

Introduction to Statistics

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What is Statistics?

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Statistics is **learning** from **data**

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Statistics

4

Five Stages of Statistical procedure-

1. Data Collection
2. Organization
3. Presentation
4. Analysis
5. Interpretation/ conclusion

Statistics

5

Statistics refers to the scientific methods for **collecting**, **organizing**, summarizing, **presenting**, and **analyzing** data, and drawing a **valid conclusion**.

Example: Child malnutrition status, Monthly expenditure of citizens of a city, Relationship of crime with space and time, Number of active users in a day of a website, average lifetime of the people of a country etc.

Population and Sample in Statistics

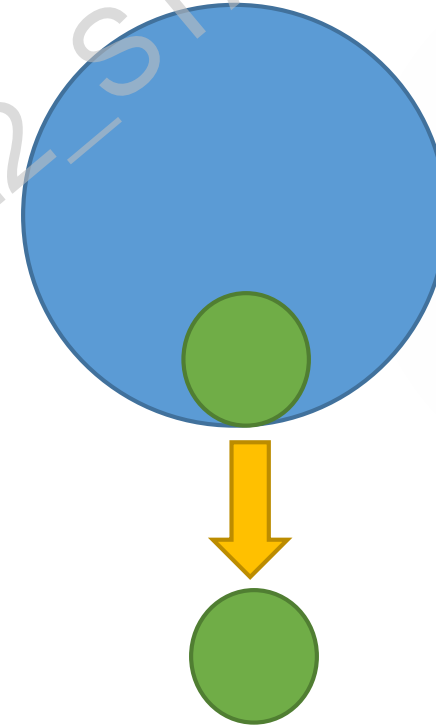
6

Population:

Population is the **collection of all items** or individuals of interest in a particular study

Sample:

A representative **part of the population** of interest

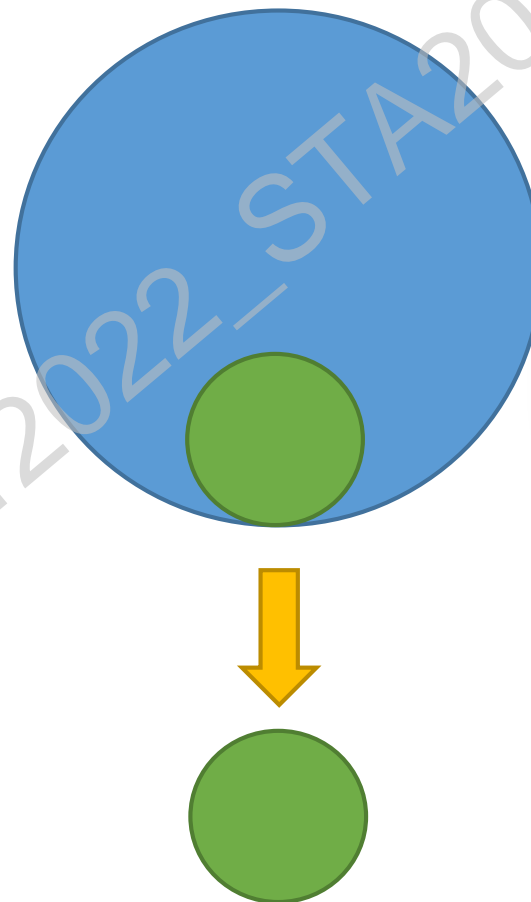


Population and Sample in Statistics

7

Population: All citizens of Dhaka
Size: 2 crore

Sample: Some citizens of Dhaka
Size: 2000



Parameter & Statistic

Parameter:

A **constant** which is a **function of population values**, and is **usually unknown**, is called a parameter

