Introduction to Statistics

Statistics:

Statistics is a mathematical science including methods of collecting, organizing and analyzing data in such a way that meaningful conclusions can be drawn from them. In general, its investigations and analyses fall into two broad catagories called descriptive and inferential statistics.

Bowley defined "Statistics are numerical statement of facts in any department of inquiry placed in relation to each other"

~~Inquiry~~

R.H Fishers defined "The science of statistics is essentially a branch of applied mathematics and may be regarded as mathematics applied to observational data."

(*) 'Statistics' that a word is often used, has been derived from the latin word 'Status' that means a group of numbers or figures; those represent some information of our human interest.

(*) Although in the beginning it was used by kings only for collecting information about states and other information which was needed about their people, their number, revenue of the state etc.

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ythis was known as the science of the state because it was used only by the kings. So it got its development as 'kings' subject or 'science of kings'

Singular statistics:

ythe singular statistics is the science of collection, presentation, analysis and interpretation of numerical data.

plural statistics:

ythe plural statistics refer to numerical facts or observations collected with a definite purpose. statistics in this sense have the following characteristics:

(i) statistics are a sum of total observations

(ii) statistics are expressed quantitatively and not qualitatively.

(iii) statistics are collected with a definite purpose.

(iv) statistics in an experiment are comparable and can be classified into various groups.

Discriptive statistics:

Discriptive statistics is the branch of statistics that involves ~~using a sample to draw conclusion about a population~~ the organization, summarization and display of data.

Inferential statistics is the branch of statistics that involves using a sample to draw conclusion about a population

Importance and scope of statistics:

(1) In planning: planning is necessary for efficient workmanship and in formulating future policies, statistics provides the valued interpretation of facts and figures relevant to planning. planning depends on forecasting the future. statistics provides the necessary tools of forecasting. so statistics is indispensable in planning.

(2) In business:

statistical knowledge is very helpful to the businessman. He formulates different plans and policies using statistics. It helps him in forecasting the future trends and tendencies. To estimate the market fluctuations, changes in the demand conditions etc. Hence for becoming a successful businessman, ideas in statistics is essential.

(3) In economics:

statistical data and their analysis are used to solve a variety of economic problems such as in consumption, production, distribution of income and assets, proverty, unemployment etc.

Limitation of Statistics:

① Statistics does not deal with isolated measurements:

Not all quantitative data are statistical. Isolated measurement is not statistical. Data are statistical when they are relating to measurement of masses, not statistical when they relate to an individual item or events as a separate entity.

② Statistics deals only with quantitative characteristics:

Statistics are numerical statement of facts. Such characteristic as can not be expressed in number in capable of statistical analysis. Thus qualitative characteristics like honesty, efficiency, intelligence and deafness can not be studied directly. However it may be possible to analyze such problems statistically by expressing them numerically.

③ Statistical laws are not exact:

Unlike the laws of physical and natural sciences, statistical law are only approximations and not exact. On the basis of statistical analysis we can take only in terms of probability.

Variables and constants and ideas on different symbols

Population:

Population means an aggregate of elements possessing certain characteristics of interest in any particular investigation or inquiry. population may be finite or infinite. If we are interested to know the height of all students of Green University, these of all students is called population. since the entire students are countable so this type of population is called finite population.

Variable:

Variable is a measurable quantity; which can vary from one person to another. Every elements of the population has one or more characteristics. If the characteristics are vary from one element to another in magnitude or in quality is called variable. As for example, if a man is element, his characteristics are height, weight, age, number of ~~head~~, hand, number of legs etc. Among these characteristics

height, weight, age are vary from one person to another. This is why these are called variable.

There are two types of variables - qualitative and quantitative.

Qualitative variable;

The value of those variables, which are not differ with quantity but differ with quality is called qualitative variable. For example, the sex of persons give qualitative variable with two categories - male and female. These categories are sometimes called attributes.

