Proportions

- So far we have used the sample proportion, \( \hat{p} \), to make inferences about the population proportion \( p \).
- To do this we needed the distribution of \( \hat{p} \).

Distribution of \( \hat{p} \)

- Shape: Approximately Normal if conditions are met.
- Center: The mean is \( p \).
- Spread: The standard deviation is

\[
SD(\hat{p}) = \sqrt{\frac{p(1-p)}{n}}
\]
Categorical Variable

When the response variable of interest is categorical, the parameter is the proportion of the population that falls in a particular category, \( p \).

Quantitative Variable

When the response variable of interest is quantitative, the parameter is the mean of the population, \( \mu \).

Means

We will use the sample mean, \( \bar{y} \), to make inferences about the population mean, \( \mu \). To do this we needed the distribution of \( \bar{y} \).
Simulation

www.ruf.rice.edu/~lane/stat_sim/sampling_dist/index.html

Simulation

- Simple random sample of size \( n=5 \).
- Repeat many times.
- Record the sample mean, \( \bar{y} \),
  to simulate the distribution of \( \bar{y} \).

Simulation

- Different samples will produce different sample means.
- There is variation in the sample means.
- Can we model this variation?
Population

- Shape: Basically normal
- Center: Mean, $\mu = 16$
- Spread: Standard Deviation, $\sigma = 5$

Distribution of $\bar{y}$

- $n = 5$
- Shape: Normal
- Center: Mean, $\mu = 16$
- Spread: Standard Deviation, $\sigma = 5$

$$SD(\bar{y}) = \frac{\sigma}{\sqrt{n}} = \frac{5}{\sqrt{5}} = 2.24$$