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

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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 $\frac{SL}{\sqrt{3}}$

Single Proportion $\dfrac{\hat{p}(1-\hat{p})}{\sqrt{n}}$

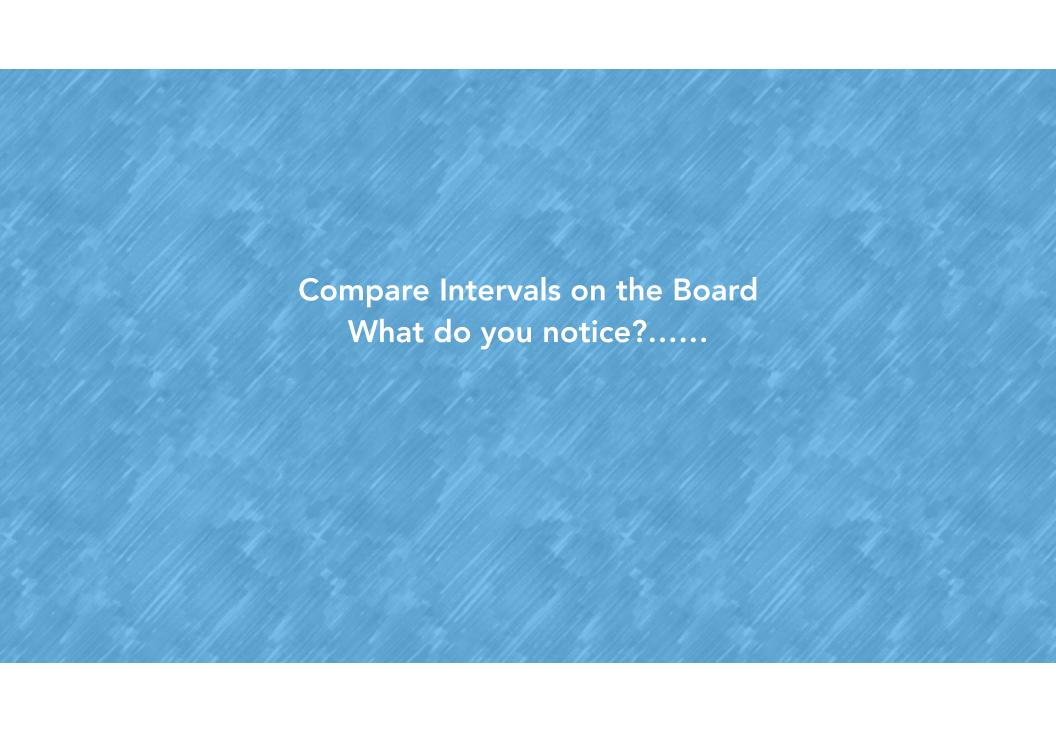
Difference in Means

$$\sqrt{rac{\mathrm{SD}_1^2}{n_1} + rac{\mathrm{SD}_2^2}{n_2}}$$

Difference in Proportions

$$\sqrt{rac{\hat{p}_1(1-\hat{p}_1)}{n_1} + rac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$$





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