

## WHAT IS STATISTICS?

### **Introduction**

The word "statistics" appears to have been derived from the Latin word "Status". Statistics was simple the collection of numerical data, by the kinds on different aspects useful to the state.

Today statistics is the scientific study of handling quantitative information. It embodies a methodology of collection, classification description and interpretation of data obtained through the conduct of surveys and experiments.

- **Population**

The total group under discussion or the group to which results will be generalized is called population. For example collection of height measurements of all college students is called population.

- **Sample**

A part of the population selected in the belief that it will represent all the characteristics of the population is called a sample. For example a sample of 10 students is selected from a population of 100 students in order to analyse the average height of the students.

- **Meaning of Statistics**

Now a days the word "Statistics" is used in two senses i.e.

#### **Singular Senses**

In its singular sense, the word statistics means the science of statistics which deals with statistical methods.

#### **Plural Senses**

The word statistics, when used in plural senses means numerical facts collected in any field of study by using a statistical method.

- **Definition Of Statistics**

Statistic is the numerical statement of facts capable of analysis and interpretation, and science of statistics is the study of their principles and methods applied in collecting, presenting, analysis and interpretation the numerical data in any field of inquiry.

OR

Science of facts and figures is called statistics.

OR

#### **(Croxtton and Cowden)**

"Statistics are collection, presentation, analysis and interpretation of numerical data"

OR

#### **(Connor)**

"Statistics are measurement enumeration or estimation or social or natural phenomena systematically arrange so as to exhibit interrelationship."

OR

#### **(Boodington)**

"Statistics is the science of estimates and probabilities."

OR

**(Achenwall)**

"Statistics are a collection of notes worthy facts concerning, both historical and descriptive."

OR

"Statistics is defined as the science of collecting organizing presentation, analysis and interpreting numerical data for making better decisions.

- **Scope of Statistics**

Statistics is the branch of mathematics that deals with data. Statistics uses data, collected through systematically method of data collection and the theories are employed to arrive at the conclusion.

- **Main Branches of Statistics / Division of Statistics**

The science of statistics may be classified into following two main branches.

1. **Statistical Methods**

In case of statistical inquiry the last 1<sup>st</sup> step is the collection of data. Most of the data are complex and confused. So for a clear picture of this data, we reduced the complexity and confusion of this data, which is done by statistical method. Statistical method includes all the rules of procedure and techniques which are used in the collection, classification, tabulation, comparison and interpretation of data. Simply statistical data simplifies the complex of numerical data.

2. **Applied Statistics**

It deals with the application of statistical method to some specific problem; applied statistics has two types.

- a. **Descriptive Applied Statistics**

In descriptive applied statistics it is applied to these data which relates to the present or past information for e.g. census in Pakistan for achieving certain conclusion.

- b. **Scientific Applied Statistics**

We apply general rules on the quantitative data which is useful for forecasting and for this purpose we use scientific applied statistics.

- **Limitation of Statistics**

1. Statistical has a handicap in dealing with qualitative observation or values.
2. Statistical results are applied only on the average
3. statistics does not study qualitative phenomena
4. Statistical deals with fact which can be numerically expressed for e.g. love, hate, beauty, poverty health cannot be measured.
5. Sufficient care need be exercised in the collection, analysis and interpretation of data otherwise statistical results may be false.

- **Use or Functions of Statistics**

1. Statistical simplifies the complicated data
2. Statistical test the law of other sciences
3. Statistics help a lot in policy making purposes
4. Statistics and Forecasting
5. Statistics and Administration
6. statistics helps in proper and efficient playing of a statistical inquiry in any field of study

- **Relationship of Statistics with other Sciences**

Now a days statistics and statistical data, methods being applied increasing in agriculture, Economics, Biology, Business, Physics, Chemistry, Astronomy, Medicine, Administration, Education, Mathematics, Meteorology and Physical science.

- 1. Statistics and Administration**

Statistics plays an important role in the field of administration and management in providing measure of performance of the employees. Statistical data are widely used in taking all administration decision. For example the authorities want of rise the pay scales of employees in view of an increase in the cost of living. Statistical methods will be used to calculate the rise in cost of living.

