

POPULATION AND SAMPLE

Population. A population refers to any collection of specified group of human beings or of non-human entities such as objects, educational institutions, time units, geographical areas, prices of wheat or salaries drawn by individuals. Some statisticians call it universe.

A population containing a finite number of individuals, members or units is a class. a population with infinite number of members is known as infinite population. The population of pressures at various points in the atmosphere is an example of infinite population. The population of concrete individuals is called as existent population, while as the collection of all possible ways in which an event can materialize as the hypothetical population. All the 400 students of 10th class of particular school is an example of existent type of population and the population of heads and tails obtained by tossing a coin on infinite number of times is an example of hypothetical population.

The population is properly defined so that there is no ambiguity as to whether a given unit belongs to the population. For example, in a survey of achievement in mathematics, a researcher will have to define the population of students by age or by grade and, if necessary, he will also specify the type of schools, the geographical area and the academic year for which the data will be collected. Inferences concerning a population cannot be drawn until the nature of the units that comprise it is clearly identified. If a population is not properly defined, a researcher does not know what units to consider when selecting the sample.

Sample. A selected group of some elements from the totality of the population is known as the sample. It is from the study of this sample that something is known and said about the whole population. The assumption is that what is revealed about the sample will be true about the population as a whole. But it may not be true always as it depends on the way the sample is drawn. If the sample is a replica of the population, the foregoing assumption is true. But, if it is biased, such inferences about the population cannot be true.

A biased sample is one that is selected in such a way that it yields a sample value which is much different from the true or population value. Hence it is basic requirement for inferential research that the sample should be free from bias. In other words, it should be representative of the population. A representative sample is a sample which has all those characteristics present in the same amount or intensity in which they are found in the population. Bias in selecting a sample can be avoided and it can be made representative of the population by selecting it randomly. A random sample involves small errors in predicting population value and this error can be estimated also. Thus the objective should always be to draw an unbiased random and representative sample.

In order to draw such a representative sample, a sample plan has to be prepared. It means a plan which, if properly executed can guarantee that if we were to repeat a study on a number of different samples each of a particular size drawn from a given population, our findings would not differ from the findings that we would get if the given population as a whole was studied by more than specified proportions of sample. For example, not more than 5 points in 90% of the samples, that is, out of 100 samples the sample value (estimate of value) will be correct within 5 points in 90 out of 100 samples. If the plan guarantees sufficiently well that the chances are great enough that the selected sample is representative of the population, it is known as a representative sampling plan. It ensures selecting diverse elements and making sure that these diverse elements are adequately represented in the sample.

Sampling. It is the process of selecting a sample from the population. For this purpose, the population is divided into a number of parts called sampling units. Most of the educational phenomena consist of a large number of units. It would be impracticable, if not possible to test or interview or observe each unit of the population under controlled conditions in order to arrive at principles having universal validity. Some populations are so large that their study would be expensive in terms of time, effort, money and manpower. Sampling is a process by which a

relatively small number of individuals or measures of objects or events is selected and analyzed in order to find out something about the entire population from which it was selected. It helps to reduce expenditure, save time and energy, permit measurement of greater scope, and produce greater precision and accuracy.

Definitions.

1. **W. G. Cochran.** “In every branch of science we lack the resources to study more than a fragment of the phenomena that might advance our knowledge.” In this definition a ‘fragment’ is the sample and ‘phenomena’ is the population. The sample observations are applied to the phenomena, i.e., generalization.
2. **David. S. Fox.** “In the social sciences, it is not possible to collect data from every respondent relevant to our study but only from some fractional part of the respondents. The process of selecting the fractional part is called sampling.” ‘Sampling design’ means the joint procedure of selection and estimation. Sampling should be such that error of estimation is minimum.

PROBABILITY SAMPLING

In probability sampling, the units of the population are not selected at the discretion of the researcher, but by means of certain procedures which ensure that every unit of a population has one fixed probability of being included in the sample. Such a method is also called random sampling.

Characteristics.

1. Each unit in the sample has some known probability of entering the sample.
2. Weights appropriate to the probabilities are used in the analysis of the sample.
3. Its observations are used for the inferential purpose.
4. Inferential or parametric statistics are used.
5. There is risk for drawing conclusions.
6. Its representatives refer to characteristics.
7. Its comprehensiveness refers to size and area.

Techniques of probability sampling.

1. **Simple random sampling.** In simple random sampling, each unit of the population is given an equal chance of being selected. The selection of units from the population is done in such a manner that every unit in the population has an equal chance of being chosen and the selection of any one unit is in no way tied to the selection of any other. The law of chance is allowed to operate freely in the selection. Carefully controlled conditions are created to ensure that each unit in the population has an equal chance of being included in the sample. To prevent the researcher from being the results by exercising direct control over the selection of units, several devices are employed to draw samples from population. Some techniques are as under:
 - a. Tossing a coin.
 - b. Throwing a dice.
 - c. Lottery method.
 - d. Blind folded method.
 - e. By using random table or ‘Tippet’s table’.

Merits.

1. It requires a minimum knowledge of population.
2. It is free from subjectivity and free from personal error.
3. It provides appropriate data for one’s purpose.
4. The observations of the sample can be used for inferential purpose.

Demerits.

