

Uses of Statistics

Use in Economics

Statistics help Economists to understand problems on production , distribution and consumption.

Statistics of consumption describes the way in which people from different income group spend their income. It helps in understanding standard of living and taxable capacity of people.

Questions like What price the monopolist should charge to maximize his profits?

What will be price of a certain commodity when its supply increases or falls?
Can be best answered with statistical techniques.

Statistics of production describes production capacity .

Statistics of imports , exports describe production capacity with respect to other nations.

Use in Commerce

Success in business and Commerce largely depends upon the capacity to forecast accurately. Statistics provide different methods of forecasting production , demand and supply with reliable accuracy.

An entrepreneur can plan production considering the probable demand for the product.

Statistics helps bankers to understand cash requirements so that the bankers can keep the optimum liquid cash to serve the customers.

Statistics in Research

Statistics is indispensable in Research work.

Design of experiment enable researchers to design the experiment efficiently.

Experiments about crop yields , different methods of cultivations , effect of two drugs , growth of animals under different diet are designed and analyzed using Statistical techniques.

Statistics in Industry

In industry Statistics is extensively used in Quality Control. The main objective of any production process is to control the quality of manufactured product by meeting the specifications laid. It is achieved through a powerful statistical technique – Control Charts which were discovered by Dr. W.A. Shewhart U.S.A in 1924

Statistics in Insurance

Probability Theory is a backbone of Insurance.

The idea of Life Insurance was developed in the late Seventeenth century after preparation of Life Tables by Edmund Hally in 1961. Actuarial Science is a branch of Statistics which gives techniques of calculating insurance premium for different class of people using Life Tables

Statistics in Astronomy

In ancient past astronomers made recording about movements of stars and planets for the study of eclipses. J Kepler, German Mathematician propounded his famous laws about movements of heavenly bodies on the basis of statistical data collected by Tycho Brahe. Kepler's laws formed the basis of laws of gravitation by Sir Isaac Newton, British Mathematician

Statistics in Physical Sciences

In Physical Sciences a large number of measurements are taken of the same phenomenon. Naturally there is bound to be variation in these measurements. The Statistical techniques such as Interval Estimation – confidence Interval and confidence limits give certain limits within which true value of measurements are expected to lie.

Statistics in Social Sciences

Every social phenomenon is affected to a marked extent by multiple factors. These factors bring out variations in observations from time to time , place to place.

Statistical tools like Correlation and Regression Analysis are used to study and isolate the effect of each of these factors

Statistics is extensively used in Sociology in Demography for studying mortality (death rates), fertility (birth rates) , gender distribution etc.

Limitations of Statistics

Not useful for individual cases

Since Statistics deals with aggregate of facts, study of individual cases is outside the scope of the subject.

Wage earned by an individual worker can not be called as a statistical data and no statistical technique can be applied to it.

Statistics deals with only quantitative data

qualitative characteristics like efficiency , intelligence can not be studied statistically.

These attributes have to be expressed in numbers.

Statistical results are true only on an average

Results obtained through Statistics are not applicable to individual cases eg. Probability of getting Head in tossing of an unbiased coin is $\frac{1}{2}$

Statistical results are subjected to a bias

The human bias as well as Statistical bias are inherent in any Statistical result.

Bias of the investigator

Bias of sample observations

It can be misused

While collecting or interpreting data , one can deceive others by pretending to be objective. Eg

No. of car accidents committed in a city by women drivers on a particular day is 10 , that by men drivers on that day is 30. Hence women are safe drivers.

Basic Concepts

Population – The collection or group of all items about which information is collected is called population or Universe.

No. of elements in population is called size of population . Population can be finite (No of students in a college , No. of employees in a company) or infinite (population of integers , universe of stars)

Parameter – A statistical measure such as mean , S.D. calculated from population is called Parameter

Sample – A group of items selected from a population in a particular manner is called sample. Eg. Students of a college is a population and students of FYBcom is a sample.

Statistic – A statistical measure which is calculated from sample is called Statistic .

Attribute – The characteristic of an item that can not be measured in definite unites is called attribute. eg. Honesty , gender , beauty , intelligence

Variable - The characteristic of an item that can be measured in definite unites is called variable. Eg. Height , Weight , Income

Collection of data

- **Objective of an enquiry-**

Objective of an enquiry should be clearly defined before actual collection of data.

If purpose is defined clearly then the data can be collected with minimum waste of time , energy and resources.

Objectives are of two types-

- ✓ To collect information about a specific problem
- ✓ Testing of a statistical hypothesis

Scope of enquiry

Once the purpose is clearly defined, next step is the scope of survey. Ie coverage with regard to type of information , subject matter and geographical area.

There are 3 factors influence scope of an enquiry- purpose , availability of time & resources

Defining Statistical unit

Before organising actual task of data collection , the statistical unit has to be clearly defined.

They can be

- a) Unit of collection – Units in terms of which the data is collected eg. Workers , students , units produced etc.
- b) Unit of analysis – Units in terms of which two or more data are compared wrt to time ,place etc. eg. Ratios , percentages , rates , coefficients

Methods of Collection of data

- a) Population Survey / Census Survey

Collection of data from each and every unit of population is called Population Survey

- b) Collection of data from units of sample is called Sample Survey.

