

# Statistics - Scope and Development

**Introduction**

The subject Statistics is fast developing and has its application in almost all walks of life. In recent years, the growth of Statistics has made itself felt in almost every phase of human activity. Statistics is no longer a mere collection of data and their presentation in charts and tables. It is now considered as the science of inferences on observed data and the entire problem of making decisions in the face of uncertainty. Here we discuss the importance of Statistics in different areas and various branches of Statistics.

**Learning Outcomes**

After the transaction of this chapter, the learner:

- 1.1 explains the history, definition and scope of Statistics.
- 1.2 recognizes the importance of Statistics in various fields.
- 1.3 compares different branches of Statistics.
- 1.4 illustrates the functions of MOSPI, CSO, NSSO, ISI and Department of Economics and Statistics in Kerala.

Concepts/Ideas/ Process Skills	Process/Activity with assessment	Learning outcome
<ul style="list-style-type: none"> <li>• History of Statistics.</li> <li>• Definitions of Statistics.</li> <li>• Scope of Statistics.</li> <li>- Observing.</li> <li>- Communicating and comprehending the ideas of others.</li> <li>- Making operational definitions.</li> </ul>	<p>Discussion on - the History, Definitions and Scope of Statistics.</p>	<p>Explains the history, definition and scope of Statistics.</p>
<ul style="list-style-type: none"> <li>• Importance of Statistics in various fields.</li> <li>- Observing.</li> <li>- Inferring.</li> <li>- Communicating and comprehending the ideas of others.</li> </ul>	<p>Seminar on - "The importance of Statistics in various fields".</p>	<p>Recognizes the importance of Statistics in various fields.</p>
<ul style="list-style-type: none"> <li>• Different branches of Statistics.</li> <li>- Observing.</li> <li>- Inferring.</li> <li>- Communicating and comprehending the ideas of others.</li> </ul>	<p>Collects information from media, websites, journals and discusses about the different branches of Statistics.</p>	<p>Compares different branches of Statistics.</p>
<ul style="list-style-type: none"> <li>• Functions of MOSPI, CSO, NSSO, ISI and Dept of Economics and Statistics in Kerala.</li> <li>- Observing.</li> <li>- Classifying.</li> <li>- Communicating and comprehending the ideas of others.</li> </ul>	<p>Visit various offices under the Dept of Economics and Statistics in your district and collect information from the media, websites, and journals about MOSPI, CSO, NSSO and ISI.</p>	<p>Illustrates the functions of MOSPI, CSO, NSSO, ISI and Department of Economics and Statistics in Kerala.</p>

*Through the Chapter....*

### **Concept: 1.1 - 1.3 History, Definitions & Scope of Statistics**

#### **Suggested activity: Discussion**

Teacher starts the discussion on the word 'Statistics'. The word is familiar to the students as they have studied it in the lower classes. The discussion should concentrate on the following.

- It is a science of inference on observed data.
- It is a science of making decisions in the face of uncertainty.
- It is a base for research findings in almost all areas of education.

Teacher divides the class into groups of 6 and leads the discussion to the origin and history of statistics. Teacher directs the students to collect various definitions using internet and magazines.

Tasks to be covered.

- Collection of suitable material.
- Discussion in groups.
- Presentation in the class.
- Finalisation of materials.
- Preparing notes on activity log by themselves.

The following indicators may be used to evaluate the students.

- Communication skill.
- Presentation.
- Leadership.
- Inter personal relationship.

#### **Consolidation points**

- The ideas about the history, definition and scope of Statistics.

### **Concept: 1.4 Importance of Statistics in various fields.**

#### **Suggested activity: Seminar - " Importance of Statistics in various fields".**

A seminar may be conducted to recognize the importance of Statistics in various fields such as Planning, Economics, Industry, Mathematics, Modern science, Psychology and Education, management studies, etc. Each group may be given different areas. The tasks to be covered are,

- Allot topics to each group.
- Discuss within the groups. (Directs them to collect materials from books, journals, internet, etc. or provide necessary materials to them)
- Finalise the report.
- Presentation of seminar.
- Consolidation by the teacher.
- Preparation of self notes by the students as part of the activity log.

**Collect the seminar reports from each student and use this material for portfolio assessment.**

The following indicators may be used to evaluate the students.

