weaknesses:

Due to the limited number of data source, detailed sub-classification must be prepared with utmost care.

Incorrect sampling design or incorrectly following the sampling plan will obtain results that are misleading.

Sampling requires an expert to conduct the study in an area, otherwise the results obtained will be erroneous.

The characteristic to be observed may occur rarely in a population. For example, teacher over 30 years of teaching experience.

Complicated sampling plans are laborious to prepare.

Two General Types of Sampling:

Probability sampling or scientific sampling gives every member of the population equal chance to be selected as part of the study.

Five Sampling Schemes of this Type:

- Simple random sampling
- Systematic sampling
- Stratified sampling
- Cluster sampling
- Multi-stage sampling

Simple random sampling is made when all the members of the population are given a chance to be selected. Selection is done by draw lot or the use of the table of random numbers.

Simple random sampling

- Get a list of the total population.
- Cut pieces of paper to small sizes (1 x 1 in.) that can be rolled.
- Put a number on each piece of paper corresponding to each number of the total population
- Roll each piece of numbered paper and put them in a box.
- Shake well the box to give equal chance for every number to be chosen as sample.
- Pick out one rolled paper at a time and unroll it.
- Record the number of the unrolled paper.
- Repeat picking out until the desired number of sample is completed.

Systematic sampling is choosing the nth name in a population as the sample. It entails using a list of the population and deciding how the nth name is chosen. For example, the population of students in one school is listed alphabetically and numbered consecutively. From the list, the sample to be taken is the name that falls every nth in the list until the desired number of sample is completed. So with a population of 500 and 250 as the desired sample, the individual sample may be the name that falls in every count of two or all those that are in the odd number or the even number.

Systematic Sampling

This sampling scheme is used when there is a ready list of the total population.

The steps in using this schemes are:

- Get the list of the total population.
- Divide the total population by the desired sample size to get the sampling interval.

Example:

If the total population is 5000 and the desired sample is 100,

$$\text{Sampling Interval} = \frac{5000}{100} = 50$$

Get the No. 50 as the first sample and every 50^{th} person in the list or 100, 150, etc. until 100 respondents are completed.

Stratified random sampling is dividing the population into strata and drawing the sample at random from each division. For example, the population to be sampled are the elementary school teachers in one district. These are stratified by their ranks as teacher 1, 2, 3. Samples of equal number are drawn from each rank

Stratified Sampling

This is used when there is a ready list of the population whose members are categorized as students, farmers, fishermen. The steps to follow are:

Get the list of the total population.

Decide on the sampling size or the actual percentage of the population to be considered as sample.

Get an equal proportion of sample from each group.

Example:

500 pupils x .20	= 100
200 teachers x .20	= 40
150 parents x .20	= 30
Total Sample	170

Get the 170 respondents by simple random or systematic sampling.

Cluster sampling is a design that uses a group as sample rather than an individual. For example, the population may be the parents in one school district. The parents may be grouped by barangay within the district or by those in the east, west, north and south of the district. From these groupings, the sample cluster is chosen randomly or systematically. This differs from stratified sampling that includes all the strata in the sampling process.

Cluster Sampling

This is used when the population is homogeneous but scattered geographically in all parts of the country and that there is no need to include all in the sampling.

Following are the steps in this scheme:

Decide on the sample size. Select the geographical area that will serve as the cluster.

Select the sample within this area/cluster by systematic or stratified sampling depending on the availability of the information.

Multi-stage sampling is done by stages: two, three, four as the case may be depending on the number of stages sampling is made. Here the population is grouped by hierarchy from which sampling is done in each stage. For example, the population to be studied consists of the personnel in the public elementary schools in the country. So samples have to be taken from the national, regional, provincial, district, and school levels

Multi-stage sampling

As the name suggests, sampling is done by stages or at each level. The steps followed in this scheme are:

Decide on the level of analysis to be studied such national, regional, provincial, district, barangay, etc.

Select the sample at the next lower level. For example if the survey is provincial, the survey should start at the municipal level, then district, then barangay, etc.

Example:

1st level, 3 municipalities/province
2nd level, 2 districts/municipality
3rd level, 4 barangays/districts
4th level, 100 respondents/barangay

Use any of the sampling techniques given earlier in arriving at the desired sample number.

2. **Non-probability or non-scientific sampling** is the opposite of probability. Here the researcher's judgment determines the choice of the sample.

Three kinds commonly used:

Purposive Sampling- In this design, the samples are chosen based on the judgment of the researcher who determines an individual as sample for possessing special characteristics of some sort.

- **Incidental/Accidental Sampling** – As the term implies, this design is used to take samples who may be the most available or the nearest at the time of data gathering.

- **Quota Sampling**- A design popular for opinion research, this sampling is made by looking for individuals that possess the required characteristics or prescribed criteria of the research.

Steps in Sample Selection

Each of the above sampling schemes follows certain procedures in determining the sample. Mercado (1985) suggested these steps, to wit:

Incidental/Accidental

Decide the sample size.

Look for people who can be interviewed.

If the sample decided in 100, interview the first 100 people you meet.

Purposive sampling

Decide on the sample size by looking at the table of sample size in statistics books.

Decide on the criteria in choosing the sample. These criteria may include age, sex, and education.

Choose the sample based on the criteria. For example if the criterion is age group 21 to 30 years old, then only respondents belonging to this age group are interviewed.

Determining the Sample Size

For a population of more than 100, sampling is a must. Following is a formula for scientific sampling, illustrations and examples (Calmorin and Calmorin, 1995):

- $Ss = \frac{NV + [Se\ (1 - p)]}{Nse + [V \times p(1 - p)]}$

Where Ss = Sample size

N = Total number of population

V = The standard value (2.58) of 1 percent level of probability with

0.99 reliability

Se = Sampling error

P = The largest possible proportion (0.50)

To illustrate the above formula, these steps have to be followed:

1. Determine the total population (N) assumed to be studied.
2. Get the value of V (2.58), Se (.01) and p (0.50).
3. Compute the sample size using the above formula

The total population is 500 has a standard value of 2.58 at 1 percent level of probability and 99 percent reliability. The sampling error is 1 pecent (0.01) and the proportion of a target population is 50 percent (0.50).

The sample size is computed as follows:

N = 500
V = 2.58
Se = 0.01
P = 0.50

$$Ss = \frac{NV + (Se)^2 \times (1-P)}{Nse + (V)^2 \times P(1-P)}$$

$$= \frac{500(2.58) + (0.01)^2 \times (1-0.50)}{500(0.01) + (2.58)2 \times 0.50(1-0.50)}$$

$$= \frac{1290 + 0.0001 \times 0.50}{5 + 6.6564 \times 0.50(0.50)}$$

$$= \frac{1290 + 0.00005}{6.6641}$$

$$= \frac{1290.00005}{6.6641}$$

$$Ss = 193.57 \text{ or } 194$$

This sample size of 194 represents the 500 subjects of study.