UNIT 1 METHODS OF SAMPLING

Structure

1.0 INTRODUCTION

We collect data in order to make generalisation. For example, 'Are agricultural labourers today more progressive than they were in nineties?' Question of this kind calls for generalisation. But only rarely does a study include observations of all respondents that are defined by the research problem. A familiar example is the elections. To predict the outcome of the elections, pollster interviews a subset of the total electorate and predict the behaviour of the entire set (the electorate or population). Similarly, suppose that, as a researcher, you want to study the effects of Integrated Rural Development Programme in your District. For this, you need not have to select all the beneficiaries in the district. Instead you may select a few representatives from the Villages / Blocks from your District and assess the effects of the programme. The process of selection demands thorough knowledge of various sampling methods. In this Unit, we shall familiarize you with the concepts of sample and population. We shall also discuss the characteristics of good sample and various methods of sampling.

1.1 OBJECTIVES

On the completion of this Unit, you should be able to:

- define the terms, population and sample;
- describe the steps in the sampling process and the various methods of sampling;
- define a probability sample and describe the various types of probability sample;
- define a non-probability sample and describe the various types of non probability sample; and
- describe the characteristics of a good sample.

1.2 CONCEPT OF POPULATION AND SAMPLE

A “sample” is a miniature representation of and selected from a larger group or aggregate. In other words, the sample provides a specimen picture of a larger whole. This larger whole is termed as the “population” or “universe”. In research, this term is used in a broader sense; it is a well defined group that may consist of individuals, objects, characteristics of human beings, or even the behaviour of inanimate objects, such as, the throw of a dice or the tossing of a coin.

Fig. 1.1: Population

Suppose there are 60 Community Development Blocks (here in after referred as Blocks) in a State and we include all the Blocks in our study , it would not only be expensive but also cumbersome and time consuming. So, we select a few Blocks. The selected Blocks are termed as sample. The total number of Blocks is called ‘population’ or ‘universe’. This process of relative few blocks is known as sampling.

Representativeness and Adequacy

Basically there are two requirement of a sample: it has to be ‘representative’ and adequate. If the nature of the population has to be interpreted from a sample, it is necessary for the sample to be truly representative of the population. Moreover, it calls for a drawing a representative ‘proportion’ of the population. The population may contain a finite number of members or units. Sometimes, the population may be ‘infinite’. Therefore, a population has to be defined clearly so that there is no ambiguity as to whether a given unit belongs to the population or not. Otherwise, a researcher will not know what units to consider for selecting a sample.

The second issue related to the representation of a sample is to decide about the ‘sampling frame’, i.e., listing of all the units of the population in separate categories. In a study, there can be different sampling frames, such as male/female students, employed/unemployed students, etc. The sampling frame should be complete, accurate and up-to-date, and must be drawn before selecting the sample.

Thirdly, a sample should be unbiased and objective. Ideally, it should provide all information about the population from which it has been drawn. Such a sample based on the logic of induction, i.e., proceeding from the particular to the general, falls within the range of random sampling errors. This leads us to the results expressed in terms of "probability".

A sample should not only provide representativeness, but should also be adequate enough to render stability to its characteristics. What, then, is the ideal size of a sample? An adequate sample is the one that contains enough cases to ensure reliable results. If the population under study is homogenous, a small sample is sufficient. However, a much larger sample is necessary, if there is greater variability in the units of population. Thus the procedure of determining the sample size varies with the nature of the characteristics under study and their distribution in the population. Moreover, the adequacy of a sample will depend on our knowledge of the population as well as on the method used in drawing the sample.

Check Your Progress 1

Define Sampling.

Note: a) Answer in the space given below.

b) Compare your answer with the given at the end of this unit.

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1.3 METHODS OF SAMPLING

In the previous section, we suggested that the method used for drawing a sample is significant to arrive at dependable results or conclusions. With this fact in view, here in this section, we shall now talk about the various sampling methods. Sampling methods can be broadly classified into two categories:

i) Probability Sampling.

ii) Non-probability Sampling.

