

What Is Statistics

Chapter 1

Learning Objectives

- Explain why we study statistics.
- Explain what is meant by descriptive statistics and inferential statistics.
- Distinguish between a quantitative variable and qualitative variable.
- Describe how a discrete variable is different from continuous variable.
- Distinguish among the nominal, ordinal, interval, and ratio levels of measurement.

Definition

Statistics is the science of collecting, organizing, presenting, analyzing, and interpreting data to assist making more effective decisions.

Who Uses Statistics?

- Statistical Techniques are used by:
 - Marketing
 - Accounting
 - Quality control
 - Consumers
 - Professional sports people
 - Hospital administrations
 - Educators
 - Politicians
 - Physicians
 - Simply EVERYWHERE!!!

Why is Statistics Required by so Many Majors

- Numerical information are everywhere.
- Statistical techniques are used to make many decisions that affect our lives
- No matter what your career, you will make professional decisions that involves data.

Types of Statistics

1. **Descriptive Statistics:** Methods of organizing, summarizing, and presenting data in an informative way.

Example 1: The Central Department of Statistics and Information in Saudi Arabia reports the population of the Kingdom of Saudi Arabia was 7,009,466 in 1974; 16,948,388 in 1992; 22,678,262 in 2004; 29,994,272 in 2013*.

Types of Statistics

1. **Descriptive Statistics:** Methods of organizing, summarizing, and presenting data in an informative way.

Example 2: “Zain KSA” reports in its quality report that the response time for 82% of the calls to (959) Operator Service was within 60 seconds in September 2014. The statistic 82 describes the number out of every 100 calls that were answered within 60 seconds.

Types of Statistics

2. **Inferential Statistics:** The Methods used to estimate a property of a **population** on the basis of a **sample**

Example 1: A recent survey done by the ministry of commerce and industry showed that 61% of consumers are dissatisfied with the performance of car agencies.

Example 2: The weather!

A “best guess” of a population value based on sample information.

Population Vs. Sample

- **Population** is the entire set of individuals or objects of interest OR the measurements obtained from all individuals or objects of interest.

Example 1: Students of King Saud University

Example 2: Samsung's laptops

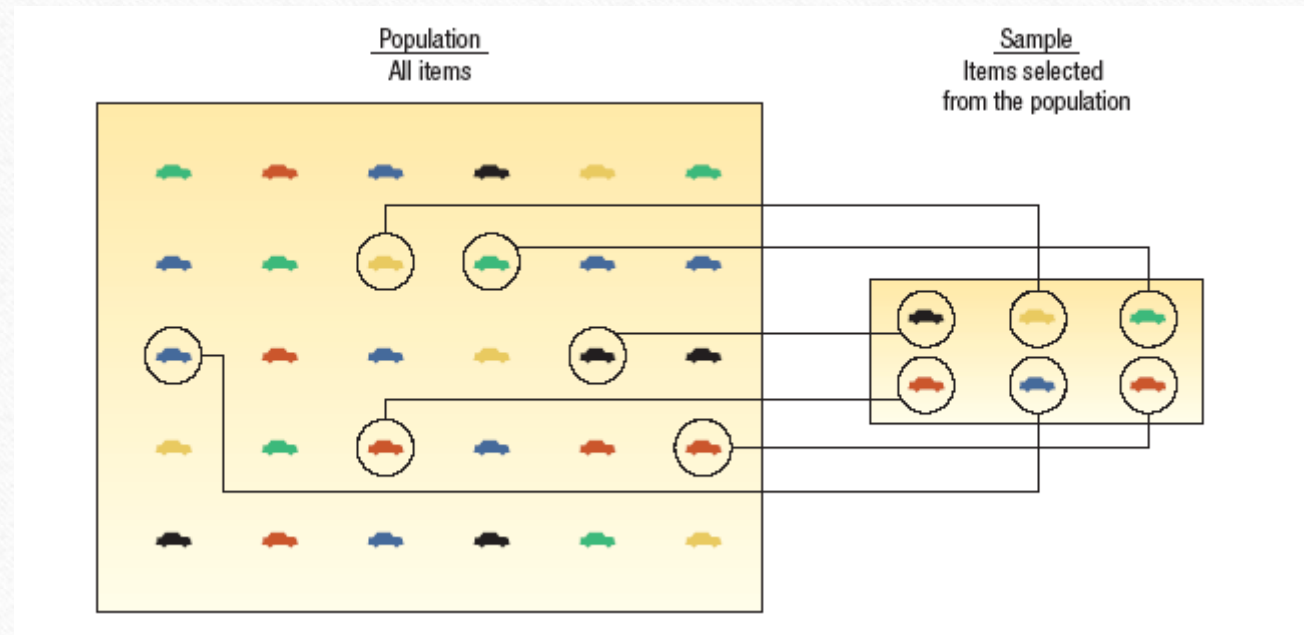
Example 3: The heights of King Saud University Students

Example 4: The weights of Samsung's laptops

Sample and Why?

