Lecture 19

Review

Recap: Confidence Intervals

Confidence interval, a general formula

$$\text{point estimate} \pm z^\star \cdot SE$$

Conditions when the point estimate $= \bar{x}$:

- **Independence:** Observations in the sample must be independent
  - random sample/assignment
  - if sampling without replacement, $n < 10\%$ of population
- **Sample size / skew:** $n \geq 30$ and population distribution should not be extremely skewed

The Inputs

- Point Estimates: computed from data, typically sample statistics (e.g., $\bar{X}$)
- $z^\star$: the critical z value, found using qnorm() and the choice of significance
- SE: the standard error, specific to each point estimate; if using $\bar{X}$ then this is SE $= \frac{\sigma}{\sqrt{n}}$.

Recap: Hypothesis testing framework

- Set the hypotheses.
- Check assumptions and conditions.
- Calculate a **test statistic** and a p-value.
- Make a decision, and interpret it in context of the research question.

Recap: Hypothesis testing for a population mean

- Set the hypotheses
  - $H_0 : \mu =$ null value
  - $H_A : \mu <$ or $>$ or $\neq$ null value
- Calculate the point estimate
- Check assumptions and conditions
  - Independence: random sample/assignment, 10% condition when sampling without replacement
  - Normality: nearly normal population or $n \geq 30$, no extreme skew – **or use the t distribution** (next chapter)

Recap: Hypothesis testing for a population mean

- Calculate a **test statistic** and a p-value (draw a picture!)

$$Z = \frac{\bar{x} - \mu}{SE}, \text{ where } SE = \frac{s}{\sqrt{n}}$$

- Make a decision, and interpret it in context
  - If p-value $< \alpha$, reject H_0, data provide evidence for H_A
  - If p-value $> \alpha$, do not reject H_0, data do not provide evidence for H_A

Let's Solve Some Problems

We're going to now solve some problems from the WW Practice.