### Normal Dists

\[ z = \frac{y - \mu}{\sigma} \]
\[ y = z\sigma + \mu \]

### Sampling Distribution of the Sample Proportion

\[ \mu_p = p \]
\[ \sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}} \]
\[ z = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}} \]

np ≥ 10 and n(1 − p) ≥ 10

### Assumptions

- One Sample
  - random sample of *categorical* data
  - np ≥ 10 and n(1 − p) ≥ 10
    (for an interval, replace p with \( \hat{p} \))

- Chi-Square Test
  \[ \chi^2 = \sum_{\text{cells}} \frac{(\text{obs} - \text{exp})^2}{\text{exp}} \]

- Confidence Interval
  \[ \hat{p} \pm z\sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \]

- Type of Inference
  - Hypothesis Test
    \[ z = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}} \]

- Sample size: \( n = \left( \frac{z}{\text{MOE}} \right)^2 \hat{p}(1-\hat{p}) \)

### Sampling Distribution of the Mean

\[ \mu_{\bar{y}} = \mu \]
\[ \sigma_{\bar{y}} = \frac{\sigma}{\sqrt{n}} \]

\[ z = \frac{\bar{y} - \mu}{\sigma / \sqrt{n}} \]

### Assumptions

- One Sample
  - random sample of *quantitative* data
  - variable is normally distributed
    (or \( n \geq 100 \))

- Dependent Samples
  - random, dependent sample of *quantitative* data
  - differences are normally distributed
    (or \( n_d \geq 100 \))

- Independent Samples
  - random, independent samples of *quantitative* data
  - variable is normally distributed for both populations
    (or \( n_1 \geq 100 \) AND \( n_2 \geq 100 \))

### Type of Inference

- Confidence Interval
  \[ \bar{y} \pm t\left( \frac{s}{\sqrt{n}} \right), \ df = n-1 \]

- Hypothesis Test
  \[ t = \frac{\bar{y} - \mu}{s / \sqrt{n}}, \ df = n-1 \]

\[ t = \frac{\bar{y}_d - \mu_d}{s_d / \sqrt{n_d}}, \ df = n_d-1 \]

\[ t = \frac{(\bar{y}_1 - \bar{y}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \]

(df will be given in output)

### ANOVA

\[ f = \frac{\text{MST}}{\text{MSE}} \]

### Regression

\[ y = mx + b \]
\[ t = \frac{\text{slope estimate} - 0}{\text{std. error}} \]