- Sample is a portion or part of the population of interest.
- Why sampling?
 1. Cost.
 2. Sometimes it is impossible.
 3. Others.

Population Vs. Sample



A Case

- Our class asked sample of 1,960 consumers to try a newly developed spiced chicken by Al Akhawain. Of the 1,960 sampled, 1,176 said they would purchase the dinner if it is marketed.
- a) What could we report to Al Akhawain regarding acceptance of the spiced chicken in the population?
- b) Is this an example of descriptive statistics or inferential statistics? Explain.

Types of Variables

1. **Qualitative variable (Attribute)** is when the characteristic being studied is nonnumeric.

Examples: Gender, type of automobile owned, place of birth, eye color...

We are usually interested in how many or what percent fall in each category.

Qualitative data are often summarized in charts and bar graphs.

Types of Variables

2. **Quantitative variable** is when the variable studied can be reported numerically.

Examples: balance in your checking account, minutes remaining in class, number of children in a family...

Types of Quantitative variable

A. **Discrete variables** can assume only certain values, and there are “gaps” between the values.

Examples: number of cars entering KSU from gate 1 in an hour, number of goals in a soccer game...

Typically, discrete variables result from counting.

Types of Quantitative variable

A. Continuous variables can assume any value within a specific range.

Examples: the air pressure in a tire, the height of students in a class, the weight of a shipment of tomatoes, Grade Point average (GPA)...

Typically, continuous variables result from measuring.

Summary of Types of Variables

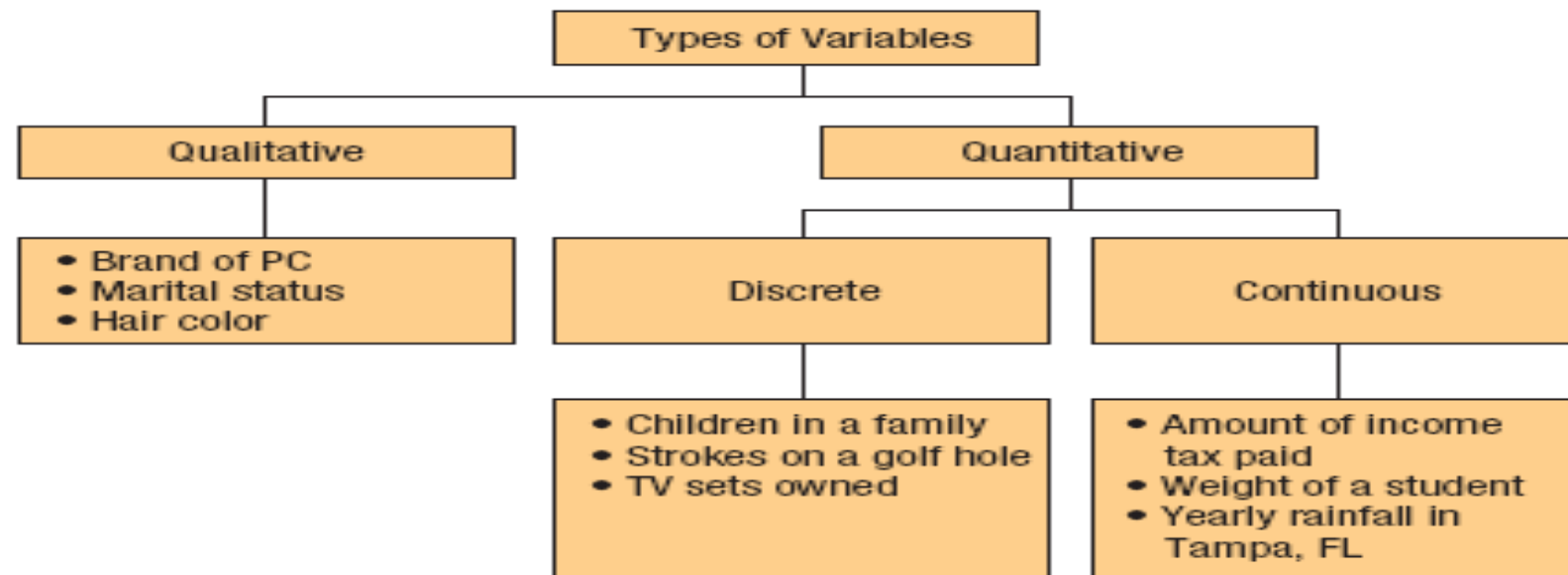


CHART 1–2 Summary of the Types of Variables

Levels of Measurement

A. **Nominal:** Data is classified into categories and cannot be arranged in any particular order.

Examples: Eye color, gender, religion, colors of candies in a bag of M&M's, and country.

Properties:

1. The variable of interest is divided into categories or outcomes.
2. There is no natural order to the outcomes.

Levels of Measurement

B. Ordinal: Involves data arranged in some order but the differences between data values cannot be determined or are meaningless.

Examples: Any ranked data, levels of education, rating of a professor (“Superior”, “Good”, “average”, “Poor”, or “Inferior”)

Properties:

1. Data classification are represented by sets of labels or names (high, medium, low) that have relative values.
2. Because of relative values, the data classified can be ranked or ordered.

