Review

Statistical Concepts

Ismail SA

BSc (EOH), MSc (OSH), MCIEH, FMIHA, FHFEM

MAEH

Learning Objectives:

At the end of this session, participants should be able to:

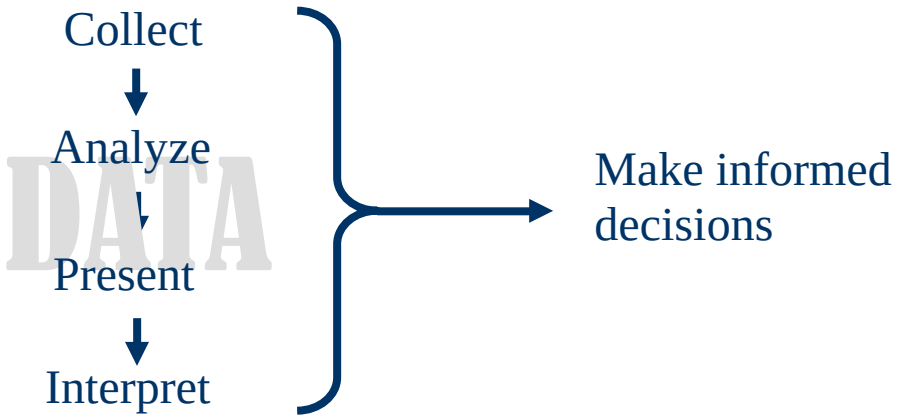
1. Define statistics,
2. Describe basic statistical concepts,
3. Understand the four scales of measurement, and
4. Match statistics to the appropriate scale of measurement

Next ▷

Definition

Statistics has two meanings:

1. Statistics refers to numerical facts;
2. Statistics refers to the field of study – as a group of methods used to:



Role of Statistics

A collection of tools and techniques that are used to convert data into meaningful information.

Role of Statistics

Types of Statistics

Depends on:

