
UNIT 3 METHODS AND TYPES OF SAMPLING

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3.0 OBJECTIVES

Data are collected in research to make generalizations. As census method is not feasible in most research works due to limited time and human resource, sampling is done. After reading this unit, you should be able to:

- understand various methods in the sampling process and steps in sampling,
- comprehend basis of sample selection,
- describe different types of probability sampling and its relevance, and
- examine varied types of non probability sampling and their advantages and disadvantages.

3.1 INTRODUCTION

Sampling is the process of selecting a few units from a bigger group, called the, Universe or Population. It possesses all the characteristic features of the universe. Therefore, a sample is also called a sub group of the population a researcher is interested in. It is considered as the basis for estimating or predicting the findings/outcomes regarding the bigger group. It can be defined as that part of statistical practice concerned with the selection of a subset of individual observations within a population of individuals intended to yield knowledge about the population of concern, especially for the purposes of making predictions based on statistical inference.

A survey can be conducted by either of the two methods:

1. Census Method
2. Sampling Method

Census Method: When the whole area or population of persons is contacted for collecting information the method is known as census method.

Population: In a statistical inquiry, all the members who fall within the purview of the enquiry is known as the universe or population. It can refer to a collection of individuals, objects or of their attributes etc. It can be finite as well as infinite.

Sample Method: In this method, we select some members of the population and study them in depth. The members selected for study constitute the sample. By studying the sample, we try to draw conclusions about the whole population.

3.2 BASIS AND TYPES OF SAMPLING

The choice of a sample as representative of the whole group is based on following assumptions:-

1. Underlying homogeneity amidst complexity:

Although, social phenomenon appears to be very complex in nature, as no two elements appear alike, sampling is based on the assumption that beneath this apparent diversity there is underlying fundamental unity.

2. Possibility of representative selection:

It is possible to draw a representative sample. It has been proved that if a certain number of units are selected from a mass of data on purely random basis, every unit having equal chance of being included, the sample so selected is likely to contain all types of units, and will be representative of the whole group.

3. Absolute accuracy not essential:

Absolute accuracy is not essential in case of mass study. It is the relative or significant accuracy that is needed in case of large scale observation and the results of sampling studies, although not hundred percent accurate, are nevertheless sufficiently accurate to permit valid generalization.

4. Importance of Sampling in Social Research:

The vastness of the population, the difficulties of contacting people and high refusal rate of the people have actually made the use of census method a difficult choice. Therefore, in such circumstances sampling is considered the best alternative in undertaking research in social studies. Recent developments in sampling technique have made this method more reliable and valid.

Theoretical Basis of Sampling:

On the basis of sample study we can predict and generalize the behaviour of mass phenomena. This is possible because there is no statistical population whose elements would vary from each other without limit. It is found that diversity is

a universal quality; every population has characteristic properties with limited variation. This makes it possible to select a relatively small unbiased random sample that can portray fairly well the traits of the population.

There are two important laws on which theory of sampling is based:

1. Law of 'Statistical Regularity':

In the words of King "The law of statistical regularity lays down that a moderately large number of items chosen at random from a large group are almost sure on the average to possess the characteristics of a large group." This means if a sample is drawn from a population, it is likely to possess almost the same characteristics as that of the population.

By random we mean a selection where each and every item of the population has an equal chance of being selected in the sample.

2. Law of 'Inertia of Large numbers':

It states that the larger the size of the sample, more accurate the results will be. The difference in the aggregate result is likely to be significant.

Steps in selecting a sample:

The steps in selecting the sample include:

- 1) Defining the population
- 2) Specifying a sample frame, a set of items or elements of the whole population.
- 3) Specifying a sampling method for selecting items or elements from the frame.
- 4) Determining the sample size.
- 5) Implementing the sampling plan.
- 6) Reviewing the sampling process.

Advantages of Sampling

1. **Saves time, money and energy:** A considerable amount of time, money and energy are saved by studying a sample instead of a population. All these three resources are saved both at the collection stage as well as at the processing stage.
2. **Better Quality Data:** A sample survey is likely to give data of better quality than complete Census since size of data is small and one can get hold of better resources.
3. **Detailed Study:** In most cases, it is possible to obtain detailed information in sample surveys as compared to Census Surveys as each and every member of the sample can be intensively interviewed and examined.
4. **Impossibility of the use of Census method:** Sometimes the use of Census method becomes impossible as the universe is too vast and geographically scattered, so every unit cannot be contacted.