1.3.1 Probability Sampling

Probability sampling is based on random selection of units from a population. In other words, the sampling process is not based on the discretion of the researcher but is carried out in such a way that the probability of every unit in the population of being included is the same. For example, in the case of lottery, every individual has equal chance of being selected. Some of the characteristics of a probability sample are:

i) each unit in the sample has some probability of entering the sample,

ii) weights appropriate to the probabilities are used in the analysis of the sample, and

iii) the process of sampling is automatic in one or more steps of the selection of units in the sample.

Probability sampling can be done through different methods, each method having its own strengths and limitations. A brief account of these is given below:

Simple or unrestricted random sampling

Simple random sampling is a method of selecting a sample from a finite population in such a way that every unit of population is given an equal chance of being selected [see item (I) above]. In practice, you can draw a simple random sample unit by unit through the following steps:

i) Define the population.

ii) Make a list of all the units in the population and number them from 1 to n.

iii) Decide the size of the sample, or the number of units to be included in the sample.

iv) Use either the 'lottery method' or 'random number tables' to pick the units to be included in the sample.

For example, you may use the lottery method to draw a random sample by using a set of 'n' tickets, with numbers '1 to n' if there are 'n' units in the population. After shuffling the tickets thoroughly, the sample of a required size, say x, is selected by picking the required x number of tickets. The units which have the serial numbers occurring on these tickets will be considered selected. The assumption underlying this method is that the tickets are shuffled so that the population can be regarded as arranged randomly. Similarly, to select five Blocks from the total population of 60 Blocks in the State you will write the serial numbers of all the Blocks on small pieces of paper. Jumble the chits as well and then choose five numbers.

The best method of drawing a simple random sample is to use a table of random numbers. These random number tables have been prepared by Fisher and Yates (1967). After assigning consecutive numbers to the units of population, the researcher starts at any point on the table of random numbers and reads the consecutive numbers in any direction horizontally, vertically or diagonally. If the read out number corresponds with the one written on a unit card, then that unit is chosen for the sample.

Fig. 1.2: Probability sample

Let us, suppose that a sample of 5 Blocks is to be selected at random from a serially numbered population of 60 Blocks. Using a part of a table of random numbers reproduced here, five two digit numbers (as the total population of Blocks 60, is a two-digit figure) are selected from Table 1.1.

Table 1.1: An Abbreviated Table of Random Numbers

Row → ↓ Column	1	2	3	4	5	…	N
1	2315	7548	5901	8372	5993	…	6744
2	0554	5550	4310	5374	3508	…	1343
3	1487	1603	5032	4043	6223	…	0834
4	3897	6749	5094	0517	5853	…	1695
5	9731	2617	1899	7553	0870	…	0510
6	1174	2693	8144	3393	0862	…	6850
7	4336	1288	5911	0164	5623	…	4036
8	9380	6204	7833	6280	4491	…	2571
9	4954	0131	8108	4298	4187	…	9527
10	3676	8726	3337	9482	1569	…	3880
11	…	…	…	..	…	….	…
12	…	…	…	…	…	…	…
13	…	…	…	…	…	…	…
14	…	…	…	…	…	…	…
15	…	….	…	…	…	…	…
n	3914	5218	3587	4855	4881	…	5042

If you start with the first row and the first column, 23 is the first two-digit number, 05 is the next number and so on. Any point can be selected to start with the random numbers for drawing the desired sample size. Suppose the researcher selects column 4 from row 1, the number to start with 83. In this way he/she can select first 5 numbers from this column starting with 83.

The sample, then, is as follows:

~~83~~ ~~75~~

53 √ 33 √

40 √ 01 √

05 √ 26 √

Now, in selecting the sample of 5 Blocks, two numbers, 83 and 75, need to be deleted as they are bigger than 60, the size of the population. The processes of selection and deletion are stopped after the required number of five units gets selected.

The selected numbers are 53, 40, 05, 33, and 01. If any number is repeated in the table, it may be substituted by the next number from the same column. The researcher will go on to the next column until a sample of the desired size is obtained.

