

Introductory Concepts

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MHA613
Statistics in Healthcare

Lecture 1



INTENDED OBJECTIVES

- 1. Understand the application of statistics in healthcare management.**
- 2. Develop skills to interpret statistical data for decision-making.**
- 3. Identify and categorize various healthcare data types.**
- 4. Recognize the role of statistics in enhancing efficiency and patient care.**



Chapter

01

IMPORTANT QUOTES

“It is the mark of a truly intelligent person to be moved by statistics “

(George Bernard Shaw)

“You can't manage what you can't measure”

(Peter Drucker)

CASE SCENARIO

Alex is the General Manager of “**X**” **Hospital**, a busy healthcare facility in a growing city. Recently, the hospital has been facing challenges with patient flow, resource allocation, and staff scheduling. The board of directors has tasked Alex with improving these aspects to enhance patient care and operational efficiency.

STATISTICS UTILIZATION

- Trend analysis to identify patterns in hospital admissions.
- Inventory levels of critical supplies and equipment.
- Frequency of shortages and excesses.
- Patient volume by time of day and day of the week.
- Patient wait times.
- Staff satisfaction and turnover rates.

DATA AND STATISTICS

- **Statistics** involves the methods of **collecting, summarizing, analyzing** and **drawing conclusions** from the data.
- We use statistical techniques to achieve our aim to convert data into information.

DATA AND STATISTICS

- **Data** may take many different **forms**.
- We need **first** to know **what form** every **variable** takes before we can make a **decision** regarding the **most appropriate** statistical methods to use.

DATA AND STATISTICS

- The purpose of most decision makers is to collect **Data** to obtain **Information** about a particular area of managerial interest.
- Our data include **Observations** on one or more variables.
- Any quantity that varies is termed a **Variable**.

DATA AND STATISTICS

- **For example**, we may collect basic **Clinical** (Blood pressure, Blood glucose level,.....etc.) and **Demographic** (Age, Gender, geographical area,.....etc.) data on patients with a **Particular illness**.

- ***Statistic:*** Value of a variable across all members of a sample.
- ***Parameter:***
Comparable value for the population.