Number of smokers (population) = 1 crore
i.e., 50%

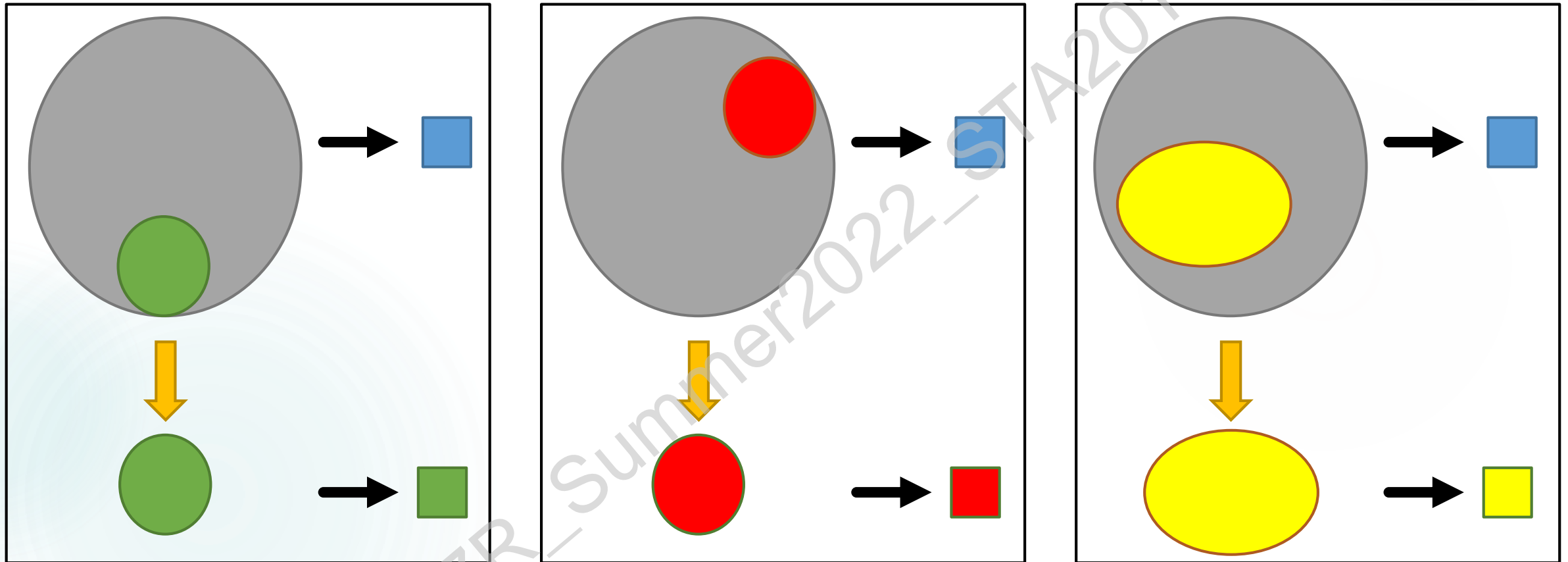
Statistic:

Any **function of sample values**, which is an **estimate of the parameter** and which is a **known** value, is called a statistic

Number of smokers (sample) = 1040
i.e., 52%

Parameter & Statistic

9



Parameter



Statistic 1



Statistic 2



Statistic 3

Characteristics of Statistics

- ❑ Statistics deals with **aggregate of individuals** rather than with individual alone
- ❑ Statistics **varied by multiplicity of causes**
- ❑ Statistics deals with **uncertainty**
- ❑ Statistics should be **expressed as numerical figures**
- ❑ Statistical laws are **valid on average**
- ❑ Statistics collected should be of **reasonable standard of accuracy**
- ❑ Statistics are collected for a **pre-determined purpose**.

Types of Statistics

11

- ❑ Descriptive Statistics
- ❑ Inferential Statistics

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Types of Statistics

- Descriptive Statistics

Methods for **organizing**, **summarizing** and **presenting** data in an informative way

- Inferential Statistics

Methods for **estimating a parameter** of a population on the **basis of a sample**

Scopes of Statistics

- ❑ State and administration
- ❑ Medical science
- ❑ Social Sciences
- ❑ Economics
- ❑ Artificial Intelligence
- ❑ Demography
- ❑ Agriculture
- ❑ Business and management
- ❑ Research etc.

Variable

14

Case No.	Gender	Age	Smoking status
Person 1	Gender (Person 1) = Male	Age (person 1) = 40	Smoker (Person 1) = Yes
Person 2	Gender (Person 2) = Male	Age (person 1) = 20	Smoker (Person 1) = No
Person 3	Gender (Person 3) = Female	Age (person 1) = 32	Smoker (Person 1) = No
Person 4	Gender (Person 4) = Male	Age (person 1) = 59	Smoker (Person 1) = No
Person 5	Gender (Person 5) = Female	Age (person 1) = 38	Smoker (Person 1) = Yes