Simple random sampling ensures the best results. However, from a practical point of view, a list of all the units of a population is not possible to obtain. Even if it is possible, it may involve a very high cost which a researcher or organisation may not be able to afford. Therefore, simple random sampling is difficult to realize. Also, in case of a heterogeneous characteristic of the total population, even though all selected units participate in the investigation.

Systematic sampling

Systematic sampling provides a more even spread of the sample over the population list and leads to greater precision. The process involves the following steps:

i) Make a list of the population units based on some order – alphabetical, seniority, street number, house number or any such factor.

ii) Determine the desired sampling fraction, say 50 out of 1000; and also the number of the K^{th} unit. [K = N/n = 1000/50 = 20].

iii) Starting with a randomly chosen number between 1 and K, both inclusive, select every K^{th} unit from the list. If in the above example the randomly chosen number is 4, the sample shall include the 4th, 24th, 44th, 64th, 84th units in each of the series going up to the 984th unit.

This method provides a sample as good as a simple random sample and is comparatively easier to draw. If a researcher is interested to study the average telephone bill of an area in his/her city, he/she may randomly select every fourth telephone holder from the telephone directory and find out their annual telephone bills. However, this method suffers from the following drawbacks because of departure from randomness in the arrangement of the population units.

i) *Periodic effects*

Populations with more or less definite periodic trend are quite common. Students' attendance at a residential university library over seven days in a week, sales of a store over a twelve months in a year and flow of road traffic past a particular traffic point on a road over 24 hours are a few examples to show periodic trend or cyclic fluctuation in a given population. In such cases systematic sample may not represent the population adequately or remain effective all the time.

ii) *Trend*

Another handicap of systematic sampling emerges from the fact that very often 'n' is not an integral multiple of 'k'. This leads to a varying number of units in the sample from the same finite population.

Suppose a population of 100 beneficiaries is listed according to seniority and a researcher wants to select a sample of 20. First he/she divides 100 by 20 to get 5 as the size of interval. Suppose he/she picks 4 at random from 1 to 5 as a starting number. Then, he/she selects each 5th name at 9, 14, 19, ……until he/she draws the desired 20 names. If he/she picks 2 as the starting point, next sample units would be 2, 7, 12, …. In the latter sample each beneficiary's seniority is lower than his/her counterpart in the former sample. The mean average of these two samples would be significantly divergent as regards seniority and other associated variables. Many such samples can be drawn by taking different starting points but there will be greater variation among them.

Thus, the 'periodic effects' and 'trend' of the listed population unduly increase the variability of the samples, and calculations made from such samples cannot show the sources of variability. The main advantages of systematic sampling are:

a) It involves simple calculations.

b) It is less expensive than random sampling.

Stratified sampling

Stratified random sampling takes into account the stratification of the main population into a number of sub-populations, each of which is homogenous with respect to one or more characteristic(s). Having ensured this stratification, it provides for selecting randomly the required number of units from each sub-population or any mode of selection. The steps involved in the stratified sampling are given as follows:

i) Deciding upon the relevant stratification criteria such as sex, geographical region, age, courses of study, etc.

ii) Dividing the total population into sub-population based on the stratification criteria.

iii) Listing the units separately in each sub-population.

iv) Selecting the requisite number of units from each sub-population by using an appropriate random selection technique.

v) Consolidating the sub-samples for making the main sample.

Thus, stratification improves the representativeness of a sample by introducing a secondary element of control. However, the efficiency of the stratified random sample depends on the allocation of sample size to the strata. Rendering proportional weightage to each criterion improves it further by allowing the use of a smaller sample and by helping in achieving higher efficiency at a reduced cost.

Stratified random sample is very useful when lists of units or individuals in the population are not available. It is also useful in providing more accurate results than simple random sampling. For example, while selecting a sample of undergraduate student of the Open University in your country, the researcher may decide the whole population of undergraduate students as males and females, north, east, south, and west regions of the country and then employed in government, private and autonomous institutions in the country. All these will be different strata. From each stratum researcher may select 50 students as a sample.

