19.b - Exact Confidence Intervals

1) Discussion of Reading
2) Looking at Assignment
3) Notes: Margin of Error and Critical Values
4) Notes: Assumptions and Conditions
5) Confidence Interval Example

Pg. 455, #4, 5, 7, 11, 12

\[ SE: \sqrt{\frac{(0.83)(0.17)}{525}} = 0.0164 \]

\[ \text{lower} = 0.83 - 2(0.0164) = 0.797 \]

\[ \text{upper} = 0.83 + 2(0.0164) = 0.863 \]

\[ (0.797, 0.863) \]
Certainty and Precision

Margin of Error
- the extent of the confidence interval on either side of \( \hat{p} \)
- distribution (for \( \hat{p} \)) in proportional units (ie. ± 3%)
- directly related to a certain amount of SE’s

Critical Values
- exact + and - z values that correspond to our desired interval
- designated with \( z^* \) (a critical value from the normal model)
- better than the Empirical Rule estimates

One-Proportion z-interval
Creating a confidence interval for the population proportion \( p \) as

\[
\hat{p} \pm z^* (SE(\hat{p})) \text{ where } SE(\hat{p}) = \sqrt{\frac{p(1-p)}{n}}
\]

Assumptions and Conditions

We can only create a ONE-PROPORTION z-INTERVAL if certain conditions are met and we assume certain things about our sample and population

I. Plausible Independence Assumption (Think)
- does one element of our sample "affect" another
  a. Randomization Condition (Check)  \( \checkmark \)
    - were the data sampled at random or generated randomly
  b. 10% Condition (Check)  \( \checkmark \)
    - is our sample less than 10% of the population of interest

II. Sample Size Assumption (Think)
- is our sample (n) large enough to be approximated with Normal
  c. Success/Failure Condition (Check)  \( \checkmark \)
    - do we expect at least 10 successes and 10 failures
Research Results

An experiment finds that 27% of 53 subjects report improvement after using a new medicine.  

a) Create a 95% confidence interval for the actual cure rate.

\[ \hat{p} = 0.27 \]

\[ \begin{align*}
\hat{p} & \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \\
0.27 & \pm 1.96 \sqrt{\frac{0.27 \times 0.73}{53}} \\
& = 0.27 \pm 1.64 \left( \frac{0.09825}{53} \right) \\
& = 0.27 \pm 0.0389 \\
& \approx (0.231, 0.309) 
\end{align*} \]

b) Create a 90% confidence interval.

c) How do the intervals compare?

d) What are the advantages and disadvantages

Assignment (Due Wednesday, February 24)

1) Read Chapter 19, Pg. 445 - 448

2) Pg. 455, #13, 15, 16, 19, 22, 25