Quantitative variable:

The variable, which differ to one another with quantity, is called quantitative variable. Quantitative variables may be classified in two types namely, discrete and continuous.

Discrete variable;

When the variable can assume only integral values, is called discrete variable. For example. the number of children in a family takes integral values.

Continuous Variable:

A variable is said to be continuous if it assume any value within certain range. For example, the age of the student of a class stay within a range s.t $16 \leq x \leq 20$. Here 'x' can take discrete and decimal values within the range.

Constant:

The measurable characteristics of any population which are not vary from one element to another either in magnitude or in quality is called constant. For example, number of hand, number of leg, number of eye etc. are not vary from one person to another. So these are constants.

Difference between qualitative and quantitative variable:

Qualitative variable	Quantitative variable
(i) The variables which are differing to one another with quality is called qualitative variable	(i) The variables which are differing to one another with quantity is called quantitative variable
(ii) It can not be measure with number	(ii) It can be measure with number

(iii) Generally it can take discrete values (iv) Education, Religion, Occupation are the examples of Qualitative variables	(iii) It can take discrete and continuous values (iv) Age, Height, Income etc are the examples of quantitative variables

Difference between discrete and continuous variable:

Discrete variable	continuous variable
(i) Discrete variables can take only integral values	(i) continuous variable can take any value within a certain range
(ii) The value of discrete variable measured by counting	The value of continuous variable measured by quantity
(iii) Examples of discrete variables are the number of person in the family, number of employment in a factory and so on	(iii) Height, weight, age, income are the example of continuous variable.

Collection of data

Data: The numerical expression of individual elements of the population is called data. Actually data is numerical expression of changeful characteristics of elements of any population.

For example, there are 100 students in a class. We want to know the height of the students. Here changeful characteristic is height. The numerical expression of height of the students is called data.

Source of Statistical data:

Data constitute the foundation of statistical analysis and interpretation. Hence the first step of statistical work is to obtain data. Data can be obtained from two important sources namely -

1. primary source
2. Secondary source

Depending on the source we can have either primary data or secondary data.

~~Primary data;~~

~~the data that is primarily collected from some published primary data by various agencies for their own purpose~~

Primary data;

the data that is primarily collected from the field through direct field investigation is known as primary data. Price Statistics collected and published by Bangladesh Bureau of Statistics are primary data in the hands of Bangladesh Bureau but those are secondary data to other agencies.

Secondary data:

Secondary data are those which are collected from some primary data by various agencies for their own purpose. The difference between primary and secondary data is only the terms of their respective use. The same data are primary in the hands of ~~data is only the terms of their respective use.~~ the original collector but secondary in the hands of the others.

Difference between primary and secondary data:

Primary data	Secondary data
1. Primary data arise Out of Original inquiry and involve direct field investigation	1. The data procured from secondary sources are called secondary data
2. It needs trained persons to collect primary data	2. It needs not trained person to collect secondary data
3. It is expensive and time consuming	3. It is not expensive and time consuming
4. It is more reliable	4. It is not reliable all time
5. primary data is such type of data that is not utilized any statistical method	5. Secondary data is such type of data that is sometimes used in statistical method

Difference between inclusive and exclusive method are given below:

Exclusive method	Inclusive method
1. In this method the upper limit of any class is not equal to the lower limit of the next class	1. In this method the upper limit of any class is equal to the lower limit of the next class
2. In this method the upper limits and lower limits are included in same classes. For example the class 10-19 includes all the values from 10 to 19.	2. In this method upper limits are included in the next classes. For example the class 10-20 20-30 the value 20 included the class 20-30
3. We can not measure median and mode by inclusive method the class boundary is needed	3. We can measure easily median and mode by exclusive method. The class boundary is not essential
4. Example of inclusive method is given below: Lower Limit: 20, 30, 40 — Upper Limit: 29, 39, 49	4. Example of exclusive method is given below: Lower Limit: 20, 30, 40 — Upper Limit: 30, 40, 50