1. Purpose

   Descriptive – Inferential

2. Assumption

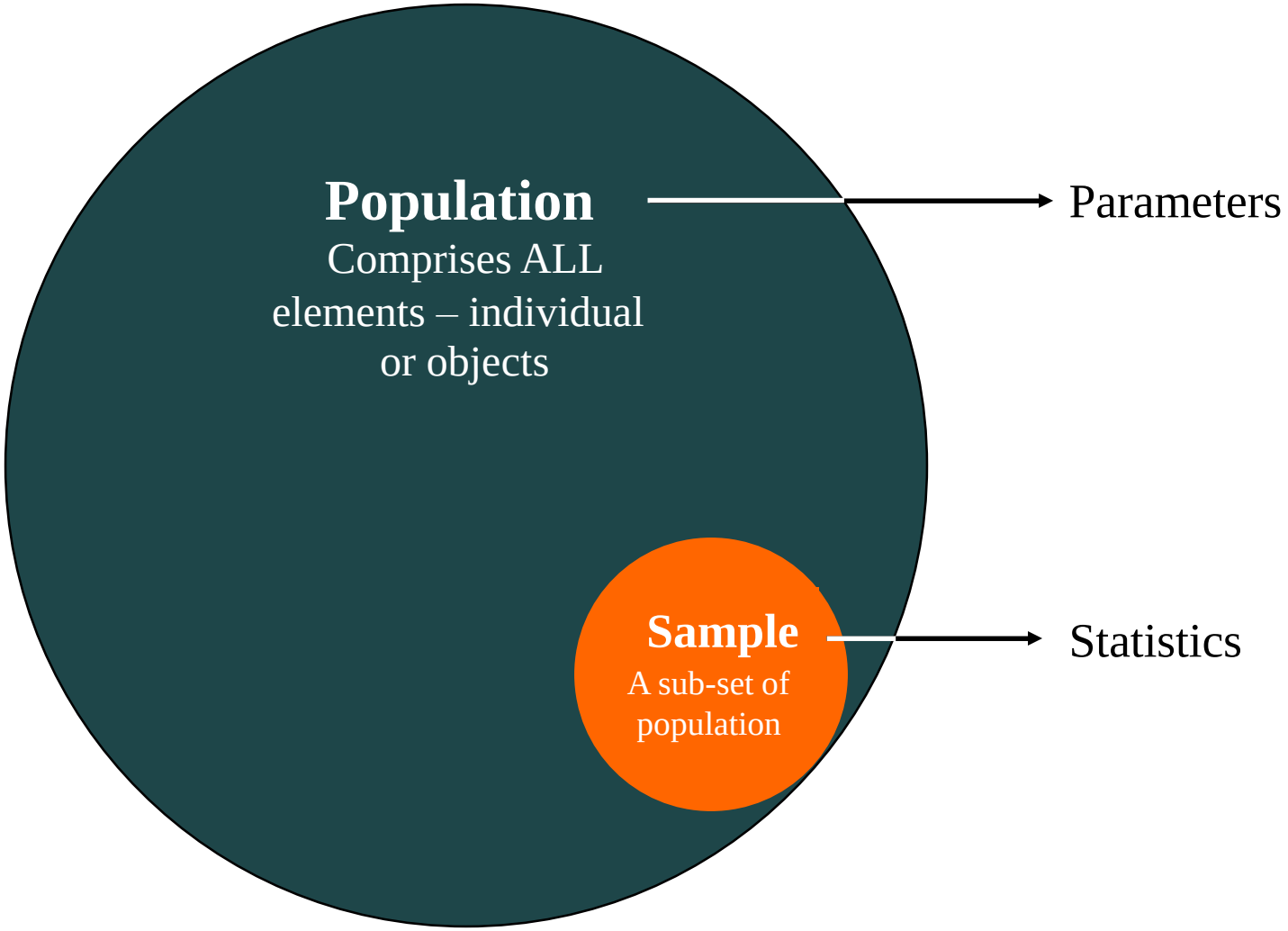
   Parametric – Nonparametric

3. Number of Variables

   Univariate – Bivariate – Multivariate

Next ▷

Population and Sample



Next ▷

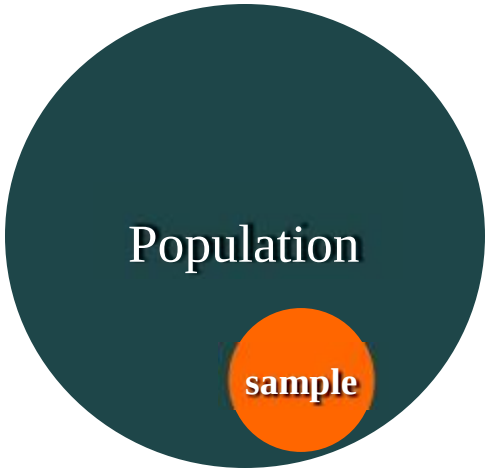
Symbols

Measures	Parameter	Statistic
Number of cases	N	n
Mean	μ	$\bar{Y}$
Variance	σ^2	s^2
Standard deviation	σ	s
Correlation coefficient	ρ	r