Sometimes stratification is not possible before collecting the data. The stratum to which a unit belongs may not be known until the researcher has actually conducted the survey. Personal characteristics such as sex, social class, educational level, age etc., are examples of such stratification criteria. The procedure in such situations involves taking of a random sample of the required size and then classifying the units into various strata. The method is quite efficient provided the sample is reasonably large, i.e., more than 20 in every stratum.

Cluster sampling

Cluster sampling is used when the population under study is infinite, where a list of units of population does not exist, when the geographical distribution of units is scattered, or when sampling of individual units is not convenient for several administrative reasons. It involves division of the population of elementary units into groups or clusters that serve as primary sampling units. As selection of the clusters is then made to form the sample. Thus, in cluster sampling, the sampling unit contains groups of elements or clusters instead of individual members or items in the population.

For example, for the purpose of selecting a sample of beneficiaries of Integrated Rural Development Programme in a state, a researcher must enlist all Blocks instead of beneficiaries of Integrated Rural Development Programme and select randomly a 5 per cent (say) of the Blocks or the clusters of units. She/he either uses all the beneficiaries of the selected Blocks as the sample or randomly select a few of them.

This method of sampling is economic, especially when the cost of measuring a unit is relatively small and cost of reaching it is relatively large.

Multi-stage sampling

Multi-stage sampling is used in large-scale surveys for a more comprehensive investigation. The researcher may have to use two, three or even four stage sampling. If a researcher intends to do a study of the impact of Self-Help Groups on Women's Empowerment, he/she can draw a sample of five states representing northern, eastern, southern, western, and central regions. From these five states, all the districts can be enlisted out of which a sample of 3 to 4 districts can be drawn randomly. Out of this, all the Blocks in the selected districts or a random sample of about 300 Blocks can be drawn as sample. Finally, a random sample of about 1500 to 2000 beneficiaries is then drawn for the study. The successive random sampling of states, districts, Blocks and finally beneficiaries provides a multi-stage sample.

Multi-stage sampling is cost effective, time saving and efficient in formulating the sub-sample data. However, this method is recommended only when it seems impractical to draw a simple random sample.

Probability proportion to size sampling

When the units vary in size, it is better to select a sample in such a way that the probability of selection of units is proportional to its size. For example, a particular Block has a population of 200 beneficiaries and another one has 100. While drawing a sample, the first Block will have double the representation as compared to the second Block. Such a sample is known as probability proportion to size sample or PPS sample.

Check Your Progress 2

List the various types of probability sampling.

Note: a) Answer in the space given below.

b) Compare your answer with the one given at the end of this Unit.

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1.3.2 Non-probability Sampling

Non-probability sampling is based on the judgement of the researcher. The guiding factors in non-probability sampling include the availability of the units, the personal experience of the researcher and his/her convenience in carrying out a survey. Since these samples are not prepared through random sampling techniques, they are known as non-probability samples. Depending on the technique used, non-probability samples are classified into purposive, incidental and quota samples. A brief description of these samples is given below.

Purposive sample

A purposive sample is also known as a judgement sample. This type of sample is chosen because there are good reasons to believe that it is a representative of the total population. This also reflects certain controls identified as representative areas like a city, state or district; representative characteristics of individuals like age, sex, marital status, etc; or types of groups like school administrators, elementary school teachers, secondary school teachers, college teachers, etc.

Fig. 1.3: Non-probability sample

A purposive sample differs from stratified random sample in that the actual selection of the units to be included in the sample in each group is done purposively rather than by random methods. For example, let us consider a study of effectiveness of the NGO's personnel who have undergone Post-Graduate Diploma courses in Rural Development through Distance Education. This approach comes in handy where it is necessary to include a very small number of units in the sample. For example, for the study, the researcher, on the basis of his/her past experience, selects NGO's personnel who have completed Post-Graduate Diploma courses in Rural Development while excluding all other personnel from the sample.