Chapter

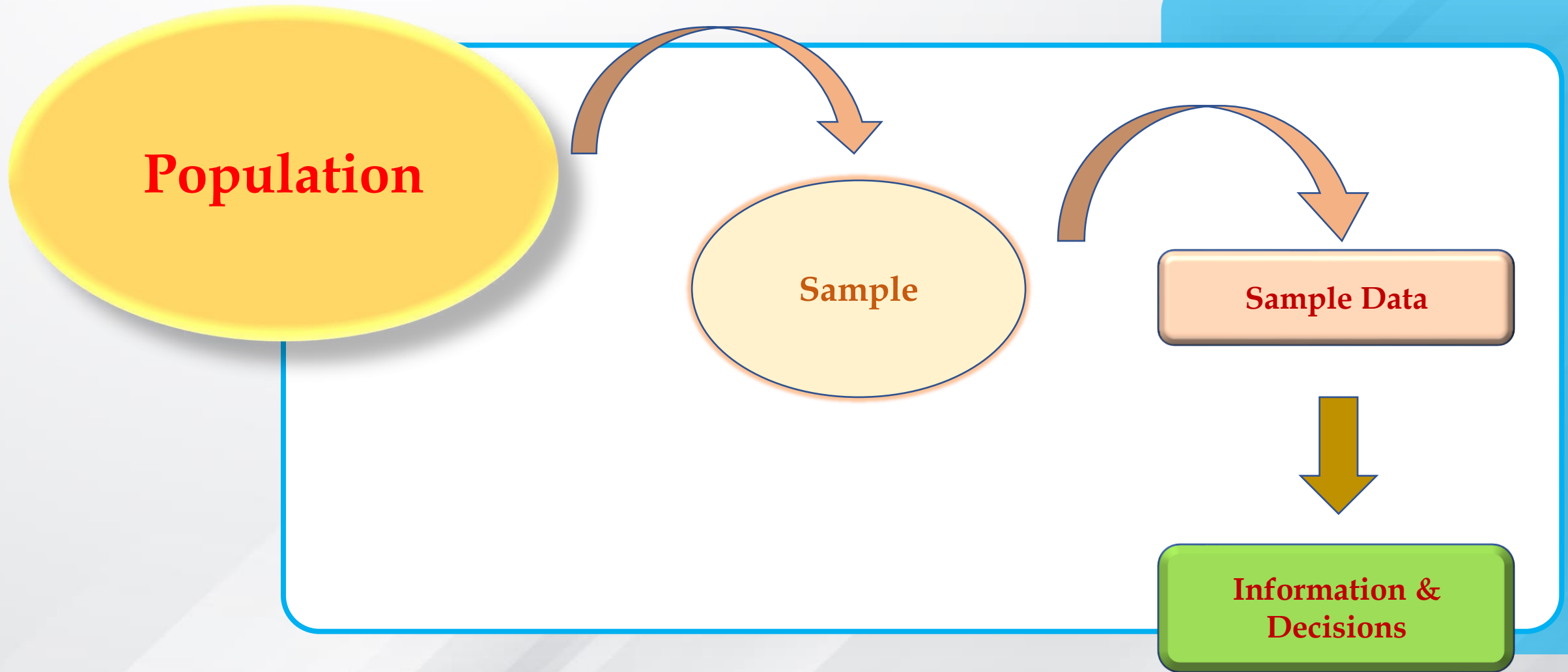
01

Statistic vs. Parameter

- **Purpose:** Determine a value for a variable or establish relationships between variables.

SAMPLE VS. POPULATION

- Our data are usually obtained from a **Sample** of individuals that represents the **Population** of interest.
- So, Our aim is to deal with these data obtained from a **Sample** in a meaningful way and extract useful information from them.



INDEPENDENT VS. DEPENDENT VARIABLES

- **Independent Variables:** Variables that can be manipulated to observe their effect on dependent variables.
- **Dependent Variables:** Variables that are measured and expected to change in response to the independent variable.

INDEPENDENT VS. DEPENDENT VARIABLES

➤ Examples:

- Examining how diet **(independent)** affects blood sugar levels **(dependent)**.
- Examining how staff-to-patient ratio **(independent)** affects patient satisfaction scores **(dependent)**.

TYPES OF DATA



1. Categorical (qualitative) data:

- These occur when each individual can only belong to one of a number of distinct categories of the variable.

1. CATEGORICAL (QUALITATIVE) DATA

A. Nominal data :

- The categories are not ordered but simply have names.
- Examples include blood group (A, B, AB and O) and marital status (married/widowed/single, etc.).

Note: There is no implication that one category (e.g., being married) is better or worse than another (e.g., being single).



1. CATEGORICAL (QUALITATIVE) DATA

B. Ordinal data :

- The categories are arranged in a specific order, either in ascending or descending sequence."
- Examples include systems for staging diseases (advanced, moderate, mild, none), and levels of pain (severe, moderate, mild, none).

- **Note that:** “A categorical variable is considered binary or dichotomous when it has only two possible categories.
- Examples include 'Yes/No,' 'Alive/Dead,' or 'Patient has disease/Patient does not have disease.’”



TYPES OF DATA



2. Numerical (quantitative) data:

- These occur when the variable is represented by a numerical value.

2. NUMERICAL (QUANTITATIVE) DATA

A. Discrete data:

- This occurs when the variable can only take specific whole (integer) numerical values.
- These are often counts of events, such as number of hospital admissions of a patient during a month.

