Presentation of Data

After having collected that data, it is classified and presented in tabulated forms to make it intelligible. We may also make use of visual methods like graphic and diagrammatical representations to represent it.

Analysis of Data

The data so collected is then analyzed. The usual methods which are employed in analyzing the data are averages, dispersion, skewness, correlation, etc.

Interpretation of Data and the Preparation of Report

After collecting, presenting and analyzing the data, we can draw certain conclusions; on the basis of these conclusions we can prepare a report to help us in policy formulation. In preparing the report, a high degree of knowledge of statistical methods and intensive knowledge of subject-matter is needed so that it may not lead to false conclusions.

Collection of Data

The process of getting values and facts from an observation or experiment is called *collection of data.*

Primary Data

The primary data is one which is collected by the investigator himself for the first time; for example, to know the Intelligence Quotient of the students, we can give them the test and collect the relevant data by ourselves. The data so collected will be primary data. In India, there are various agencies which collect primary data; National Sample Survey Organization is one of them; National Council of Applied Economic Research is another and so on. Data collected in the population census constitute primary data.

> *Data originally collected for investigation are known as **primary data.***

The person collecting the data is called an *investigator*.

Primary data gives the *first hand* information. It is *original* in nature. It is *accurate* and *reliable.*

It consumes more money and time.

The amount of O_2 estimated by a student by titration is a primary data. The rainfall recorded by PWD department is a primary data.
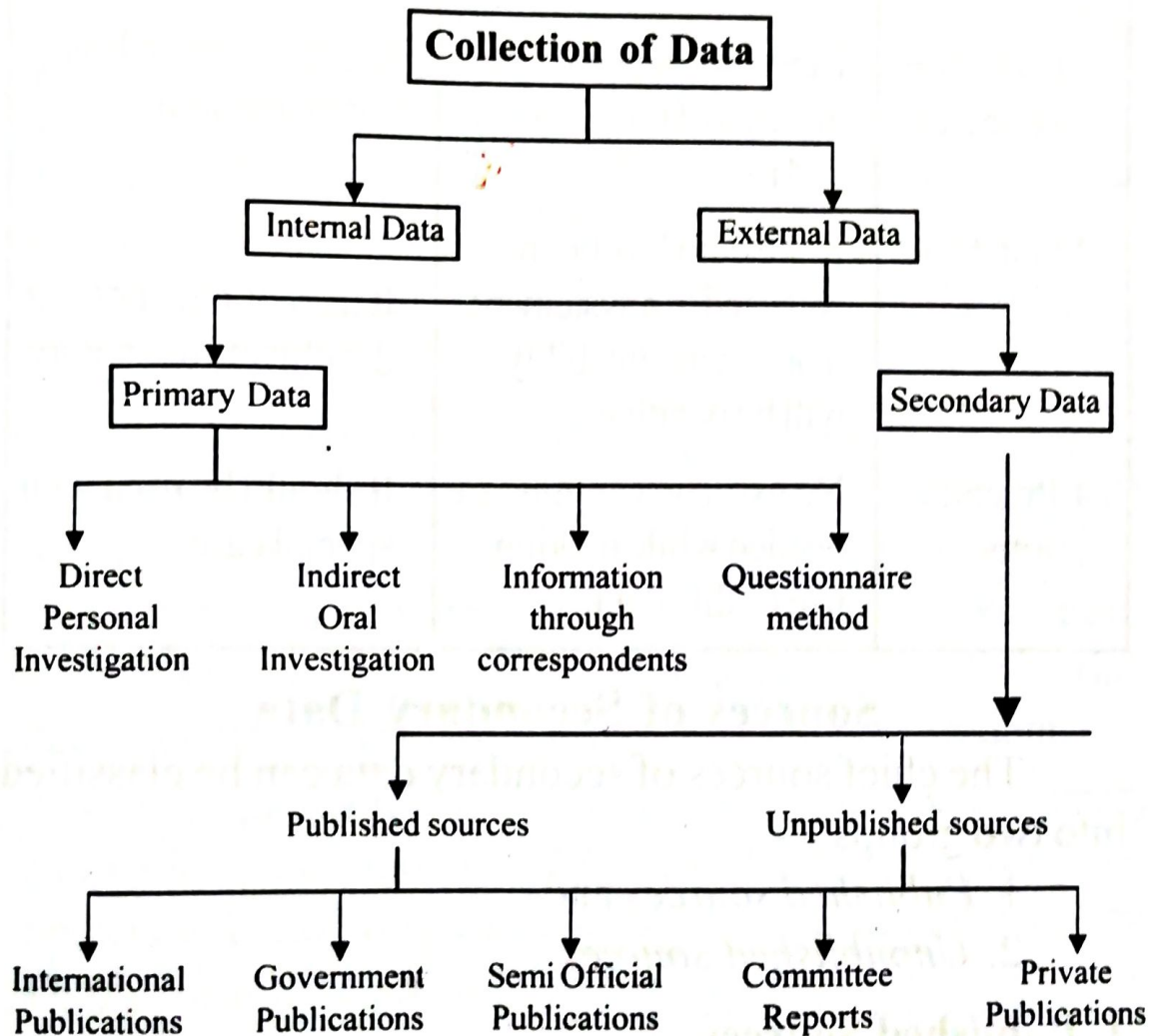
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                    ┌──────────────────────┐
                    │  Collection of Data  │
                    └──────────────────────┘
                    ┌────────────┴────────────┐
            ┌───────────────┐         ┌───────────────┐
            │ Internal Data │         │ External Data │
            └───────────────┘         └───────────────┘
            ┌───────┴───────────────────────────┴────────┐
      ┌──────────────┐                          ┌────────────────┐
      │ Primary Data │                          │ Secondary Data │
      └──────────────┘                          └────────────────┘
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| Direct Personal Investigation | Indirect Oral Investigation | Information through correspondents | Questionnaire method |

