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An empirical investigation is an investigation where facts are collected through observation.

Quantitative Data and Qualitative Data: When information or observation are recorded in numbers or quantity we say we have quantified information. For example, the number of people in a state who are strict vegetarians, heights or weights of students, everyday temperature, income of individuals prices of wheat during this week, number of people in country are really poor-rich-middle class, number of people are illiterate who will not get jobs, number of highly educated and will have best job opportunities, etc. are known as '*Quantitative data*'.

However, not all information can be numerically expressed. It is not possible in certain cases to measure or quantify information, e.g., preference of people viewing T.V. channels, intelligence of students, appreciation of art, beauty, music etc. Supposing a selection for a post is to be made, candidates are interviewed, some questions are put to them and their qualifications are taken into consideration. The interview board discusses the comparative merit of the candidates and ranks them for final selection. This judgment is not quantifiable, it is based on impression.

Non- quantifiable/qualitative items can however be measured in percentages. For example, percentage of people watching T.V. news in English or Hindi or other regional languages. This information obtained in percentages is called '*Quantitative data*'. It may be collected through questionnaire or opinion poll using landline or mobile telephone, internet or newspapers.

What is Statistics?

It is necessary to have quantitative measurement even for things which are not basically quantifiable. This is necessary for preciseness of statement. The systematic treatment of quantitative expression is known as ‘Statistics’. Not all quantitative expressions are statistics; we will see that certain conditions must be fulfilled for a quantitative statement to be called statistics. We will also consider later the functions and limitation of statistics. First, let us understand what comes under the name Statistics.

Statistics can be defined in two ways:

- (a) In plural sense.
- (b) In singular sense.

Statistics defined in plural sense (as statistical data): Let us consider whether figures 1600, 400, 80, 20, 700, 300, 70 and 30 are statistics? Figures are innocent and do not speak anything. But when they refer to some place, person, time etc., they are called statistics. Let us look at the table given below:

	Kendria Vidyalaya		Govt. Senior Secondary School	
Students	Number	Percentage	Number	Percentage
Boys	1600	80	700	70
Girls	400	20	300	30
	2000	100	1000	100

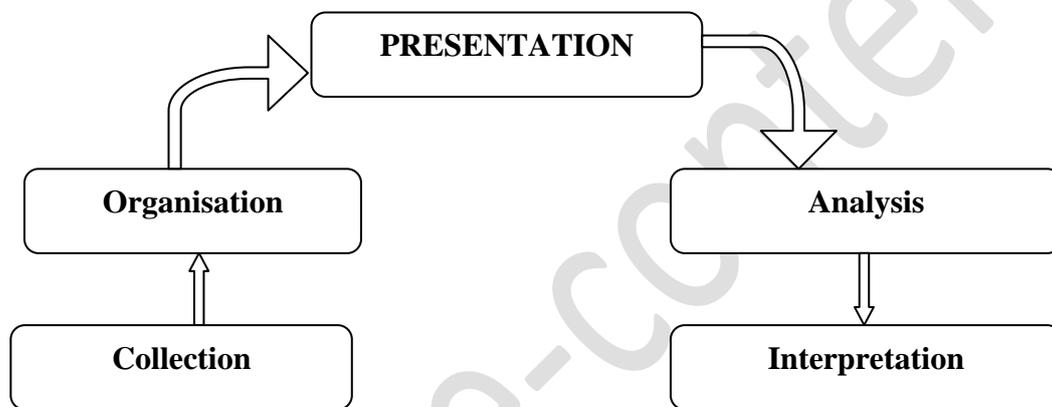
The above table gives a numerical description of students in Kendria Vidyalaya and Govt. Senior Secondary School. Students are grouped as boys and girls and percentage is calculated for each group. Now, in this context the figures 1600, 400, 700 etc., have a statistical meaning; we call this statistics of students. Similarly, we find in newspaper statistics of scores in a cricket match, statistics of price, statistics of agricultural production, statistics of export and import etc.

According to Horace Secrist, *“By statistics we mean aggregates of facts affected to a marked extent by multiplicity of causes numerically expressed, enumerated or estimated according to reasonable standards of accuracy, collected in a systematic manner for a predetermined purpose and placed in relation to each other.”*

- (a) **Statistics are aggregates of facts:**
- (b) **Statistics are affected to a marked extent by multiplicity of causes**
- (c) **Statistics are numerically expressed:**

- (d) Statistics are enumerated or estimated according to reasonable standard of accuracy
- (e) Statistics are collected in a systematic manner
- (f) Statistics are collected for pre-determined purpose
- (g) Statistics are placed in relation to each other

Statistics defined in singular sense (as a statistical method) : Statistics in its second, singular sense, refers to the methods adopted for scientific empirical studies. Whenever a large amount of numerical data are collected, there arises a need to organize, present, analyse and interpret them. Statistical methods deal with these stages:



According to Croxton and Cowden, “Statistics may be defined as a science of collection, presentation, analysis and interpretation of numerical data.”

The above definition covers the following statistical tools:

- (a) **Collection of data :** Data should be gathered with maximum care by the investigator himself or obtained from reliable published or unpublished sources.
- (b) **Organisation of data :** Organised by editing, classifying and tabulating.
- (c) **Presentation of data :** The organised data can be presented with the help of tables, graphs, diagrams etc.
- (d) **Analysis of data :** There are large number of methods used for analysing the data such as averages, dispersion, correlation etc.
- (e) **Interpretation of data :** Interpretation of data implies the drawing of conclusions on the basis of the data analysed in the earlier stage. On the basis of this conclusion certain decisions can be taken.

