*PSYC 2200: Elementary Statistics for Behavioral and Social Science*

# Lecture Notes: Definitions & Scaling (Ch. 2)

## Variables

**Variables**: anything that can take on different values or amounts over a period of time

Variables *vary*...

Whatever can be measured can be a variable.

### Kinds of Variables

There are different ways to describe types of variables.

We're going to focus on the difference between qualitative and quantitative variables.

These are important because they determine which statistics to use on your data.

#### Qualitative Variables

Qualitative variables have different values to represent different *categories* or kinds.

Values are discrete.

It's either an apple or an orange.

Halfway between an apple and an orange doesn't *mean* anything.

There is no average value.

Qualitative variables are counted,

The counts are used in statistical analyses.

Q: What is a qualitative variable that I can measure this class about? hair color, gender, eye color, race, year in school

#### *Nominal Scale*

Qualitative variables are called "nominal" in your book.

Nom=name

Qualitative/nominal variables name or label different categories of objects.

The name or label can be a number, but the number doesn't *mean* anything.

For example, let's say I collected data from this class and coded:

- All students who live in Bakersfield = 1
- All students who live in Taft = 2,
- All students who live somewhere other than Bakersfield or Taft = 3.

Q: Does it make any sense to add these numbers? To find the "mean" of Taft and Bakersfield students? No, the numbers are just labels. They don't have value

## Quantitative Variables

Quantitative variables have different to values represent different amounts.

Height: The number of inches is the amount. It differs for everyone.

Values are continuous.

Halfway between 1 inch and two inches has a *meaning*.

You can find an average value.

Q: What is a quantitative variable that I can measure this class about?
weight height distance from school GPA Age income

***Practice:*** ***Quant or Qual?***

1. City qualitative
2. Gender qualitative
3. Weight quantitative
4. Type of degree qualitative
5. Major ~~quantitative~~ qualitative
6. Percent correct on Exam 1. quantitative
7. Score on a depression scale (between 0 and 10) quantitative
8. How long it takes you to blink after a puff of air hits your eye. quantitative
9. What is another example of a qualitative variable? dominant hand
10. What is another example of a quantitative variable? number of kids you have

## Scales of Measurement

Your textbook discusses different types of quantitative variables:

- Ordinal
- Interval
- Ratio

ordinal

| | ~~Ratio~~ | Interval | Ratio |
|---|---|---|---|
| **Q: What's the definition in the textbook? Q: What page is it on?** | identify objects and tells us their ranking or order p. 16 | Each unit is assumed to be equal to each other unit on a scale p. 17 | Has all properties of other scales, but also has true zero. p. 18 |
| **Professor's definition** | Ordinal scales show an order. Ordinal scales are all about <u>ranking</u>. | Variables that are continuous, but zero (nothing) doesn't mean anything in this type of scale. | Variables that are continuous with specific units, *and* there's a true zero. |
| **Hints** | They show what is higher and what is lower. They cannot show how much better the 1st place gymnast is compared to the 2nd place gymnast. | Rating scales are examples of interval scales: Example rating scale anchors: In these types of scales, a zero doesn't exist, or doesn't mean "no satisfaction at all". | Zero really means ~~nothing~~ none or nothing |
| **Q: Example?** | Class rank Sport team ranking Military rank | temperature in ~~Celcius~~ Farenheit It has a zero, but doesn't mean no temperature | If I have one ounce of tequila and I add one ounce of tequila, then we have two ounces of tequila. A person can have no ounces of tequila (zero). |

### Final Word on Scales of Measurement

The type of scale determines what specific statistical analysis you should use.

Unfortunately, statistical software will run what you ask, regardless of the measurement scale of the variable.

> If it's a number, you can analyze it.
>
> When this happens with qualitative variables, the results are junk. If you say apple=1 and orange=2, it will find the average of an appleorange.

## Population & Samples

- Target Population: All the people you want to learn about.
- Selected Sample: Those chosen to participate in the study.
  - These are the people who are contacted.
- Actual Sample: Those who actually participate in your study.
  - When we say we have a sample, this is what we're talking about.

## Practice

Let's say I want to know if there's a relationship between intelligence and reading science fiction books in the U.S.

Q: What is the target population?

Everyone in the US

If I survey 100 of my Introduction to Psychology students on their intelligence and reading of science fiction, but only 30 respond,

Q: What is the Selected Sample?

100 of the introduction to Psychology students

Q: What is the Actual Sample?

The 30 psych students who respond

Actual drug use is much higher in the U.S. than drug arrests suggest, so you might want to measure how many people use meth.

Q: What is the target population? Everyone in the US in Kern County

If you send out a survey to everyone with a driver's license asking about their drug use, and get back 20% of your surveys,

Q: What is the Selected Sample?

Everyone with a driver's license in Kern County

Q: What is the Actual Sample?

The 20% of drivers who responded

Q: Does the actual sample represent the target population? Why or why not?

No because it only represents people with driver's license and in Kern County

For each Ch. 11. Exercise:

- Q: What is the target population?
- Q: What is the Actual Sample?
- Q: Does the actual sample represent the target population? Why or why not?

# Descriptive Statistics

## Descriptive vs. Inferential Statistics

Descriptive- Used to describe or summarize the data from the sample.

Inferential- Used to make generalizations from the sample data to the population of interest.

Used to infer characteristics of the population based on characteristics of the sample.

Formulas are different if you're analyzing data from the population versus data from a sample.

## Practice

*Example 1:*

Q: Which of the following statements is descriptive of the sample and which is making an inference about the population? *Why?*

Target Population -- Psychology Majors

Sample -- 30 students from PSYC 2205 (Research Methods)

Data -- 18 want to become Clinical Psychologists (60%)

- 60% of Psychology majors want to be clinical psychologists. population inferential
- 60% of the students in the sample want to be clinical psychologists. sample descriptive

*Example 2:*

Q: Which of the following statements is descriptive of the sample and which is making an inference about the population? *Why?*

Target Population -- California college Students

Sample -- 300 students from all 112 California community colleges

Data – 150 are from the central valley, 150 are from outside of the valley

- 50% of California community college students are from the central valley. population inferential
- 50% of the students in the sample are from the central valley. descriptive

## Due Next:

- Chapter 2 Homework: Complete the worksheet provided.
- For extra credit, you can complete any Exercises for Chapter 2.