

Origin, History and Development of Statistics

Statistics is as old as human civilization.. In ancient time, Statistics was called 'science of king' since the king and ruler used to collect information about total population, land, wealth, total number of employees, soldiers etc. to have the idea of the manpower of the country to formulate administrative set-up, military and fiscal policies of the government. The word "Statistics" have been derived from the Latin word "*Status*" or the Italian word "*Statista*" or the German word "*Statistik*" or the French word "*Statistique*" each of which means a political state. Sir R.A.Fisher (1890-1962) who is popularly known as the father of Statistics, made numerous and significant contributions to statistics.

Statistics: Statistics is concerned with scientific methods for collecting, organizing, summarizing, presenting, and analyzing sample data as well as drawing valid conclusions about population characteristics and making reasonable decisions on the basis of such analysis.

Statistics: Statistics may be defined as the science of collection, organization, presentation, analysis and interpretation of numerical data

Characteristics of Statistics:

- (a) Statistics should deal with aggregate of individual rather than with individual alone;
- (b) Statistics should be expressed in numerical figures;
- (c) Statistics should have the property of being varied by multiplicity of causes;
- (d) Statistical data should be collected with reasonable standard of accuracy;
- (e) Statistics should be obtained for pre-determined purposes;

Functions of Statistics: The following are the important functions of statistics:

- a) Statistics present facts in definite form;
- b) It simplifies mass of figures;
- c) It facilitates comparison;
- d) It helps in formulating and testing hypothesis;
- e) It helps in predication;
- f) Statistics helps in the formulation of suitable policies.

Limitations of Statistics;

- a) Statistics does not deal with isolated measurements;
- b) Statistics deal only with quantitative characteristics

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- c) **Statistical results are true only on an average;**
- d) **Statistics can be mis-used**

Importance of Statistics:

- a) The statistics of health and manpower are important for development planning
- b) Statistics is widely used in trade and commerce
- c) Statistics helps the planners to estimate the revenue income and expenditure of the money for the ensuing year;
- d) Statistics has found wide application in education and psychology
- d) Statistics helps the policymakers to formulate suitable policies
- e) Statistical studies help the industrialist to enlarge its establishment-effectively and economically;
- f) The phenomena related to Engineering, physical, medical, geological, meteorological and Agricultural can be estimated and predicted with reliable accuracy depending on probability theory.

Some related terms:

Population: A population is the totality or collection of *all units or elements or items or individuals of interest of a particular study. Population is generally denoted by N.*

Finite population: If a population has definite number (countable) of units, is called finite population.

Example : Number of students in a class, number of patients in a hospital, number of workers in an industry etc

Infinite population: A population composed of an infinite number of elements which cannot be enumerated, is called infinite population.

Example : Number of fishes in a river, number of Mosquitoes in a city, number of insects in a large agricultural fields. etc.

Sample: A sample is a representative part of the population units which are under study..

or

A finite sub set of Statistical individuals in a population is called sample. Sample is usually denoted by 'n'.

Census: The term census may defined as the process of collecting, compiling, and publishing demographic, social and economic data about the entire population of a defined territory at a specified time.

Ex. Population Census, Agriculture census, animal census

Constant: The term constant refers to a property whereby the members of a group or category remains fixed and do not differ one from another.

Variable: A variable is a characteristic containing two or more values or categories that can vary from person to person, object to object or from phenomenon to phenomenon.

Example: Income. Height , weight, GPA, etc

Types of variable:

Qualitative: A qualitative variable is one for which numerical measurement is not possible, such as hair colure, beauty, honesty intelligence etc.

Quantitative: A quantitative variable is one for which the resulting observations are numeric, such as family size, height, weight, age etc.

Types of quantitative variable:

1. **Discrete:** A variable which can take only isolated or countable of values is known as discrete variable. Example: Family member, number of students in different classes. Size of television etc

2. **Continuous:** A variable which can take infinitely many values in a certain range is called continuous variable.

or A variable which can take on any value within a given range or domain is called continuous variable.

Example: Height of a student, length of a fish, weight of an animal etc.

Parameter: Any numerical value describing a characteristic of population is called parameter.

Ex. Population means is μ ; Population variance is σ^2

Statistic: Any function of sample observations is known as sample



Statistic. Let x_1, x_2, \dots, x_n be n observations of random sample drawn from a population. The sample mean \bar{x} is a statistic and sample variance s^2 is also a statistic.

DATA

The raw materials of statistics consists of observations usually obtain by some process of counting or measurement, referred to collectively as data.

Secondary data: When an investigator (researcher) uses the data which has already been collected by others. under reference for an entirely different reasons.

