4

STATISTICS : MEANING AND SCOPE

4.1 INTRODUCTION

Every day we come across different types of quantitative information in newspapers, magazines, over radio and television. For example, we may hear or read that population of India had increased at the rate of 2.5% per year (per annum) during the period 1981-1991, the number of admission in National Open School had gone up by, say, 20% during 1996-97 as compared to 1995-96, etc. We would like to know that what these figures mean. These quantitative information or expression called statistical data or statistics. In this lesson you will learn about the meaning of statistics and its scope.

4.2 OBJECTIVES

After going through this lesson, you will be able to :

- explain the need of statistics in Economics;
- outline the scope of statistics;
- distinguish between statistical data and statistical methods;
- state the meaning of statistical data and its characteristics;
- explain the different stages of statistical enquiry.

4.3 NEED AND SCOPE OF STATISTICS

(a) Need for Statistical Data

There is need of statistical data in every walk of life. No field of study is complete without the supporting quantitative information about that field. Look at your study material in Economics, Commerce, Accountancy, Geography, Physics, Chemistry, Biology etc. These are all flooded with quantitative information. No government department can function well

without the support of statistical data. The need of statistics in Economics is immense.

(i) Needed to approve or disapprove an economic theory :

An economic theory is first developed on the basis of what we observe in real life. It is then approved or disapproved by the statistical data relative to the observations. For example, it is observed that consumers demand more at lower prices. But this observation takes the shape of a theory when it is confirmed from actual statistical data that consumers really demand more at lower prices.

(ii) Needed to reveal the structure of an economy :

We study the structure of an economy with the help of data only. It involves knowledge about population, natural resources, employment, national income, production, exports, imports etc. The statistical knowledge about these helps to know the extent of defects in the structure of the economy. Once the extent of defect is known, it becomes easier to find solution.

(iii) Needed for planning :

No economic planning is possible without the aid of statistical data. Targets of production cannot be fixed unless we have data about available resources and requirements of the country. India is an over-populated country. However, the extent of over-population can be revealed by data on population and resources available to support the population only. Effective polices to control population can be framed only after we know how much over-populated India is.

(iv) Needed to assess the success of programmes and policies of the government :

It is not only enough to implement plans but also necessary to know whether the implementation has been proper or not. For that, we require statistical data about, say, rise in production, employment etc. during the planning period.

We have pointed out above some of the areas in economics where statistical data is needed. In order that the data is accurate we need proper statistical methods to collect the data.

(b) Scope of Statistics

The word statistics is used in two senses: (a) the plural sense and (b) the singular sense. In plural sense it refers to quantitative information or simply statistical data. In singular sense it refers to method or methods used in arriving at the quantitative information or dealing with it. We can explain the difference between the two with the help of following example :

Table 4.1
Growth of Population in India

Year	Population (in crores)
1951	36.1
1961	43.9
1971	54.8
1981	68.5
1991	84.6

Source : Census of Population 1991.

The above table 4.1 records population of India in different years. Here we are referring only to the quantitative information about population. We are using the word statistics in the plural sense in this case.

When we say that population of India was estimated through the census method; that the figures are presented in the tabular form; that population of India is continuously rising and that it is rising on account of fall in death rate, we are referring to the methods of collection, presentation, interpretation of trend in data and analysis of data respectively. All these steps are the statistical methods . Here we are using the word statistics in the singular sense.

POINTS TO REMEMBER

- Statistical data is needed to approve or disapprove any economic theory.
- Data is needed to reveal the structure of the economy.
- Data is needed for planning.
- Data is needed to assess the success of programmes and policies of the government.
- The word statistics in the plural sense of the term refers to the quantitative information or statistical data.
- The word statistics in the singular sense of the term refers to the methods used in arriving at statistical data.

INTEXT QUESTIONS 4.1

1. Fill in the blanks with appropriate word from the brackets :

i) An observation becomes a theory when it is confirmed from ..... (statistical data, government department).

ii) The word 'statistics' in plural sense refers to statistical ..... (methods, data).