5. **Administrative Convenience:** Small sample is usually more convenient from administrative point of view. In social research, we have to deal with human beings who cannot be made to work according to our own will. A small sample is hence, more manageable especially in social research.
6. **Accuracy of result:** At times, the results drawn by sampling techniques are more reliable than the results from Census method.

Types of Sampling Designs

There can be two types of sampling:

- 1) Probability Sampling Design
- 2) Non-Probability Sampling Design

Let us understand the intricacies of these two types of sampling and their sub-types

3.3 PROBABILITY SAMPLING

For a sampling design to be called a random or probability sample, it is important that each element in the population has an equal and independent chance of being included in the sample. Equal implies that the probability of selection of each element in the population is the same; that is, the choice of an element in the sample is not influenced by other considerations such as personal preference or biased choices. The concept of independence means that the choice of one element is not dependent upon the choice of one another element in the sampling; that is, the selection or rejection of element does not affect the inclusion or exclusion of another.

There are two advantages of random or probability samples:

- As they represent the total sampling population, the inferences drawn from such samples can be generalized to the whole sampling population.
- Some statistical tests based upon the theory of probability can be applied only to data collected through random sampling.

Methods of drawing a random sample include:

Simple Random Sampling

This is a type of sampling where each member of the population has an equal chance of being included in the sample. Depending on whether the items are replaced or not, random sampling will be random sampling with replacement and random sampling without replacement. We can make this distinction clear with the help of an example. Let us consider the selection of a sample from a population size of 100. Now the probability of selecting the first item is $1/100$. The selection of the second item can be done in either of the ways:

- a) Selection of the second item after replacing the first (this implies that the number of items in the population will remain 100) and
- b) Selection of the second item without replacing the first item (this implies that number of members in the population random to 99).

In the former case, the probability of selecting the second member would be $1/100$ while in the latter case it would be $1/99$. Again, the probability of selecting the third member would be $1/100$ and $1/98$ in the two cases respectively and so on. The first method of random selecting is known as random sampling with replacement. However in social sciences we mostly make use of simple random sample without replacement.

To ensure that each member in the population has an equal chance of being included in the sample, the selection of members for the sample is done by one of the following methods:

a) Lottery Method

Under this method, we assign different numbers to the members of the population, write their names on different pieces of paper, fold all these pieces of paper in an identical manner, thoroughly mix them and then pick up required number of chits. The member corresponding to the number on that piece of paper is selected in the sample. This process is repeated until the desired size of the sample is obtained.

Random Number Table

If the population is very large, lottery method becomes very tedious and it has been observed that sometimes an element of bias also creeps in. To overcome these difficulties, tables of random numbers were prepared by some statistician, the most popular tables being those by Tippett, by Kendall and by Babington Smith. Tippett's table consists of 41,600 digits taken from census reports and combined to give 10,400 four figure numbers. The method of selecting and sampling with the help of Tippett's table is very easy. For instance, let us suppose that we have to select a sample of 20 members from a population of 4,000. The members of the population are assigned the numbers from 1 to 4000 and a page from Tippett's table is then opened up. The first 20 numbers are selected of two digit size either in the vertical direction or horizontal direction.

b) Selecting from Sequential list

Under this plan, the names are first arranged serially according to some particular order which may be alphabetical, geographical or serially. Then out of the list, every 10th or any other number of case may be taken up. For example, if every tenth unit is to be selected, the selection may begin from 7th followed by 17, 27, 37 etc. and so on.

c) Grid System

It is used for selecting a sample of area. According to this method, a map of entire area is prepared. Then a screen with square is placed upon the map some of the squares are selected at random. Then the screen is placed upon the map and the areas falling within the selected squares are taken as samples.

Merits and demerits of random sampling are:

Merits:

1. Every member has an equal chance of being included in the sample. Therefore, the choice is unbiased.

2. The theory of probability and many other important theories of statistics are applicable only in the case of a random sample.
3. Use of this method in selecting samples involves less time, money and energy.
4. As compared to purposive sampling, a random sample represents the population in a better way. In fact, as the size of the sample increases it becomes more and more representative of the population.