STAGES OF STATISTICAL STUDY

- (1) INTERPRETATION OF DATA
- (2) ANALYSIS OF DATA
- (3) PRESENTATION OF DATA
- (4) ORGANISATION OF DATA
- (5) COLLECTION OF DATA

LIMITATIONS OF STATISTICS

Statistics is very widely used in all sciences but it is not without limitations. It is necessary to know the misuses and limitations of statistics. The following are the limitations of statistics.

- 1. It does not Study the qualitative aspect of a problem :** The most important condition of statistical study is that the subject of investigation and inquiry should be capable of being quantitatively measured, Qualitative phenomena, e.g., honesty, intelligence, poverty, etc., cannot be studied in statistics unless these attributes are expressed in terms of numerals.
- 2. It does not Study individuals :** Statistics is the study of mass data and deals with aggregates of facts which are ultimately reduced to a single value for analysis. Individual values of the observation have no specific importance. For example, the income of a family is, say Rs. 1,000 does not convey statistical meaning while the average income of 100 families say Rs. 400, is a statistical statement.
- 3. Statistical laws are true only on an average :** Laws of statistics are not universally applicable like the laws of chemistry, physics and mathematics. They are true on an average because the results are affected by a large number of causes. The ultimate results obtained by statistical analysis are true under certain circumstances only.
- 4. Statistics can be misused:** Statistics is liable to be misused. The results obtained can be manipulated according to one's own interests and such manipulated results can mislead the community.

5. **Statistics simply is one of the methods of studying a phenomenon:** Statistical calculations are simple expressions which should be supplemented by other methods for a completed comprehension of the results. Thus statistics is only a means and not the end.

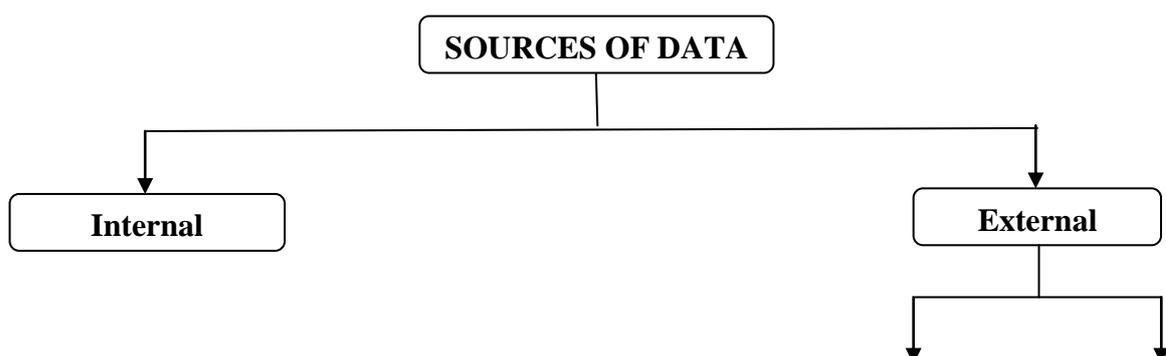
6. **Statistical results lack mathematical accuracy:** The results drawn from statistical analysis are normally in approximates. As the statistical analysis is based on observations of mass data, number of inaccuracies may be present and it is difficult to rectify them. Therefore, these results are estimates rather than exact statements. Statistical studies are a failure in the fields where cent-per-cent accuracy is desired.

MISUSE OF STATISTICS

This is so because it is possible to misuse statistics by deliberately twisting or manipulating data. This is possible just as the law can be interpreted by a lawyer to prove his own point. That is why some people say '*with statistics anything can be proved*' or '*statistics is another form of lying*'.

SOURCES OF DATA

There are different sources of collection of data. This is the first stage in statistics. Before deciding the source to collect the data one has to make a proper planning of investigation and the purpose of enquiry. Following are the various sources of collection of data.



Internal : A large number of individual organizations and Government departments *generate* the data as their regular function which is the internal information. They gather this information for printing regular reports for their own purpose. Internal data may be available in the organization about sales, production, salary, wage, profit, dividends etc. Such data are always available in the books of the organization which are compiled and sent to management for future planning. Government departments *viz.*, Railways, Social Welfare, Education, etc., do generate a large number of internal data for preparing financial reports and extraordinary reports.

External : Information collected from outside agencies is called external data which can be obtained from primary source or secondary source. This type of information can be collected by census or sample methods by conducting surveys and investigations.

PRIMARY AND SECONDARY DATA

Primary data is original and first hand information. If you want to get some statistical information about payment of wages of workers of a factory you as an investigator can visit the workers' colony, get this information by contacting every worker by enquiring about the wages paid to him and record it, this first hand information is the primary data. But, you may have the other choice that of visiting the factory accounts department, and record the information from the salary register or, may gather this information from the published report of the factory about the payment of wages. This is secondary source for an investigator but, for the factory it is a primary source.

Thus, primary data is collected originally and secondary data is collected through other sources. Primary data is first hand Information for a particular statistical enquiry while the same data is second hand Information for an another enquiry. The same data is primary in one had and secondary in the other, e.g., any

Government publication is first hand (Primary) for Government and second hand (Secondary) for a research worker. Thus, secondary data can be obtained either from published sources or from any other source, for example, a website which saves time and cost.

