

Statistics: Its types & Scopes

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Sem– 2, TC- 204

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Introduction of Statistics

The subject of Statistics, as it seems, is not a new discipline but it is as old as the human society itself. Its origin can be traced to the old days when it was regarded as the 'science of state-craft' and was the by-product of the administrative activity of the State. The word 'Statistics' seems to have been derived from the Latin word 'status' or the Italian word 'statista' or the German word 'statistik' and each of which means a 'political state'. In ancient times, the government used to collect the information regarding the population and 'property or wealth' of the country. The former enabling the government to have an idea of the man-power and the latter providing it a basis for introducing new taxes and levies.

Statistics has been defined differently by different authors from time to time. The reasons for a variety of definitions are primarily **two**. **Firstly**, in modern times the field of utility of statistics has widened considerably. In ancient times Statistics was confined only to the affairs of state but now it embraces almost every sphere of human activity. Hence a number of old definitions which were confined to a very narrow field of enquiry were replaced by new definitions which are much more comprehensive and exhaustive. **Secondly**, Statistics has been defined in two ways. Some writers define it as 'statistical data' while others define it as 'statistical method'. Some of the definitions are:

Statistics as Statistical Data – Some definition

According to **Webster**, "Statistics are the classified facts representing the conditions of the people in a State- specially those facts which can be stated in number or in tables of numbers or in any tabular or classified arrangement."

According to **Bowley**, "Statistics are numerical statement of facts in any department of enquiry placed in relation to each other."

Statistics as Statistical Methods – Some definition

According to **Boddington**, “Statistics is the science of estimates and probabilities.”

According to **Harlow**, “Statistics is the science and art of handling aggregate of facts – observing, enumeration, recording, classifying and otherwise systematically treating them.”

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

From a logical analysis of the above definitions, it is clear that the definition of Statistics given by Croxton and Cowden is the most scientific and realistic one.

Types of Statistics

Every student of statistics should know about the different branches of statistics to correctly understand statistics from a more holistic point of view. Often, the kind of job or work one is involved in, hides the other aspects of statistics, but it is very important to know the overall idea behind statistical analysis to fully appreciate its importance and beauty. Statistics can be categorized into two types:

Descriptive Statistics

Descriptive statistics is the type of statistics that probably springs to most people’s minds when they hear the word “Statistics.” In this branch of statistics, the goal is to describe. Numerical measures are used to tell about features of a set of data. There are a number of items that belong to this portion of statistics, such as:

- The average, or measure of the central tendency, consisting of the mean, median, mode.
- The spread of a data set, which can be measured with the range or standard deviation.
- Measurements such as skewness and kurtosis.
- The exploration of relationships and correlation between paired data.
- The presentation of statistical results in graphical form.

These measures are important and useful because they allow scientists to see patterns among data, and thus to make sense of that data. Descriptive statistics can only be used to describe the population or data set under study: The results cannot be generalized to any other group or population.

Inferential Statistics

Inferential statistics are produced through complex mathematical calculations that allow scientists to infer trends about a larger population based on a study of a sample taken from it. Scientists use inferential statistics to examine the relationships between variables within a sample and then make generalizations or predictions about how those variables will relate to a larger population.

It is usually impossible to examine each member of the population individually. So scientists choose a representative subset of the population, called a statistical sample, and from this analysis, they are able to say something about the population from which the sample came. There are two major divisions of inferential statistics:

- A confidence interval gives a range of values for an unknown parameter of the population by measuring a statistical sample. This is expressed in terms of an interval and the degree of confidence that the parameter is within the interval.
- Tests of significance or hypothesis testing where scientists make a claim about the population by analyzing a statistical sample. By design, there is some uncertainty in this process. This can be expressed in terms of a level of significance.

Techniques that social scientists use to examine the relationships between variables, and thereby to create inferential statistics, include linear regression analyses, logistic regression analyses, ANOVA, correlation analyses, structural equation modeling, and survival analysis. When conducting research using inferential statistics, scientists conduct a test of significance to determine whether they can generalize their results to a larger population. Common tests of significance include the chi-square and t-test. These tell scientists the probability that the results of their analysis of the sample are representative of the population as a whole.

Scope of Statistics

In modern times, Statistics is viewed not as a mere device for collecting numerical data but as a means of developing sound techniques for their handling and analysis and drawing valid inferences from them. It has a very wide scope.

The scopes of Statistics are:

- 1. Statistics and Planning** – Statistics is indispensable to planning. In modern age which is termed as “the age of planning”, almost all organizations in the government or managements of business are resorting to planning for efficient working and for formulating policy decisions. To achieve this end, the various advance statistical techniques are of paramount importance.
- 2. Statistics and Mathematics** – Statistics is intimately related to and essentially dependent upon mathematics. Ever increasing role of mathematics in Statistics has resulted in the development of a new branch of Statistics called ‘Mathematical Statistics’.
- 3. Statistics and Economics** – Statistical data and techniques of statistical analysis have proved immensely useful in solving a variety of economic problems, such as wages, prices, consumption, production, distribution and wealth etc.
- 4. Statistics and Business** – Statistics is an indispensable tool of production control also. Business executives are relying more and more on statistical techniques for studying the needs and the desires of the consumers and for many other purposes.
- 5. Statistics and Psychology and Education** – In education and psychology, too, Statistics has found wide application, e.g. to determine the reliability and validity of a test, ‘factor analysis’ etc.
- 6. Statistics and Biology, Astronomy and Medical Science** – The various biological theories have a statistical base like regression, theory of heredity etc. In Astronomy, the theory of Gaussian ‘Normal Law of Errors’ and in Medical science, the statistical tools for the collection, presentation and analysis of observed facts relating to the causes and

incidence of diseases and the results obtained from the use of various drugs and medicines, are of great importance.

- 7. Statistics and War** – In war, the theory of 'Decision Function' can be of great assistance to military and technical personnel to plan 'maximum destruction with minimum effort'.

Thus, we see that the science of Statistics is associated with almost all the sciences – social as well as physical.

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