Next ▷

Types of Samples

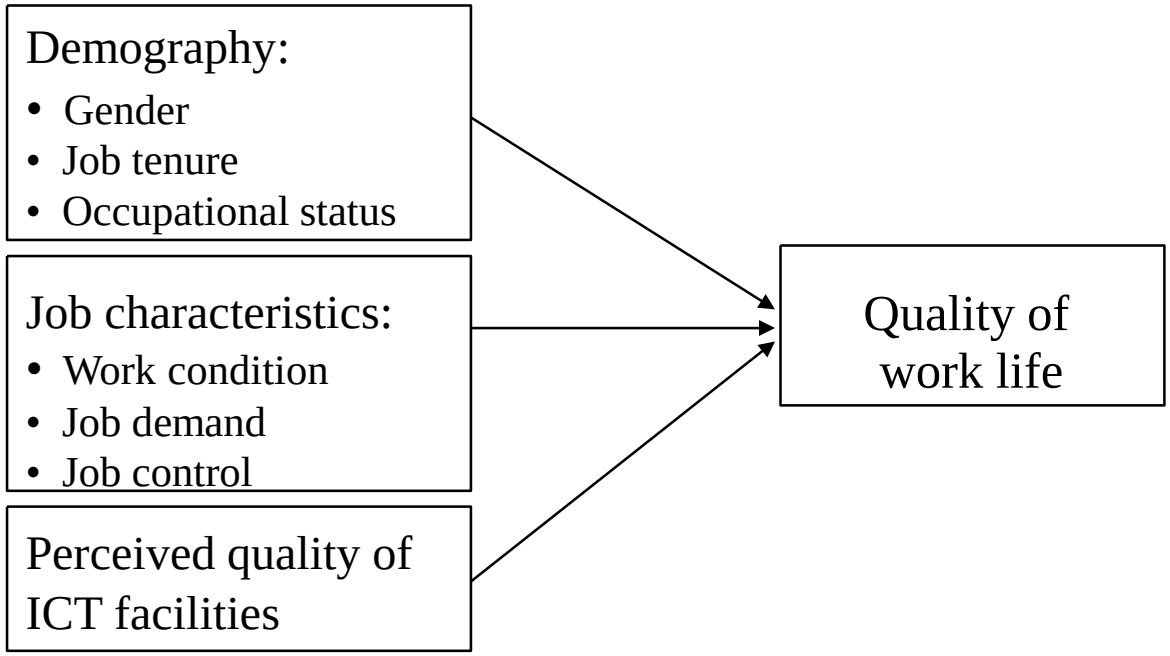
1. **Probability samples**
   - Simple random samples
   - Stratified random samples
   - Systematic samples
   - Cluster samples
2. **Non-probability samples**
   - Convenient samples
   - Purposive samples