How Primary Data is Collected

The most popular and common tool is questionnaire/interview schedule to collect the primary data. The questionnaire is managed by the enumerator, researchers or trained, investigators. Sometimes the questionnaire is managed by the respondents also.

DRAFTING THE QUESTIONNAIRE?

Following are the basic principles of drafting questionnaire :

(1) Covering letter : The person conducting the survey must introduce himself and make the aims and objectives of the enquiry clear to the informant. A personal letter can be enclosed indicating the purposes and aims of enquiry. The informant should be taken into confidence. He should be assured that his answers will be kept confidential and he will not be solicited after he fills up the questionnaire. A self addressed and stamped envelope should be enclosed for the convenience of the informant to return the questionnaire.

(2) Number of questions : The informant should be made comfortable by asking minimum number of questions based on the objectives and scope of enquiry. More the number of questions, lesser the possibility of response. Therefore, normally fifteen to twenty-five questions are sufficient enough for making the required enquiry. Lengthy questions should preferably be divided into parts. Irrelevant questions should be eliminated. The questionnaire should not be too long to enable the respondent to answer quickly, correctly and clearly.

(3) Personal questions should be avoided : The informant may not desire to answer such questions which may disclose his confidential, private or personal Information. Question affecting the sentiments of Informants should not be asked.

(4) The questions should be simple and clear : The language of the questions should be easy to understand. It should not be ambiguous. It should be simple and clear. The questionnaire should start from general questions.

(5) The questions should be arranged logically : It helps in classification and tabulation of data. It is not logical to ask a man his income before asking him whether he is employed or not. There should be a proper sequence of the questions.

(6) Instructions to the Informations : Definite instructions for filling in the questionnaire should be given, instructions about when and where to return the questionnaire instructions about units of measurement should be given.

(7) The questions may be divided and subdivided under different heads and subheads and should be properly numbered for the convenience of the informant and the investigator.

(8) Multiple choice questions : Questions should be capable of objective answers. They should be framed in such a way that the answers are factual or objective. For this the informant should be able to give the answers simply by using a tick-mark in the blank space, e.g.,

Which of the following languages you use most for writing? (Put a cross)

- | | | | |
|---------------|--------------------------|------------|--------------------------|
| (i) English | <input type="checkbox"/> | (ii) Hindi | <input type="checkbox"/> |
| (iii) Punjabi | <input type="checkbox"/> | (iv) Urdu | <input type="checkbox"/> |
| (v) Any other | <input type="checkbox"/> | | |

(9) Simple alternative questions : (Yes/No) As far as possible the questions should framed in such a way that they are answerable in 'Yes' or 'No' or 'Right' 'Wrong', e.g., ()

Are you married? Yes/No

Are you employed? Yes/No

(10) Specific information question : The questionnaire should start from general questions to more specific ones. We get specific answers to such type of questions. These questions are simple and direct.

In which class do you read?

In which subject you are more interested?

(11) Open question : It makes the informant free to give any reply he chooses. Such questions are difficult to tabulate and increase labour in statistical work. Such questions should be minimum in number in the questionnaire.

Example :

- (a) Suggest the measures to solve the problems of poor students in University of Delhi.
- (b) How will you solve the wage problem in your industry?

(12) The questions should be directly related to the point under enquiry for which the data is being collected. The question should not use negatives as starting with 'wouldn't', 'Don't you'.

(13) Avoidance of leading questions : As far as possible leading questions should be avoided. Why do you like 'Broke Bond Tea'? Instead of such simple question, two questions can be framed for enquiry, namely :

(14) Attractive layout : The questionnaire should be made to look as attractive as possible. Keeping in view the possible answer to the questions of schedule, sufficient space should be provided.

(15) Avoidance of questions of calculations : As far as possible no question should be asked which requires mathematical calculations like percentage, ratio etc. It gives strain to the informant and he may avoid sending the questionnaire back.

(16) Avoidance of certain questions : Correct answers to certain questions cannot be obtained. Such debatable questions should never be included in the questionnaire.

Example : (a) Do you tell a lie?

(b) Do you love your children?

(c) Do you beat your wife?

