

The Nature of Probability and Statistics



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Outline

- Descriptive and Inferential Statistics
- Variables and Types of Data
- Data Collection and Sampling techniques

Objectives

After the end of this chapter, you should be able to

- A. Demonstrate knowledge of statistical terms
- B. Differentiate between the two branches of statistics
- C. Identify types of data
- D. Identify the measurement level for each variable

Statistics

It is the science of conducting studies to collect, organize, summarize, analyze, and draw conclusions from data.

Descriptive and Inferential

- **Variable** – a characteristic or attribute that can assume different value.
- **Data** – are values that the variables can assume.
- **Random Variables** – variables whose values are determined by chance.
- **Data set** – a collection of data values.
- **Data value** – Each value in the data set.

Examples:

- *Variables: a characteristic or attribute that can assume different value.*
 - Grades, gender, height,...
- *Data: are values that the variables can assume.*
 - {89,98,99,100}, {male, female}, {50cm, 100cm, 89cm, ...}

Examples:

- Random Variables: *variables whose values are determined by chance.*
 - Number of heads or tails in tossing a coin, results in tossing a die/s...
- Data set: *a collection of data values.*
 - {89,98,99,100}, {male, female}, {50cm, 100cm, 89cm, ...}.

Descriptive and Inferential

Data can be used in different ways. The body of knowledge called statistics is divided into two main areas, depending on how data are used. The two areas are:

- Descriptive statistics
- Inferential statistics

Descriptive and Inferential

- **Descriptive Statistics** – consists of the collection, organization, summarization and presentation of data.

Examples:

- ✓ Nine out of ten on-the-job fatalities are men.
- ✓ Expenditures for the cable industry were \$5.66 billion in 1996.
- ✓ The national average annual medicine expenditure per person is \$1052.

Descriptive and Inferential

- **Inferential Statistics** – it consist of generalizing from samples to populations, performing estimations and hypothesis tests, determining relationships among variables, and making predictions.
 - Example:
 - The chances of winning the California Lottery are one chance in twenty-two million.
 - There is a relationship between smoking cigarettes and getting emphysema.

Exercise:

1. Financial analysts say that mortgage may soon hit bottom.
2. The monthly average expenditures of per household is P10,000.
3. The guard in the SM Megamall records the number of shoppers for the past 15 days.
4. The Philippine Regulation Commission (PRC) ranks the result of the Certified Public Accountants professional examination in 2010.

Population

It consists of all subjects (human or otherwise) that are being studied.

Example:

BISU Students

Filipino

Tourists

Boholana

...

Sample

A group of subjects selected from a population

Example:

Population	Sample

Sample

A group of subjects selected from a population

Example:

Population	Sample
BISU students	
Filipino	
Tourists	
Boholana	

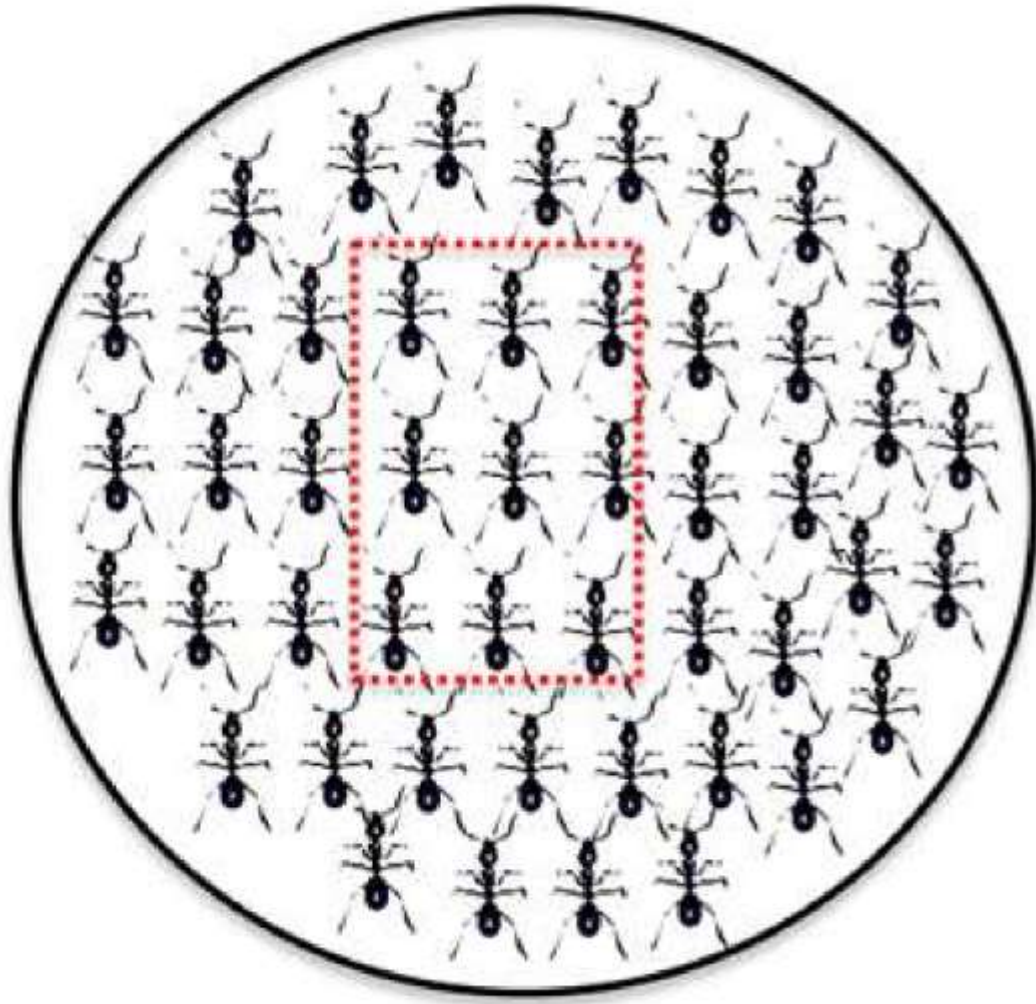
Sample

A group of subjects selected from a population

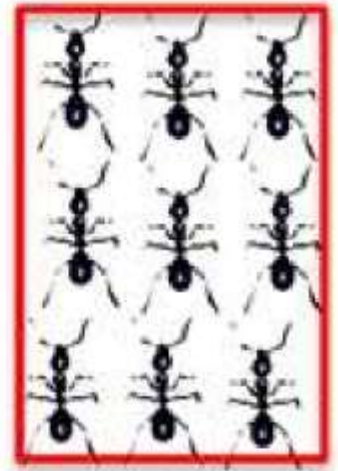
Example:

Population	Sample
BISU students	Tourism students
Filipino	Igorots
Tourists	Korean who visits in 2018
Boholana	Female Tagbilaranon

Population (N)



Sample (n)



Variables and Types of Data

As stated in the first section, statisticians gain information about a particular situation by collecting data for random variables.

This section will explore greater detail the nature of variables and types of data

Variables and Types of Data

Variables can be classified

as

Quantitative or Qualitative.

Qualitative Data

These are variables that can be placed into distinct categories, according to some characteristic or attributes.

Example

Gender (feminine, masculine, bisexual)

Sex(male, female)

...

Quantitative Data

These are variables are numerical and can be ordered or ranked.

Example

Age, heights, weights, body temperatures

...

Exercise:

Classify the variables as qualitative or quantitative:

1. Automobile ownership of students.
2. Net weight (in grams) of package cereal.
3. Political party affiliation of civil service workers.
4. Number of bankrupt corporations per month in the Philippines.

Quantitative Data

Quantitative variables can be further classified into two groups:

Discrete and Continuous variables.

Discrete variables

These variables can be assigned values such as 0, 1, 2, 3 and are said to be countable.

Examples of discrete variables are the **number of children in a family**, the number of student in a classroom, **the number of calls received by a switchboard operator each day for a month.**

Discrete variables

Assume values that can be counted.

Continuous variables

These variables can assume an infinite number of values between any two specific values.

They are obtained by measuring.

They often include fractions and decimals.

