Introduction to Statistics

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What is Statistics?

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

Statistics

Five Stages of Statistical procedure-

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

Statistics

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.

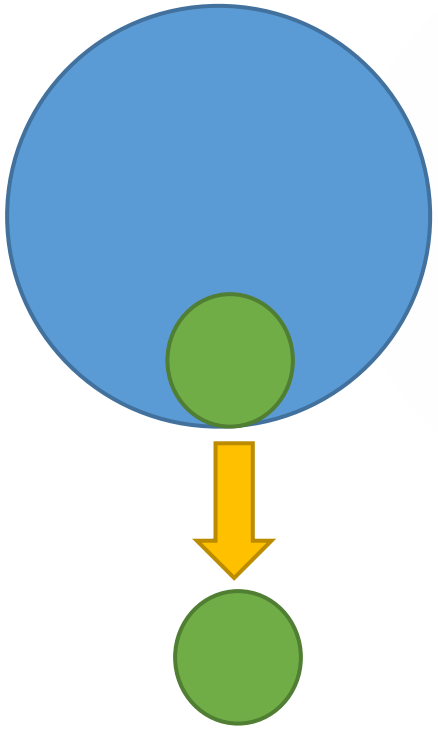
Population and Sample in Statistics

Population:

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

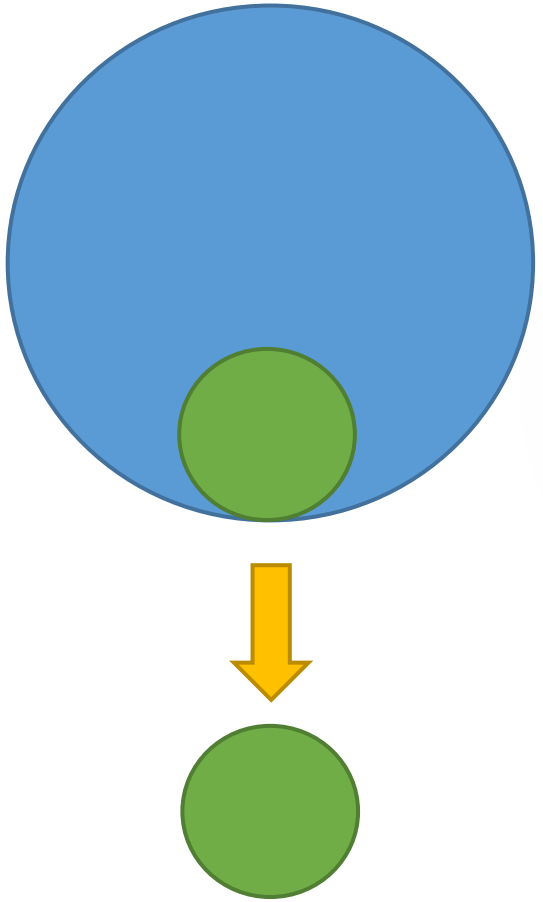
Sample:

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



Population and Sample in Statistics

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

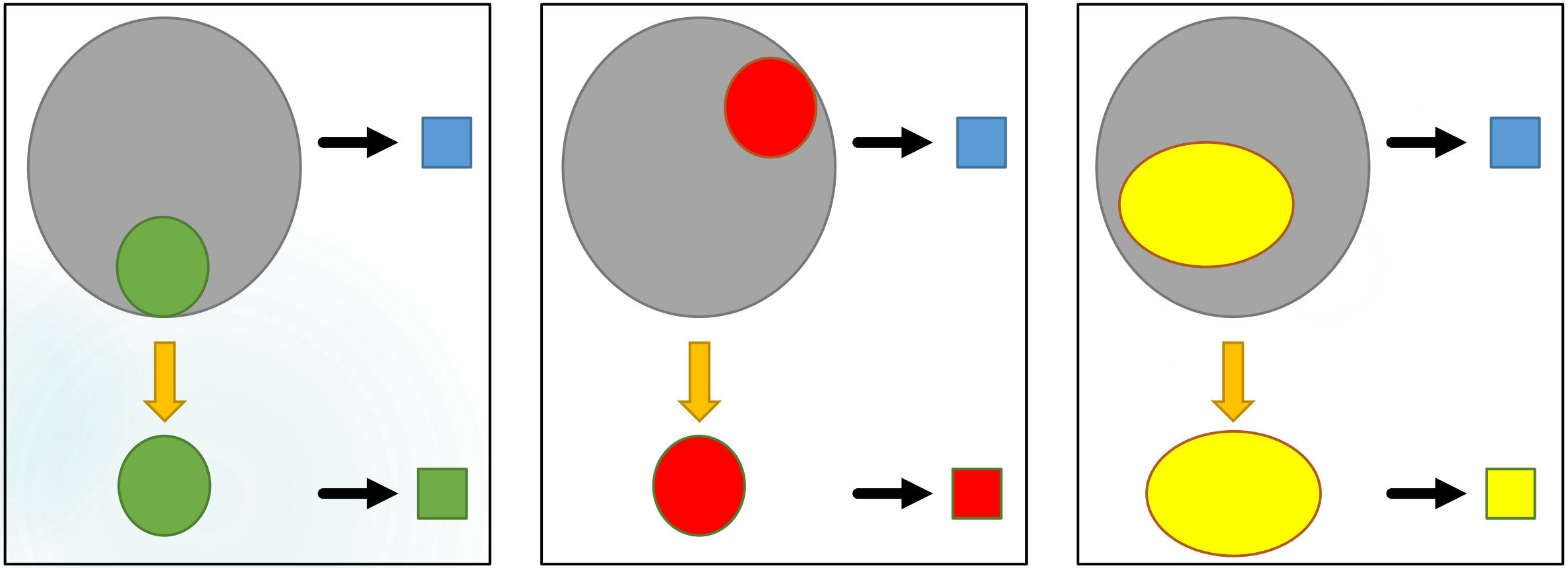
Number of smokers (population) = 1 crore
i.e., 50%

