Lecture 7: Confidence Intervals
Practice Problems
STAT 310, Spring 2021

Exercise 1. We are interested in estimating the proportion of graduates at a mid-sized college who found a job within one year of completing their undergraduate degree. Suppose we conduct a survey and find that 348 of the 400 randomly sampled graduates found jobs.

(a) Calculate a 95% confidence interval for the proportion of graduates who found jobs within one year of completing their undergraduate degree at this university. Interpret the interval in the context of the data.

$$\hat{p} = \frac{348}{400} = 0.87, \quad n = 400, \quad z^* = 1.96$$

$$\hat{p} \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \implies 0.87 \pm 1.96\sqrt{\frac{0.87(.13)}{400}}$$

$$\implies \boxed{(0.837, 0.903)}$$

We are 95% confident that the population proportion of graduates who found jobs within a year is between 0.837 and 0.903.

(b) Check if the conditions for constructing a confidence interval based on this data are met.

- Data come from a random sample ✓
- $n\hat{p} = 348$ ✓
- $n(1-\hat{p}) = 52$ ✓

Yes, the conditions are satisfied.

(c) If using the same data, would a 99% confidence interval be wider or narrower than a 95% confidence interval?

wider

Exercise 2. The General Social Survey asked a random sample of 1,390 Americans the following question: "On the whole, do you think it should or should not be the government's responsibility to promote equality between men and women?" 82% of the respondents said it "should be". At a 95% confidence level, this sample has 2% margin of error. Based on this information, determine if the following statements are true or false. 95% CI is 82% ± 2% ⟹ (80%, 84%)

(a) We are 95% confident that between 80% and 84% of Americans in this sample think it's the government's responsibility to promote equality between men and women. FALSE. since CI is for population proportion

(b) We are 95% confident that between 80% and 84% of all Americans think it's the government's responsibility to promote equality between men and women.

TRUE

(c) If we considered many random samples of 1,390 Americans, and we calculated 95% confidence intervals for each, about 95% of these intervals would include the true population proportion of Americans who think it's the government's responsibility to promote equality between men and women.

TRUE

(d) Based on this confidence interval, there is sufficient evidence to conclude that a majority of Americans think it's the government's responsibility to promote equality between men and women.

TRUE. since CI is 80% to 84%, which falls above 50%.