Important Sources of Secondary Data:

Internal: Monthly abstract of statistics, Statistical year book, Different ministries, Central bank, BBS, BIDS, NIPOIT, BARI, BRRI, BMD, BFRI, BJMC, BTMC, BENBAISE, Population council etc.;

International: UNO, WHO, UNESCO, FAO, ILO, IMF, UNICEF, UNFPA, ICDDR'B, IOM, IRRI, UNCTAD, Internet, World Bank, Statistical Year Book- published by the Statistical Office of the UN etc.;

Other sources: Journals, Reports, Historical documents, Professional bodies, Biographies etc

Primary Data:

Primary data are those which are collected afresh and for the first time and thus happen to be original in character. Such data are published by the authorities who themselves for their collection.

Methods of collecting primary data:

Personal Interview method (Schedule method): In this method the investigator goes from house to house and interviews the individuals personally. He/She asks the questions one by one and fills up the schedule on the basis of the information supplied by the respondents.

Mailed questionnaire method: A questionnaire relevant to subject of enquiry is mailed to a selected list of persons with a request to return is dully field in. Supplementary information regarding the definition of terms used and the methods of filling up the forms should also accompany the questionnaire. The question should be very clear, without any ambiguity keeping in mind the there is no investigator to help the respondent.

Observation method: : The observation method is the most commonly used method especially in the studies relating to behavioral sciences. Under the observation method, the information is sought by way of investigators own direct observation without asking from the respondents. The information about the extent of damage caused by natural calamities like flood, earthquake, can be collected by personal observation by a trained investigator

Telephone Interview method: This method of collecting information consists in contacting respondents on telephone itself. This method is inexpensive but limited to scope as respondents must possess a telephone. The telephone interview method is used in industrial surveys especially in developed regions.

Questionnaire: A questionnaire whether it is called a schedule, interview form, or measuring instrument, is a formalized set of questions for obtaining information from respondents.

Characteristics of a Good Questionnaire:

The following aspects are to be considered in preparing a questionnaire:

1. The number of questions should be as few as possible;
2. The questions in a questionnaire should be easy, understandable, self explanatory, fine in language and non-complex;
3. The questions should be in accordance to the objective of the survey;
4. The word in any question should not be of multiple meaning;
5. Questions of a sensitive nature should be avoided;
6. Questions should be capable of objective nature;

DATA CONDENSATION

A. Classification: Classification is grouping of related facts into different classes;

Types of classification

- a. Geographical-area wise-cities, district, division, rural urban, etc.
- b. Chronological—on the basis of time (Time series)

- c. Qualitative-According to some attribute
- d. Quantitative – According to magnitude

B. PRESENTATION OF DATA

A. **Tabulation:** Tabulation is a systematic arrangement of statistical data in rows and columns. Rows are horizontal arrangement whereas columns are vertical arrangement.

STEPS IN TABULATION:

1. Tables should have number;
2. The table should be started with short title;
3. Columns and rows of tables should have headings
4. All the observations are contained in the body of the table
5. In case of secondary data the sources should be mentioned at the bottom of the table;
6. Table should be ended with footnotes if any

B: Graphical presentation:

MEASUREMENT AND SCALING

Measurement: A measurement is obtained when a variable is measured on experimental unit. Measurement means assignment of numbers or other symbols to characteristics of objects according to certain pre-specified rules.

Scaling: Scaling may be considered as an extension of measurement. Measurement is the actual assignment of a number to each respondent. Scaling is the process of placing the respondents on a continuum with respect to their attitude toward the object/item/institution.

There are four primary scales of measurement.

a. **Nominal scale:** A qualitative measurements are called nominal regardless of whether the categories are designed by names or numbers. In nominal data, the categories of variables are differ from one another in name only. One category of variable is not necessarily higher or lower; greater or smaller than other category.

Example: Religion, Place of birth, Marital status, House number, Jersey number etc.

b.Ordinal scale: When there is an ordered relationship among the categories, the variable is said to an ordinal variable. The categories of the ordinal variable may have the relations higher, greater, more desired, less difficult and so on.

Example: Level of knowledge, Types of house, Socio-economic status, Degree obtained etc.

c.Interval scale: The level of measurement is called interval scale, when a quantitative variable is measured in natural numerical scale in the experimental unit but have no absolute zero as origin.

Example: Body temperature of patient, Calendar time, IQ-test score etc.

d.Ratio scale: A level of measurement is called ratio scale, when a quantitative variable is measured numerically on experimental unit with absolute zero as origin.

Example: Distance, Height, Weight, Length, Number of children etc.



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