- 2. Statistics and Agriculture**

Agriculture Statistics cover a wide field. These include Statistics of land utilization, production of crop, price and wages in agriculture etc. Agriculture is greatly benefited by the statistical methods.

- 3. Statistics and Medicine**

Statistics plays an important role in the field of medicine, to test the effectiveness of different types of medicines.

Vital Statistics may be defined as the science.

This deals with the application of numerical methods to vital fact. It is a part of the broader field of demography.

Demography is a statistical study of all phases of human life relating to vital facts such as births, deaths, age, marriages, religions, social affairs, education and sanitation.

Vital statistics is a part of demography and comprises of vital data.

- 4. Statistics and Mathematics**

All statistical methods have their foundations in mathematics. No calculating work can be done without the help of mathematics. Therefore, mathematics is applied widely in statistics. The branch of statistics is called mathematical statistic. Both these subjects are so interrelated.

- 5. Statistics and Physical Sciences**

Physical science greatly depending upon science of statistics in analysis and testing their significance for drawing result. Statistical methods are used in physical science like physics, chemistry, Geology etc.

- 6. Statistics and Economics**

Important phenomena in all branches of economics can be described, compared with the helps of statistics.

Statistics of production described wealth of nation and compare it year after showing there by the effect of changing economics policies and other factors on the level of production.

- 7. Statistics Helps in Forecasting**

Through estimating the variables that exit in the fast forecasting about in times to come, can easily be done.

Statistics helps in forecasting future events. Use of some statistical techniques like extrapolation and time series analysis helps in saying some thing the future courses of events.

Statistics plays an important role in filed of astronomy, transportation, communication publics, health, teaching methods, engineering psychology, meteorology wealth forecasting.

## 8. **Statistics and Business**

Statistics plays an important role in business. It helps the business men to plan production according to the tastes of the customers; the quality of the products can also be checked by using statistical methods

- **Characteristic of Statistics**

Statistics have the following characteristics.

1. **Statistics are aggregates of facts**

Statistics are a number of facts.

A single fact even if numerically expressed, cannot be called statistics.

A single death, an accident etc, does not constitute statistics but on the other hand a number of deaths, accidents are statistics.

2. **Statistics are affected by many causes**

Statistics are aggregates of such facts only as grow out of a variety of circumstances – their size, shape at any particular moment is the result of the action and interaction of forces.

3. **Statistics are numerically expressed**

In statistics, we study quantitative expressions and not qualitative like old, young, good, bad etc.

4. **Statistics are estimates to a reasonable standard**

What standard of accuracy is to be regarded as reasonable will depend upon the aims and objects of inquiry and whatever the standard of accuracy is once adopted it must be uniformly maintained throughout the inquiry.

5. **Statistics are collected in a systematic manner**

Statistics collected in a haphazard manner can not be accurate.

- **Statistics Inquiry**

The inquiry about any problem which has been done with the help of statistical principles and methods is called statistical inquiry.

### **Steps in Statistical Inquiry**

Requiring collection of data, the following steps are involved in statistical inquiry.

1. Planning inquiry.
2. Collection of data.
3. Editing the collected data.
4. Tabulating the data.
5. Analyzing the data by calculated statistical measures.

- **Planning of Statistics Inquiry**

Following are the factors of planning of statistical inquiry.

1. **Object and Scope of Inquiry**

2. **Nature and Type of Inquiry**

- i. Primary or Secondary
- ii. Census or Samples
- iii. Open and Secret
- iv. Direct or Indirect
- v. Regular or Adhoc
- vi. Initial or Receptive
- vii. Official, Semi Official or Non Official

### 3. Statistical Unit

The unit of measurements which are applied in the collected of data is called statistical unit. For e.g. if we collect the rice crop according to per acre then it will be a statistical unit, for wheat crop there are two types of statistical unit.

- i. Physical Unit
- ii. Arbitrary Units

#### Advantages of statistical Units

- i. If fulfills the object of inquiry stable.
- ii. Stable.
- iii. Homogeneous.
- iv. In obvious words.

### 4. Degree of Accuracy

This decision about the nature of inquiry and purpose of investigation is called degree of accuracy.

- **Variable**

A measurable quantity which can vary (differ) form one individual to another or one object to another object is called variable. For e.g. height of students, weight of children. It is denoted by the letters of alphabet e.g. x, y, z etc.

