STAT 630, HW 1
Due: Thursday, August 27 on Blackboard

Reading: OpenIntro, Chapter 1

Exercise 1. A YouGov poll[1], conducted between August 16-18, 2020, asked a random sample of 1246 registered voters in the U.S., "How do you plan on voting in 2020?" 38% of respondents said in-person on election day, 21% said in-person before the election, 39% said by mail, and 2% said they would not vote this year. Identify the sample, population, statistics, and parameters for this survey.

Exercise 2. The following table shows the first several rows of Fisher's famous Iris data set, which is available in R. The data set provides measurements (in centimeters) on sepal length and width, and petal length and width, for 50 flowers from each of 3 species of iris (*setosa*, *versicolor*, and *virginica*).

```
> head(iris)
  Sepal.Length Sepal.Width Petal.Length Petal.Width Species
1          5.1         3.5          1.4         0.2  setosa
2          4.9         3.0          1.4         0.2  setosa
3          4.7         3.2          1.3         0.2  setosa
4          4.6         3.1          1.5         0.2  setosa
5          5.0         3.6          1.4         0.2  setosa
6          5.4         3.9          1.7         0.4  setosa
> dim(iris)
[1] 150   5
> table(iris$Species)
    setosa versicolor  virginica
        50         50         50
```

(a) How many rows are in this data set? What does each row (observation) represent?

(b) Indicate whether each variable in this data set is numerical or categorical. If categorical, indicate whether the variable is ordinal or nominal.

(c) Explain what you think the R command `table(iris$Species)` is doing?

Exercise 3. Indicate whether each of the following variables is numerical or categorical.

(a) A person's eye color

(b) The number of hours a person spends commuting during a given week

(c) Zip code

(d) Score (out of 100 points) on a midterm exam

(e) Tree height in meters

[1] https://docs.cdn.yougov.com/orl7grxw85/econToplines.pdf

Exercise 4. A migraine is a particularly painful type of headache, which patients sometimes wish to treat with acupuncture. To determine whether acupuncture relieves migraine pain, researchers conducted a randomized controlled study where 89 females diagnosed with migraine headaches were randomly assigned to one of two groups: treatment or control. 43 patients in the treatment group received acupuncture that is specifically designed to treat migraines. 46 patients in the control group received placebo acupuncture (needle insertion at non-acupoint locations). 24 hours after patients received acupuncture, they were asked if they were pain free. Results are summarized in the contingency table below.

		Pain free		
		Yes	No	Total
Group	Treatment	10	33	43
	Control	2	44	46
	Total	12	77	89

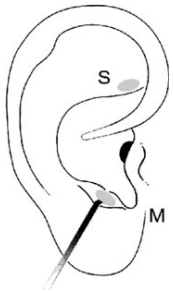

Figure from the original paper displaying the appropriate area (M) versus the inappropriate area (S) used in the treatment of migraine attacks.

(a) What percent of patients in the treatment group were pain free 24 hours after receiving acupuncture?

(b) What percent were pain free in the control group?

(c) In which group did a higher percent of patients become pain free 24 hours after receiving acupuncture?

(d) Your findings so far might suggest that acupuncture is an effective treatment for migraines for all people who suffer from migraines. However this is not the only possible conclusion that can be drawn based on your findings so far. What is one other possible explanation for the observed difference between the percentages of patients that are pain free 24 hours after receiving acupuncture in the two groups?

Exercise 5. For each of the following scenarios, identify whether the study is an observational or experimental study. If it is an experiment, identify the response variable and the different treatment groups.

(a) Researchers surveyed 959 ninth graders who attended 3 large US urban high schools and found that those who listened to music that had references to marijuana were almost twice as likely to of used marijuana than those who did not listen to music with references to marijuana.

(b) Researchers randomly placed 500 rats into one of three chambers containing radio antennas. One group was exposed to digital cell phone radio waves, the second to analog cell phone waves, and the third group to no radio waves. One year later the rats were examined for the presence of brain tumors. No significant differences were found among the three groups.

(c) A sample of 1500 adults were randomly selected and asked whether they worry about climate change. 45% of respondents said that they worry about climate change.