Incidental sample

The term incidental sample, also known as accidental sample, is applicable to samples that have been drawn because of the easy availability of units. An investigator employed in the IGNOU may select learners enrolled for **Post-Graduate Diploma in Rural Development** while conducting a study on rural development, as these learners are readily available and fulfil the conditions of the study. But, neither of the two reasons may be of the investigator's choice. Therefore, such casual groups rarely constitute random samples of any definable population.

The merits of this procedure are mainly the convenience of obtaining units, the ease of testing and completeness of the data collected. However, it is the limitations that have defined population and no randomization has actually been done. Therefore any attempt to arrive at generalized conclusion in such cases will be erroneous and misleading.

Quota sample

Quota sample is another type of non-probability sample. It involves the selection of sample units within each stratum or quota on the basis of the judgement of the researcher rather than on calculable chance of the individual units being included in the sample. Suppose a national survey has to be done on the basis of quota sampling. The first step in quota sampling would be to stratify the population region wise like rural/urban, administrative districts etc. and then fix a quota of the sample to be selected. In the initial stage quota sampling is similar to stratified sampling. However, it may not necessarily employ random selection procedure in the initial stage in exactly the same way as probability sampling. The essential difference between probability sampling and quota sampling lies in the selection of the final sampling units. The quota is usually determined by the proportion of the groups. Suppose a researcher wants to study the attitude of university teacher towards distance education. First of all, he/she may stratify the university teachers in the category of sex and then as professors, readers, and lecturers. Later, he/she may fix quotas for all these categories. In this way, the quota sample would involve the use of strata but selection within the strata is not done on a random basis.

The advantages of quota sampling are, its being less expensive, convenient, and more suitable in the case of missing or incomplete sampling frames.

The non-probability samples are generally considered to be convenient when the sample to be selected is small and the researcher wants to get some idea of the population characteristics within a short time. In such cases, the primary objective of the researcher is to gain insight into the problem by selecting only those persons who can provide maximum insight into the problem.

However, the following are some inherent limitation of non-probability sampling methods:

1) No statistical theory has been devised to measure the reliability of results derived through purposive or other non-random samples. Hence, no confidence can be placed in the data obtained from such samples and results cannot be generalized for the entire population.

2) The selective sampling based on convenience affects the variance within the group as well as between the groups. Further, there is no statistical method to determine the margin of sampling errors.

3) Sometimes such samples are based on an obsolete frame which does not adequately cover the population.

1.3.3 Choice of the Sampling Method

The choice of sampling method depends on several considerations unique to each individual project. These include issues related to the definition of population, availability of information about the structure of the population, the parameters to be estimated, the objectives of the analysis including the degree of precision required, and the availability of financial and other resources. This calls for appropriate selection of a sample for the conduct of any research study.

1.3.4 Characteristics of a Good Sample

A good sample should have the characteristics of (i) Representativeness and (ii) Adequacy.

It is essential that the sample should be 'representative' of the population if the information from the sample is to be generalized for that population. The term representative sample means an ideal 'miniature' or 'replica' of the population from which it has been drawn.

A good sample should also be 'adequate' or of sufficient size to allow confidence in the stability of its characteristics. An adequate sample is considered to be one that contains enough cases to ensure reliable results. Hence, planning the size of the sample in advance is very important. It varies with the nature of the characteristics under study and its distribution.

It may be mentioned that representativeness and adequacy do not automatically ensure accuracy of results. The sampling and data collection techniques need to be selected and employed carefully to obtain higher degrees of precision in results and generalizations about the population.

1.3.5 Determination of Sample Size

Most researchers find it difficult to determine the size of the sample.

Krejcie and Morgan (1970) have given a table in which no calculations are needed to determine the size of the sample. The table is reproduced here for your reference.

Table for Determining Sample Size from a Given Population

N	S	N	S	N	S
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	396
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	341

N	S	N	S	N	S
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	361
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note: N is population size, S is sample size

Let us take one example. If you want to know the sample size required to be representative of the opinions of 300 beneficiaries, refer table at N=300. The sample size representative of the beneficiaries in this case will be 169. The table given above is applicable to any defined population.

