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Module

2: Measurement of

Data

Course Facilitator: Dr.
Bibhunandini Das



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Concepts

- Statistics is the science of conducting studies to collect, organize, summarize, analyze, and draw conclusions from data.
- What are the branches of statistics?
- What are data?
- How are samples selected?



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Concepts

- Variable is a characteristic or attribute that can assume different values.
- Data are the values (measurements or observations) that the variables can assume.
- Random variables- Variables whose values are determined by chance (e.g. 3 out of every 100 automobiles the company insured were involved in accidents during a 1-year period)
- A collection of data values forms a **data set**.
- Each value in the data set is called a data value or a datum.



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Type of Statistics

➤ Descriptive statistics

Consists of the collection, organization, summarization, and presentation of data.

Example Census Presented in charts, graphs, or tables

➤ Inferential statistics

consists of generalizing from samples to populations, performing estimations and hypothesis tests, determining relationships among variables, and making predictions.

Inferential statistics uses probability



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Population vs. Sample

➤ Population

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

➤ Sample

is a group of subjects selected from a population

If the subjects of a sample are properly selected, most of the time they should possess the same or similar characteristics as the subjects in the population.



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Making Inferences from Sample

➤ Hypothesis testing is a decision-making process for evaluating claims about a population, based on information obtained from samples

For example, a researcher may wish to know if a new drug will reduce the number of heart attacks in men over 70 years of age. For this study, two groups of men over 70 would be selected. One group would be given the drug, and the other would be given a placebo (a substance with no medical benefits or harm). Later, the number of heart attacks occurring in each group of men would be counted, a statistical test would be run, and a decision would be made about the effectiveness of the drug

Relationship

E.g “Smoking and Health,”

Attendance and grades Prediction



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Types of Variables

- Qualitative variables are variables that can be placed into distinct categories, according to some characteristic or attribute.

For example, if subjects are classified according to gender (male or female), then the variable *gender is qualitative*. Other examples of qualitative variables are religious preference and geographic locations.

- Quantitative variables are numerical and can be ordered or ranked.

For example, the variable *age is numerical*, and people can be ranked in order according to the value of their ages. Other examples of quantitative variables are heights, weights, and body temperatures.



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Types of Quantitative Variables

- Discrete variables assume values that can be counted.

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

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

They are obtained by measuring.

They often include fractions and decimals.