| Published sources | Unpublished sources |

| International Publications | Government Publications | Semi Official Publications | Committee Reports | Private Publications |

Fig.2.4: Collection of data.

Secondary Data

Data which are obtained from published or unpublished sources are known as secondary data.

The secondary data is one which has already been collected by a source other than the present investigator.

Table 2.1: Distinction between primary and secondary data.

Basis	Primary data	Secondary data
1.Originality	It is original, because the investigator himself collects the data.	It is not original.The investigator makes use of the data collected by other agencies.
2.Collection expenses	It involves large expenses in terms of time, energy and money.	It is relatively a less costly method.
3.Suitability	If the data has been collected in a systematic manner, its suitability will be positive.	It may or may not suit the objects of enquiry.
4.Precautions	No extra precautions are needed while making use of this data.	It should be used with special care.

Sources of Secondary Data

The chief sources of secondary data can be classified into two groups:

1. *Published sources* and
2. *Unpublished sources*

1. Published Sources

There are certain international, national and local agencies which publish statistical data on a regular basis. Certain periodicals are published regularly. Moreover, there are certain research organizations which publish magazines or other periodicals. These sources can be summed up as follows:

1. International Publications : Foreign Governments and International agencies publish regular and occasional reports on Economics and other related matters of significances,

i.e., UNO Statistical year Book. Demography year Book, Annual Reports of the International Labour Organization and the Annual Reports of the Economic and Social Commission for Asia and Pacific (ESCAP), International Monetary Fund (IMF), World Bank, etc.

2. Official Publications of Central and State Government : The Central Government and the State Governments and their different departments publish reports on current problems. They gather information which is generally more reliable and authentic. Some of the important publications are census of India, Reserve Bank of India Bulletins, Statistical Abstracts of the States, Report of Currency and Finance, etc.

3. Semi-Official Publications : Semi-Government institutions like municipalities, corporations, district boards, block and panchayat samits, etc., publish reports and data regarding birth and death, health and sanitation and other related subjects. These sources supply rich original materials to the researchers and other persons interested in data.

4. Committe Reports : The Government appoints survey and enquiry commissions to find out the expert views on matters of great importance. Reports of these commissions supply invaluable secondary information.

5. Private Publications : The private research and commercial institutions also supply data on the current economic and other situations. Some of them are as follows:

i) Commercial and Financial Institutions : These institutions also publish occasional reports and statistical data of common and specific interest, eg. the reports of stock exchange, trade unions. FICCI, etc.

ii) Research Institutions : The different departments of Indian Universities, Indian Statistical Institute, National

council of applied Economic Research, Institute of Economic Growth, etc., are enaged in research work and publish their findings in the form of research papers and small monographs. These are perennial sources of information.

iii) Newspapers and Magazines : The Economic Times, Financial Express, Commerce, Transport, Business standard, Research magazines, etc., also maintain their research bureaus and publish original data on important problems.

iv) Individual Research Scholars : The individual research scholars of universities and other allied agencies also supply a rich material on matters of importance.

