Thursday 3/19/20

Lesson 10.1: Which gender uses Twitter more?

twitter

$\hat{p}_1 = \frac{110}{200} = .55$

n_1

A recent random sample of 200 U.S. females revealed 110 use Twitter regularly. A separate random sample of 150 males revealed that 60 use Twitter regularly. Construct a 95% confidence interval for the true difference in proportions who use Twitter regularly (females – male).

n_2 $\hat{p}_2 = 60/150 = .40$

STATE: State the parameter you want to estimate and the confidence level.

Parameter: $p_1 - p_2$ True Difference in proportions (females-males)

Statistic: $\hat{p}_1 - \hat{p}_2 = .55 - .40 = .15$

Confidence level:

95%

PLAN: Identify the appropriate inference method and check conditions.

Name of procedure: Two Sample Z interval for $p_1 - p_2$

Check conditions:

Random:	10%		Normal/Large Counts	
SRS of 200 Females	$10(200) \leq N$	Def more than 2000 females	$n_1 p_1 \geq 10$	$n_2 p_2 \geq 10$
SRS of 150 males	$10(150) \leq N$	& 1500 males in the U.S.	$200(.55) \geq 10$	$150(.4) \geq 10$
			$110 \geq 10$	$60 \geq 10$
			$200(.45) \geq 10$	$150(.6) \geq 10$
			$90 \geq 10$	$90 \geq 10$

DO: If the conditions are met, perform the calculations.

General Formula: Point Estimate ± Margin of Error

Specific Formula: $(\hat{p}_1 - \hat{p}_2) \pm z^* \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$

invNorm(.025) = 1.96

Work:

$.15 \pm 1.96 \sqrt{\frac{.55(.45)}{200} + \frac{.4(.6)}{150}}$

$.15 \pm .104$

Answer: $(.046, .254)$

CONCLUDE: Interpret your interval in the context of the problem.

Interpret: We are 95% confident that the interval from .046 to .254 captures the true difference in proportions of females to males who use Twitter.

(We estimate females use twitter 4.6% to 25.4% more than males.)

Lesson 10.1: Confidence Interval for a Difference in Proportions

Important ideas: 2 sample Z interval for $p_1 - p_2$

$p_1 - p_2 \rightarrow$ true diff in prop.

$\hat{p}_1 - \hat{p}_2 \rightarrow$ statistic

$$(\hat{p}_1 - \hat{p}_2) \pm z^* \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$$

Interpretation of Interval

$(+,+) \rightarrow p_1$ is greater

$(-,-) \rightarrow p_2$ is greater

$(-,+) \rightarrow$ we don't know which is greater. May be no difference.

Check Your Understanding

A Pew Research Center poll asked independent random samples of working women and men how much they value job security. Of the 806 women, 709 said job security was very or extremely important, compared with 802 of the 944 men surveyed. Construct and interpret a 95% confidence interval for the difference in the proportion of all working women and men who consider job security very or extremely important.

State: $p_1 - p_2$ = true difference in the proportion of working women and men who consider job security very important. w/ 95% conf.

$\hat{p}_1 = \frac{709}{806} = .88$ $\quad \hat{p}_2 = \frac{802}{944} = .85$

PLAN: Two sample Z-interval for $p_1 - p_2$

Random: SRS stated

10% Cond: $10(806) \geq 10$, $10(944) \geq 10$ — Def more than 8,060 working women & 9,440 working men

Normal:
$806 \cdot (.88) \geq 10$ → $709 \geq 10$ ✓ $\quad 944(.85) \geq 10$ → $802 \geq 10$
$806(.12) \geq 10$ → $97 \geq 10$ $\quad 944(.15) \geq 10$ → $142 \geq 10$ ✓

Do: Pt. Estimate ± M.O.E.

$$\hat{p}_1 - \hat{p}_2 \pm z^* \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$$

$$(.88 - .85) \pm 1.96 \sqrt{\frac{.88(.12)}{806} + \frac{.85(.15)}{944}}$$

$.03 \pm .032$

$(-.002, .062)$

CONCLUDE: We are 95% confident that the interval from −.002 to .062 captures the true diff (women − men)

We do not know which is greater. !!