Here certain pre- decided no. of units are selected from population and desired characteristic is studied for only these units.

Advantages-

Less time , Less cost , Greater scope

Degree of accuracy

The investigator has to decide about the degree of accuracy that he wants to attain. It is very difficult to attain 100 % accuracy as

- ✓ Statistics are based on estimates
- ✓ Tools of measurement are not perfect
- ✓ There may be unintentional bias of investigator

Types of data-

a) Primary data – The data which is collected for the first time by the investigator himself is known as primary data.

It is first hand data and hence raw. It needs to be organised and presented before it is used.

b) Secondary data – Data collected by somebody else and used already is known as Secondary data. It is organised and can be used directly subject to its validity.

Collection of Primary data

Direct Personal Investigation or interview

- Interviewer meets the members of population , interviews them and collect the necessary information.
- Interviewer has face to face contact with respondents.
- Interviewer have to be trained , good communication skills and skill to acquire the response

Indirect Personal Investigation

- In some investigations , it may happen that the persons concerned may not know the problem or not interested in giving the information.
- Investigator interviews third parties who are not directly involved , but can provide the information. They are known as witnesses.
- Study about drug addicts , health issues of infants , diseases like cancer , leprosy , Aids etc.

Questionnaire Method

In this method the required information is collected in question answer form

- Mailed Questionnaire-

Mainly used where field of investigation is vast or informants are spreaded over wide geographical area

Relatively cheap method

It can be administered for literate people

- Questionnaire through enumerators-

Enumerator ask informants the questions and fill up the Questionnaire .

It can be used even if the respondents are illiterate.

Gives better response as enumerator help respondents to answer the questions

Sources of secondary data

They can be broadly classified into two heads

- Published sources
- Unpublished sources

Main sources are

Government Publications-

Various government bodies – State & Central , collect the data about various social and economic problems and publish them regularly. Such govt. publications eg. Census reports , Pay Commission Report , Retail price bulletin , Bulletin on Index of Industrial production are reliable source of data.

- Foreign governments & international bodies like UNO , WHO , IMF publish the data pertaining to their own fields. Eg. Malnutrition problem in India compared to other countries can be studied by data published by WHO.
- Private bodies such as various trade unions , chambers of commerce , Institute of Bankers , Institute of Chartered Accountants , big business houses collect and publish data pertaining to their own field.
- Various journals , magazines , weeklies are devoted to social and economic problems. They have their own staff to collect the data and these data are fairly reliable.
- Publications of Educational institutions , Universities , research institutions are reliable source of secondary data.

Advantage of Sampling

- Reduced cost

Since we collect the data from the small part of population , naturally the cost is relatively low.

- Greater speed

The data can be collected and studied in less time as it is less in the volume than the population.

- Greater scope

Collecting reliable information is a skilled job and skilled personnel is not in abundance. So we have to resort to Sampling .

In some situations it is impossible or impracticable to conduct population survey when nature of enquiry is destructive

- Greater Accuracy

As sample survey is carried out by trained and skilled personnel and it deals with manageable size of data , it gives good amount of accuracy

Steps in Sample Survey

- Defining Objective

A simple clear objective is base of correct data collection

- Defining Universe

Investigator should know what kind of units are to be included.eg If we have to measure yield of wheat per acre , then we need to decide what should be minimum size of the field of which the production is to be measured.

- Defining data to be collected

All necessary information should be obtained and care to be taken to avoid including irrelevant information

- Choice of Sampling units

Care should be taken that sampling units are not overlapping

- Selection of sample

Various methods of selecting samples are available. We need to decide the sample size. This may be as per the budget available.

- Field work

The process of actual collection of data should be supervised in order to get the desired results.

- Summary and Analysis

The data collected should be checked for errors , omissions , inconsistencies etc. How the data is to be classified and tabulated should be decided

Simple random Sampling

- SRS is a technique of drawing a sample in which each unit of population has equal chance of being selected. It can be done in two methods
- SRSWR
- In this case a unit is selected from population by giving equal chance to all units in the population. After selection required characteristics are noted and it is replaced back in the population. Hence every time equal no. of units are available for the draw. Also there is a chance that same unit is selected more than once.
- SRSWOR
- In this case once selection is done, unit is kept aside, it is not replaced back in the population. Hence sample comprises of distinct units.

Methods of drawing Simple Random Sample

- Lottery method
- All members of population are serially numbered. Slips or cards of identical size, shape, colour are made bearing these numbers. They are folded and mixed thoroughly. Then a slip is drawn. Here every slip/card has same chance of being included in the sample.
- This method is not practicable when size of population is huge.
- Random Numbers method

If population size is large, lottery method is not suitable to use, Random number method is used where we use random number tables.

Random number tables are designed in such a way that every digit 0,1,2,...,9 has same chance of occupying any place in the table.

Various Random number tables are available.

- Tippets Random number table
- Fisher & Yates Random number table
- Kendall & Smith Random number table