- Ability to plan and organize.
- Awareness of content.
- Proper presentation.
- Preparation of reports.
- Skill in communication.

#### **Consolidation points**

- o Importance of Statistics in various fields.

### **Concept: 1.6 Applied Branches of Statistics**

#### **Suggested Activity : Discussion and presentation**

Divide the class into 3 groups. One branch each is given to the groups - Biostatistics, Actuarial Statistics and Agricultural Statistics.

Directs the students to collect information about the different branches from various sources. If they experience any difficulty, provide the students adequate materials. The following tasks are to be covered.

- Discussion within the groups.

#### **Discussion points are,**

- o Origin of the branch.
- o Connection with Statistics.
- o Statisticians involved in the area, etc.
- Discussion with the teacher.
- Presentation by each group.
- Consolidation by the teacher.

The preparation of details by each student and the self notes prepared by each student, can be used in the activity log and can be considered for portfolio assessment.

### Consolidation Points

- o Different branches of Statistics - Biostatistics, Actuarial Statistics, Agricultural Statistics.

### Evaluation points

- Ability to plan and organize.
- Awareness of content.
- Proper presentation.
- Preparation of reports.
- Skill in communication.

## **Concept: 1.7 Official Statistics**

### **Suggested activity: Field trip**

Teacher identifies 4 or 5 nearest centres of organisations, like the NSSO or government departments, like the Department of Economics and Statistics, Kerala and MOSPI. Divide the students into 4 or 5 groups and plan a trip to the offices identified. The following tasks are to be covered,

- Preparation for the field trip.
- Proper instruction should be given to the groups to collect the information from the concerned officials.
- Discuss within the groups and prepare reports.
- Collect additional information from official websites of the departments or other sources.
- Presentation of each group in the class.
- Consolidation by the teacher.
- Preparation of self notes by each student as part of the activity log and for portfolio assessment.

### Consolidation Points

- o The activities of MOSPI.
- o The duties of NSSO, CSO and ISI.
- o The functions of the Department of Economics and Statistics, Kerala.

### Evaluation points

The following points are used to evaluate the students.

- Leadership quality
- Organisation skill
- Communication skill
- Interpersonal relationship
- Rapport building

### **Suggested CE Activities**

1. Assignment on the history and development of Statistics.

### **TE Items**

Try to discuss the TE questions given in the Textbook. After discussion each student may do the problems as individual work. If needed the following questions can also be used.

1. The discipline that applies mathematical and statistical methods to assess risk in the insurance and finance industries is called
  - a) Bio statistics
  - b) Agricultural statistics
  - c) Actuarial Statistics
  - d) Production Statistics
2. The Central Statistical Office is located at
  - a) Mumbai
  - b) Kolkatta
  - c) New Delhi
  - d) Chennai
3. The largest organisation in India conducting regular socio-economic surveys is:
  - a) CSO
  - b) NSSO
  - c) ISI
  - d) NASA
4. Discuss the origin and history of Statistics.
5. Briefly describe the different branches of Statistics.

# Collection of Data

**Introduction**

Having gone through the previous chapter, students would have understood that the first step in the study of statistics is the collection of data. The different data collection methods explained in this chapter equip the students to reach the right level of thinking in different situations.

**Learning Outcomes**

After the transaction of this chapter, the learner:

- 2.1 differentiates between population and sample.
- 2.2 recognizes investigator, investigation, enumerator and enumeration.
- 2.3 classifies variables and constants.
- 2.4 distinguishes qualitative variables and quantitative variables.
- 2.5 differentiates between discrete and continuous variables.
- 2.6 compares primary and secondary data.
- 2.7 identifies questionnaire and schedule.
- 2.8 constructs/drafts a questionnaire.
- 2.9 explains the different methods of data collection.
- 2.10 recognizes the sources of secondary data.