Check Your Progress 3

a) Describe the various types of non-probability sample.

b) Discuss the characteristics of a good sample.

Note: a) Answer in the space given below.

b) Compare your answer with the one given at the end of this Unit.

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1.4 KEY POINTS AT A GLANCE

1) A population is a well-defined group of units: individuals, objects, attributes, qualities, characteristics, traits of human beings, etc.

2) A sample is a small representation of a population. It is a miniature picture of the entire group from which it has been selected.

3) To obtain a representative sample, you must select the unit in a specified way. This process is called sampling. It usually involves the following four steps: (i) Defining the population; (ii) Listing the population; (iii) Selecting a representative sample; and (iv) Obtaining an adequate sample.

4) Sampling methods can be classified into two broad categories: (i) Probability sampling and (ii) Non-probability sampling.

5) 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 population has the same probability of being included in the sample.

6) Simple or unrestricted random sampling, systematic sampling, stratified sampling, cluster sampling, multi-stage sampling and probability proportion to size sampling are the six main types of probability sampling. In all these types each unit in the sample has some known probability of entering the sample.

7) In simple or unrestricted random sampling each unit of the population is given an equal chance of being selected, 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 of such samples and carefully controlled conditions are created to ensure that each unit in the population has an equal chance of being included in the samples.

8) The researcher may use the lottery method or a table of random numbers for drawing a simple random sample.

9) Simple random sampling ensures best results. However, it is neither feasible nor possible if the lists of units do not exist or if such lists are incomplete.

10) If there is more heterogeneity among the units of population, a simple random sample may not necessarily represent the characteristics of the total population even if all selected units participate in the investigation.

11) In systematic sampling, a researcher generally starts with a list in which all the N units of the population are listed in alphabetical or in any other order. To select a sample of size n, the researcher has to select a unit at random from the first $k = (N/n)$ units of the list and then every subsequent k^{th} unit is selected.

12) A systematic sample is as good as a simple random sample and is comparatively more convenient to draw. However, the characteristics of “trend”, “cyclical fluctuations” and “periodic effects” of a listed population unduly increase the variability of samples.

13) When the units in a sample are proportional to their presence in the population, the sampling is said to be stratified.

14) When a population is stratified, the units within each stratum are more or less homogeneous than the units within the entire population.

15) Stratified random sampling is very useful when lists of units in the population are not available. The method has been found practical even for small finite populations when cent percent response is difficult to secure within the desired time.

16) Stratified random sampling provides more accurate results than simple random sampling only if stratification results in greater homogeneity within the strata than in the whole population taken as one unit. It is particularly useful in opinion survey studies.

17) Cluster sampling is used when the population under study is infinite, where a list of units of the population does not exist, when the geographical distribution of units is scattered, or when sampling of individual units is not convenient for various practical purposes.

18) Cluster sampling involves division of the population of elementary units into groups of elements or clusters instead of individual members or items in the population.

19) Cluster sampling is economical, especially when the cost of measuring a unit is relatively small and cost of reaching it is relatively large.

20) Multi-stage sampling is used in large-scale surveys for a more comprehensive investigation. In this type of sampling, the researcher may have to use two, three or even four stages of sampling.

21) Multi-stage sampling is comparatively convenient, less time consuming and less expensive. However an element of sample bias gets introduced because of the unequal size of some of the selected sub-samples.

22) When the units vary in size, it is better to select a sample in which the probability of selection of a unit is proportional to its size. This sample is known as probability proportion to size sample or PPS sample.

23) Non-probability sampling is based on the judgement of the researcher. Its guiding principles are: (i) availability of sampling units, (ii) personal experiences of the researcher, and (iii) the researcher's convenience in conducting the research. Since this type of sampling does not involve the principle of probability, it is called non-probability sample.

24) Non-probability sampling provides (i) purposive samples, (ii) incidental samples, and (iii) quota samples.

