01 Md. Abdul Alim 20-07-2010

Chapter: Descriptive Statistics

Historical Development of Statistics: The word "statistics" seems to have obtained from the Latin word "Status" or the Italian word "Statista" or the German word "Statistik" each of which means "Political State". In ancient time the government 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 for formation of administrative set up, fiscal, new taxes, levies and military policies of the government.

22-07-2010

Definitions of Statistics: Different authors defined statistics in a number of ways .Among those some of the important definitions are given below:

1. **Croxton and Cowden:** "Statistics may be defined as the collection, presentation and interpretation of numerical data".

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

3. **Connor:** "Statistics are measurements, enumerations or estimates of natural or social phenomena, systematically arranged so to exhibit their inner relation".

4. **Yule and Kendal:** "By Statistics we mean quantitative data affected to a marked extent by a multiplicity of causes."

5. **R. A. Fisher:** "The science of statistics is essentially a branch of applied mathematics and may be regarded as mathematics applied to observational data."

Importance and 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.

1. **Statistics and Planning:** Statistics is indispensable to planning .In the modern age which is termed as "the age of planning", almost all over the world, governments are resorting to planning for the economic development.

2. **Statistics and Economics:** Statistical data and technique of statistical analysis have proved immensely useful in solving a variety of economic problems, such as wages, prices, analysis of time series and demand analysis.

3. **Statistics and Business:** Statistics as an indispensable tool of production control also. Business executives are relying more or more on statistical techniques for studying the needs and the desires of the consumers and for many other purposes. The success of a businessman more or less depends upon the accuracy and precision of his statistical forecasting.

4. Statistics and Industry: In Industry, Statistics is very widely used in 'Quality Control'. In production engineering, to find whether the product is conforming to specifications or not, statistical tools, viz. inspection plan, control charts, etc.are of extreme importance.

5. Statistics and Mathematics: Statistics and mathematics are very intimately related. Recent advancements in statistical techniques are the outcomes of wide applications of advanced mathematics.

6. Statistics and Medical Science: 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 Psychology and Education: In education and psychology, too, Statistics has found wide applications e.g., to determine the reliability and validity of a test, 'Factor Analysis', etc.

8. Statistics and War: In war, the theory of 'Decision Functions' can be great assistance to military and technical personnel to plan 'maximum destruction with minimum effort.'

Limitations of Statistics: Statistics, with its wide applications in almost every sphere of human activity, is not without limitations. The following are some of its important limitations:

1. Statistics is not suited to the study of qualitative phenomenon: Statistics, being a science dealing with a set of numerical data, is applicable to the study of only those subjects of enquiry which are capable of quantitative measurement. As such, qualitative phenomena like honesty, poverty, culture etc. which cannot be expressed numerically, are not capable of direct statistical analysis.

2. Statistics does not study individuals: Individual items, taken separately, do not constitute statistical data and are meaningless for statistical enquiry. Hence, Statistical analysis is suited to only those problems where group of characteristics are to be studied.

3. Statistical laws are not exact: On the basis of statistical analysis we can talk only in terms of probability and chance and not in terms of certainty. Statistical conclusions are not universally true-they are true only on an average.

4. Statistics is liable to be misused: Statistical methods are the most dangerous tools in the hands of the in experts. The use of the statistical tools by inexperienced and untrained persons might lead to very fallacious conclusions.

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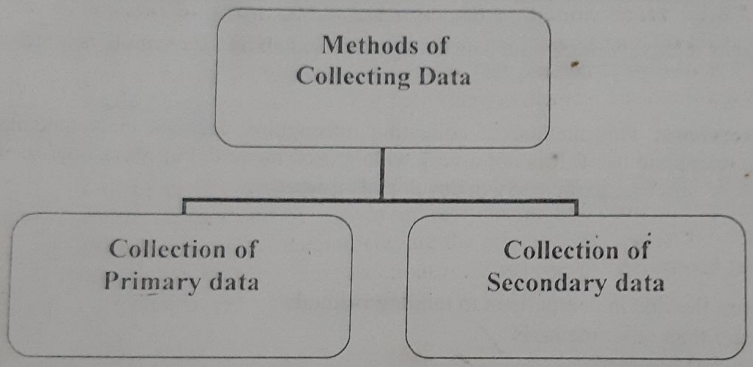
Data: The raw material of statistics consists of numbers or observations usually obtained by some process of counting or measurement is known as data.