2. NUMERICAL (QUANTITATIVE) DATA

B. Continuous data:

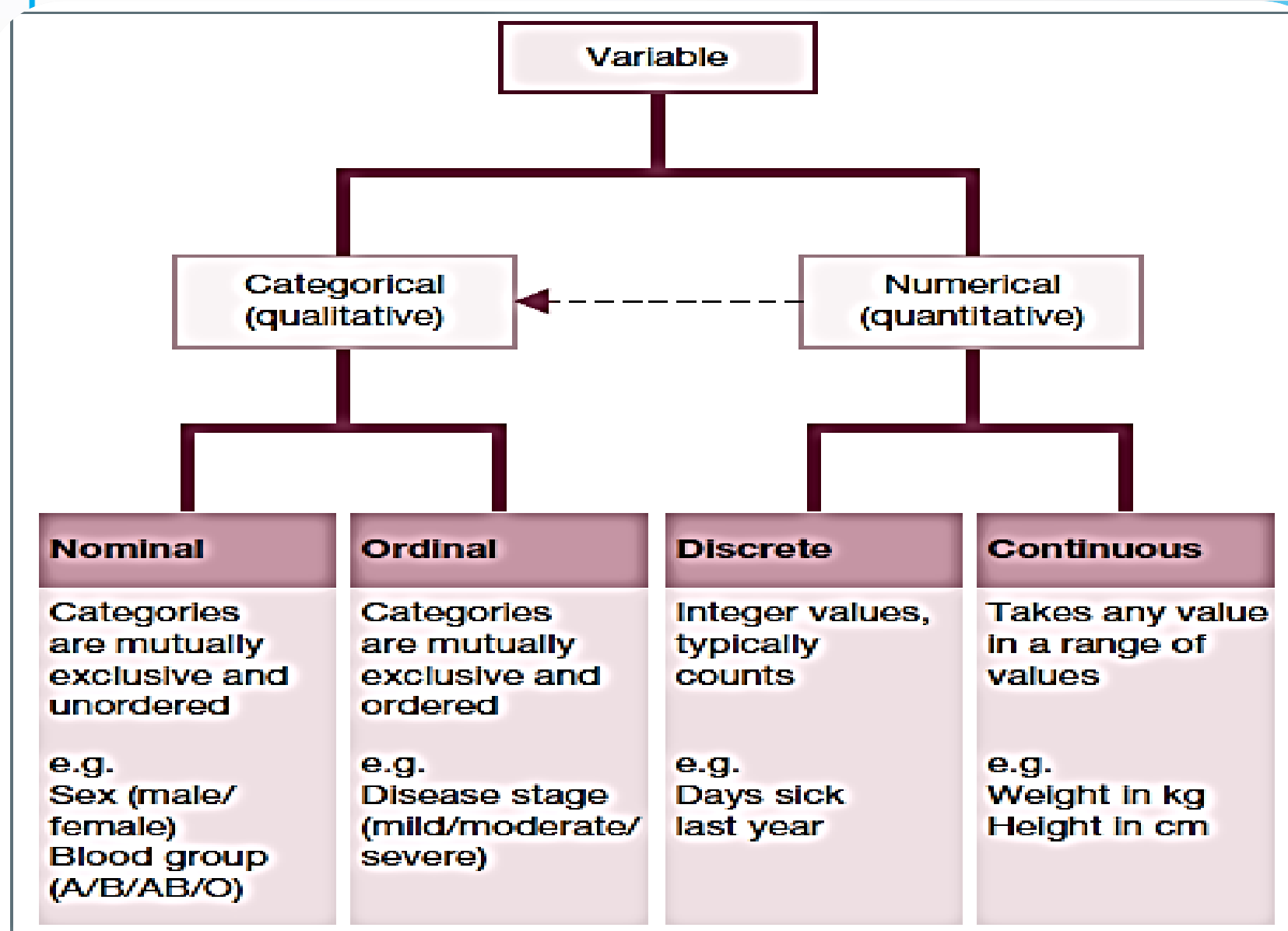
- Occurs when there are no restrictions on the values a variable can take, allowing for fractions or decimals, such as weight or height.

TRANSFORMATION OF DATA

It is relatively easy to convert continuous numerical data into categorical data after collection.



Form of numerical data		Form of categorical data
150 – 160 cm height.	→	Short
161 – 180 cm height.	→	Medium
181 – 200 cm height.	→	Tall



DERIVED DATA



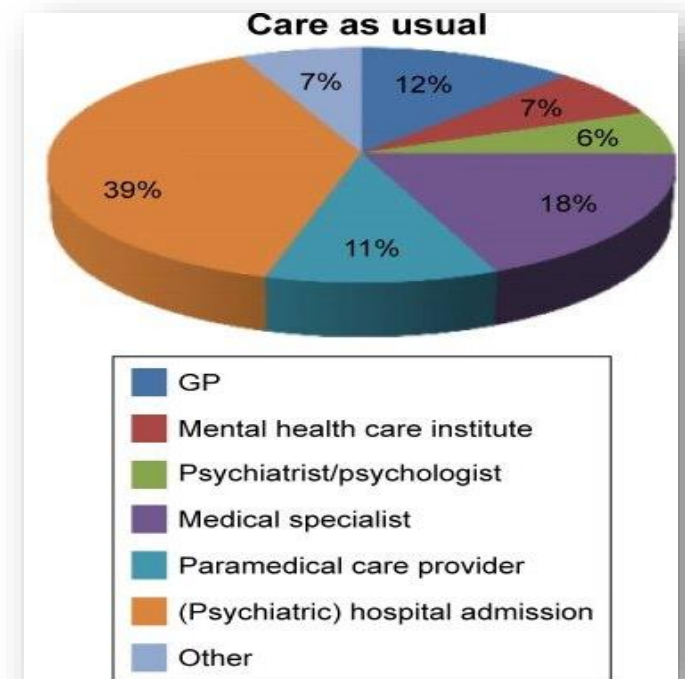
- You might come across various other types of data in the healthcare sector.
- These could include:
 1. Percentages.
 2. Ratios.
 3. Rates.