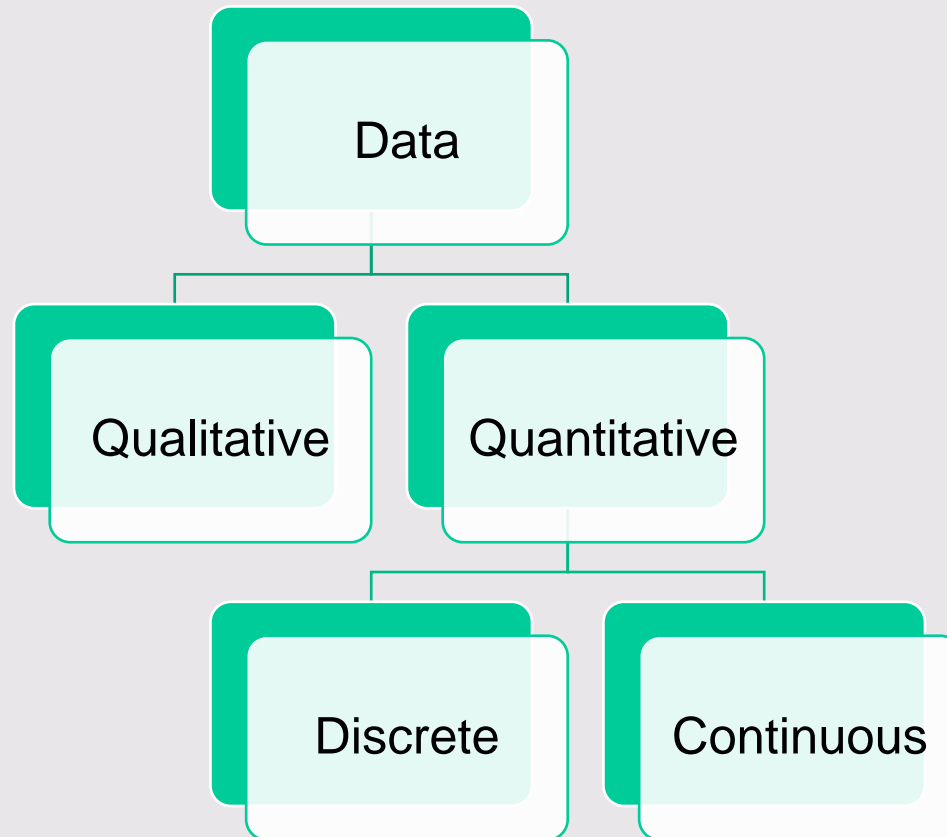
Example temperature



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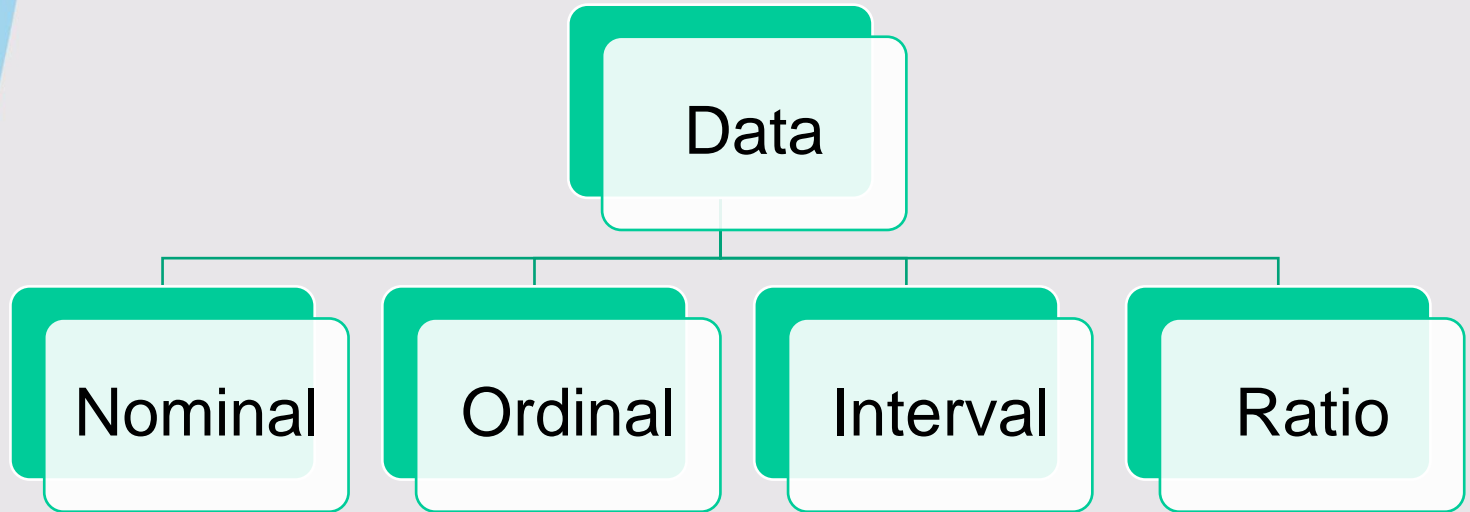




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Based on how variables are categorized, counted, or measured?





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Nominal

- The nominal level of measurement classifies data into mutually exclusive (no overlapping) categories in which no order or ranking can be imposed on the data.
- No ranking is involved
- Example
 - A sample of college instructors classified according to subject taught (e.g., English, history, psychology, or mathematics)
 - Classifying survey subjects as male or female
 - Classifying residents according to zip codes



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Ordinal

- The ordinal level of measurement classifies data into categories that can be ranked; however, precise differences between the ranks do not exist.
- Example
 - from student evaluations, guest speakers might be ranked as superior, average, or poor.
 - people are classified according to their build (small, medium, or large),



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Interval

- The interval level of measurement ranks data, and precise differences between units of measure do exist; however, there is no meaningful zero.
- Example
 - IQ
 - Temperature



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Ratio

- The ratio level of measurement possesses all the characteristics of interval measurement, and there exists a true zero.
- In addition, true ratios exist when the same variable is measured on two different members of the population.
- Example
 - Height
 - Weight
 - Area



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THANK YOU