2. Which of the following refers to quantitative information ?
i) Anju is the tallest girl in her class.
ii) Manju is the shortest girl in her class.
iii) Deepak is 3 inches taller than Mohit.
iv) Mohan and Sohan are of equal heights.

3. Which of the following statement refers to statistics in the 'singular' sense ?
i) Kapil scored a century in his first innings in cricket.
ii) Kapil's average was 50 runs per innings.
iii) Kapil played 20 test matches in all.
iv) Kapil's highest score was 175 runs.

4.4 STATISTICAL DATA (PLURAL SENSE)

(a) Meaning

Numerical statements of facts are statistical data. How does the statistical data look like? Table 4.1 is an example of statistical data. It gives information about population of India.

(b) Characteristics

(i) Statistical data are aggregates of facts :

Single and isolated quantitative figure is not statistics. We cannot compare a single figure given alone. For example, Ruchi scored 45 marks out of 100 in Physics, is not statistical data or statistics. If, however, we say that Ruchi, Sen Gupta, Karim and Mary scored 45, 60, 72 and 59 marks respectively, the group of figures become statistics. Now, we can compare, analyse and draw some conclusions from these figures.

For example :

1. Highest marks obtained are 72
2. Lowest marks obtained are 45
3. Marks range between 45 and 72
4. Average marks obtained is $59 = \frac{(45 + 59 + 60 + 72)}{4}$

(ii) Statistical data are numerically expressed :

Qualitative statements such as 'per capita income of India is low' or ' the population of India is rapidly increasing' are not statistics. Rather, they are conclusions based on quantitative information. They cannot be presented and analysed.

Statistics are in numbers and quantities. Population of India has increased from 36.1 crores in 1951 to 84.6 crores in 1991 , death rate has fallen from 27.4 to 9.8 per thousand during 1951-1991 etc. are some examples of quantitative nature of data.

(iii) Data must be collected in a systematic manner :

Suitable planning of data collection is to be made in advance. Data collected in a haphazard or disorderly manner may lead to wrong conclusions. For example, if we are not clear about the objective of our enquiry, or if our investigators are not properly trained or are biased or, if our questionnaire is faulty, we are likely to collect data which may lead to wrong conclusions.

(iv) Figures must be accurate to a reasonable degree or standard :

Data can be enumerated or counted with a reasonable level or degree of accuracy if the area of our study is small. For example, data regarding age and height of students can be enumerated more precisely or more accurately in a small class. As the area becomes wider, chances of mistakes in collection of data increase. For example, when the study regarding age and height of students is extended to all schools in state, the chances of making mistakes in recording of data increase. Care must be taken that data is accurate to a reasonable degree.

(v) Statistics are collected for a predetermined purpose :

We must have well defined purpose, specific aims and objectives before we collect data. Suppose, we want to compare the performance of students of, say, secondary level of National Open School in one subject or more, we must specify the subjects and the year for which comparison is being carried out.

POINTS OF REMEMBER

- Statistics in the plural sense of the term means statistical data.
- Statistics are aggregates of facts and numerically expressed.
- Statistics must be collected with a reasonable degree or level of accuracy and systematically.
- Statistics should be collected for a predetermined purpose.

INTEXT QUESTIONS 4.2

1. Tick (✓) the correct answers :

a) Statistical data are :

i) numerical statements of facts

ii) qualitative information

iii) both quantitative and qualitative information.

b) Statistical data are :
i) single or isolated facts and figures
ii) aggregates of facts
iii) unsystematic and disorderly data.

2. State whether the following statements are true or false :

a) Statistical data are numerical data.
b) Statistical data are not single or isolated figures.
c) Statistical data are qualitative data.

4.5 STATISTICAL METHODS (SINGULAR SENSE)

(a) Meaning

Using the word statistics in a singular sense means statistical methods. Statistics is a science of collection, presentation, analysis and interpretation of numerical data. These are the stages through which every statistical enquiry has to pass through. We shall discuss these stages one by one.