Demerits:

1. Use of the random sampling method requires a complete and up-to-date list of the population units. This is often not available.
2. The size of the sample has to be sufficiently large or else it will not be representative of the population.
3. The process of numbering the population units is quite lengthy and consumes a lot of time.
4. In large geographical areas, the sample units selected may be widely scattered making it difficult to contact them at a reasonable cost.
5. At times, random sampling may give highly improbable results e.g. suppose we are studying the economic condition of the people residing in Delhi city area. If a random sample of 1,000 people is taken, it is possible to get a sample consisting of very rich people only. The results of the sample will give a very high per capita income, such a sample cannot be considered as representative of the population. Hence, to overcome this difficulty, stratified sampling method is used.

Systematic Sampling

A systematic sample is formed by selecting a unit at random and then selecting additional units at evenly spaced intervals until the sample has been formed. This method is popularly used in those cases where a complete list of the population from which the sample is to be drawn is available. This may be prepared in alphabetical, numerical, geographical or any other order. The first unit is chosen at random generally by lottery method and the subsequent items are selected by taking every kth from the list. 'k' refers to the sampling interval or sampling ratio.

$$k=N/n$$

Where, k=Sampling interval

N=Universe size

n= Sample size

In systematic sampling, the first item is selected from the first 'k' items according to the method of random sampling. The second member will be determined by adding 'k' to the first item. The same process has to be repeated in all subsequent selection of members. e.g.

Population = 200 (N)

Sample size = 20 (n)

$k = 200/20 = 10$

Steps:

1. Arrange the population from 1-200 in ascending order.
 2. Select any item at random from 1-10 and Suppose 3 is selected.
 3. 2nd item = $3+10=13$
 3rd item = $13+10=23$
 4th item $23+10=33$
- } In this manner, the twenty items selected will be
- 3, 13,23,33,43,53,63,73,83,93,103,113,123,133,143,153,163,173,183,193

Merits and demerits of systematic sampling are:

Merits:

1. Very convenient and easy method
2. Can be used when population is homogenous and large and it is difficult to divide it into strata.
3. Can be used in different strata of stratified sampling method.

Demerit:

1. This method may give totally misleading results if there are periodic fluctuations in the data.

Stratified Random Sampling:

Under this type of sampling, the population is divided into different categories (known as strata, hence the name, stratified sampling) and members from these strata are then selected according to the technique of random sampling.

It can be of two types:

1. **Proportionate** – Here the number of members selected from different strata is in proportion to the members of the population falling within each category.
2. **Disproportionate** – Here number of members selected from each strata is not in proportion to the members of the population falling in these categories, instead equal number of members are selected from each category.

Merits and demerits of Stratified Random Sampling Method:

Merits:

1. **More Representative:** While discussing the demerits of random sampling we had noted that in some cases, a random sample may not be truly representative of the population as some group or groups of people may be totally left. It is possible to completely overcome this drawback of random

- sampling by using stratified sampling as the population is divided into various strata and then a certain fixed number of members are selected from each stratum by random sampling.
2. Greater Precision: It ensures greater accuracy since variability within each stratum is considerably less than in random sampling.
 3. Administrative convenience: The universe to be sampled is subdivided into stratified groups which are mutually exclusive and include all items in the universe. A stratified random sample is then chosen independently from each group, based on stratification.
 4. Replacement of Members: As all the strata are homogenous, replacement can easily be done among the members without affecting the results greatly.

Demerits:

1. Each stratum must retain homogenous units, otherwise we are likely to get distorted results.
2. Care is required not only in determining the different strata, equal care has to be exercised in determining the size of the sample to be selected from each stratum.
3. At times, it becomes very difficult to decide the stratum in which a particular item has to be included, especially when two or more strata do not seem to be very much different from one another.

Multi Stage/Cluster Sampling:

This method is generally used in selecting a sample from a large area and the selection of the sample is done in more than two stages. For example, the following procedure will be adopted to select a sample of a few hundred houses from a large city.

- a) Divide the whole city into homogenous regions. Care should be taken to see that each region is approximately equal in size and there is similarity among the people of one region atleast regarding the aspect that is being studied.
- b) Select two primary sample areas from each region by random sampling method.
- c) Select one block (cluster from each primary sample area)
- d) Select some houses from each block cluster on random sampling basis.

Thus, we see that the selection of final sample units is done in a number of stages. The method is thus a combination of random sampling and stratified sampling, and if conducted judiciously, it possesses the advantages of both the types, greatest representation can be achieved in shortest possible numbers and representative of every area is secured.