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) = 1200
i.e., 52%

Parameter & Statistic



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

- Descriptive Statistics
- Inferential Statistics

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

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

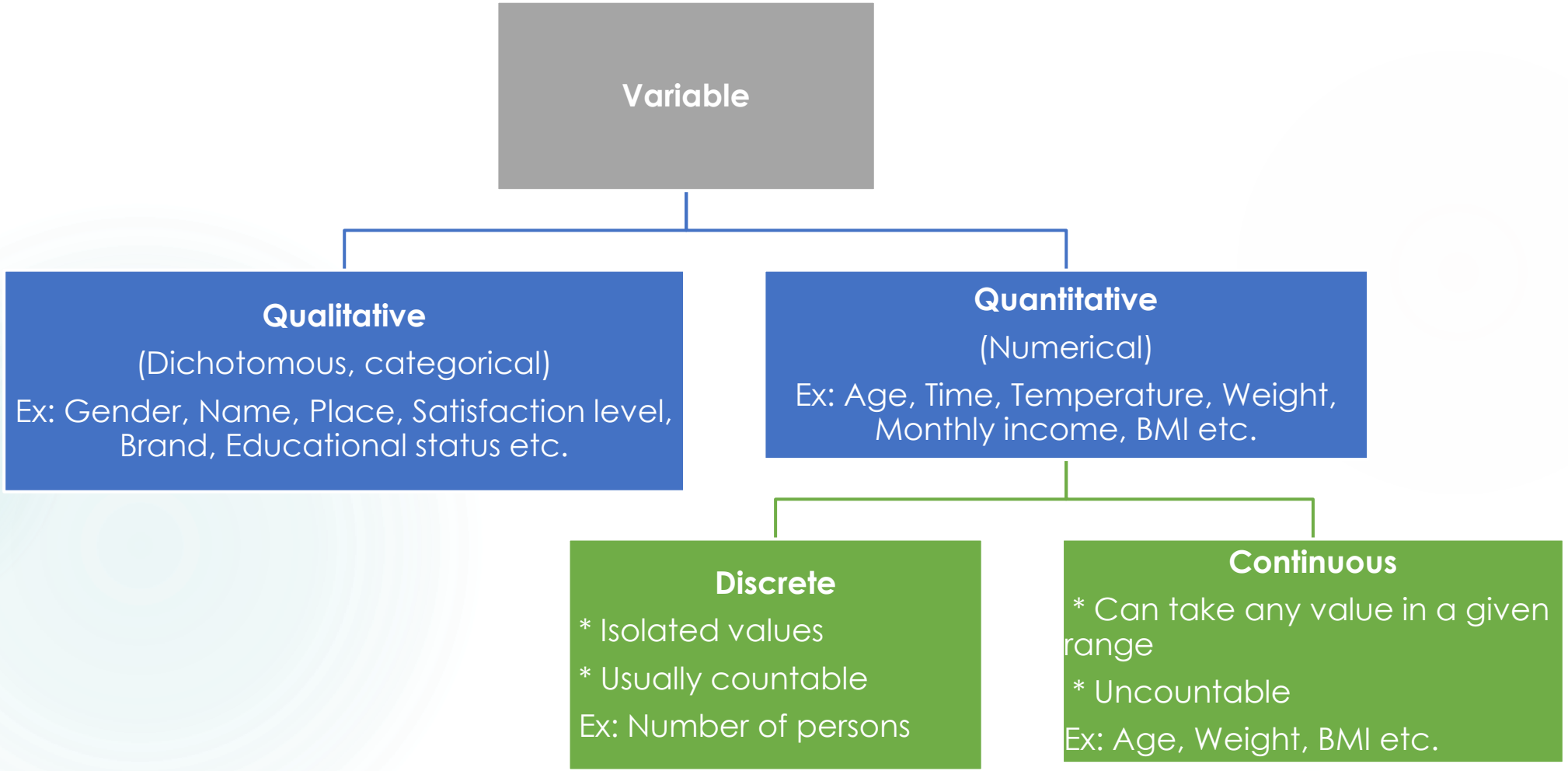
- A variable is a **characteristic**, containing two or more values or categories that can **vary** from person to person, object to object, or phenomenon to phenomenon

- Example: Gender, Age, Educational status, Hair color, religion, Place of residence, Monthly income, Satisfaction level, Soap brand, Temperature, GPA etc.