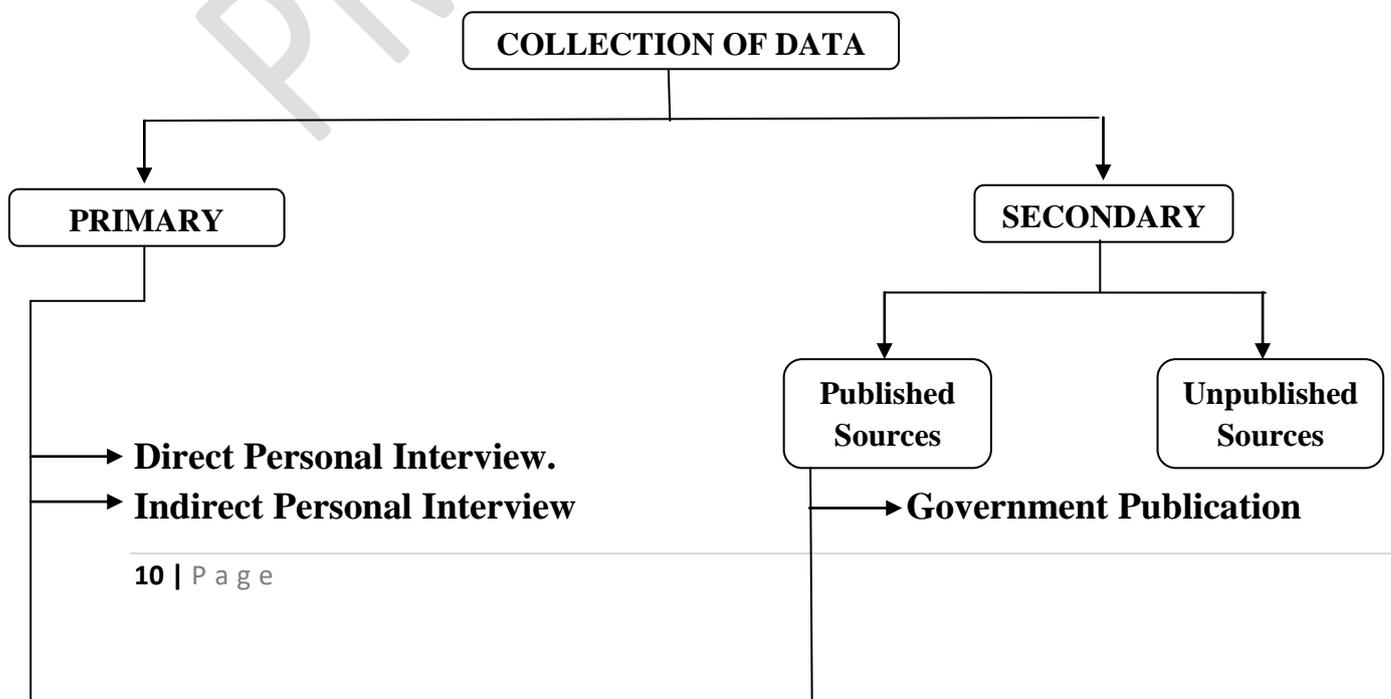
(17) Cross checks : Some questions should provide the means of checking inaccuracy in the answers. For example, question on age and date of birth is a cross check. It helps to decide whether the informant is answering the questions correctly and consistently.

(18) Questions on familiar topics : Questions which require strain should be avoided. Too much reliance on memories of distant past may elicit wrong answers. Informants should be able to answer from their own memory and knowledge.

(19) Pre-testing of questionnaire : Before taking the enquiry on a large scale the questionnaire drafted should be pre-tested with a small number of a group of persons.

METHODS OF COLLECTING PRIMARY DATA

(I) Direct personal interview



—→ Telephone Interview Bodies	—→ Publications of Internal
—→ Information from Correspondents	—→ Semi-official Publications
—→ Commissions Mailed Questionnaires	—→ Report of Committees and Private Publications
—→ Questionnaires Filled by Newspapers Enumerators Bodies Co. Reports	(a) Journals and (b) Research Institutions (c) Professional Trade (d) Annual Reports of Joint Stock (e) Articles, Market Reviews and

Merits :

1. Original data are collected by this method.
2. There is uniformity in collection of data.
3. The required information can be properly obtained.
4. There is flexibility in the enquiry as the investigator is personally present.
5. Information can be obtained easily from the informants by a personal interview.
6. Since the enquiry is intensive and in person, the results obtained are normally reliable and accurate.
7. Informants' reactions to questions can be properly studied.
8. Investigators can use the language of communication according to the educational standard and attitude of the informant.

Limitations :

1. This method can be used if the field of enquiry is small. It cannot be used when field of enquiry is wide.
2. It is costly method and consume more time.

3. Personal bias can give wrong results.
4. Investigators need to be trained and supervised for the job, otherwise results obtained may not be reliable.
5. This method is lengthy and complex.

(II) Indirect personal interview :

Merits :

1. This method covers a wide area of investigation. Whenever the informant in direct investigation is reluctant to give information, or cannot be contacted, this method is a good alternative.
2. As the information is obtained from the third party, it is more or less free from biased or prejudiced approach of the investigator and the informant.
3. It saves labour, time and money.
4. As the information covers a wide range, different aspects of problems can properly be studied.

Limitations :

1. As the information is obtained from the third-party and not by the person directly concerned, there exists a possibility of not getting true information.
2. Various evidence obtained may be sometimes exaggerated according to the interest of the person answering the question or supplying the information.

(III) Telephone interview :

Merits :

1. Telephone interviews are cheaper than personal interviews.
2. It can be conducted in a shorter period of time.
3. The investigator can assist the respondent by clarifying the questions.
4. Sometimes respondents are reluctant to answer some questions in personal interviews, Telephone interviews are better in such cases.

Limitations :

1. Information cannot be obtained from people who do not have their own telephones.

2. Reactions of respondents on certain issues cannot be judged; but it sometimes becomes helpful in obtaining information from respondents.

(IV) Information from correspondents :

Merits :

1. This method is comparatively cheap.
2. It gives results easily and promptly.
3. It can cover a wide area under investigation.

Limitations :

1. In this method original data is not obtained.
2. It gives approximate and rough results.
3. As the correspondent uses his own judgment, his personal bias may affect the accuracy of the information sent.
4. Different attitudes of different correspondents and agents may increase errors

(V) Mailed questionnaires :

Merits :

1. Large field can be studied by this method. We can use this method in cases where informants are spread over a wide geographical area.
2. This is not an expensive method. It is cheap as mailing cost is less than the cost of personal visits.
3. We can obtain original data by this method.
4. It is free from the bias of the investigator as the information is given by the informants themselves.