The merits and demerits of Multi Stage/Cluster sampling are:

Merits:

1. Wide geographical areas can be covered with relative ease. The field work can be concentrated, yet wide areas can be covered.
2. Another important advantage of multi-stage sampling is that second stage sampling units are selected only from those first stage sampling units which are included in the sample. Similarly, third stage sampling units are to be selected only from those second stage sampling units which are already included in the sample and so on. This reduces the operational costs substantially.

Demerit:

1. It has been observed that a multi stage sample is less efficient than a suitable single stage unit of the same size.

Check Your Progress I

Note: Use the space provided for your answer.

- 1) What are the merits of stratified random sampling method?

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3.4 NON PROBABILITY SAMPLING

Non probability sampling is also known as non-random sampling. These sampling methods do not follow the theory of probability in the choice of elements from the population. Non-probability sampling designs are used when the number of elements in a population is either unknown or cannot be individually identified. In such situations, the selection of elements is dependent upon other considerations. Following are the sub-types of non-probability sampling:

Purposive or Judgement Sampling

This is also known as deliberate sampling as the choice of members of the population to be included in the sample depends upon the statistician himself. The researcher selects only those members of the population in his sample who, according to him, exhibit the characteristics of the population to a large extent.

The merits and demerits of purposive sampling are:

Merits:

1. In some cases where size of the sample is small, the researcher might feel that adoption of the random sampling method is likely to miss some important items. In such cases, use of purposive sampling is justified.

2. If an intensive study of some known characteristic of the population is to be carried out; it often becomes necessary to use the purposive method, for selecting those members in the sample who possess the characteristics as per the requirement of the researcher.
3. This method finds extensive usage in everyday business because the businessmen usually do not have the time or patience to adopt simple random sampling or stratified random sampling methods.
4. It is also used extensively in conducting pilot surveys.

Demerits:

1. It possesses a heavy human bias since it depends exclusively on the researcher himself, his personal bias and prejudices play the most important role in the selection of the sample.
2. Due to the above reason, the results obtained are often viewed with a certain amount of doubt.
3. No objective method is available to determine the size of the sampling errors in case of purpose sampling.

Quota Sampling

In this type of sampling, quotas are fixed for different categories of the population based on the considerations relevant to the study being conducted and the selections within the categories are based on personal judgment. It is also a non probability method in which the chances of an element of being selected from the population remains unknown. It contains elements of human bias. It can yield best results only when bias is needed in a study, e.g. The government may be anxious to know the reaction of the people to certain legislation it is planning to bring in the parliament. Suppose it appoints an investigator and asks him to interview 300 people living in a certain area. It has also laid down that out of these 300, 150 should be office goers, 100 businessmen, and 50 housewives. Thus, the quotas have been decided and the investigator is free to interview any 150 office goers, 100 businessmen and 50 housewives. \

The merits and demerits of quota sampling are:

Merits:

1. It is the least expensive way of selecting a sample.
2. It does not need any information, such as sampling frame, the total number of elements, their location, or other information about the sampling population.
3. It guarantees the selection of the elements that are needed by the study.

Demerits:

1. The findings cannot be generalized to the total sampling population.
2. The elements of the sample might not be truly representative of the population.

Convenience/Accidental Sampling

According to this system, a sample is selected according to the convenience of the researcher. This convenience may be in respect of availability of source list, accessibility of the units, etc. This method is resorted when –

- a) Universe is not defined.
- b) Sampling unit is not clear
- c) Complete source list is not available contacting anyone who is easily available constitute the sample.

Self Selected Sample

Sometimes a sample is not actually selected but people themselves opt to be included or not to be included in a sample. e.g. an enquiry has to be made about the people's liking for a particular radio programme, and an announcement to this effect is made on the radio. In such a case the sample is not fixed. Those who care to reply form the part of the sample, such a sample is known as self selected sample.

Snowball Sampling

Snowball sampling is the process of selecting a sample using networks. To start with, a few individuals in a group or organization are selected and the required information is collected from them. They are then asked to identify other people in the group or organization, and the people selected by them become a part of the sample. Information is collected from them, and then these people are asked to identify other members of the group and, in turn, those identified become the basis of further data collection. This process is continued until the required number or a saturation point has been reached, in terms of the information being sought.

The merits and demerits of snowball sampling are:

Merits:

- 1) This method is highly useful when one knows very little about the group or the organization one wishes to study.
- 2) Useful for studying communication patterns, decision making or diffusion of knowledge within a group.