2. Unpublished Sources

There are various sources of unpublished data such as the records maintained by the various Government and private offices, studies made by the research scholars in the universities and other research institutions, etc.

Precautions in the Use of Secondary Data

Before making use of the secondary data, the investigator must satisfy himself about the following:

1. Whether the data are reliable? In order to know the reliability of data, the integrity and experience of the collecting organization, the purposes, method of collection, degree of accuracy and test-checking must be ascertained.

2. Whether the data are suitable for the purpose?

3. Whether the data are adequate?

Methods of Data Collection

The main methods of collecting the data are as follows:

1. *Direct personal investigation*
2. *Indirect oral investigation*
3. *Information through correspondents* and
4. *The questionnaire method*
5. *Experiments*

6. *Census*

7. *Sampling method.*

1. Direct Personal Investigation

The investigator has to contact the sources of information directly and personally. This method of collecting data is suitable: a. When the area of investigation is limited, b. When a higher degree of accuracy is needed, c. When the results of the investigation are to be kept confidential, d. Where the area of investigations is complex and heterogeneous and e. Where a greater degree of intellectual power, experience and labour are required.

Merits

1. Original data is collected.
2. Reliable information is obtained.
3. There is uniformity in the collection of information.
4. This method is elastic because the Investigator can use his influence and different techniques as the situation demands.
5. The method yields more accurate results.
6. It can be most useful when the area of investigation is very small.

Demerits

1. This method is unsuitable when the area of investigation is large.
2. It is more expensive and time-consuming.
3. The chances of personal bias are more.
4. It is more complex and places a heavy burden upon the resources of the investigator.

Precautions

1. In the use of this method, precautions must be taken in regard to the nature, behaviour and personality of the investigator. The investigator must possess the aptitude necessary for conducting personal interviews.

2. The success of this method mainly depends upon the qualities of the investigator, viz.efficiency, consistency, farsightendness and impartiality.

3. The questions should be limited in number. Only relevant questions should be asked.

2. Indirect Oral Investigation

There are certain situations when the informations cannot be approached directly. In such situations, we have to collect data from those persons who may possess some knowledge about the investigation. Such persons are known as *'witnesses'*. This method is suitable in the following situations:

a. When the area of investigation is large, b. When the information cannot be obtained directly from the informants, c. When expertise in collection of data is required to be used. The Governments and other such institutions generally make use of this method.

Merits

1. It can be used when the area of investigation is large.
2. It is a simple and convenient method of investigation.
3. It is economical and saves time, money and labour.
4. More complex data can also be analyzed.
5. It is not open to bias.
6. It is possible to obtain complete and adequate information regarding the enquiry.

Demerits

1. The results may not always be true and accurate; these may be open to suspection and doubt.
2. The informants may not be serious in furnishing the proper replies and hence degree of accuracy can be affected.

Precautions

1. It must be ascertained that the informants possess the required knowledge and are interested in providing the correct information.

2. The number of informants should be fairly large in order to obtain reliable results.

3. It must be ascertained that informants are not biased and are providing correct and true informations only.

3. Information Through Correspondents

In this method, the investigator does not collect the information directly from the respondents. The task is handed over to a few persons or a group of persons, who are known as *correspondents.* The method is suitable in the following situations:

a. When the area of investigation is very large, b. When regular and continuous information is required, c. When the degree of accuracy is only of secondary importance. This method is generally employed by newspapers, magazines, broadcasting agencies and various governmental agencies requiring information on regular basis.

Merits

1. It is the most economical and extensive method of investigation.

2. It is a very convenient method of collecting information from far-off areas.

3. It is useful where the information is needed from time to time.

Demerits

1. There is lack of originality in data.

2. The information can be biased.

3. Degree of accuracy is generally very low.

4. Information made available may be out-of-date.

5. There may not be uniformity in the collected data.

Precautions

1. Only properly trained correspondents should be appointed.

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2. Efforts should be made to reduce the personal bias of the correspondents. This bias may arise due to caste, religion, etc.

3. The consistency of information should be verified at regular intervals.

4. Questionnaire Method

In this method, the information is obtained from the informants through questionnaire. This method is of two forms:

1. Questionnaire Sent Through Post

In this method the questionnaire is mailed to the informants. It also carries a request for the quick response and lays down the aims and objectives of collecting the information. In this method, the return postage expenses are generally borne by the investigator. This method is suitable in the following situations:

a. When the area under investigation is very large and b. When the informants are educated and are likely to co-operate.