Variable

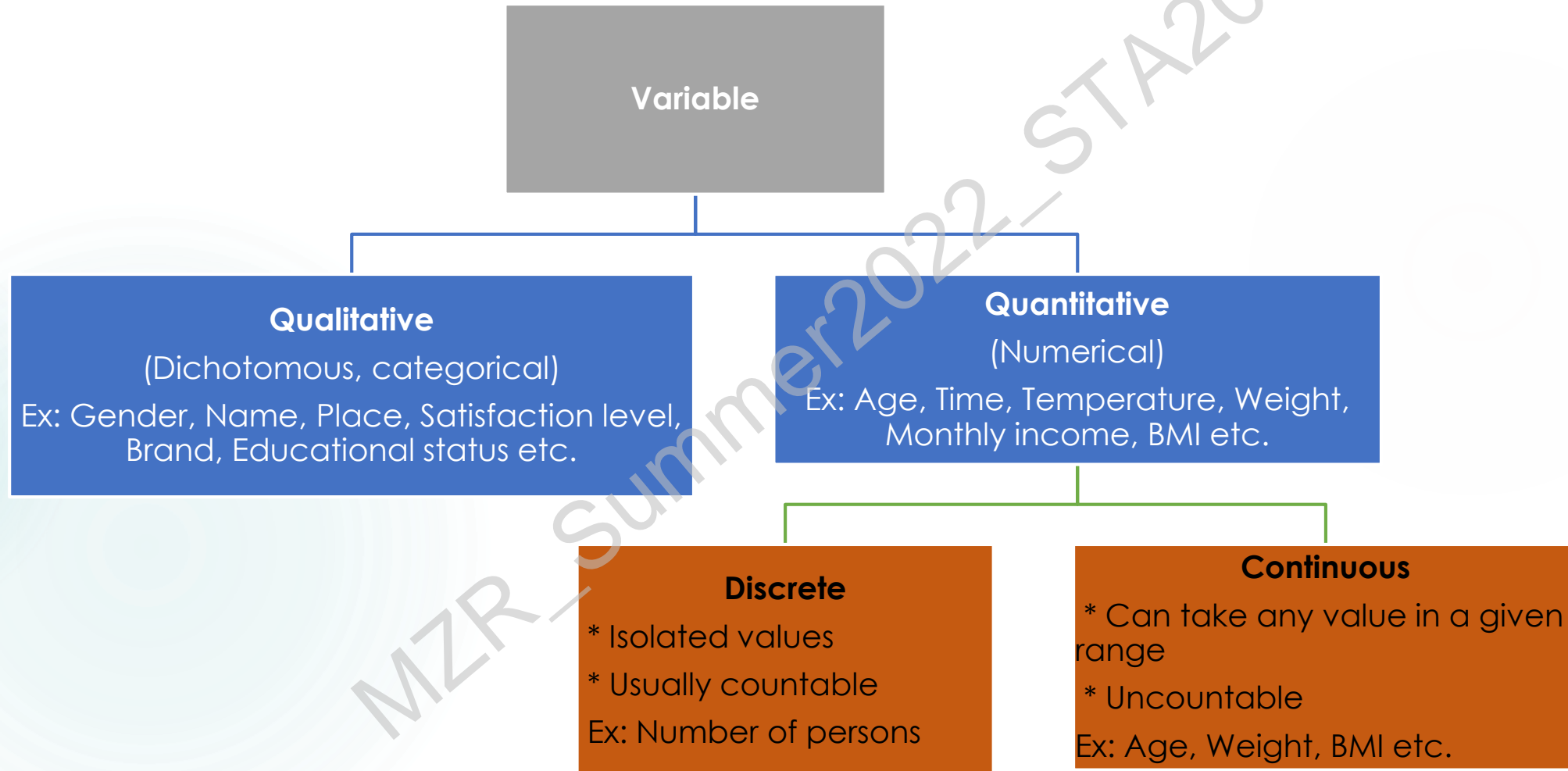
- ▶ A variable is a **characteristic**, containing two or more values or categories that can **vary** from person to person, object to object, or phenomenon to phenomenon
- ▶ Example: Gender, Age, Educational status, Hair color, religion, Place of residence, Monthly income, Satisfaction level, Soap brand, Temperature, GPA etc.

Variable

16

Variable	Possible Values / Categories
Gender	Male, Female
Age	10, 50, 36, 18, 29, 75 etc.
Highest education level	Primary, Secondary, Higher etc.
Number of employees	10, 50, 89, 125, 4562 etc.
Salary	\$1000, \$10000, IR45000, BDT 98000, Rs.500000 etc.
Duration	10 hours, 2 days, 4 weeks, 10 years etc.
Weight	45 lb., 60 kg, 900 gm, 5 ton etc.
Wealth status	Poor, middle, Higher etc.

Classification of Variables



Classification of Variables

Class Task:

Find the types of the following variables-

- Monthly salary:
- Soap Brand:
- Occupation:
- Color:
- Weight:
- Duration of a class:
- Number of family members:
- Satisfaction level:
- Religion:
- Temperature:
- Food flavor:
- Wealth Status:
- Highest education level:
- Nationality:

Level of measurement

Variable type	Scale of measurement
Qualitative	Nominal: <ul style="list-style-type: none">• Names or categories• Cannot be ordered or numerically measured <u>For example:</u> person's name, gender, place of resident, brand name etc.
	Ordinal: <ul style="list-style-type: none">• Categories• Can be ordered• Cannot be numerically measured <u>For example:</u> Wealth status: poor, middle, rich; Education: primary, secondary, higher etc.