Demerits:

- 1) The choice of the entire sample rests upon the choice of individuals at the first stage. If they belong to a particular faction or have strong biases, the study may be biased.
- 2) It is difficult to use this technique when the sample becomes fairly large.

Check Your Progress II

Note: Use the space provided for your answer.

- 1) Briefly describe purposive sampling.

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3.5 SAMPLING PROCEDURES

The procedure of selecting a sample differs according to the types of sample selected. Yet some fundamental rules can be cited. These are:

1. **Defining universe:** The whole group from which the sample is to be selected is technically called universe or population. Thus, in order to draw the sample, we must first of all have a clear idea about the universe from which the sample is to be drawn. It can be definite or indefinite. But it is very essential to define it, at the first step.
2. **Sampling Unit:** Before drawing a sample, we have to decide the unit of the sample. What shall we select - a house, a family, an individual or a group?
3. **Sources List:** The list which contains the names of the units of universe from which the sample is to be selected is technically known as source list. It may be already in existence or it needs to be prepared.
4. **Method:** Deciding about the method of sampling technique to be followed.
5. **Size:** Deciding about the size of the sample.

Size of the Sample:

The size of the sample depends on many factors:

1. The size of the universe: Larger the size of the universe larger will be the sample size.
2. Resources available: If the resources available are large then a larger sample size should be taken.
3. Homogeneity or heterogeneity: In those cases where the population consists of homogenous units, sample size can be small, but in case of heterogeneous elements, a larger sample is inevitable.
4. Nature of study: For an intensive and continuous study, a small sample may be suitable. But for studies which are not likely to be repeated and are extensive in nature, a large sample size may be necessary.

5. Method of sampling adopted: The size of the sample depends on the sample design. e.g. simple random sampling requires a larger sample size.
6. The degree of accuracy or precision required: For a larger accuracy and precision, larger sample size should be used. But a larger sample does not always ensure greater accuracy.

Merits and Limitations of Sampling Method:

Merits:

1. **Less time-consuming:** Since the sample is a study of a part of the population, considerable time and labour are saved when a sample survey is carried out. Time is saved not only in collecting data but also in processing it. For these reasons, a sample provides more timely data in practice than a census.
2. **Less Cost:** Although the amount of effort and expense involved in collecting information is always greater per unit of the sample than a complete census, the total financial burden of a sample survey is generally less than that of a complete census.
3. **More Reliable Results:** Although the sampling technique involves certain inaccuracies owing to sampling errors, the result obtained is generally more reliable.
4. **More detailed Information:** Since the sampling technique saves time and money, it is possible to collect more detailed information in a sample survey.
5. **Sometimes only method:** Sampling Method is the only method that can be used in certain cases. There are cases in which the census method is inapplicable and the only practical means is provided by the sample method. For example, if one is interested in testing the breaking strength of chalks manufactured in a factory; under the census method, all the chalks would be broken in the process of testing. Hence, census method is impracticable and it is best to resort to the sample method.
6. **Enhancing accuracy of results:** The Sample Method is often used to judge the accuracy of the information obtained on a census basis: For example, in the population census which is conducted very often (10 years in our country), the field officers employ the sample method to determine the accuracy of information obtained by the enumerators on the census basis.

Demerits:

1. A sample survey must be carefully planned and executed otherwise the results obtained may be inaccurate and misleading. Of course, even for a complete count, care must be taken but serious errors may arise in sampling, if the sampling procedure is not perfect.
2. Sampling generally requires the services of experts, if only for consultation purposes. In the absence of qualified and experienced persons, the information obtained from sample surveys cannot be relied upon. In India, shortage of experts in the sampling field is a serious hurdle in the way of reliable statistics.

3. At times the sampling plan may be so complicated that it requires more time, labour and money than a complete count. This is so, if the size of the sample is a large proportion of the total population and if complicated weighted procedures are used. With each additional complication in the survey, the chances of error multiply and greater care has to be taken, which in turn, means more time and labour.
4. If the information is required for each and every unit in the domain of study, a complete enumeration survey is necessary.

3.6 SAMPLING AND NON SAMPLING ERRORS

Errors that arise due to the fact that a sample is being studied while inference is being drawn about the whole of the population are termed as sampling errors. Naturally if the entire universe is studied, such errors will not be there.