Next ▷

Variable

Characteristics studied that assume different values for different elements



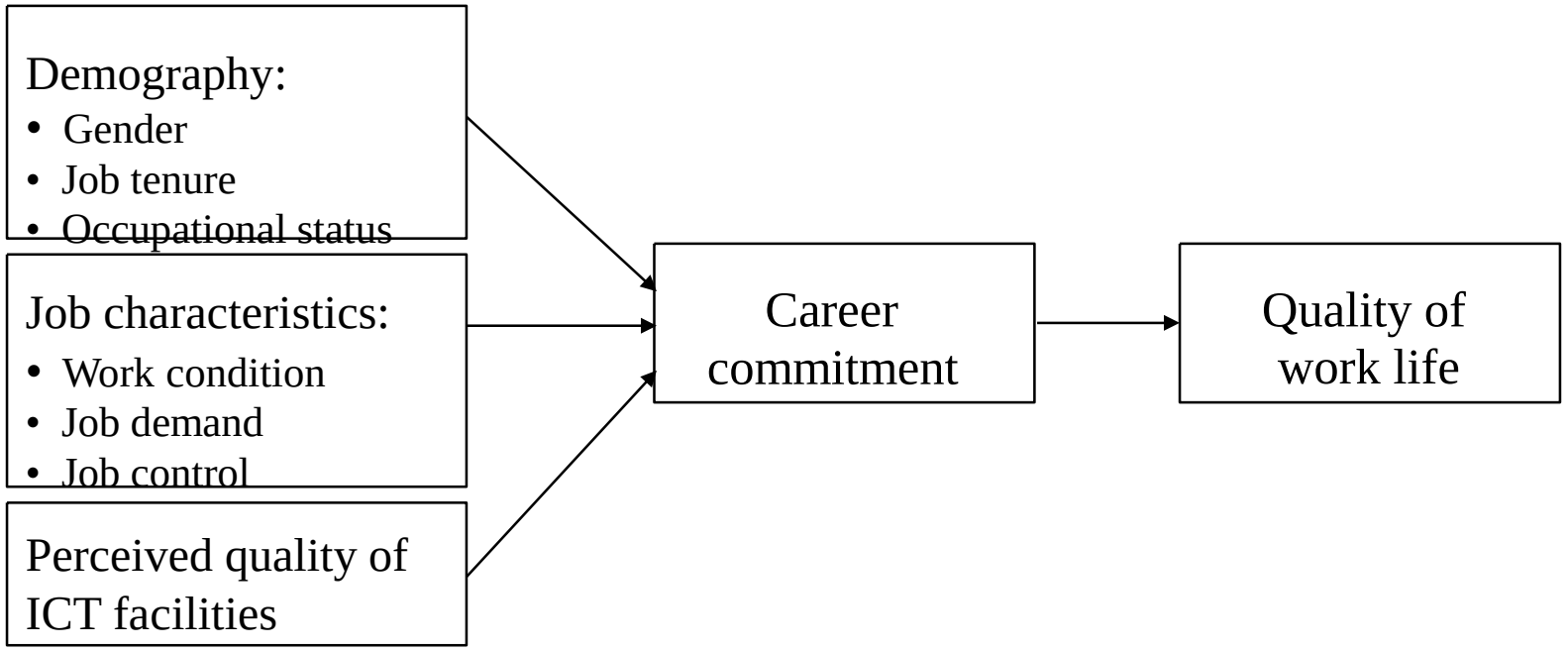
Independent Variables

Dependent Variable

Research Conceptual Framework

Next ▷

OR



Independent Variables

Intervening Variable

Dependent Variable

Research Conceptual Framework

Next ▷

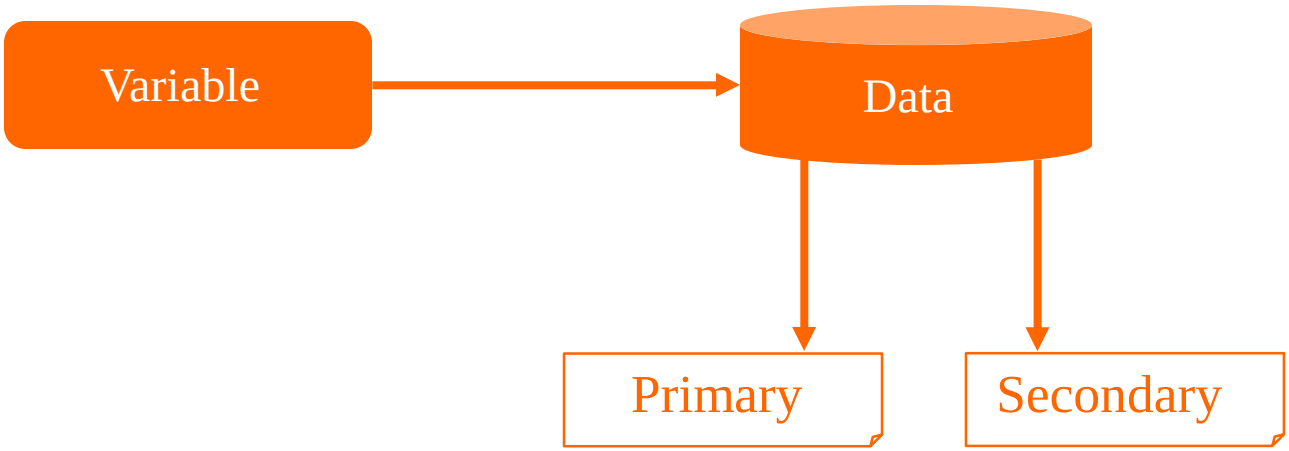
Types of Variables

1. Quantitative Variables
   - A variable that can be measured numerically
   - Can be classified into:
     - Discrete variable
     - Continuous variable
2. Qualitative or Categorical Variable

