Chapter 10: Probability and Statistics

Section 10.3: 
Samples and Surveys

OBJ: Identify sampling methods and bias in samples/surveys.

Studies Vocabulary

• **Observational study**: you measure members of a sample in such a way that they are not affected by the study.

• **Controlled experiment**: you divide the sample into two groups. You impose a treatment on one group but not on the other “control” group. Then you compare the effect on the treated group to the control group.

Example 1: Types of Studies

A human resources director of a large company is interested in how often employees use their computers during breaks. She watches a selected group of employees at their desks during the break times. This study would best be described as __________

Samples Vocabulary

• **Population** – all members of a set.

• **Sample** – a part of a population.

<table>
<thead>
<tr>
<th>Stratified sample</th>
<th>Simple random sample</th>
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<tbody>
<tr>
<td>To be sure to have some subjects from each subgroup in your sample, split into subgroups, then take a simple random sample out of each subgroup.</td>
<td>Each member of population is equally likely to be selected.</td>
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Example: systematic

Create a pattern to select from the population.
- Ex: List names alphabetically then pick every tenth person
- Nonexample: picking only people with J- names

Example 1: Types of Studies

A company wants to compare two washing detergents (Brands A and B) to see which best keeps colors from fading. Twenty new, identical red t-shirts will be used in the trials. Ten t-shirts are washed 15 times with Brand A in warm water. The other 10 t-shirts are washed with Brand B in cold water. The amount of fading is rated on a 0 to 100 scale, and the mean for the t-shirts washed in Brand A is compared to the mean for the others. Is this a good experimental design? **Experiment**
Convenience sample
members of population who are conveniently and readily available.

Self-selected sample
members of population volunteer for the sample.

Example:
Studying behavior of toddlers and studying kids at your friend’s daycare.

Example:
Comment cards
People who write reviews for products on Amazon

Examples
Population: school
Sample: members of DECA
What other population vs. sample examples can you think of?

Vocab
• Bias
  – In a sample: selecting subjects in a way that favors or skew the results in favor of a certain group.

  – In a survey: asking questions that lead to a specific answer

  – A systematic error introduced by the sampling method of a survey. (MATH definition.)

Why is it important to recognize bias?

Sampling Method? Is there bias?
• To survey the eating habits of the community, employees of a local television station interview people visiting a food court in the mall.

  Convenience, bias

Sampling Method? Is there bias?
• A political candidate wants to know what percent of his constituency favors Referendum A on an upcoming ballot election. His staff asks each person who comes into the candidate’s office for three days whether they support Referendum A.

  Convenience, bias
Sampling Method? Is there bias?

- The manager of a grocery store wants to determine what percent of shoppers are using the store coupons printed in the Sunday paper. He asks an employee to ask every tenth shopper who passes through the store's door for the next week if he or she intends to use a store coupon on their visit.

Survey Vocabulary

Survey: you ask every member the same set of questions.

1. A poorly written survey may introduce bias.
2. Questions should be clear, precise, and fair.
3. Questions should avoid:
   - Combining two or more issues
   - Overlapping answer choices
   - Using double negatives
   - Loaded Questions – uses words that cause strong reactions
   - Leading Questions – suggesting a particular answer

Is there bias? Explain.

- Do you think farmers should use poison to control insects on crops? **bias, loaded question**
- Don't you agree that most teachers are underpaid? **bias, leading**
- Do you think teachers should communicate frequently with students and their parents about class grades? **bias, combining issues**

Is there bias? Explain.

- Should already high movie ticket prices be raised by fifty cents per person? **bias, leading**
- Do you think the dress code is too strict and the punishments for violating the dress code too harsh? **bias, combining issues**
- Should cell phone usage while driving be illegal? **No bias**

Example

An athletic shoe company wants to learn which brand of athletic shoes is worn most often by local high-school students. The company sets up a booth in a local mall and offers a coupon for a free pair of their athletic shoes to any one who answers the question, "What is your favorite brand of athletic shoes?"

a. What is the sampling method used? There may be more than one.

b. Is there any bias in the company's sampling method?

Answers

a. People in the mall are readily available to the booth. Also, people must volunteer to participate. The sample is a convenience sample and is self-selected.

b. The survey is biased in several ways:
   - People who do not shop at the mall are excluded.
   - Only people who choose to walk up to the booth participate in the survey.
   - People who are not high-school students may participate in the survey.
   - People may be more likely to say this company makes their favorite shoes when they are offered a free pair.
Example

An athletic shoe company wants to learn which shoe features are important to local high-school students. Is there any bias in any of these survey questions? Explain.

a. Choose the feature that is most important to you in a shoe.
   - fit
   - style
   - color
   - appearance

b. Isn’t fit the most important feature in any shoe?

c. How important is it to you that shoe materials have not been tested on laboratory animals?

Answers

a. Style and color both contribute to the appearance of a shoe. The question is ambiguous by offering overlapping answer choices and leaves out other choices.

b. This question implies that fit is the most important feature. It is a leading question.

c. The question introduces a second issue, laboratory-animal testing. This is a loaded question.

Reciprocal teaching

Work with your group of four

1. Read the question on your own and fill in the first box with what you think the sampling method is. Then answer if you think there is bias.
2. One person from group reads questions aloud.
3. As a group decide the sampling method and bias then write answer in last box

Summary

Sampling methods:
- Convenience
- Self-selected
- Systematic
- Random

Study methods:
- Observational study
- Controlled experiment
- Survey

Exit Ticket:

How would you find a sample of Burke High School to determine if students agree with a new cell phone policy? (sampling method?)