Levels of Measurement

C. **Interval:** similar to the ordinal level, with the additional property that difference between values is a constant size and there is no natural zero point

Examples: Weather temperature ($^{\circ}\text{F}$, $^{\circ}\text{C}$) and women dress sizes.

If the distance between the numbers make sense but the ratio do not, then we have an interval level of measurement.

Properties:

1. Data classification are ordered according to the amount of characteristic they possess.
2. Equal differences in the characteristic are represented by equal differences in the measurements.

$$0^{\circ}\text{C} \approx 273\text{ K}$$
$$0\text{ K} \approx -273^{\circ}\text{C}$$

If the Temp. changed from 2°C *to* 4°C does that mean the temp. doubled?

$$0^{\circ}\text{C} \approx 273\text{ K}$$
$$1^{\circ}\text{C} \approx 274\text{ K}$$
$$2^{\circ}\text{C} \approx 275\text{ K}$$
$$3^{\circ}\text{C} \approx 276\text{ K}$$
$$4^{\circ}\text{C} \approx 277\text{ K}$$

$$\frac{277}{275} \approx 1.007 \neq 2$$

Women Dress Sizes

Size	Bust (in)	Waist (in)	Hips (in)
8	32	24	35
10	34	26	37
12	36	28	39
14	38	30	41
16	40	32	43
18	42	34	45
20	44	36	47
22	46	38	49
24	48	40	51
26	50	42	53
28	52	44	55

Levels of Measurement

D. Ratio: is an interval level with a meaningful zero point, differences, and ratios.

Examples: Monthly income, distance traveled, unites of production.

Properties:

1. Data classification are ordered according to the amount of characteristic they possess.
2. Equal differences in the characteristic are represented by equal differences in the measurements.
3. The zero point is the absence of the characteristic and the ratio between two numbers is meaningful.

Summary Levels of Measurement

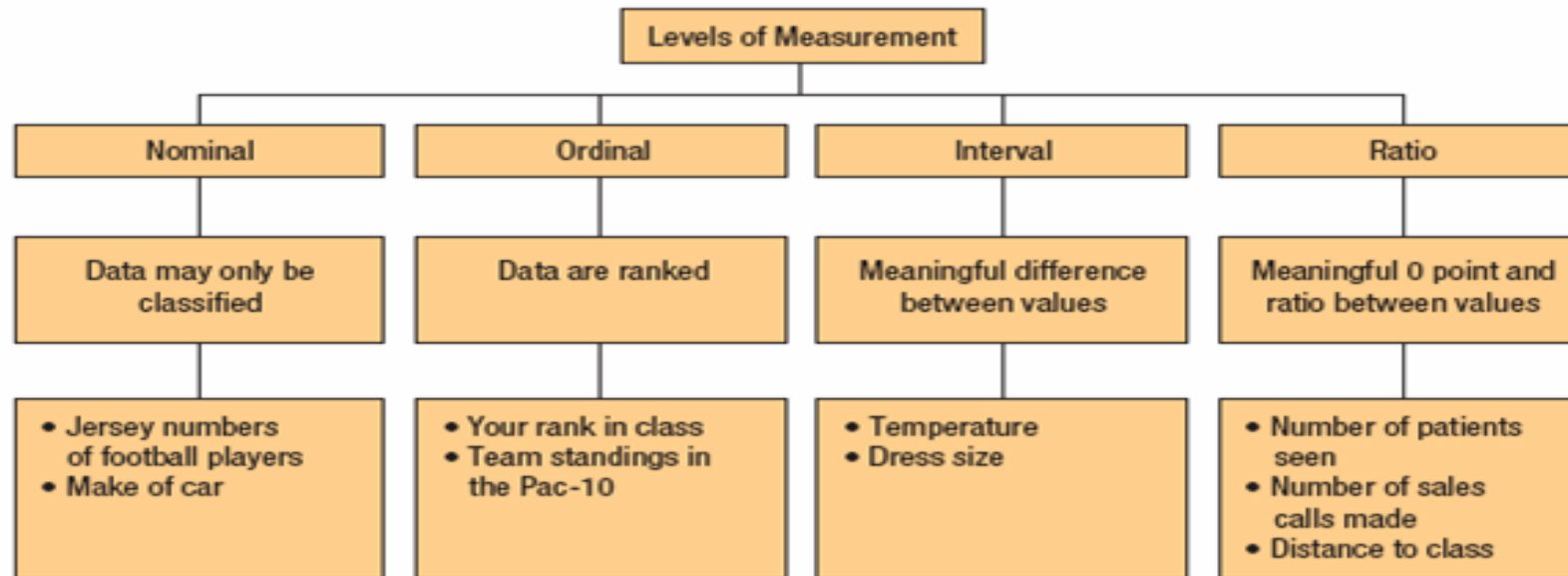


CHART 1–3 Summary of the Characteristics for Levels of Measurement