

## 8.6 Let's Investigate

### *A Solidify Understanding Task*

When we want to draw conclusions about some population, there are at least two different statistical ideas to consider. We learned about sampling in *Would You Like to Try a Sample*, since it is usually more practical to sample the population rather than somehow measure everyone or everything in the population.



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The second thing to consider is how to measure the parameter of interest, the thing we want to know about the population. Sometimes it's obvious, like if you want to know the average weight of a population, you determine a sample and then put each of the subjects on a scale. Three other techniques are the following:

- **Surveys:** When they want to know how people feel, what their preferences are, what they own, how much they make, etc., researchers often construct a survey to ask the people in the sample about the parameter of interest.
- **Observational Studies:** In this type of study, researchers observe the behavior of the participants/subjects without trying to influence it in any way so they can learn about the parameter of interest.
- **Experiments:** In an experiment, researchers manipulate the variables to try to determine cause and effect.

1. Imagine that you want to know whether a new diet plan is effective in helping people lose weight. You might choose any of the three methods to determine this.

If you used a survey, you could simply ask people that had tried the diet plan if they lost weight.

If you used an observational study, you might monitor volunteers that try the diet plan and measure how much weight they lost.

If you used an experiment, you might randomly assign participants to two groups. One group (the control group) eats as they normally would and the other group (the experimental group) eats according to the diet plan. At the end of two months, the two groups are compared to see the average weight gain or loss in each group.

Based on these three examples,

- What are some possible advantages and disadvantages of surveys?



- b. What are some possible advantages and disadvantages of observational studies?
- c. What are some possible advantages and disadvantage of experiments?

2. Identify which method is illustrated by each example:

- a. To determine whether drinking orange juice prevents colds, researchers randomly assigned participants to a group that drank no orange juice or a group that drank two glasses of orange juice a day. They measured the number of colds that each group had over the course of the year and compared the results of the two groups.
- b. To determine whether exercise reduces the number of headaches, researchers randomly selected a group of participants and recorded the number of hours each participant exercised and the number of headaches each participant experienced.
- c. To determine the effectiveness of a new advertising campaign, a restaurant asked every tenth customer if they had seen the advertisement, and if it had influenced their decision to visit the restaurant.
- d. To determine if a new drug is an effective treatment for the flu, researchers randomly selected two groups of people that had the flu. One group was given a placebo (a sugar pill that has no physical effect) and one group was given the new drug. Researchers measured the number of days that participants experienced flu symptoms and compared the two groups to see if they were different.
- e. To determine if higher speed limits cause more traffic fatalities, researchers compared the number of traffic deaths on randomly selected stretches of highway with 65 mph speed limits to the number of traffic deaths on an equal number of randomly selected stretches of highway with 75 mph speed limits.

3. Describe how you might select a sample and use a survey to investigate which soft drink people prefer: Soda A or Soda B.

4. Describe how you might select a sample and use an observational study to investigate which soft drink people prefer: Soda A or Soda B.



5. Describe how you might select a sample and use an experiment to investigate if consuming large quantities of Soda A causes headaches.

6. Describe the method you would use to determine if excessive texting causes bad grades. Explain why you chose that method and what conclusions could be drawn from the study.

