# The What and the Why of Statistics EDP 613

Week 1

#### **Basic Ideas**

Statistical Methods I

- Parameter A number describing an entire *population*
- Statistic A number describing a slice, or a sample of a population

#### **Polar Views of the World**



Frequentist Statisticians believe that there is one and only one correct parameter that can be found by using multiple samples.

- parameters are fixed and data vary
- there is a single truth that can be found with enough indicators
- only objectibity can be used

**Bayesian Statisticians** believe that multiple parameters exist which are all based on varying probabilities.

- parameters vary and the data is fixed
- there are multiple truths and getting to any one is based on chance
- subjectivity is a built feature





- You likely do not know enough about probability so for now assume that the frequentist point-of-view is correct.
- It is easier to begin to learn statistics if you don't have to consider multiple outcomes in superposition.
- We will come back to the Bayesian vs. Frequentist arguement

#### **Start**



Descriptive Statistics - Mathematical techniques for organizing and summarizing a set of numerical data

#### **Finish**

**Inferential Statistics** - Generalizing from a sample to a population

#### **Definitions**



- Information is collected on *elements* or *individuals*
- The characteristics of the individuals about which we collect information are called *variables*
- The values of the variables that we obtain are called *data*

## **Overarching Types of Data**

Statistical Methods I

- Qualitative variables (aka categorical variables) classify elements into categories.
- Quantitative variables tell how much or how many of something there is.

## Example



Which of the following variables are qualitative and which are quantitative?

	Situation	Туре
1	The name of the schools in your district.	
2	The number of schools in your district.	
3	The amount of each ingredient in a cake.	
4	The ingredients in a cake.	

## **Solution**



	Situation	Туре
1	The name of the schools in your district.	Qualitative
2	The number of schools in your district.	Quantitative
3	The amount of each ingredient in a cake.	Quantitative
4	The ingredients in a cake.	Qualitative

## **Levels of Measurement**



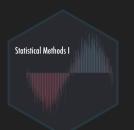
	Nominal	Ordinal	Interval	Ratio
Naming, labeling, or classifying observations	<b>✓</b>	✓	<b>✓</b>	✓
Ranks categories in order		<b>✓</b>	<b>✓</b>	<b>✓</b>
Known equal intervals			<b>✓</b>	<b>✓</b>
Includes a natural zero point				<b>✓</b>

## Note



Your textbook pools interval and ratio together as *interval-ratio*.

# Example



	Situation	Туре
1	The (typical) letter grade distribution in a school	
2	Toppings on a cheeseburger	
3	Social economic status	
4	A telephone number	
5	Time	

## **Solution**



	Situation	Туре
1	The (typical) letter grade distribution in a school	Ordinal
2	Toppings on a cheeseburger	Nominal
3	Social economic status	Ordinal
4	A telephone number	Ordinal
5	Time	Interval Ratio

#### **Discrete and Continuous**



- Discrete variables are quantitative variables whose possible values can be listed
  - possibly infinite
  - obtained by counting
- Continuous variables are quantitative variables that can take on any value in some interval.
  - possibly infinite
  - obtained by measuring

# Example



Which of the following variables are discrete or continuous?

	Situation	Туре
1	Time it takes to get to school	
2	Water temperature	
3	Ratings on a 5-point rating scale	
4	Number of cars currently in a parking lot	

## **Solution**



	Situation	Туре
1	Time it takes to get to school	Continuous
2	Water temperature	Continuous
3	Ratings on a 5-point rating scale	Discrete
4	Number of cars currently in a parking lot	Discrete

#### That's it. Take a break before our R session!

