Statistical and Critical Thinking

Colby Community College

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A **sample** is a subcollection of members selected from a population.

Example 1

In the journal article "Residential Carbon Monoxide Detector Failure Rates in the United States" (by Ryan and Arnold, *American Journal of Public Health*, Vol. 101, No. 10) it was stated that there are 38 million carbon monoxide detectors installed in the United States. When 30 of them were randomly selected and tested, it was found that 12 of them failed an alarm in hazardous carbon monoxide conditions.

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Note

Performing a full census is typically very hard. So, the goal is to use sample data as a basis for drawing conclusions about the full population. The methods of statistics are helpful in drawing such conclusions.

General Process of a Statistical Study

1. Prepare
   - Context. (What do the data represent? What is the goal of the study?)
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   - Graph the Data
   - Explore the Data
     - Are there any outliers?
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3. Conclude
   - Significance
     - Do the results have statistical significance?
     - Do the results have practical significance?

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  - Many telemarketers have been disguising their sales pitch as an opinion poll, causing the nonresponse problems to increase in recent years.

Percentages

- **Percentage of:** To find a percentage of an amount, replace the % symbol with division by 100 and multiply by the amount.

  Example: 6% of 1200 responses is $\frac{6}{100} \cdot 1200 = 72$

- **Decimal to Percentage:** To convert from a decimal to a percentage, multiply by 100%.

  Example: $0.25 \rightarrow 0.25 \cdot 100\% = 25\%$

- **Fraction to Percentage:** To convert from a fraction to a percentage, divide the denominator into the numerator and multiply by 100%.

  Example: $\frac{3}{4} = 0.75 \rightarrow 0.75 \cdot 100\% = 75\%$

- **Percentage to Decimal:** To convert from a percentage to a decimal number, replace the % by division by 100.

  Example: $85\% \rightarrow \frac{85}{100} = 0.85$