Limitations :

1. It is difficult to presume the cooperation on the part of the informants. They may fail to send back the schedules or may misinterpret or may not understand some questions.
2. Schedules sent back by the informants may be incomplete or inaccurate and it may be difficult to verify the accuracy.

3. There may be delays in getting replies to the questionnaires.
4. This method can be used only when the informants are educated or literate, so that they return the questionnaires duly read, understood and answered.
5. There is a possibility of getting wrong results due to partial responses, and, those who do answer may not include certain type of persons from whom the specific information is required.
6. There may be loss of questionnaires in mail.

(VI) Questionnaire filled by enumerators :

Merits :

1. It can cover a wide area.
2. The results are not affected by personal bias.
3. True and reliable answer to difficult questions can be obtained through establishment of personal contact between the enumerator and the informant.
4. As the information is collected by trained and experienced enumerators, it is reasonably accurate and reliable.
5. This method can be adopted in those cases also where the informants are illiterate.
6. Personal presence of investigator assured complete response and respondents can be persuaded to give the answers to the questionnaire.

Limitations :

1. It is expensive method as compared to other methods of primary collection of data, as the enumerators are required to be paid.
2. This method is time consuming since the enumerator is required to visit people spread out over a wide area.
3. This method needs the supervision of investigators and enumerators.
4. Enumerators need to be trained. Without good interview and proper training, most of the collected information is vague and may lead to wrong conclusions.

5. It needs a good battery of investigators to cover the wide area of universe and therefore it can be used by bigger organizations.

CENSUS AND SAMPLE SURVEYS:

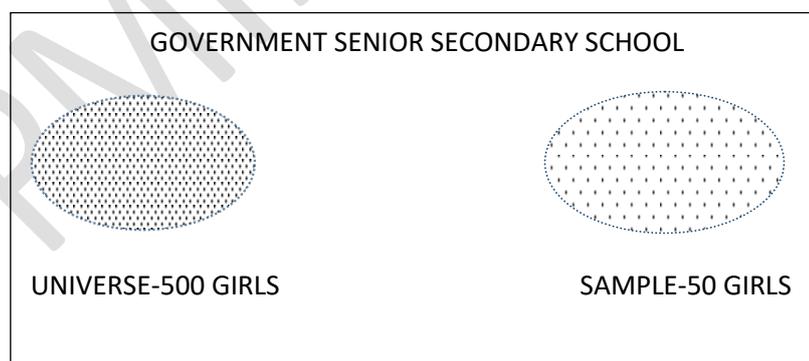
Every individual who is using the statistical technique is required to collect information. There are two methods of survey to collect data :

- (a) Census method/Census Survey, and
- (b) Sample method/Sample Survey.

For discussing the above methods, it is necessary to have a clear understanding of terms “population” and “sample”.

Population and Sample :

In statistics the term ‘Population’ and ‘Universe’ means the inclusion of all the items in the field of statistical enquiry and sample means selection of few items as representatives of all the items. A part of the whole population is called *sample* and the process of selection is termed as sampling. Suppose, there are 500 girls in Govt. Senior Secondary School. If we want to know the average weight of those girls, we will weigh each girl and will get the information about all the five hundred girls. Then the average weight will be obtained by dividing the total weight of the girls by the number of girls. The population is the weight of the entire group of 500 girls. However, we can save the time and labour



by taking only 50 girls out of 500 and obtain the average of this part of the total population. The average of 50 girls reasonably be representative of average weight of 500 girls. In this case weight of 50 girls is the sample.

Census Surveys

The objective of a census method or complete enumeration is to collect information for each and every unit of the population/universe. In this method every element of population is included in the investigation. Thus, when we make a complete enumeration of all items in population, it is known as 'Census Method' or 'Method of Complete Enumeration'. In above example, collecting weights of all the 500 girls in Senior Secondary School is census method of collection where no Student is left over, as each student is a unit.

Following are few examples of census :

1. The population census is carried out once in every ten years in India. Most recently population census in India was carried out in February, 2001 by house to house enquiry to cover all households in india.
2. Demographic data obtained by census method on death rates and birth rates, literacy, work force, life expectancy and composition of population etc. are published by Registrar General of India.
3. The data relating to estimation of the total area under principal crops in India are obtained by using village records maintained regularly by Patwari.

Let us review the following census data in the following Table no. 2 regarding relative growth of Urban and Rural Population in India obtained from Reports and Economic Survey 2002-2003,

TABLE 2

Relative Growth of Urban and Rural Population in India

Year	Urban Population (in crores)	Rural Population	Total Population (in crores)	As Percentage of Total Population	
				Urban Population	Rural Population
1901	2.58	21.25	23.83	10.9	89.1
1911	2.59	22.62	25.21	10.3	89.7

1921	2.80	22.32	25.12	11.2	88.8
1931	3.35	24.54	27.89	12.1	87.9
1941	4.41	27.44	31.85	13.8	86.2
1951	6.24	29.87	36.11	17.3	82.7
1961	7.89	36.02	43.91	18.0	82.0
1971	10.89	43.93	54.82	19.9	80.1
1981	16.22	52.11	68.33	23.7	76.3
1991	21.76	62.87	84.63	25.7	74.3
2001	28.50	74.2	102.7	27.8	72.2

Source : Census Reports and Economic Survey 2002-2003.