DERIVED DATA

1. Percentages:

- These may be used to reflect the improvements in patients after undergoing treatment.



DERIVED DATA

- For example, after implementing a new patient care protocol, the percentage of patients who report a significant improvement in their quality of life may increase by 30%.
- This percentage reflects the proportion of patients who experienced enhanced well-being as a result of the new protocol.

DERIVED DATA

2. Ratios:

- Sometimes, you may go through the ratio of two variables.



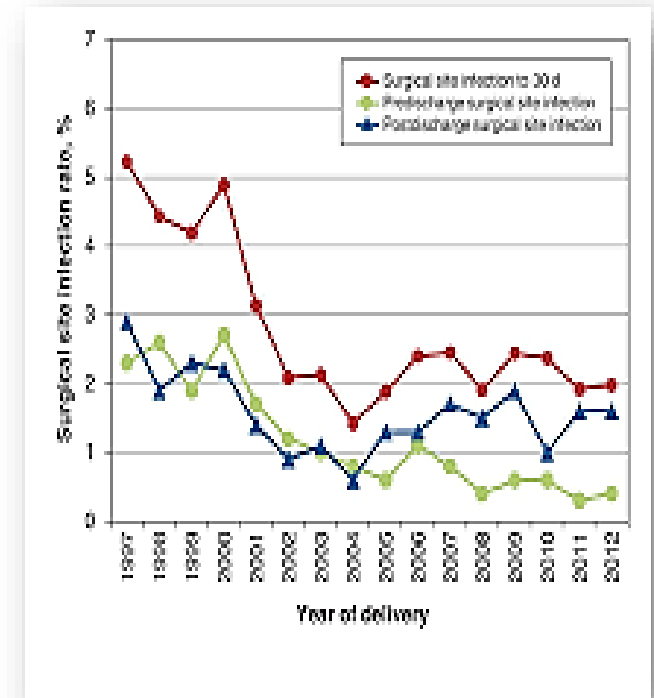
DERIVED DATA

- **For example:** Patient-to-Nurse Ratio: This ratio is used to assess the staffing levels in a healthcare facility. It is calculated by dividing the number of patients by the number of nurses.
- **For example:** if a hospital has 150 patients and 30 nurses, the patient-to-nurse ratio is 5:1., This indicates that, each nurse is responsible for 5 patients.

DERIVED DATA

3. Rates:

- It is typically data that related to time.



DERIVED DATA

- **For example:** Patient Admission Rates: calculated by dividing the number of patient admissions to a hospital by the total number of days over which admissions are tracked.
- **For example:** if a hospital had 1,200 admissions in a year and 3,000 patient-days, the admission rate would be 1,200 admissions per 3,000 patient-days. This rate shows how often patients are admitted relative to the total patient-days.

1		Week 1	Week 2	Week 3
2	Day	Hospital admissions	Hospital admissions	Hospital admissions
3	Day 1	12	18	32
4	Day 2	14	21	34
5	Day 3	18	27	42
6	Day 4	17	28	39
7	Day 5	21	33	48

Hospital admissions:

Discrete data



Gives an idea about admissions trend numerically.

TO WRAP UP

- Statistics are applied in staffing, resource management, and optimizing workflows.
- Statistical analysis helps monitor patient outcomes and reduce errors in healthcare.
- Sample (a subset of individuals selected from a population) and a Population (the entire group of individuals of interest).

TO WRAP UP

- Independent variables are manipulated to observe their effect on dependent variables, which are the outcomes being measured.
- Differentiation between categorical (qualitative) and numerical (quantitative) data in healthcare contexts.
- Know how percentages, ratios, and rates are used to make informed decisions in healthcare.



Thank You