1. It cannot ensure representativeness of a sample.
2. It does not use the knowledge of the population.

3. Its inferential accuracy depends upon the size of the sample.

2. **Cluster sampling.** It means selecting the intact group as a whole. In it the sample units contain groups of elements (clusters) instead of individual members or items in the population. For example, a researcher lists all of the degree colleges in the city, select at random 15% of these clusters of units and uses all of the students in the selected colleges as a sample.

Merits.

1. It is a good representative of the population.
2. It is an easy method.
3. It is an economical method.
4. It is highly applicable in education.
5. Its observations can be used for inferential purpose.

Demerits.

1. It is not free from errors.
2. It is not comprehensive.

3. **Stratified sampling.** It is an improvement over systematic method. In it the research divides his population in strata on the basis of some characteristics from each of these smaller homogenous groups (strata) the researcher draws at random a pre-determined number of units. He should choose that characteristics or criterion which seems to be more relevant in his research work.

Types of stratified sampling.

- a. **Disproportionate sampling.** It means that the size of the sample in each unit is not proportionate to the size of the unit but depends upon judgement and convenience. This method is more effective for comparing strata which have different error possibilities. It is less for determining population characteristics.
- b. **Proportionate sampling.** It refers to the selection of a sample from each sampling unit that is proportionate to the size of the unit. Its advantage include representativeness with respect to variables used as the basis of classifying categories and increased chances of the comparison between strata. Lack of information on proportion of the population in each category and faulty classification are the disadvantages of this method.
- c. **Optimum allocation stratified sampling.** It is representative as well as comprehensive. It refers to selecting unit from each stratum in proportion to the corresponding stratum of the population.

Merits.

1. It is a good representative of the population.
2. It is an improvement over the earlier.
3. It is an objective method of sampling.
4. Observations can be used for inferential purpose.

Demerits.

1. It is difficult for the researcher to decide the relevant criterion for stratification.
2. Only the criterion can be used of stratification.
3. It is costly and time consuming.

- d. **Multi-stage sampling.** It is more comprehensive and representative of the population. In it the primary sample units are inclusive and secondary units are sub-groups within these ultimate units to be selected which belong to one and only one group. Whenever stratification is done by the researcher, stages of population are usually available within a group or population. The individuals are selected from different stages for constituting the multi-stage sampling.

Merits.

1. It is a good representative of the population.
2. It is an improvement over the earlier methods.

3. It is an objective procedure of sampling.
4. Its observations may be used for inferential purpose.

Demerits.

1. It is difficult and complex.
2. It involves errors while considering the primary and secondary stages.
3. It is subjective.

NON PROBABILITY SAMPLING

In non-probability sampling the units are selected at the discretion of the researcher. Such samples use human judgement in selecting units and have no theoretical basis for estimating population characteristics. If the researcher is to select a sample of 200 school students, he may exercise his own judgement based on experience for finding a given student in the sample. Such a sample is arbitrarily selected because there is good evidence that it is a representative of the total population. The evidence is always based on experience. For example, in a study of delinquency, the researcher, on the basis of his past experience, selects certain areas that have shown higher rate of delinquent acts in the past. In non-probability sampling, the cases are selected on such bases as availability and interviewer judgement. The non-probability methods are very convenient in the situations when the sample to be selected is very small and the researcher wants to get some idea of the population characteristics in a short time.

Characteristics.

1. There is no idea of population.
2. There is no probability of selecting any individual.
3. It has free distribution.
4. The observations are not used for generalization purpose.
5. Non-parametric and non-inferential statistics are used.
6. There is no risk for drawing conclusions.

Types of non-probability sampling.

1. **Quota sampling.** It combines both judgement sampling and probability sampling. In it the population is classified into several categories. The proportion of population falling into each category is decided on the basis of judgement or assumption or the previous knowledge. Thereafter a quota of cases to be drawn is fixed and the observer is allowed to sample as he likes. It is an arbitrary method likely to figure in municipal surveys.

Merits.

- a. It is an improvement over the judgement sampling.
- b. It is an easy sampling technique.
- c. It is most frequently used in social surveys.

Demerits.

- a. It is not a representative sample.
 - b. It is not free from errors.
 - c. It has the influence of regional, geographical and social factors.
2. **Judgement sampling.** It involves the selection of a group from the population on the basis of available information though it should be representative of the total population. It involves the selection of a group by intuition on the basis of criterion deemed to be self-evident. As the investigator takes the judgement sample, this sampling is highly risky.

Merits.

- a. In it knowledge of the investigator can be best used.
- b. It is economical.

Demerits.

- a. It is not free from errors.
- b. It includes uncontrolled variation.

c. In it inferential statistics cannot be used of observations. Therefore, generalization is not possible.

- 3. Purposive.** It is selected by some arbitrary method because it is known to be representative of the total population. It is known that it will produce well-matched groups. It picks out the sample in relation to some criterion, which are considered important for a particular study. It is appropriate in a study which lays emphasis on the control of certain specific variables.

Merits.

- a. It uses the best available knowledge concerning the ample subjects.
- b. It gives better control to significant variables.
- c. In it sample groups data can be easily matched.
- d. In it there is homogeneity of subjects used in sample.

Demerits.

- a. In it the reliability of the criterion is questionable.
- b. In it the knowledge of population is essential.
- c. There may be errors in classifying sampling subjects.
- d. It is usable to utilize the inferential parametric statistics.
- e. It is unable to make generalization concerning total population.

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