



PROJECT-SET

Statistics Education for Teachers

Activity Sheet

Confidence Intervals and Plausible Values

This activity culminates our work with sampling variability. In particular, we explore how our work with the sampling distribution for formal inference. Part A will be done by hand. Parts B through D should be completed using software.

Guiding questions:

- A. How can we estimate a population parameter and how can we decide if our estimate is accurate?
- B. How can we construct an interval of plausible parameter values using one sample?
- C. How well do intervals of plausible values capture the parameter?
- D. Given a random sample from a population with unknown parameter, what are the plausible values for that parameter?

A. How can we estimate a population parameter and how can we decide if our estimate is accurate?

A radio station asks people to call in and report how long their commute time is each day into work. The commute times of the first 100 people to call in are recorded (see Commute Times data).

Assuming this is a random sample of commuters in Los Angeles:

1. What is an estimate for the mean commute time among people who drive to work in Los Angeles?
2. Describe the sampling distribution of the sample average commute time and what it tells us about the behavior of the sample average commute time. Be as detailed as possible. Make sure to note that the center of the sampling distribution is μ .
3. What would a plausible range of values be for the average commute time in Los Angeles? How can you use the sampling distribution in (b) to help us determine which values might be plausible? Is it plausible for μ to be 5 minutes? Is it plausible for μ to be 30 minutes? Is it plausible for μ to be 200 minutes?

B. How can we construct an interval of plausible parameter values using one sample?

Note: Part B and C are just for exercise purposes to understand how confidence intervals work. In reality, you will not know the population parameters. See part A and part D.

1. Open up your Mira Beach data and draw one sample of size 40. Compute the mean income and standard deviation for your sample. Pretend you do not know the population information.
2. What is the shape of the sampling distribution of the sample mean income?
3. What is the standard deviation of the sampling distribution of the sample mean income (use sample information)?
4. What is the mean of the sampling distribution of the sample mean income?
5. Compute a formal 95% confidence interval for the population mean based on your sample.

C. How well do intervals of plausible values capture the parameter?

1. Simulate 1000 confidence intervals for the population mean income.
2. What do the simulated confidence intervals show us about their capture rate (see how many of the confidence intervals contained the population mean and many missed it)?
3. Based on your answers, write a statement that summarizes your original confidence interval found in part A.

D. Given a random sample from a population with unknown parameter, what are the plausible values for that parameter?

1. Open up Math Test Scores data. These data provide you with a sample of size 1000 of randomly selected kindergarten students' test scores on a math test in the US.
2. Compute the average math test score for your sample.
3. Find a confidence interval for the mean math test score.
4. Explain what this confidence interval tells us.