Variable

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:** • Names or categories • Cannot be ordered or numerically measured For example: person's name, gender, place of resident, brand name etc.
	Ordinal: • Categories • Can be ordered • Cannot be numerically measured For example: Wealth status: poor, middle, rich; Education: primary, secondary, higher etc.

Level of measurement

Variable type	Scale of measurement
Quantitative	**Interval:** • Numerically measured • Can be find differences, but not ratios • Does not have true or meaningful zero point For example: Temperature: 0°C temperature does not mean that there is no heat. It will read 32° in Fahrenheit scale!
	Ratio: • Numerically measured • Can be find differences and also ratios • Does have true or meaningful zero point For example: Height: 0 cm height means 'no' height, Distance: 0 meter distance means 'no' distance etc.

Level of measurement

Class Task:

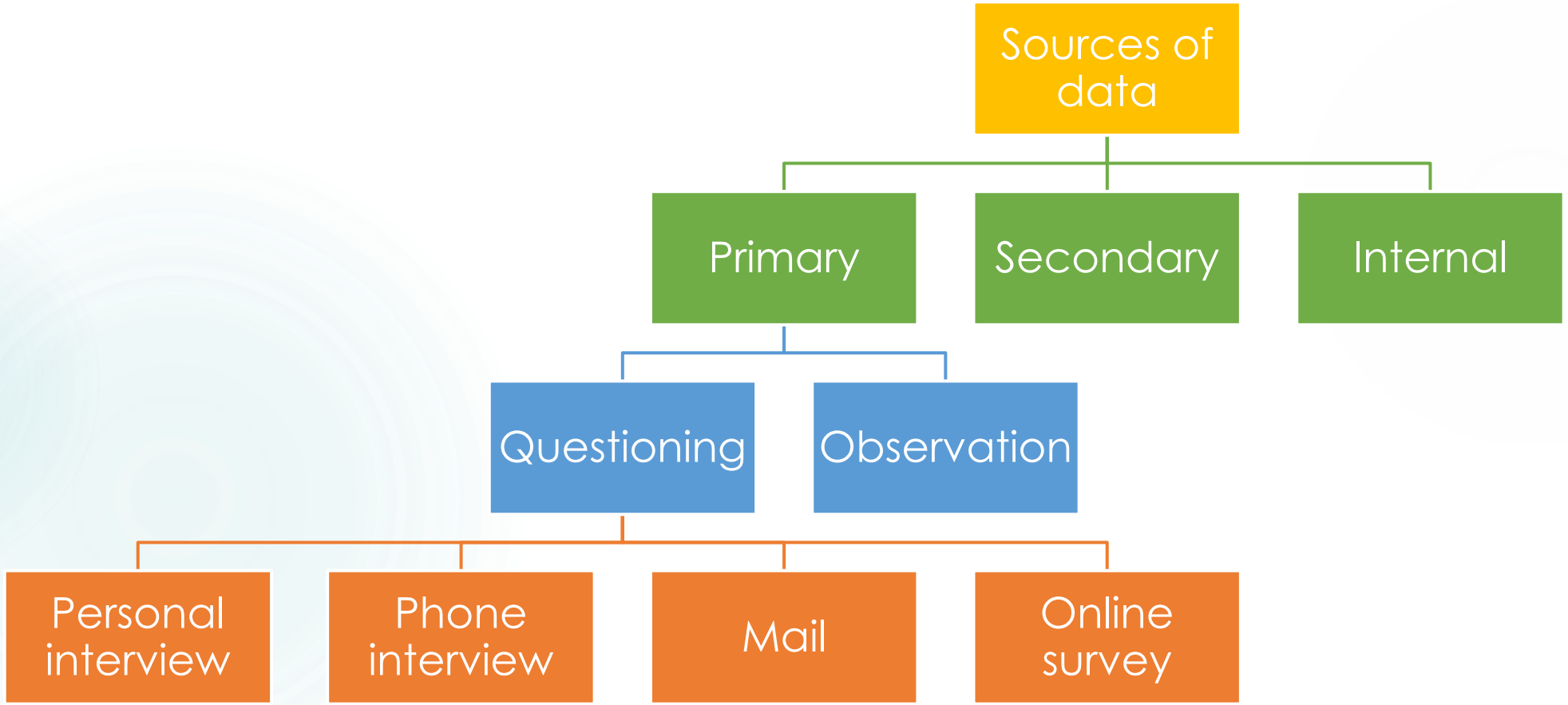
Find the level of measurement of the following variables-

- 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

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

Sources of data



Sources of data