**Basics in Statistics**

•First we need to know basics in statistics

•Type of statistics utilized

•Identify the measured variables’ characteristics

**Basics in Statistics**

•Two types of statistics

•Descriptive

•Inferential

**Basics in Statistics**

•Descriptive statistics

•“Describe” a characteristic of a group that has been directly measured

•“Professional soccer players are on average 6’ tall”

•“There are 25,436 students enrolled at Auburn University”

•“7.9% of registered vehicles are minivans.”

**Basics in Statistics**

•Inferential statistics (note)

•“Infer” a characteristic of a population from a sample

•“Auburn men on average are 6’ tall based on a sample of 300 men living in Auburn”

•“There are 7 billion people living on the earth based on a sample 23 countries’

censuses”

•“12.3% of engineers in the U.S. are women based on a sample of 267 U.S. engineers.”

**Basics in Statistics**

•Look at goal (purpose) when categorizing

•Only care about the group measured then

•Classified as descriptive statistics

•Want to estimate to those not measured then

•Classified as inferential statistics

**Basics in Statistics**

•Inferential statistics

•“Infer” a characteristic of a population from a sample

•“Auburn men on average are 6’ tall based on a sample of 300 men living in Auburn”

•“There are 7 billion people living on the earth based on a sample 23 countries’

censuses”

•“12.3% of engineers in the U.S. are women based on a sample of 267 U.S. engineers.”

**Basics in Statistics**

•Population

•Includes all observations of something of interest

•“The height of all men in Auburn”

•“The number of all people living in the U.S.”

•“The number of all female engineers in the U.S.”

•Researcher defines the population of interest

•Populations are usually difficult to measure

**Basics in Statistics**

•Population for analyses purposes

•Different measures require different populations

•“The height of all men in Auburn”

•“The weight of all men in Auburn”

•A population description includes:

1. Who or what is being measured (men in Auburn)

2. The specific measure (height or weight)

3. The number of observations in the population if provided (use “all” if not provided)

**Basics in Statistics**

•Sample

•A subset of the population

•“Height of 300 men living in Auburn”

•“Counts of citizens from 23 countries”

•“267 female engineers in the U.S.”

•Used as a proxy for the population

•Can be easily measured

**Basics in Statistics**

•Sample

•Different measures require different samples

•“267 female engineers in the U.S.”

•“267 female drivers in the U.S.”

•A sample description includes:

1. Who or what is being measured (females in U.S.)

2. The specific measure (frequency of engineers or drivers but not both even if they are

the same people/things)

3. The number of observations in the sample (267)

**Basics in Statistics**

•Treating samples as populations (norming)

•Large, robust samples can be equated to pops.

•Census data

•ACT/SAT/GRE norms

**Basics in Statistics**

•First we need to know basics in statistics

•Type of statistics utilized

•Identify the measured variable’s characteristics

•Operational definitions

•The type of variable

•The variable’s distribution

•The measures of central tendency and variability

**Basics in Statistics**

•A variable is

•A property whose value can change

•Variables “vary” or “change”

•Height/weight

•Number of all people living in the U.S.

•Proportion of female engineers

•Measures of personality

•Number of defective garments

**Basics in Statistics**

•Variables need to be operationally defined

•Procedures used to measure or manipulate a variable

•Weight is measured by having a person stand on a scale in pound units

•U.S. pop. is measured by a citizens’ mailed 2010 census self-report of the # of people

living in his/her household

•The proportion of women engineers is measured by the total number of women over

the total number of men and women who self-report an engineer occupation based on

mailed, 2010 census surveys.

**Basics in Statistics**

•Operational definitions should:

•Include the units used in the measurement

•Be specific to allow for easy replication

**Basics in Statistics**

•First we need to know basics in statistics

•Type of statistics utilized

•Identify the measured variable’s characteristics

•Operational definitions

•The type of variable

•The variable’s distribution

•The measures of central tendency and variability

**Basics in Statistics**

•Identify the type of variable measurement\*\*

Used to determine statistical tests

Used to meet statistical test assumptions

Needed to know mathematical operations

**Basics in Statistics**

•Identifying the type of variable measurement

Continuous (scale or score)

•Ratio variables

•Interval variables

Discrete

•Ordinal variables

•Nominal variables

**Basics in Statistics**

•Continuous (scale or score) observations

Ratio

•Equal distances between numbers

•Has a meaningful zero point (absolute absence)

•Lets us multiply and divide

•Kelvin scale, income, etc.

Interval

•Equal distances between numbers

•Lets us add and subtract

•Fahrenheit, some response scales, etc.

**Basics in Statistics**

•Discrete observations

Ordinal

•Rankings

•Greater than, less than

•Winners of a race, preferences, birth order, class standing

Nominal

•Categories (group variables)

•Gender, class standing, ethnicity, etc.

**Basics in Statistics**

•Variable ambiguity (exceptions)

Variable type is based on context

•Continuous scales are often dichotomized into nominal variables

•Some variables could be treated as interval or ratio

•Ex. Age

•Response scales are treated as interval or ratio although technically ordinal

Operational definitions include numerical context

**Basics in Statistics**

•Response scales provide indirect measurements

Ex. Faces Pain Scale

**Basics in Statistics**

•We also need to know:

•If the variables are reliable and valid

**Reliability and Validity**

•Reliability is

•The consistency of a measure

•Height and weight should be consistent for a person

•Personality traits (i.e., extroversion) should be consistent for a person

•Not a “yes” or “no” question

•There are many types of reliability

•Which is more reliable height or weight?

**Reliability and Validity**

•Validity is when the

•Measure measures the construct of interest

•A scale measures weight

•A ruler measures height or distance

•A ruler measures extroversion poorly

•Not a “yes” or “no” question

•There are many types of validity

•Which is more valid a ruler for height or a personality questionnaire for the trait

extroversion?

**Reliability and Validity**

•A valid measure is reliable

•A reliable measure is not necessarily valid

•Ruler and extroversion