

Lesson 12–9

Example 1 Biased and Unbiased Samples

State whether each method would produce a random sample. Explain your reasoning.

- a. surveying people coming out of a movie theater to find out people’s favorite entertainment

This would probably not result in a random sample because the people surveyed would probably be more likely than normal to select going to the movies as a favorite entertainment. Also, people who do not go to movies would not be represented.

- b. placing a survey in the local newspaper to determine how people voted in the last election

This would probably not result in a random sample because only people who buy the local newspaper would be represented. Also, not all people would fill out the survey.

- c. selecting students at a school to answer questions by randomly drawing their student identification numbers from a hat

This would result in a random sample. Each student identification number in the hat would have an equal chance of being selected.

Example 2 Find a Margin of Error

In a survey of 2500 randomly–selected teenagers, 65% said they had to purchase some of their clothing using their allowance. What is the margin of error.

$$\begin{aligned} ME &= 2\sqrt{\frac{p(1-p)}{n}} && \text{Formula for margin of sampling error} \\ &= 2\sqrt{\frac{0.65(1-0.65)}{2500}} && p = 65\% \text{ or } 0.65, n = 2500 \\ &\approx 0.019079 && \text{Use a calculator.} \end{aligned}$$

The margin of error is about 2%. This means that there is a 95% chance that the percent of teenagers in the whole teenage population who would say they have to purchase some of their clothing using their allowance is between $65 - 2$ or 63% and $65 + 2$ or 67%.

Example 3 Analyze a Margin of Error

SENIOR CITIZENS In a survey of U.S. citizens aged 65 and over, 52% said that they participated in activities at their local Senior Citizen Center at least twice a year. The margin of error was 5%.

- a. What does the 5% indicate about the results?

The 5% means that the probability is 95% that the percent of people in the population aged 65 and over who participated in activities at their local Senior Citizen Center at least twice a year was between $52 - 5$ or 47% and $52 + 5$ or 57%.

b. How many people were surveyed?

$$ME = 2\sqrt{\frac{p(1-p)}{n}} \quad \text{Formula for margin of sampling error}$$

$$0.05 = 2\sqrt{\frac{0.52(1-0.52)}{n}} \quad ME = 0.05, p = 0.52$$

$$0.025 = \sqrt{\frac{0.52(0.48)}{n}} \quad \text{Divide each side by 2.}$$

$$0.000625 = \frac{0.52(0.48)}{n} \quad \text{Square each side.}$$

$$n = \frac{0.52(0.48)}{0.000625} \quad \text{Multiply by } n \text{ and divide by } 0.000625.$$

$$n = 399.36 \quad \text{Use a calculator.}$$

About 399 people were surveyed.