25) A purposive sample is arbitrarily selected because there is good evidence that it is a representative of the total population. The evidence is based on researcher's experience.

26) An incidental sample is generally used with those groups which are selected because of the easy or ready availability of sample units.

27) A quota sample involves selection of the sample units within each stratum or quotas on the basis of the judgement of the researcher rather than on calculable chance of being included in it.

28) Non-probability samples are very convenient in situations where the sample to be selected is very small and the researcher wants to get some idea of the characteristics of a population in a shorter time.

29) Non-probability samples have certain limitations. No valid generalisations can be made beyond the sample studied. These samples depend exclusively on uncontrolled factors and the researcher's insight. Hence, the sampling error of such samples is hardly determinable.

30) The choice of an appropriate sampling method by a researcher depends upon many factors. These include (i) defining the population, (ii) availability of information about the structure of population, (iii) the parameters to be estimated, (iv) the objectives of the analysis including degree of precision required, and (v) the availability of financial and other resources.

31) Representativeness and adequacy are the major characteristics of a good sample.

1.5 LET US SUM UP

In this Unit we discussed the concept of population and sample, and the two methods of sampling, namely, probability and non-probability sampling.

Under 'probability sampling' we discussed its various types such as simple random sampling or unrestricted random sampling, systematic sampling, stratified sampling, cluster sampling and multi-stage sampling.

Under 'non-probability' sampling we discussed purposive sample, incidental sample, quota sample and also touched upon the choice of sample.

We ended this Unit with a description of the characteristics of a good sample: representativeness and adequacy.

1.6 GLOSSARY

Population : A population is any group of individuals or units that have one or more characteristics in common and are of interest to the researcher. It may consists of all the units or individuals of a particular type or a more restricted part of that group.

Sample : A sample is a small proportion of a population selected for analysis. By observing the sample, certain inferences may be drawn about the population. Samples are not selected haphazardly, but deliberately, so that the influence of chance or probability can be estimated.

Probability : Probability is the ratio of the number of ways in which a favoured way can occur to the total number of ways theevent can occur. It may range from zero, when there is no chance whatever, of the favoured event, to 1.0, where there is absolute certainty that nothing else could happen.

Probability Sampling : In probability sampling, the units of a population are not selected at the discretion of the researcher but by means of certain

		procedures which ensure that every unit of the population has one fixed probability of being included in the sample. It is a procedure of drawing the units of a population in such a way that every unit has an equal and independent chance of being included in the sample.
Non-probability Sampling	:	In non-probability sampling, the units are selected at the discretion of the researcher. The researcher uses his/her judgement or experience while selecting the sample.
Sampling Frame	:	A complete, accurate, and up-to-date list of all the units in population is called a sampling frame.
Representative Sample	:	A representative sample is one that matches with its corresponding population with respect to the characteristics important for the research.
Parameter	:	Measures which describe a population are called parameters.
Statistics	:	The measures estimated from the samples are called statistics.
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 a 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'.
Biased Sample	:	A sample that is not representative is known as a biased sample. Biases may be due to imperfect tools or instruments, personal qualities of the researcher, defective techniques or other causes.

1.7 CHECK YOUR PROGRESS: THE KEY

1) Sampling is the process of selecting a sample which is a small representation of a large whole or group. A sample should represent truly and adequately the larger whole. A sampling frame should be complete, accurate, up-to-date, unbiased and objective.

2) Sampling or unrestricted random sampling, systematic sampling, stratified sampling, cluster sampling, multi-stage sampling and probability proportion to size sampling (PPS) are the important types of probability sampling.

3) a) Non-probability sampling includes (i) purposive sample, (ii) incidental sample and (iii) quota sample.

- Purposive sample is useful when we have to include a very small number of units in a given sample.
- Incidental sample is generally applied in the case where units are easily or readily available.
- Quota sample involves the selection of sample units within each stratum or quota on the basis of the judgement of the researcher. Sample units are not included accidentally or at random.

b) A good sample must be

- representative of the population chosen
- adequate and
- accurate.