Other errors that arise mainly at the processing stage and can appear both in a sampling enquiry as well as a census enquiry are called non sampling errors.

Sampling Errors: It is generally not possible to eliminate these errors completely as the sample is never a perfect miniature of the population. Such errors are of two types – Biased errors and Unbiased errors.

Biased errors arise because of biases in selection, estimation, etc, while unbiased errors arise due to chance differences between the members of the sample and members not included in the sample. It has been observed that with an increase in the size of the sample, the unbiased errors decrease in magnitude. However, biased errors do not decrease and are thus non compensating.

Causes of bias:

1. Bias in choosing the sample.
2. Substitution
3. No response
4. Faulty information and biased information
5. Pressure of a selective factor
6. Bias due to wrong estimation method

Reducing Sampling Errors:

Easiest method of reducing the sampling error is to increase the size of the sample. There is an inverse relationship between the sampling error and the sample size.

This is obvious as well because we expect that with an increase in its size, the sample becomes more representative of the population. In fact, as the sample size approaches the size of the population the sampling error reduces to zero.

Non Sampling Error: Errors that occur in acquiring, recording or tabulating statistical data that cannot be ascribed to sampling error are known as non sampling errors.

Such errors can exist in a sample enquiry as well as a census enquiry. They can arise at any stage of the enquiry – from planning the survey to the ultimate analysis of the data. It increases as the number of units included in the survey increases. Thus they are greater in a census enquiry than in a sample enquiry.

Causes:

1. Faulty definition of the population or statistical units to be used in the study.
2. Faulty formulation of questionnaire which results in ambiguous answers.
3. Faulty method of conducting interviews.
4. Lack of trained and skilled staff to carry out the survey.
5. Personal bias of the investigator.
6. Errors arising due to no response or incomplete responses.
7. Errors in processing, recording, punching and verifying data.
8. Errors committed during presentation and printing of tabulated results.

Standard Error

This differs from the standard deviation in that, while the latter is a measure of an actual distribution, the standard error measures the dispersion about the mean of a hypothetical distribution. The values which make up this hypothetical universe are the means of all possible samples of a universe. Thus the mean of this distribution is a means of means and can be thought of as the true mean of the universe.

Formula: $SE = \sigma / \sqrt{N}$

SE = Standard Error

σ = Standard Deviation

N = No. of observation in the sample

We are not likely to know the true means. We are here concerned with the stability of our empirical mean i.e. if we took a similar sample of the same size, how close would its mean be to that of the first sample. We therefore, take our empirical mean as the best estimate of the true mean.

Check Your Progress III

Note: Use the space provided for your answer.

1) Describe briefly “Sampling Errors”.

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3.7 LET US SUM UP

In this unit, we studied about the sampling types and procedures. A sample is a small representation of a population. The process of selecting representative sample from a population is called sampling. Sampling methods can be categorized into two broad groups - probability and non-probability sampling. Simple random sampling, systematic sampling, stratified sampling, cluster sampling, multi-stage sampling are the main subtypes of probability sampling. Non-probability sampling is based on the judgment of the researcher. Purposive sampling, judgmental sampling, quota sampling, convenience sampling, snowball sampling, are the examples of non-probability sampling. Merits and demerits of each subtype of sampling have been pointed out. Sampling procedure and sampling errors are also explained

3.8 KEY WORDS

- Population** : It is any group of individuals or units that have one or more characteristics in common and are of interest to the researcher. It may consist of all the units or individuals of a particular type or a more restricted part of that group.
- Sample** : It is a small proportion of a population selected for analysis. By observing the sample, certain inferences may be drawn about the population.
- Probability Sampling** : In this type of sampling, the units of population are selected by means of certain procedures which ensures that every unit of the population has one fixed probability of being included in the sample.
- Non-probability Sampling** : In this type of sampling, the units are selected at the discretion of the researcher.
- Sampling Frame** : A complete, accurate and up-to-date list of all the units in the population.
- Sampling Error** : The 'statistics' estimated from samples tend to differ more or less from sample to sample drawn from the same population due to sampling fluctuations. On the other hand, the 'parameter' is considered to have fixed reference value. It is not possible to compute parameter but there is a statistical procedure to forecast the parameter from sample statistics provided certain conditions have been satisfied. The difference between the sample estimate (statistics) and the population value (parameter) is called the 'sampling error'.

3.9 SUGGESTED READINGS

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