EPSY 5261 : Introductory Statistical Methods

Day 16
Introduction to Confidence Intervals

Learning Goals

- At the end of this lesson, you should be able to…

  - Identify when to answer a research question with a confidence interval

  - Explain the need for creating a confidence interval to do statistical inference

  - Know how to calculate a confidence interval by hand and using R Studio

  - Interpret a confidence interval

Confidence Intervals

- Sampling Variability = Samples vary

- We need something to quantify the uncertainty in our estimates

→ Confidence Intervals

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Confidence Intervals

Terminology

- 95% confidence interval:

  - Sample statistic +/- (2 x SE)

- Margin of error:

  - A specified number of standard errors that we add and subtract from the sample statistic to get a confidence interval.

  - Margin of error quantifies the amount of sampling error due to variation from sample to sample.

Terminology

- Standard deviation:

Average distance from the mean, where each point in the data is an <u>individual</u> value

- Standard Error: standard deviation for a sample

Table 17.1 in text

Formulas to compute the standard error (SE) for the different situations we have studied in EPsy 5261.

Situation	SE
Single Mean	$\dfrac{\text{SD}}{\sqrt{n}}$
Single Proportion	$\dfrac{\hat{p}(1-\hat{p})}{\sqrt{n}}$
Difference in Means	$\sqrt{\dfrac{\text{SD}_1^2}{n_1} + \dfrac{\text{SD}_2^2}{n_2}}$
Difference in Proportions	$\sqrt{\dfrac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \dfrac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$

Music Library Activity

Compare Intervals on the Board
What do you notice?……

Summary

- For a research question asking for an estimate, the best way to answer is with a confidence interval

- The confidence interval allows us to take into sampling account variability