Concepts/Ideas/ Process Skills	Process/Activity with assessment	Learning outcome
<ul style="list-style-type: none"> <li>• New statistical terms</li> <li>- Observing</li> <li>- Classifying</li> <li>- Communicating and understanding</li> <li>- Identifying</li> <li>- Making Operational definitions</li> </ul>	<p>Group discussion on data collection by creating a situation of collecting information explaining the statistical terms involved in it.</p> <p>OR</p> <p>Role Play</p>	<ol style="list-style-type: none"> <li>1. Differentiates between population and sample</li> <li>2. Recognizes Investigator, Investigation, Enumerator, Enumeration</li> </ol>
<ul style="list-style-type: none"> <li>• Variables</li> </ul>	<p>Lists different types of variables and describes them.</p>	<ol style="list-style-type: none"> <li>3. Classifies variables and constants</li> <li>4. Distinguishes qualitative variables and Quantitative variables</li> <li>5. Differentiates between discrete and continuous variables.</li> </ol>
<ul style="list-style-type: none"> <li>• Two types of data</li> <li>- Comparing</li> <li>- Observing</li> <li>- Classifying</li> <li>- Charting</li> <li>- Preparing of table</li> <li>- Making operational definitions</li> </ul>	<p>Group discussion based on the findings of the first activity of this chapter. Classification of the two types of data and charting the comparison of primary and secondary data.</p> <p>OR</p> <p>Role Play</p>	<ol style="list-style-type: none"> <li>6. Compares primary and secondary data.</li> </ol>
<ul style="list-style-type: none"> <li>• Questionnaire, schedule and comparison</li> <li>• Requisites of a good Questionnaire</li> <li>- Inferring</li> <li>- Classifying</li> <li>- Charting</li> <li>- Communicating and understanding</li> <li>- Identifying</li> <li>- Experimenting</li> </ul>	<p>Lists real life situations of primary data collection.</p> <p>Discusses about their classification.</p> <p>Prepares a table of comparison.</p> <p>Prepares requisites of a good questionnaire and makes a selection on them.</p> <p>Prepares a sample questionnaire satisfying these qualities.</p> <p>OR</p> <p>Continuation of first activity</p> <p>Role Play</p>	<ol style="list-style-type: none"> <li>7. Identifies questionnaire and schedule</li> <li>8. Constructs / drafts questionnaire</li> </ol>

Concepts/Ideas/ Process Skills	Process/Activity with assessment	Learning outcome
<ul style="list-style-type: none"> <li>• Different methods of primary data collection                             <ul style="list-style-type: none"> <li>• Direct investigation</li> <li>• Indirect oral investigation</li> <li>• Direct observation method</li> <li>• Telephone interview</li> <li>• Mailed questionnaire</li> <li>• Focus Group Discussion</li> </ul> </li> <li>- Communicating and understanding</li> <li>- Charting</li> <li>- Identifying</li> <li>- Formulating definitions</li> <li>- Preparing table</li> </ul>	<p>Group Discussion on methods of collecting primary data. Make findings on the basis of this discussion.</p> <p>Teacher supports the findings through illustration.</p>	<p>9. Explains different methods of data collection.</p>
<ul style="list-style-type: none"> <li>• Different sources of secondary data.</li> <li>- Observing</li> <li>- Classifying</li> <li>- Communicating and understanding</li> <li>- Inferring</li> <li>- Preparing of List</li> </ul>	<p>Collection of data from newspaper, magazines, office records reports from social media, Internet etc.</p> <p>Support findings with illustrations and help them to list out different sources.</p>	<p>10. Recognizes the sources of secondary data.</p>

## **Values and attitudes**

The learner is able to:

- scans the pulse of the society and environment.
- show understanding, tolerance and inclusion.
- show respect and responsibility.
- practice behaviour based on values.
- nourish with productive thinking.
- treat others fairly and impartially.
- be innovative.
- choose among alternatives.
- be frank and genuine with others.

*Through the Chapter....*

### **Concept 2.1 & 2.2: New statistical terms - Statistical Investigation , Population, Sample, Census, Sample, Investigation, Investigator, Enumeration, Enumerator, Statistical Survey**

#### **Suggested Activity : Role Play / Group Discussion**

Ask the students to discuss about some situations of data collection. Ask them to list from among them the teacher may select an appropriate data collection situation (eg: survey from PHC, survey from panchayat, etc).

Create a situation of data collection. Group the students in 4 or 5 groups. Teacher directs the students to discuss that situation for 10 minutes in groups. Select a group to make a role play revealing this situation. Evaluate the students as a part of CE and keep the report of role play as portfolio assessment.