Primary data: Primary data are measurements observed and recorded as part of an original study. When data required for a particular study can be found neither in the internal records of the enterprises, nor in published sources, it may become necessary to collect original data i.e. to conduct first hand investigation.

Secondary Data: Secondary data means data that are already available i.e. they refer to the data which have already been collected and analyzed by someone else. When the researcher utilizes secondary data then he has to look into various sources from where he can obtain them. In this case he is certainly not confronted with the problems that are usually associated with the collection of original data. Secondary data may either be published data or unpublished.

Method of Data Collection



Collection of Primary Data

They are several methods of collecting primary data, particularly in surveys and descriptive researches .Important ones are:

1. Observation method
2. Interview method
3. Through questionnaires
4. Through Schedules
5. Other Methods

1. Observation Method: The observation method is the most commonly used method especially in studies relating to behavioral sciences. Under the observation method, the information is sought by way of investigator's own direct observation without asking from the respondent. The main objective of this method is that subjective bias is eliminated, if the observation is done accurately. Secondly, the information obtained under this method relates to what is currently happening. it is not complicated by either the past behavior or future intentions or attitudes.

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2. Interview Method: This method can be used through personal interviews and if possible through telephone interviews.

a) **Personal interviews:** Personal interview method requires a person known as the interviewer asking questions genera'ly in a face to face contact to the other persons. At times the interviewee may also ask certain questions and the interviewer responds to these, but usually the interviewer initiates the interview and collects the information.

Merits

i. More information and that too in greater depth can be obtained
ii. Interviewer by his own skill can overcome the resistance
iii. Personal information can as well be obtained easily under this method

Demerits

i. It is very expensive method, especially when large and widely spread geographical sample is taken.
ii. This method is relatively more time consuming, especially when the sample is large.

b) **Telephone interviews:** This method of collecting information consists in connecting respondents on telephone itself. It is not a very widely used method, but plays important part in individuals' surveys, particularly in developed regions.

Merits

i. It is more flexible in comparison to mailing method
ii. It is faster than other methods
iii. No field staff required

Demerits

i. Surveys are restricted to respondents who have telephone facilities
ii. Questions have to be short and to the point, probes are to difficult to handle.

3. Collection of data through questionnaires: It is being adopted by private individuals, research workers, private and public organizations and even by governments. In this method a questionnaire is sent (usually by post) to the persons concerned with a request to the answer the answer the questions and return the questionnaire. The questionnaire is mailed to respondents who are expected to read and understand the questions and write down the reply in the spaces put for the purpose in the questionnaire itself. The respondents have to answer the questions on their own.

Merits

i. There is low cost even when the universe is large and is widely spread geographically
ii. It is free from the bias of the interviewer, answers are in respondents own words.

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Demerits

i. It can be used only when respondents are educated and cooperating
ii. It is difficult to know whether willing respondents are truly representative.
iii. This method is likely to be the slowest of all.

4. Collection of data through schedules: This method of data collection is very much like the collection of data through questionnaire, with little difference which lies in fact that schedules (Performa containing a set of questions) are being filled in by enumerators who are especially appointed for the purpose. The enumerators along with schedules, so to respondents, put to them the questions from the Performa in the order the questions are listed and record the replies in the spacement for the same in the Performa.

5. Some other methods of data collection

i. **Warranty cards:** Warranty cards are usually postal sized cards which are used by dealers of consumer durables to collect information regarding their products. The information sought is printed in the form of questions on the warranty cards which is placed inside the package along with the product with a long with the product with a request to the consumer to fill in the card and post it back to the dealer.

ii. **Use of mechanical devices:** The use of mechanical devices has been widely made to collect information by way of indirect means. Eye camera, Pupilometric camera, Motion picture camera and Audiometer are the principal devices so far developed and commonly used by modern big business houses, mostly in the developed world for the purpose of collecting the required information.

Collection of Secondary Data

Secondary data may either be published data or unpublished data.

a. Collection of published data

i. Various publications of the central, state are local governments
ii. Various publications of foreign governments
iii. Technical and trade journals
iv. Books, magazines and newspapers
v. Report and publications of various association connected with business and industry, banks, stock exchange etc.
vi. Reports prepared by research scholars, universities, economists etc
vii. Public records and statistics, historical documents and other sources of published information.