   A variable that cannot assume a numerical value but can be classified into ≥ 2 categories

Data

Basic elements used in statistical analysis



Tools for Collecting Data

1. Experiments
2. Telephone survey
3. Mail questionnaires
4. Online questionnaires
5. Direct observation
8. Personal interviews

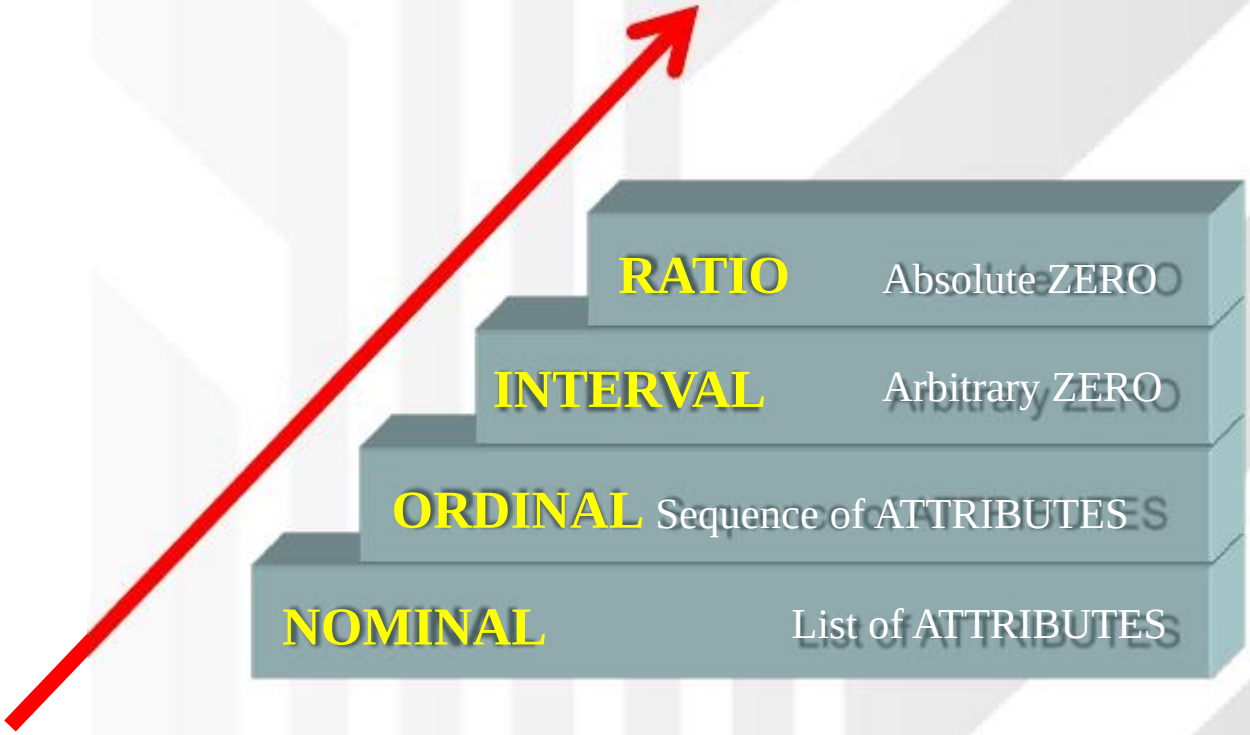
Next ▷

Scales of Measurement

1. **Nominal**
   - The lowest scale
   - Numbers assigned to identify attributes
   - No order/sequence
2. **Ordinal**
   - Numbers assigned in ranking order
   - Arrange from lowest to highest or vice versa
3. **Interval**
   - Arbitrary zero (no absolute zero)
   - Zero does not represent absence of thecharacteristic
4. **Ratio**
   - The highest scale
   - True zero (represents absence of the characteristic)

