## CI Proportions

Conditions: Independence, randomization, 10%, Success Failure

ME

$$\hat{p} \pm z^* \times SE(\hat{p})$$

Sample Proportion

$$SE(\hat{p}) = \sqrt{\frac{\hat{p}\hat{q}}{n}}$$

## CI Means

Conditions: randomization, 10%, Nearly normal condition

ME

$$\bar{y} \pm t^*_{n-1} \times SE(\bar{y})$$

Mean from sample data

$$SE(\bar{y}) = \frac{s}{\sqrt{n}}$$

## H Testing Proportions

$H_0: p = p_0$

Conditions same as CI

$$z = \frac{(\hat{p} - p_0)}{SD(\hat{p})} \qquad SD(\hat{p}) = \sqrt{\frac{p_0 q_0}{n}}$$

P val = Prob(z ___ )

## H Testing Means

$H_0: \mu = \mu_0$

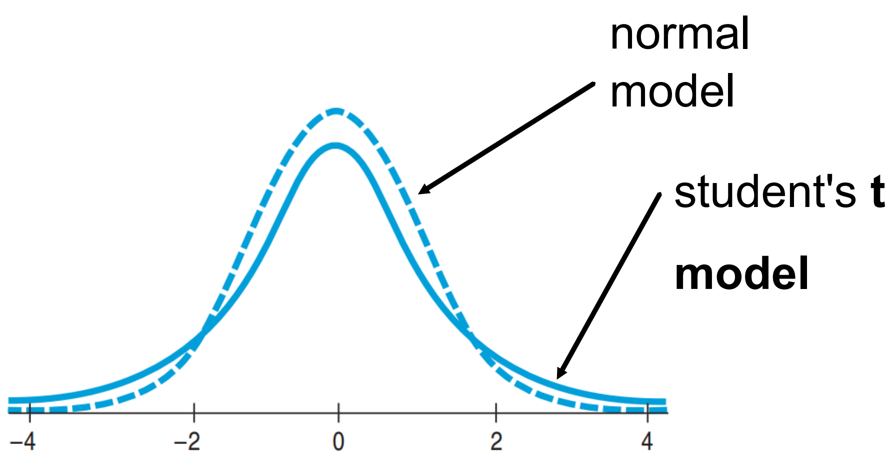
Conditions same as CI for means

$$t_{n-1} = \frac{\bar{y} - \mu_0}{SE(\bar{y})} \qquad SE(\bar{y}) = \frac{s}{\sqrt{n}}$$

sample SD

P val = Prob ($t_{n-1}$ ____)

t models associated with sample size


normal
model
student's **t**
**model**
−4
−2
0
2
4

## Two proportion z - interval

**Conditions**: Independence, 10%, independent groups, randomization success/failure for each group.

$$SE(\hat{p}_1 - \hat{p}_2) = \sqrt{\frac{\hat{p}_1\hat{q}_1}{n_1} + \frac{\hat{p}_2\hat{q}_2}{n_2}}$$

The confidence interval is:

$$(\hat{p}_1 - \hat{p}_2) \pm z^* \times SE(\hat{p}_1 - \hat{p}_2)$$

## Two sample t-interval for the difference between means

**Conditions**: Independence, independent groups, randomization, nearly normal condition for both groups.

$$SE(\bar{y}_1 - \bar{y}_2) = \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

The confidence interval is:

$$(\bar{y}_1 - \bar{y}_2) \pm t^*_{df} \times SE(\bar{y}_1 - \bar{y}_2)$$

depends on CI and sample size

## Two proportion z-test

We hypothesize no difference

$H_0: p_1 - p_2 = 0$

We pool the two sample proportions to get *p*-hat pooled

$$\hat{p}_{\text{pooled}} = \frac{Success_1 + Success_2}{n_1 + n_2}$$

$$SE_{\text{pooled}}(\hat{p}_1 - \hat{p}_2) = \sqrt{\frac{\hat{p}_{\text{pooled}}\,\hat{q}_{\text{pooled}}}{n_1} + \frac{\hat{p}_{\text{pooled}}\,\hat{q}_{\text{pooled}}}{n_2}}$$

Then calculate,

$$z = \frac{(\hat{p}_1 - \hat{p}_2) - 0}{SE_{\text{pooled}}(\hat{p}_1 - \hat{p}_2)}$$

and find the p-value

## Two sample t-test for the difference between means

**Conditions**: Independence,

independent groups, randomization, same as two sample t-interval

nearly normal condition for both groups.

$H_0: \mu_1 - \mu_2 = \Delta_0$ (delta naught is commonly 0)

$$SE(\bar{y}_1 - \bar{y}_2) = \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

Then use *t-score* to find p-value

$$t = \frac{(\bar{y}_1 - \bar{y}_2) - \Delta_0}{SE(\bar{y}_1 - \bar{y}_2)}$$

Model: student's t --- use **tcdf ( ,deg freedom)**