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b. Collection of unpublished data
   i. They are may be found in diaries
   ii. Letters
   iii. Unpublished biographic
   iv. Autobiographic

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Selection of appropriate method of data collection

1. **Nature, Scope and object of enquiry:** This constitutes the most important factor affecting the choice of particular method. The method selected should be such that it suits the type of enquiry that is to be conducted by the researcher. This factor is also important is deciding whether the data already available (secondary data) are to be used or the data not yet available (primary data) to be collected.

2. **Availability of funds:** Availability of funds for the research project determines to a large extent the method to be used for the collection of data. When funds at the disposal of the researcher are very limited, he will have to select a comparatively cheaper method which may not be as efficient and effective as some other costly methods.

3. **Time Factor:** Availability of time has also to be taken into account in deciding a particular method of data collection. Some methods take relatively more time, whereas with others the data can be collected in a comparatively shorter duration.

4. **Precision required:** Precision required is yet another important factor to be considered at the time of selecting the method of collection of data.

Designing a Questionnaire: The success of the questionnaire method, of collecting information depends largely on the proper designing of the questionnaire. Designing questionnaire is a highly specialized job and requires a great deal of skill and experience.

Developing a questionnaire, the researcher has to be very clear in the following issues:

1. What information will be sought?
2. What types of the questionnaire will be required?
3. How that (those) questionnaire will be administrated?
4. What the content of the individual question will be?
5. What the from of response of each question will be?
6. How many questions will be used and how the individuals' questions will be sequenced?

The following points may be kept in mind while designing a questionnaire.

1. **Covering letter:** The persons conducting the survey must introduce himself and state the objective of the survey. It is desirable that-

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i. A short letter is enclosed. The letter should state in as few a words as possible. the purpose of the survey and how the informant would tend to benefit from it.
ii. Enclose a self-addressed envelop for the respondent's convenience in returning the questionnaire.
iii. Assure the respondent that his answers will be kept in strictest confidence.
iv. Promise the respondent that he will not be harassed after he fills up the Questionnaire.
v. Offer especial inducement (free gifts, conseesion, coupon, etc.)to return the questionnaire.
vi. If the respondent is interested, promise him a copy of the result of the survey.

2. **The number of questions should be as few as possible:** The number of questions should be kept to the minimum. The precise number of question to be included would naturally depend on the object and scope of the investigation.

3. **Question should be logically arranged:** The questions must be arranged in the logical order so that a natural and spontaneous reply to each is introduced. Thus it is undesirable to ask a man how many children he has before asking whether he is married or not. Similarly, if would be illogical to ask a man his income before asking him whether he is employed or not.

4. **Question should be short and simple:** The questions should be short, simple and easy to understand and they should convey one and only one sense.

5. **Questions of a sensitive nature should be mineded:** As far as possible questions of a personal and pecuniary nature should not to be asked. For example, questions about sources of income, volume of sales etc, may be unwillingly answered in writing. Where such information is essential, it should be obtained indirectly, preferably by personal interviews.

6. **Instructions to the informants:** The questionnaire should provide necessary instructions to the informants. For example, the questionnaire should specify the time within which it should be sent and the place where it should be sent.

7. **Footnotes:** If a particular question needs clarification, it should be marked or lettered and the explanation provided in footnotes.

8. **Questions should be capable of objective answer**

   a. **Dichotomous questions:** Two examples of dichotomous questions are:

      i. Do you intend to purchase a colored television set this year?

         - Yes
         - No

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b. **Multiple choice questions**

Why did you purchase Sony TV?

- Price is lower than othe. brands
- It represents best quality
- Picture is better
- Warranty period is longer
- After sales service is better
- Any other

c. **Open -ended or free answer questions:** If the free answer form or open-ended questions, the respondent is asked to answer a question in his/her own words in easy form. The MBA students after completion of the course may be asked questions like:

What is your opinion of the quality of teaching?

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9. **Answer to questions should not require calculations:** Questions should not require calculations to be made. For example, informant should not be asked yearly income, for in most cases they are paid monthly.

10. **Pretesting the questionnaire:** The questionnaire should be pretested with a group before mailing it out.

11. **Cross-Checks:** If possible, one or more cross checks should be incorporated into the questionnaire, to determine whether the respondent is answering the questions carefully.

12. **Incentives to the respondents:** Some incentives for filling up the questionnaire should be provided. It ma be in the form of gift coupons, a sample of product which the company wanted to introduce etc.

13. **Method of tabulation to be used:** The method to be used for tabulating the results should be determined before the final draft of the questionnaire is made.

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