Next ▷

Scales Properties



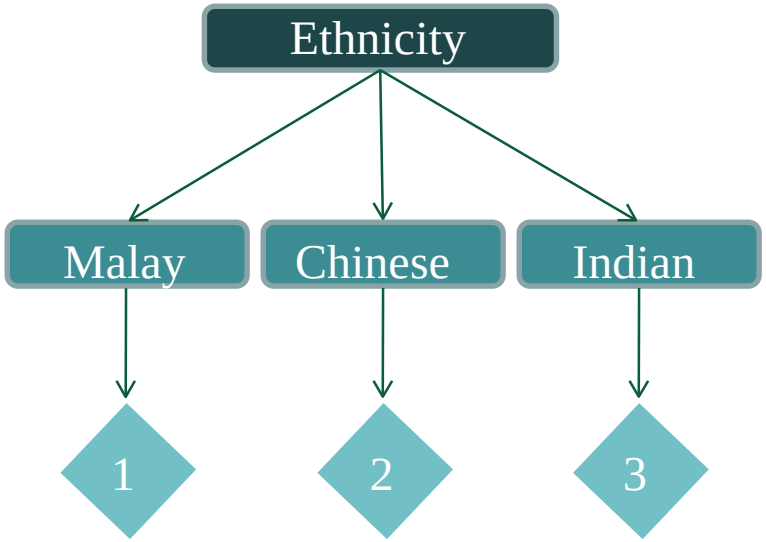
Next ▷

Variable, Attribute, Value

Variable

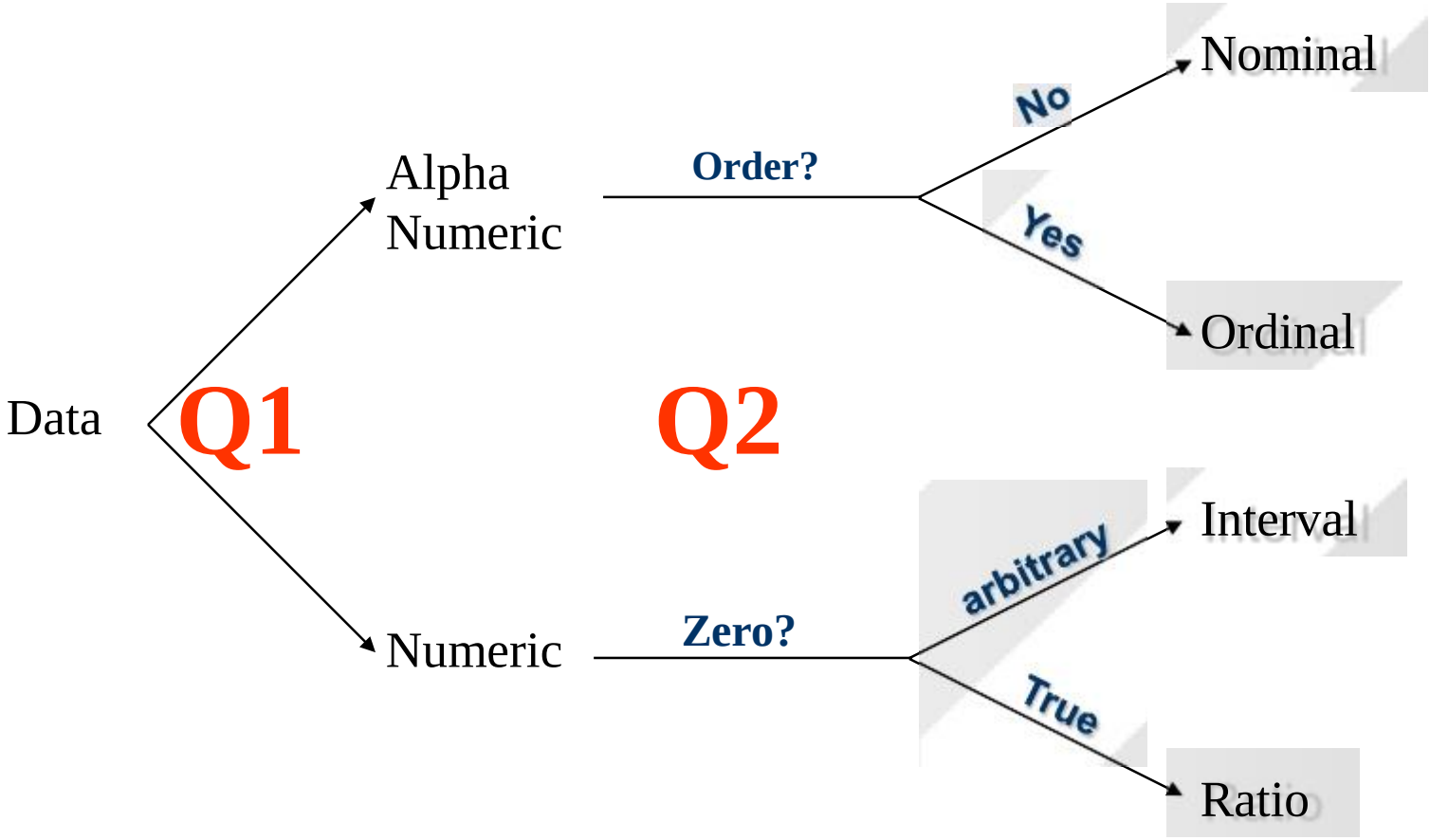
Attributes

Values



Determining scales of Measurement

(Two-step questions)



Next ▷

Exercise:

What are the scales of measurement for these variables?

1.	Program of study	**Nominal**
2.	Speed (km/hr)	**Ratio**
3.	Motivation scores	**Interval**
4.	Income categories	**Ordinal**
5.	Number of SMS received	**Ratio**
6.	Marital status	**Nominal**
7.	Quality of work life scores	**Interval**
8.	Socio-economic status	**Ordinal**
9.	Perception scores	**Interval**
10.	Membership status	**Nominal**

Next ▷

Overview of Statistics

Major Research Concerns

❶ **Describe Phenomenon**

- Frequency/Percent
- MCT
- MD

❷ **Comparison between Groups**

- T-Test
- ANOVA

❸ **Relationship between Variables**

- Chi-square
- Spearman rank correlation
- Pearson PM correlation
- Regression Analysis

Next ▷

DATA	Non-metric	Multiple categories		Chi-Square
		Two groups	Independent	Ind. *t*-test
			Dependent	Paired *t*-test
	Differences	Multiple groups or variables	Independent	One-way ANOVA
				Factorial ANOVA
			Dependent	Repeated-Measure ANOVA
	Metric	Two variables	Metric	Pearson's *r*
			Rank	Spearman's *r*
			Dichotomous	Point biserial
	Relationships	Multiple variables		Multiple regression

Next ▷

Statistics – Scales of Measurement

Statistics	Dependent	Independent
T-Test	Interval/Ratio	Nominal/Ordinal *(k=2)*
ANOVA	Interval/Ratio	Nominal/Ordinal *(k>2)*
Chi-square	Nominal/Ordinal	Nominal/Ordinal
	(At least one of the scales is Nominal)	
Spearman Rho	Rank Ordered	Rank ordered
	Interval/Ratio	Interval/Ratio *(x Normal)*
Pearson Correlation	Interval/Ratio	Interval/Ratio
Regression	Interval/Ratio	Interval/Ratio

end

- Null = tiada beza berat antara sem
- Alternatif = ada beza berat antara sem
- P=0.359 >0.05
- Maka = fail to reject null
- Conclusion = tiada beza berat antara sem