Rural areas in India account for more than 72 per cent of India's population. In 2001, 74.2 crore persons, out of about 102.7 crore total population lived in around 5.5 lakhs villages while the remaining 28.5 crore persons lived in towns and cities or urban areas. In 1901, about 2.6 crore persons out of a total population of around 24 crores lived in urban areas. The urban population formed about 11 per cent and rural population 89 per cent of total population. The ratio of urban population had gone up to around 28 per cent in 2001 while still over 72 per cent people lived in rural areas. The above table shows the relative growth of rural and urban population in India since 1901.

The net addition to rural population between 1991-2001 was 11.33 crore, while urban population increased by 6.74 crore persons. The decadal growth rate for rural and urban population was 17.9 and 31.2 respectively. There was a net increase of 2.1 per cent in the growth rate of urban population in the decade ending 2001 over the decade ending 1991.

SAMPLE SURVEYS

We may study a sample drawn from the large population and if that sample is adequate representative of the population, we should be able to arrive at valid conclusions. The results obtained by sample study can be applied to the whole universe or population. Thus, when we make sample enumeration of some units of

population is called 'Sample Method' of collecting of data. In above example, collecting the weights of 50 girls out of 500 girls in Senior Secondary School is sample method of collection. In this method few students as sample considered for our study.

Following are a few common examples of sampling:

- (a) We look at a handful of grain to evaluate the quality of wheat, rice or pulses, etc.
- (b) A few items are tested to find out the life span of electric bulbs out of each lot.
- (c) A drop of blood is tested for diseases like malaria or typhoid etc.
- (d) A few nuts or bolts are tested from the complete lot of production for final judgment of the quality.
- (e) The television network provides election coverage by exit polls and prediction is made.

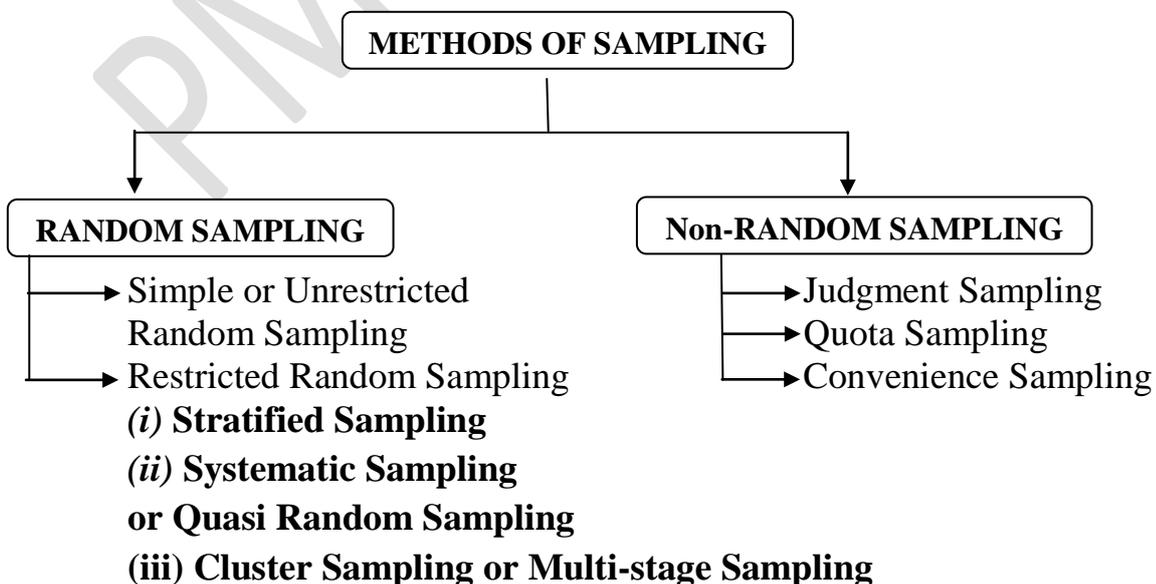
Thus, in our statistical terminology *population* or *universe* does not mean the total number of people, in an area; it means the total number of observations or items in particular enquiry. And sample means a small population of items selected from a universe for statistical studies.

METHODS OF SAMPLING

Broadly speaking, various methods of sampling can be grouped under two main heads :

- (a) Random Sampling, and (b) Non-Random Sampling.

Let us discuss now the various sampling methods which are popularly used in practice.



RANDOM SAMPLING

Random Sampling is one where the individual units (Samples) are selected at random. It is called as probability sampling.

Random sampling does not mean unsystematic selection of units. It means the chances of each item of the universe being included in the sample is equal. The term 'Random Sampling' here is not used to describe the data in the sample but it refers to the process used for selecting the sample. Following are the methods of random sampling.

Simple or Unrestricted Random Sampling

This method is also known as simple random sampling. In this method the selection of item is not determined by the investigator but the process used to select the terms of the sample decides the chances of selection. Each item of the universe has an equal chance of being included in the sample. It is free from discrimination and human judgement. Random sampling is the scientific procedure of obtaining a sample from the given population. It depends on the law of probability which decides the inclusion of items in a sample. To ensure randomness, mechanical devices are used. There are two methods of obtaining the simple random sample. They are:

- (a) Lottery method, and
- (b) Table of Random Numbers.