#### Type of Variable

There are many type of variable.

#### 1. Continuous Variable

A variable which can take set of values (fractional) b/w two limits and has continuous integer numbers is called continuous variable.

Or

A variable which can assume any value within a given range is called a continuous variable. For e.g. age of persons, speed of car, temperature at a place, income of a person, height of a plant, a life time of a T.V tube etc.

#### 2. Discrete Variable

A variable which can assume only some specific values within a given range is called discrete variable. For e.g. Number of students in a class, Number of houses in a street, number of children in a family etc. it can't occur in decimal.

#### 3. Quantitative Variable

A characteristic which varies only in magnitude from one individual to another is called quantitative variable. It can measurable.

Or

A characteristics expressed by mean of quantitative terms is known as quantitative variable. For e.g. number of deaths in a country per year, prices temperature readings, heights, weights etc.

#### 4. Qualitative Variable

When a characteristic is express by mean of qualitative term is known as qualitative variable or an attributes. For e.g. smoking, beauty, educational status, green, blues etc. it is noted that these characters can not measure numerically.

- **Domain**

A set of value from which variables are taken on a value is called domain.

- **Constant**

A characteristic is called a constant if it assumes a fixed value e.g.  $\pi$  is a constant with a numerical value of 3.14286. e is also a constant with numerical value of 2.71828.

- **Errors**

The difference b/w the actual values and the expected value is called errors. There are two types of errors.

1. Compensating error
2. Biased errors

- **Data**

A set of values or number of values is called data.

- **Quantitative Data**

The data described by a quantitative variable such as number of deaths in a country per year, prices temperature readings, heights, weights, wheat production from different acres, the number of persons living in different houses etc, are called quantitative data.

- **Qualitative Data**

Data described by a qualitative variable e.g. smoking, beauty, educational status, green, blue The marital status of persons such as single, married, divorced, widowed, separated, The sex of persons such as male and female, etc are called qualitative data.

- **Discrete Data**

Data which can be described by a discrete variable is called discrete data. Number of students in a class, Number of houses in a street, number of children in a family etc

- **Continuous Data**

Data which can be described by a continuous variable is called continuous data. For e.g. age of persons, speed of car, temperature at a place, income of a person, height of a plant, a life time of a T.V tube etc

- **Chronological Data**

A sequence of observations, made on the same phenomenon, recorded in relation to their time of occurrence, is called chronological data. A chronological data is also called a time series.

- **Geographical Data**

A sequence of observations, made on the same phenomenon, recorded in relation to their geographical region, is called a geographical data.

- **Statistical Data**

When the data is classified on the basis of a numerical characteristic which is know as statistical data on classification according to class interval.

Statistical data may be classified is to two types

1. **Primary Data**

It is most original data which is note complied by someone or it is first hand collected data. It has also not undergone any sort of statistical treatment.

2. **Secondary Data**

It is that data which has already been compiled and analyzed by someone, may be sorted, tabulated and has undergone statistical treatment.

- **Collection of Data**

Following methods are used for collection of data.

1. **Methods for Collection of Primary Data**

Following are the main methods by which primary data are obtained.

- i. Direct Personal Investigation
- ii. Indirect Investigation
- iii. Local Source
- iv. Questionnaire Method
- v. Registration
- vi. Questionnaire by Post
- vii. By Enumerators
- viii. By Telephone
- ix. Through Internet

2. **Methods for Collection of Secondary Data**

Secondary data may be obtained from the following sources.

**i. Official Source**

For e.g. publication of Statistical division, Ministries of food, Agriculture and Railways, Bureaus of Education, Finance, Provincial Bureaus of Statistics etc.

**ii. Semi – Official Source**

For e.g. State Bank of Pakistan, National Bank of Pakistan, WAPDA, District Councils Economics Research Institute, P.I.D.C, Central Cotton Committee etc.

**iii. Private Source**

For e.g. Publications of Trade Association Chambers of Commerce, Market Committee and industry

**iv. Research Organization**

For e.g. University, other institute of education and Research, Irrigation Research Institute etc.

**v. Technical, Trade, Journals and Newspaper**