

### VOCABULARY | CHAPTER 1

<b>Statistics:</b>	a branch of mathematics that deals with collecting data and analyzing information to draw conclusions and help make decisions when faced with uncertainty. Statistics also provides a measure of confidence in a conclusion that is drawn.	<b>Example:</b>	1) Gathering data 2) Organizing and summarizing that data 3) Analyzing the data to find answers 4) Reporting the results in a way that shows how reliable those answers are
<b>Data</b>	“a fact or proposition used to draw a conclusion or make a decision.”	<b>Example:</b>	numerical; height. Nonnumerical; gender.
<b>Anecdotal</b>	The information being conveyed is based on casual observation, not scientific research.		----- the misuse of data typically happens when data is incorrectly obtained or analyzed.

### Population vs. Sample

<b>Population:</b>	the entire group of items or individuals about which we want information; the entire set of objects or individuals to be studied	<b>Example:</b>	the set of all undergraduate students enrolled in Boston University as of Jan. 19, 2024.
<b>Sample:</b>	a subset of the population that is being studied.	<b>Example:</b>	part of the population of interest that we examine in order to gather information.

### Descriptive vs. Inferential Statistics

<b>Descriptive Statistics:</b>	consists of organizing and summarizing data using numerical summaries (e.g. mean, IQR, standard deviation), tables, and graphs.
<b>Inferential Statistics:</b>	uses information from a sample to make a conclusion about a larger group of items or individuals, e.g. the population. Inferential statistics are used to draw inferences about a population from a sample.

### Types of Variables



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Not published yet.  
Last updated 6th May, 2024.  
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## VOCABULARY | CHAPTER 1 (cont)

<b>Qualitative (or categorical) variable:</b>	a characteristic or attribute that places an individual into one of several categories	<b>Examples:</b> gender; year in college –e.g. freshman, sophomore; state in which a person was born.
<b>Quantitative variable:</b>	a characteristic or attribute with numerical values for which arithmetic operations provide meaningful results (or “for which arithmetic operations make sense”)	<b>Examples:</b> How the daily weather is described - temperature, relative humidity.

### Two Types of Quantitative Variables

<b>Discrete variable:</b>	quantitative variable with either a finite number or countable number of possible values. Countable means the values result from counting, e. g. 0, 1, 2, 3 and so on.	<b>Examples:</b> a household could have three children or six children, but not 4.53 children.
<b>Continuous variable:</b>	quantitative variable with infinite possible values which are not countable	<b>Examples:</b> the response time of a computer could be 0.64 seconds, or it could be 0.64237123922121 seconds

### Observational Study vs. Designed Experiment

<b>Observational Study:</b>	researchers simply observe individuals or question participants without trying to influence their response. Often participants are chosen randomly.
<b>Designed Experiment (Experimental Study)</b>	Researchers setup an experiment and manipulate a variable and measure the effect of the manipulation on some outcome of interest. Often participants are randomly assigned to the various conditions and treatments.

**Confounding:** occurs in a study “when the effects of two or more explanatory variables are not separated.”



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## VOCABULARY | CHAPTER 1 (cont)

**Lurking variable:** a variable that was not considered explicitly "in a study, but that affects the value of the response variable"

### Bias In Sampling

Bias is a common problem during survey sampling.

**Selection bias (or Sampling bias):** occurs if the method for selecting the participants produces a sample that does not represent the population of interest.

## STATS

### Percentage (%)

$$\% \text{ change} = \frac{\text{final value} - \text{initial value}}{\text{initial value}} \times 100\%$$

The minimum wage in Massachusetts was \$12.00/hour as of January 1, 2019. It increased to \$15.00/hour on Jan. 1, 2023.

% change = ?

$$\% \text{ change} = \frac{\$15.00 - \$12.00}{\$12.00} \times 100\%$$

$$\% \text{ change} = \frac{\$3.00}{\$12.00} \times 100\% = 25\%$$

The 2023 minimum wage is a 25% increase from the state's minimum wage in 2019.

!

### Percentage (%)

$$\% \text{ difference} = \frac{\text{reference value} - \text{base value}}{\text{base value}} \times 100\%$$

Harriett's annual salary: \$40,000  
Bob's annual salary: \$52,000

Harriett filed for a divorce. A legal advisor stated: Bob's salary is 130% higher than Harriett's salary. Is the advisor's claim correct?

## VOCABULARY | CHAPTER 2

### Graphical Methods for Qualitative (Categorical) Variables

**Qualitative (categorical) variable:** a characteristic that places an individual into one of several categories  
**Examples:** e.g. sex, nationality, political party)

**Qualitative variables:** can be numerically described with frequencies (counts), relative frequencies (percent, proportions), cumulative frequencies, and cumulative relative frequencies.

The number of times each unique variable element is observed is called the **count**, or **frequency (f)**. The relative frequency equals the frequency divided the sample size  $n$  or  $f/n$ . **Relative Frequency =  $f/n$**



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Not published yet.

Last updated 6th May, 2024.

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