(a) Lottery Method : A random sample can generally be selected by this simple and popular method. All the items of the universe are numbered and these numbers are written on identical pieces of paper (slip). They are mixed in a bowl and then there starts the selection by draw one by one shaking the bowl before every draw. The numbers are picked out blind folded. All slips must be identical in size, shape and colour to avoid the biased selection. A special kind of rotating drum is used for finding random numbers. It is called the

Electronic Random Numbers Indicator Equipment. The drum contains round wooden or metal pieces on which numbers 0 to 9 are written. The drum is rotated by a mechanical device and each time one piece comes out. The process is repeated to get the full number of digits, for instance if the number is in thousands, the drum is to be rotated four time. This method is used in drawing prizes for lotteries, prize bonds, etc.

Restricted Random Sampling

They are as follows:

- (i) **Stratified random sampling:** In this method the universe is divided into strata or homogeneous groups and an equal sample is drawn from each stratum or layer at random. This method is therefore useful when the population of the universe is not fully homogeneous.

For example, suppose we want to know how much pocket money an average university student gets every month will betaken equal sample from various strata, namely: B.A. students, M.A. students and Ph.D. students etc. Stratified random sampling is widely used in market research and opinion polls, it is fairly easy to classify people into occupational, economic, social, religious and other strata.

There are different types of stratified sampling

- (a) Proportional stratified sampling is one in which the items are taken from each stratum in the proportion of the units of the stratum to the total population.
- (b) Disproportionate stratified sampling is one in which units in equal numbers are taken from each stratum irrespective of its size.
- (c) Stratified weighted sampling is one where units are taken in equal number from each stratum, but weights are given to different strata on the basis of their size.
- (ii) **Systematic sampling or quasi-random sampling :** Systematic sampling is a simpler and a more convenient method. This is used

when a complete list of the population is available. This is called a quasi-random method because a kind of randomness is achieved by preparing this list in some random order, for example, alphabetical order.

The method consists of selecting every n th item from the list, n stands for any number. Suppose we have a universe of 10,000 items and we want a sample of 1000, then we take $n = 10$. The method of selecting the first item from the list is to decide at random from the first sampling interval, i.e., between one and ten. Suppose we pick up the 5th item. Then the other items will be 15th, 25th, 35th, and so on until we have got our full sample. In order to get reliable results it should be made sure that the list of the universe is fully random and that there are no inherent periodicities in the list.

Merits

1. It is systematic, very simple, convenient and checking can also be done quickly.
2. In this method time and work is reduced much.
3. The results are also found to be generally satisfactory.

Demerits

1. Systematic selection may or may not approach chance or random selection as random will not be a determining factor in the selection of a sample.
2. It is feasible only if the units are systematically managed.
3. If the universe is arranged in wrong manner, the results will be misleading.

NON-RANDOM SAMPLING

Non-random sampling is done on the basis of convenience and judgement of the investigator and not on the basis of probability, as

against random sampling. Thus, non-random sampling is not free; it is determined by certain considerations. The following are some important methods of non-random sampling:

- (a) Judgement or purposive sampling
- (b) Quota sampling
- (c) Convenience sampling.

ADVANTAGES OF SAMPLING

Having discussed the various methods of sampling we will now enumerate the advantages of sampling method in general.

1. Economy of time.
- 2.. Economy of cost.
3. Reliability.
4. Minimum errors.
5. Follow up.
6. Information in depth.
7. Indispensability.
8. Checking census results.

HOW SECONDARY DATA IS COLLECTED

Secondary data are those which are collected by some other agency and are used for further studies. It is not necessary to conduct special surveys and investigations. We can obtain the required statistical information from other institutions, or reports which are ready published by them as a part of their routine work. It saves cost and time which are involved in collection of primary data. Secondary data may be either (a) published or (b) unpublished.

Published Sources

The various sources of published data are as under :

- (i) **Government publications** : Different ministries and departments of Central and State Governments publish regularly current information

along with statistical data on a number of subjects. This information is quite reliable for related studies. The examples of such publications are: Annual Survey of Industries, Labour Gazette, Agriculture Statistics of India, Indian Trade Journal, etc.

- (ii) Publication of international organization : We can obtain valuable international statistics from official publication of different international organizations, like, the United Nations Organisation (UNO), International Labour Organisation (ILO) , International Monetary Fund (IMF), World Bank, etc.
- (iii) Semi-official publications : Local bodies such as Municipal Corporation, District Board etc. publish periodical reports which give factual information about health, sanitation, birth, deaths etc.
- (iv) Reports of committees and commissions : Various Committees and Commissions are appointed by the Central and State Governments for some special study and recommendations. The reports of such committees and commissions contain valuable data. Some of the reports are : Report of National Agricultural Commission, Report of the Tariff Commission, the Patel Committee Report etc.
- (v) Private Publications :
 - (a) **Journal and newspapers.** Journals like Eastern Economists, Journal of Industry and Trade, Monthly Statistics of Trade; and newspapers, like Financial Express, Economics Times, collect and regularly publish the data on different fields of economics, commerce and trade.
 - (b) **Research institutions.** There are a number of institutions doing research on allied subjects. This is the most important source of obtaining secondary data. The National Council of Applied Economic Research and Foundation of Scientific and Economic Research are such institutions. Research scholars at the university level also contribute significantly to the availabilities of secondary data.