Exercise:

- Identify each item as discrete or continuous:
 1. Outcomes in rolling a pair of dice.
 2. Square root of two.
 3. $f(x)=x+3$
 4. Number of online purchases made in a week.

Variables

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graph TD; Variables --> Qualitative; Variables --> Quantitative; Quantitative --> Discrete; Quantitative --> Continuous;
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Qualitative

Quantitative

Discrete

Continuous

Level of Measurements

Nominal level of measurements

Ordinal Level of measurements

Interval level of measurements

Ratio level of measurements

Nominal Level of Measurements

- It classifies data into mutually exclusive categories in which no order or ranking can be imposed on the data.

Example:

Subjects

Classifying survey subjects such as male or female

Zipcodes

Religion

Marital status

Ordinal Level of Measurements

- Data measures in this level can be placed into categories.
- These categories can be ordered or ranked.

Example:

Student evaluations

Guest speakers might be ranked as superior, average, or poor

Size (small, medium, large)

Interval Level of Measurement

- This level differs from the ordinal level in that precise differences do exist between units.

Example:

many standardized psychological tests yield values measured in an interval scale. IQ is an example of Interval level;

Temperature

Ratio Level of Measurement

- It has a true zero point (complete absence of the attribute being measured). Ratio data are either discrete or continuous variables.

Example:

Weight, Age, Salary

Exercise:

- Determine the following as nominal, ordinal, interval, ratio_data.
 1. SSS number

Exercise:

- Determine the following as nominal, ordinal, interval, ratio_data.
 1. SSS number (nominal)

Exercise:

- Determine the following as nominal, ordinal, interval, ratio_data.
 1. SSS number (nominal)
 2. Military ranks

Exercise:

- Determine the following as nominal, ordinal, interval, ratio_data.
 1. SSS number (nominal)
 2. Military ranks (ordinal)

Exercise:

- Determine the following as nominal, ordinal, interval, ratio_data.
 1. SSS number (nominal)
 2. Military ranks (ordinal)
 3. Temperature measured in Kelvin scale

Exercise:

- Determine the following as nominal, ordinal, interval, ratio_data.
 1. SSS number (nominal)
 2. Military ranks (ordinal)
 3. Temperature measured in Kelvin scale (interval)

Exercise:

- Determine the following as nominal, ordinal, interval, ratio_data.
 1. SSS number (nominal)
 2. Military ranks (ordinal)
 3. Temperature measured in Kelvin scale (interval)
 4. The number of LRT passengers from Recto to Santolan Station.

Exercise:

- Determine the following as nominal, ordinal, interval, ratio_data.
 1. SSS number (nominal)
 2. Military ranks (ordinal)
 3. Temperature measured in Kelvin scale (interval)
 4. The number of LRT passengers from Recto to Santolan Station. (nominal)
 5. Time required for engineers to do a certain project. (ratio)

Random Sampling

1. Simple Random Sampling
2. Systematic Sampling
3. Stratified Sampling
4. Cluster Sampling

Random Sampling

1. Simple Random Sampling – a process of selecting n sample size in the population via random numbers or through lottery.

Random Sampling

1. Simple Random Sampling
2. Systematic Sampling – is a process of selecting the k^{th} element in the population until the desired number of subjects or respondents is attained.

Random Sampling

1. Simple Random Sampling
2. Systematic Sampling
3. Stratified Sampling – a process of subdividing the population into subgroups or strata and drawing members at random from each subgroup or stratum.

Random Sampling

1. Simple Random Sampling
2. Systematic Sampling
3. Stratified Sampling
4. Cluster Sampling – a process of selecting clusters from a population which is very large or widely spread out over a wide geographical area.

Non-Random Sampling

1. Convenience Sampling
2. Purposive Sampling
3. Quota Sampling
4. Snowball Sampling

Methods of Collecting Data

- Direct or Interview Method
- Indirect or Questionnaire Method
- Registration Method
- Observation method
- Experimental Method

Method of Presenting Data

- Textual Method
- Tabular Method
- Graphical Method

End of Chapter 1

“I hope you gained a lot”

Prepare for Chapter Quiz

Next meeting.

God Bless You!!!