Initiate discussions on the basis of role play and lead the discussion to the consolidation points and ask them to write the notes in the activity log.

While the activity progresses the teacher may concentrate on the following indicators for Continuous Evaluation.

- Group participation
- Communication skill
- Leadership quality
- Responsibility

Creativity,  
Effectiveness of the role  
Timing

### Consolidation Points

- Statistical Investigation.
- Population and Sample.
- Census and sampling.
- Investigation and Investigator.
- Enumeration and Enumerator.
- Statistical Survey.

### Concept 2.3 & 2.4 & 2.5 :Variables & Constants, Variables - Qualitative variable, Quantitative Variable, Discrete variable, Continuous variable

#### Suggested Activity : Group discussion and Illustration

Lead the students to discuss about the situation of data collection from PHC. What are the possible data they collected? Ask them to list. Take a random selection of students from the class and ask them to read. The questions may be about House owners name, No. of family members, No. of children, No. of adults, sex, age, height, weight, blood group, HB count etc. Help the students identify the listed items as variables. Teacher can illustrate the definition of variables and constants.

Can you find any difference among the variables listed above? The information about the variable blood group is not measurable but its quality can be determined. But the variable height can be measured. Lead the discussion in the above way and help them to identify Qualitative variable, Quantitative Variable, Discrete variable and Continuous variable.

Teacher can give some other examples of similar situations and help the students to suggest some more examples.

#### While the activity is progressing the teacher may concentrate on the following indicators for Continuous Evaluation

- Participation- individually and in the group
- Creativity
- Effectiveness of the role
- Communication skill
- Leadership quality

- Responsibility
- Preparation of notes

### **Consolidation Points**

Teacher concludes the discussion on the following concepts.

- Variables
- Qualitative and quantitative variables
- Discrete and Continuous variables

## **2.6 Concept: Primary & Secondary data**

### **Suggested Activity : Group Discussion**

Take up a discussion on data and how to collect it. Let them discuss the topics data and the purpose of data collection. Teacher leads the discussion. In the above activity we had listed many variables and the enumerator collects information about these variables. Continue the discussion and lead the students to identify that these collected information are called data.

What are the different methods of collecting data? Group the students into 5 or 6 groups and ask them list out different methods of data collection. After discussion ask the students to read the listed items and write them on the board. The list may contain interview method, questionnaire method, observation method, data from internet, data from magazine etc. Teacher can list them under two heads and help the students to identify primary and secondary data.

Enable the students to compare primary and secondary data. Ask them to prepare a chart of comparison

**While the activity is progressing the teacher may concentrate on the following indicators for Continuous Evaluation**

- Individual and group participation
- Interaction with the peer group
- Proper presentation
- Ability to criticize and consolidate
- Preparation of charts

### **Consolidation Points**

Teacher concludes the discussion about the following concepts

- Primary data
- Secondary data
- Comparison between primary and secondary data

## 2.7 & 2.8 Concept: Questionnaire and schedule

### Suggested Activity : Group Discussion and Illustration

Through the previous activity the student understands that the questionnaire is one of the primary data collection methods. Lead the discussion to develop the requisites of a good questionnaire. (detail are given in the text book) List them out and explain it in detail and lead them to design a Questionnaire which satisfies the above requisites.

Ask the students to suggest some themes for preparing questionnaires (eg: money spending habits of students). Give time for discussion group wise. Teacher directs the students to construct a Questionnaire about a selected topic for group discussion and peer group assessment. Ask them to present it group wise in the class room and make their own suggestion. Teacher can evaluate these questions and finally develop a good questionnaire satisfying the above requirements.

A survey can be conducted using the prepared questionnaire as a pilot survey in their group and with corrections made , it may be extended to other groups.

Suppose the informant is not capable of filling the questionnaire or reluctant to give a proper answer, what is to be done? The investigator, himself can collect the data from the informant using another format of questionnaire. This type of a set of question used for collecting data and is filled by the enumerators himself is known as a schedule. In this method he can collect some additional information, if necessary. This is one of the advantages of schedule.