- (c) **Professional trade bodies.** Chambers of Commerce and Trade Association publish statistics relating to trade and commerce. Federation of Indian Chamber of Commerce, Institute of Chartered Accountants, Sugar Mills Association, Bombay Mill Owners Association, Stock Exchanges, Bank and Cooperative Societies. Trade Unions, etc. publish statistical data.
- (d) **Annual reports of joint stock companies** are also useful for obtaining statistical information. These are published by companies every year.
- (e) **Articles, market review and reports** also, provide valuable data for research study.

Unpublished Data

Research institutions, trade associations, universities, labour bureaus, research workers and scholars do collect data but they normally do not publish it. Apart from the above sources we can get the information from records and files of government and private offices.

Limitation of Secondary Data

One should use the secondary data with care and full precaution and should not accept them at their face value as they may be suffering from the following limitations::

1. They may not have been collected by proper procedure.
2. They may not be suitable for a required purpose. The information which was collected on a particular base may not be suitable and relevant to an enquiry.
3. They may have been influenced by the biased investigation or personal prejudices.
4. They may be out of date and not suitable to the present period.
5. They may not satisfy a reasonable standard of accuracy.
6. They may not cover the full period of investigation.

Precautions in the Use of Secondary Data

The investigator should consider the following points before using the secondary data :

- (a) Are the data reliable.
- (b) Are the data suitable for the purpose of investigation?
- (c) Are the data adequate?
- (d) Are the data collected by proper method?
- (e) From which source were the data collected?
- (f) Who has collected the data?
- (g) Are the data biased?

Thus, the secondary data should not be used at its face value. It is risky to use such statistics collected by others unless they have been properly scrutinized and found reliable, suitable and adequate.

SOME IMPORTANT SOURCES OF SECONDARY DATA (CENSUS OF INDIA AND NATIONAL SAMPLE SURVEY ORGANISATIONS)

There are various sources and organizations through which statistical data are being compiled in India. Since India achieved Independence, great and rapid strides have been made in the field of collection of data. In the context of economic planning, importance of statistics (data) in the country has become great. Statistics are necessary for framing and judging the progress of economic planning. The study of Indian statistics is made under following heads :

- I. Statistical Organisation of India (CSO)
- II. Indian Statistical Material.

This can be studied under following sections:

- (A) Agriculture Statistics
- (B) National income and Social

Accounting

(C) Population Statistics

(E) Price Statistics

(G) Trade Statistics

(I) Labour Statistics

(D) National Sample survey

(F) Industrial Statistics

(H) Financial Statistics

There are some agencies both at the national and state level, which collect, process and tabulate statistical data. Some important major agencies at the national level are Census of India, National Sample Survey Organisation (NSSO), Labour Bureau, Central Statistical Organisation (CSO), Registrar General of India (RGI), Director General of Commercial intelligence and Statistics (DGCIS), etc.

CENSUS OF INDIA

India had the unique experience of undertaking the biggest census in the world in 1981, and has also an unbroken record of more than hundred years of decadal censuses. The Indian census is universally acknowledged as most authentic and comprehensive source of information about our land and people. In 1869 Hunter was appointed Director General of Statistical Surveys. He not only elaborated the statistical system but also assisted the statistical surveys of districts and provinces. That later followed into famous Gazetteers. He advised in conduction of census of India which undertook explantor surveys from 1869 to 1872 and thereafter matured into a decennial census which ever since continued without interruption. After 1872 the next census was taken in 1881 and since the it has become a regular feature of holding census every ten years uninterruptedly. The Census of India provides the most complete and continuous demographic record or population. The first census after Independence was held 1951and latest one complete in 2001. The study of population is important for several reasons in overall study or economic development. Information of demographic characteristics include birth and death, fertility, sex ratio, age-composition,migration and literacy etc. The economy characteristics of population are manifested through workers' participation in

economy activities, its distribution and classification of workers in various occupations, employment and unemployment.

The data generated by the Census of India 2001 provide benchmark statistics on the people of India at the beginning of the next millennium. This is a mirror of a fair representation of the socio-economic and demographic condition of our people which constitute about one-sixth of the human population on this planet. The census statistic is useful for assessing the impact of the developmental programmes and identify new thrust areas for focusing the efforts on improving the quality of life in our country. Basic population data from primary Census Abstract. Census of India 2001 gives information of population in India as:

Persons	Males	Females	Sex Ratio
1,028,610,328	523,156,772	496,453,536	933

National Sample Survey Organisation (NSSO)

The National Sample Survey (NSS), initiated in the year 1950, is a nationwide, large scale continuous survey operation conducted in the form of successive rounds. It was established on the basis of a proposal from Prof. P.C. Mahalanobis to fill up data gap for socio-economic planning and policy making through sample surveys. On march 1970, the NSS was recognized and all aspects of its work were brought under a single Government organization namely the National Sample Survey Organisation (NSSO) under the overall direction of a Governing Council to impart objectivity and autonomy in the matter of collection, processing and publication of the NSS data.

The Governing Council consists of 18 experts from within and outside Government and is headed by an eminent economist/statistician and the member-

secretary of the council is Director General and Chief Executive Officer of NSSO. The Governing Council is empowered to take all technical decisions in respect of survey work, from planning of survey to release of survey results. The NSSO headed by a Director General and Chief Executive Officer, has four divisions namely, Survey Design and Research Division (SDRD), Field Operation Division (FOD), Data Processing Division (DPD) and Coordination Publication Division (CPD). A Deputy Director General heads each division except FOD. An Additional Director General heads FOD.