Merits

1. It can conveniently be used when the area of investigation is very large.

2. It is economical and involves less labour and time.

3. Collected information may be more reliable.

4. Original data can be obtained directly from the informants.

Demerits

1. It is not possible to determine the degree of accuracy of data.

2. Informants may prove unco-operative, and hence may refuse to part with proper information.

3. Information may be biased.

4. Informants may not like to provide written information.

5. If the questionnaire is complex, it may not be responded.

6. If may involve a long time-lag in answering the questionnaire.

Precautions

1.Goodwell and co-operation on informants are prime requisite.

2. Questionnaire should be simple, attractive and unambiguous.

3. Language used in the questionnaire should be polite and effective.

4. The efforts should be made to extract the information as quickly as possible.

2. Questionnaire Sent Through Enumerators

The enumerators go to the informants with a prepared questionnaire and get the replies to the questions. This method is generally used by public organizations like FICCI, NCAER, etc., for the research projects that need a high rate of response.

Merits

1. There is no chance of non-response since the enumerator go to all the informants.

2. Personal contact makes it possible to collect reliable data.

3. Personal bias is minimized.

4. Illiterate informants can also be approached.

Demerits

1. This is a very costly method as the enumerators have to be paid their services.

2. It is time-consuming.

3. Personal bias of enumerators may lead to false results.

4. This method can be used only by big organizations.

Precautions

1. The success of this method lies on the calibre of enumerators.

2. The enumerator should be, a. wise, honest, laborious and active, b. educated and technically trained, c. unbiased, d. interested in research work, e. well-versed in local language, customs, traditions, etc.

3. The number of questions should be small.

Technique of Drafting of a Good Questionnaire

Questionnaire method is a most popular method of collecting data. A questionnaire should be prepared and drafted with utmost care, since the success of any statistical investigation is determined by the quality of the questionnaire and the response it evokes from the informants. More usually a '*pilot survey*' is gone through before the questionnaire is sent to the real informants. The primary purpose of pilot survey of this type is to test effectiveness of the question-naire in hand.

Drafting of questionnaire requires skill and expertise which can be provided only by a well-trained statistician. A good questionnaire should possess the following characteristics:

1. The size of the questionnaire should be small: The number of questions should be as less as possible keeping in view the nature of information desired. Generally, 15 to 20 questions can be asked in one good questionnaire. If more information is required, the questionnaire should be divided into various parts.

2. The questions should be simple, clear and corroboratory in nature.

3. Possible answers could be suggested also with the questions. On this basis we can divide the questions and their possible answers into the following four types:

Uses of Statistics

The following are the main uses of statistics.

(a) Statistics simplifies complex data

The various statistical methods like classification, tabulation, averages etc. help in simplifying the mass of data into a few figure which can be easily understood.

(b) Statistics presents the facts in a definite form

Statistics presents numerical data. The conclusions stated numerically are definite and more convincing than qualitative statements.

(c) Statistics helps in formulating suitable policies

Statistics helps in framing suitable policies like preparation of production schedule based on expected sales figures, how much food grains we should import in a particular year based on expected consumption etc.

(d) Statistics facilities comparisons

The various statistical tools like table, averages, measures of dispersion etc. help in comparing different sets of data.

(e) Statistical helps in forecasting

Statistical methods are not only helpful in estimating the present trend but also helps in forecasting the future.

(f) Statistics and Research

Statistics in indispensible tool of research studies. There is hardly any research finding without statistics.

(g) Wide application in many fields

Statistics has a good application in the field of commerce, business, economics, science, State administration etc.

Limitations of Statistics

Though statistics has wide scope and utility, it has certain limitations. They are as follows:

a. **Statistics does not study individuals:** Statistics deals with aggregate of facts. It does not deal with individual items.

b. **Statistics does not study qualitative aspect:** Statistics deals with facts which are expressed in numerical figures. It does not study qualitative aspects such as honesty, efficiency, intelligence etc.

c. **Statistical results are only approximate:** Hundred per cent accuracy is very rare in statistical work. Therefore, the results are only approximate.

d. **Statistics deals with only averages:** The laws of Statistics are true only on an average. They are not universally applicable as the laws of Physics or Chemistry.