(b) Stages of statistical enquiry

(i) Collection of data :

First of all, we have to collect data to study a problem. Data can be collected by the investigator himself. Such data are called primary data. He can obtain data from other sources also. Such data are secondary data. These data are found in published as well as unpublished forms. Some examples of published data are :

1. Reserve Bank of India Bulletin.
2. National Accounts Statistics.
3. Census of Population of India.

(ii) Presentation of data :

After data have been collected, the next step is to arrange them in a systematic manner and present the data in various forms such as frequency distribution in the form of tables, graphs, diagrams and pictures. This you will study in next lesson.

(iii) Analysis of data :

The next step is analysis of data. It is undertaken to derive conclusions from them. Analysis of an economic or other problems is not possible without the use of certain statistical tools such as measures of central tendency like mean, mode or median.

(iv) Interpretation of data :

Interpretation of data is the last stage of a statistical enquiry. After making analysis with the help of statistical tools, we interpret the data to derive some conclusions in order to formulate certain policies. Interpretation must be done carefully, as wrong interpretation will lead to formulation of wrong policies and hence do more harm than good.

POINTS TO REMEMBER

- Statistics in the singular sense means statistical methods.
- Statistical enquiry includes collection, presentation, analysis and interpretation of data.
- Data is first collected through primary and secondary sources. After that it is presented in the form of frequency distribution, tables, graphs, diagrams and pictures.
- Analysis of data means drawing conclusions from data with the help of statistical tools.
- Interpretation of data means interpreting the conclusions to formulate polices.

INTEXT QUESTIONS 4.3

1. Complete the following statements :
   i) Statistics in plural sense means.....
   ii) Statistics in singular sense means.....
   iii) The first step in statistics is.....
   iv) The last step in statistics is.....
   v) Wrong conclusions may lead to formulation of.....
   vi) Reserve Bank of India Bulletin and National Accounts Statistics are ..... sources of data.

2. Match the following :

a) Collection of data	1. Mean, mode and median
b) Presentation	2. Primary or secondary source
c) Analysis	3. Arriving at conclusions
d) Interpretation	4. Tables, diagrams and pictures

3. Which of the following statement is **not** true about 'analysis'?
   a) It comes after 'presentation' stage.
   b) It uses tools such as measures of central tendency.
   c) It is the last stage of statistical enquiry.
   d) It derives conclusions about data collected.

WHAT YOU HAVE LEARNT

- The word statistics is used in two senses. In plural sense it means statistical data. In singular sense it means the science of collection, presentation, analysis and interpretation of statistical data.
- Statistical data are : (i) aggregates of facts, (ii) numerically expressed, (iii) collected in a systematic manner and (iv) accurate to a reasonable degree or standard.
- A statistical enquiry passes through the stages of collection, presentation, analysis and interpretation of data.
- The data is collected through primary and secondary sources.
- The data is presented in the form of frequency distribution, tables, graphs, diagrams and pictures.
- Analysis of data help in deriving conclusions.
- Conclusions are interpreted to formulate policies.

GLOSSARY

Analysis trying to know much more from numerical information in order to be able to draw useful conclusions.

Census of Population - counting each and every member of the population.

Magnitude - size.

Primary Data - The quantitative information collected first hand by the investigator himself.

Secondary data - are those quantitative information which have already been collected and investigator borrows them to use in his own inquiry. All published data represent secondary data for those who have not collected themselves.

TERMINAL QUESTIONS

1. State the need of statistics in economics.
2. Outline the scope of statistics.
3. Distinguish between statistical data and statistical methods with the help of an example.
4. Explain the meaning of statistical data and its characteristics.
5. State briefly the various stages of a statistical enquiry.

ANSWERS

Intext Questions 4.1

1. (a) statistical data (b) data
2. (iii)
3. (ii)

Intext Questions 4.2

1. (a) (i), (b) (ii)

2. (a) True (b) True (c) False

Intext Questions 4.3

1. i) statistical data
   ii) statistical methods
   iii) collection of data
   iv) interpretation of data
   v) wrong policies
   vi) secondary
2. (a)–2, (b)–4, (c)–1, (d)–3

3. b

Terminal Questions

1. Read section 4.3 (a)
2. Read section 4.3 (b)
3. Read section 4.3 (b)
4. Read section 4.5
5. Read section 4.5 (b)