Level of measurement

20

Variable type	Scale of measurement
Quantitative	Interval: <ul style="list-style-type: none">• Numerically measured• Can be find differences, but not ratios• Does not have true or meaningful zero point <p><u>For example:</u> Temperature: 0°C temperature does not mean that there is no heat. It will read 32° in Fahrenheit scale!</p>
	Ratio: <ul style="list-style-type: none">• Numerically measured• Can be find differences and also ratios• Does have true or meaningful zero point <p><u>For example:</u> Height: 0 cm height means 'no' height, Distance: 0 meter distance means 'no' distance etc.</p>

Level of measurement

Class Task:

Find the level of measurement of the following variables-

- Monthly salary:
- Soap Brand:
- Occupation:
- Color:
- Weight:
- Duration of a class:
- Number of family members:
- Satisfaction level:
- Religion:
- Temperature:
- Food flavor:
- Wealth Status:
- Highest education level:
- Nationality
- IQ level

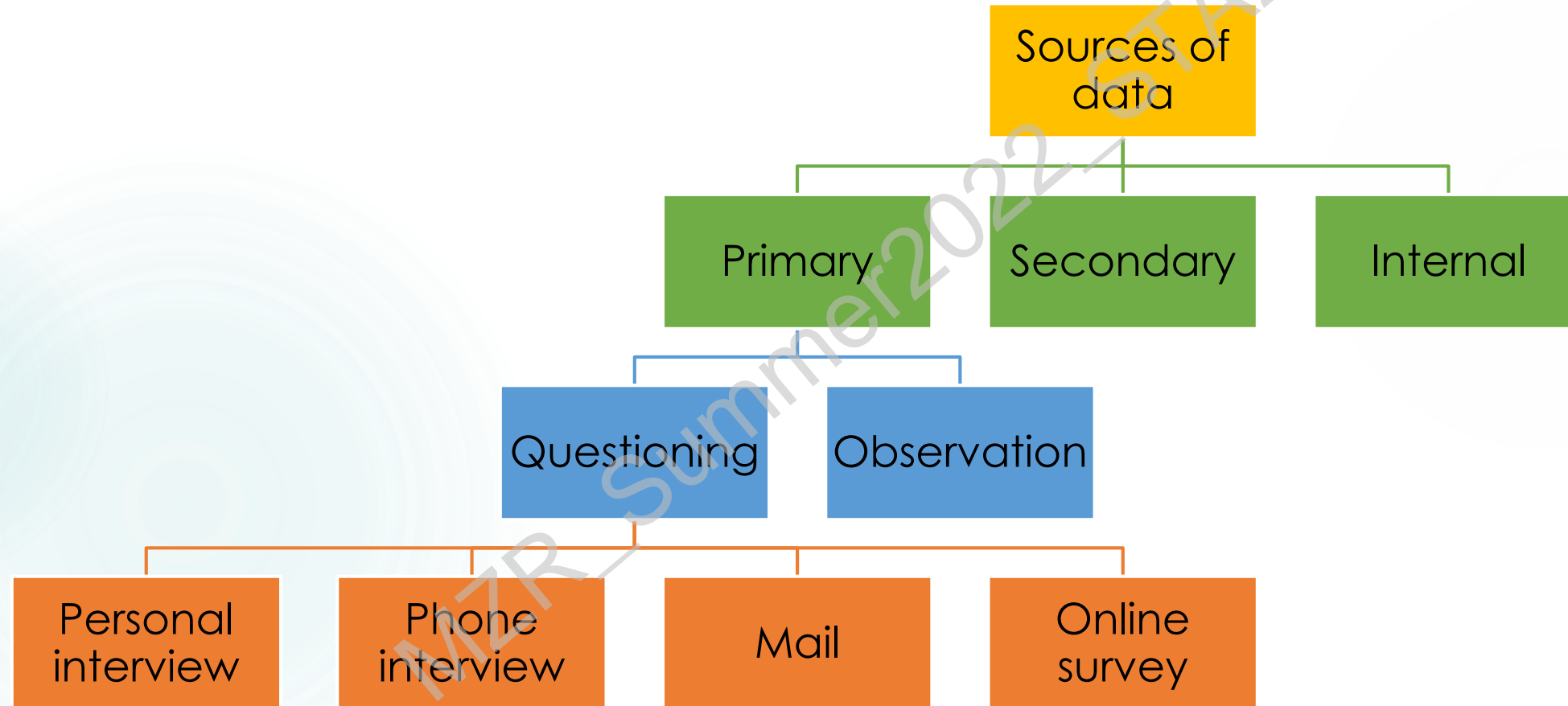
Data

22

Data are raw, disorganized facts and figures collected from any field of inquiry.

Sources of data

23



Sources of data

24