Help the students to prepare a chart of comparison between Questionnaire and Schedule

**While the activity is progressing the teacher may concentrate on the following indicators for Continuous Evaluation**

- Communication skill
- Group participation
- Initiative
- Participation in tool development(questionnaire)
- Accurate use of tool and collection of information
- Write and present report

### **Consolidation Points**

Teacher concludes the discussion on the following concepts

- Questionnaire
- Schedule
- Comparison between Questionnaire and schedule
- Requisites of a good questionnaire
- Drafting a questionnaire
- Preparation of more questionnaires
- Conducting survey

## **2.9 Concept: Methods of primary data collection**

### **Suggested Activity : Teacher presentation & Group Discussion**

Through the previous activities students have become familiar with primary data collection methods. Teacher divides the class into 5 or 6 groups and students discuss and interact with each other to reveal all the primary data collection methods. Each group presents their report. The teacher evaluates the discussion and leads the students to list and explain the following data collection methods.

- Direct investigation
- Indirect oral investigation
- Direct observation method
- Telephone interview
- Mailed Questionnaire
- Focus Group Discussion (FGD)

**While the activity is progressing the teacher may concentrate on the following indicators for Continuous Evaluation**

- Ability to plan and organize.
- Ability to comprehend the topic based on previous knowledge.
- Own observations or suggestions or views or judgments or evaluations.

### **Consolidation Points**

Different methods of primary data collection

- Direct investigation
- Indirect oral investigation
- Direct observation method
- Telephone Interview

- Mailed Questionnaire
- Focus Group Discussion (FGD)

## **2.10 Concept: Sources of Secondary data**

### **Suggested Activity : Collection / Group discussion**

Through the previous activity students get an idea about secondary data. Teacher helps the students to collect information regarding a recent social issue from news papers, magazines, reports in social media, internet etc. Students present the data they collected and leads the discussion to sources of secondary data and its reliability. Teacher can help the students to furnish the secondary data as required.

**While the activity is progressing the teacher may concentrate on the following indicators for Continuous Evaluation**

- Preparation of tools for data collection
- Selection of proper reports
- Collection of articles
- Participation in peer group assessments
- Write and present report

### **Consolidation Points**

- Sources of secondary data
- Reliability of secondary data

### **Suggested activities for CE**

1. Evaluate the students participation as an individual and as a member of a group in group discussion.
2. Evaluate the students in their individual and group participation in Role play.
3. Preparation of Questionnaire.
4. Pilot Survey.
5. Survey using Questionnaire to other groups.
6. Secondary data collection methods.
7. Interview with a reputed person as part of primary data collection method.

### **TE Items**

Try to discuss the TE questions given in the Textbook. After discussion each student may do the problems as individual work. If needed the following problems can also be used.

1. An electric company manufactures tubes and claims that the average life of an electric tube is 400 Hrs. Which type of study did they conduct for making such a claim. Justify your answer.
2. You are asked to collect information regarding the alcohol drinking habits in your district.
  - (a) Which type of data would you prefer? (b) Why?
3. Mr. Ramu needs the marks of tenth class students in the nearby three schools. He collected the list of students studying in the tenth class from the respective schools and collected the details of marks by personal investigation. He also collected marks from the school records. Name the two types of data.
4. What method of collection of primary data will you suggest for the following
  - (a) Investigation regarding income and expenditure of families.
  - (b) Market information regarding price of consuming items.
  - (c) Effect of newspaper on children.
5. Based on the measurability, 'severity of illness of a patient' is a data on ..... scale.
6. The Government of Kerala needs some information regarding the labour problems in Techno Park. The Assistant Labour Commissioner, collected information directly from Techno Park and from some other sources. Categorise the data as Primary and Secondary and mention the methods of collecting Primary data.
7. You are asked to collect information regarding the daily accidents in your district. Which type of data would you prefer and why?
8. Indicate whether the following statements are true or false.
  - (a) For testing the effectiveness of drugs for rheumatic fever the census method is preferred to sampling
  - (b) The list of questions and provisions for filling answers and information entered by the enumerator is called a schedule.
  - (c) You can ask questions which hurt the sentiments of the respondent.
  - (d) Secondary data needs much scrutiny and should not be accepted at its face value.
9. Classify the following characteristics as variables or constants.
  - (a) Height (b) Boiling point of water
  - (c) Age (d) No. of days in week
10. Compare Census and Sampling.
11. Prepare a questionnaire to study the problems of the Higher Secondary of your school.