

Stat 145 Homework Solutions: Chapter 19

Problem 19.1

(a) The proportion of women who feel vulnerable is:

$$\hat{p}_F = \frac{27}{56} = 0.482$$

The proportion of men who feel vulnerable is:

$$\hat{p}_M = \frac{46}{63} = 0.730$$

(b) A 95% confidence interval for the difference (men minus women) is:

$$\begin{aligned} (0.730 - 0.482) &\pm 1.96 \sqrt{\frac{0.730(1 - 0.730)}{63} + \frac{0.482(1 - 0.482)}{56}} \\ 0.248 &\pm 0.171 \end{aligned}$$

Problem 19.7

The data is arranged in the table below.

Group	n	# of successes	\hat{p}
1 – African miners	33,809	223	0.0066
2 – European miners	1541	7	0.0045

The hypotheses are:

$$H_0 : p_1 = p_2$$

$$H_A : p_1 > p_2$$

The pooled proportion of successes is:

$$\hat{p} = \frac{223 + 7}{33809 + 1541} = \frac{230}{35350} = 0.0065$$

The value of the test statistic is:

$$\begin{aligned} z &= \frac{0.0066 - 0.0045}{\sqrt{0.0065(1 - 0.0065) \left(\frac{1}{33809} + \frac{1}{1541} \right)}} \\ &= 1.00 \end{aligned}$$

The P -value is:

$$P = P(Z \geq 1.00) = 1 - .8413 = .1587$$

This is not convincing evidence that the proportion of African miners who died was higher than the proportion of European miners who died.

Problem 19.8

(a) The value of \hat{p} is:

$$\hat{p} = \frac{1318}{2092} \doteq 0.63$$

A 95% confidence interval for p is:

$$\begin{aligned} 0.63 \pm 1.96\sqrt{\frac{0.63(1-0.63)}{2092}} \\ 0.63 \pm 0.0207 \end{aligned}$$

(b) The data is arranged in the table below.

Group	n	# of successes	\hat{p}
1 – Users	1318	1041	0.79
2 – Nonusers	774	294	0.38

A 95% confidence interval for the difference (users minus nonusers) is:

$$\begin{aligned} (0.79 - 0.38) \pm 1.96\sqrt{\frac{0.79(1-0.79)}{1318} + \frac{0.38(1-0.38)}{774}} \\ 0.41 \pm 0.04 \end{aligned}$$

Problem 19.15

The data is arranged in the table below.

Group	n	# of successes	\hat{p}
1 – Hispanic	539	286	0.5306
2 – White	292	164	0.5616

The hypotheses are:

$$H_0 : p_1 = p_2$$

$$H_A : p_1 \neq p_2$$

The pooled proportion of successes is:

$$\hat{p} = \frac{286 + 164}{539 + 292} = \frac{450}{831} = 0.5415$$

The value of the test statistic is:

$$\begin{aligned} z &= \frac{0.5306 - 0.5616}{\sqrt{0.5415(1 - 0.5415) \left(\frac{1}{539} + \frac{1}{292}\right)}} \\ &= -0.86 \end{aligned}$$

The P -value is:

$$P = P(Z \leq -0.86 \text{ or } Z \geq 0.86) = 2P(Z \leq -0.86) = 2(.1949) = .3898$$

This is not convincing evidence that the proportion of Hispanic drivers who wear seat belts is different from the proportion of white drivers who wear seat belts.

A 95% confidence interval for the difference (Hispanic minus white) is:

$$\begin{aligned} (0.5306 - 0.5616) \pm 1.96 \sqrt{\frac{0.5306(1 - 0.5306)}{539} + \frac{0.5616(1 - 0.5616)}{292}} \\ -0.031 \pm 0.071 \end{aligned}$$

Problem 19.17

(a) They should be simple random samples.

(b) The value of \hat{p} is:

$$\hat{p} = \frac{34}{1679} \doteq 0.0203$$

A 95% confidence interval for p is:

$$\begin{aligned} 0.0203 &\pm 1.96\sqrt{\frac{0.0203(1 - 0.0203)}{1679}} \\ 0.0203 &\pm 0.0067 \end{aligned}$$

Problem 19.17 (continued)

(c) The data is arranged in the table below.

Group	n	# of successes	\hat{p}
1 – Freshmen	1679	34	0.0203
2 – Seniors	1366	24	0.0176

The hypotheses are:

$$H_0 : p_1 = p_2$$

$$H_A : p_1 \neq p_2$$

The pooled proportion of successes is:

$$\hat{p} = \frac{34 + 24}{1679 + 1366} = \frac{58}{3045} = 0.019$$

The value of the test statistic is:

$$\begin{aligned} z &= \frac{0.0203 - 0.0176}{\sqrt{0.019(1 - 0.019) \left(\frac{1}{1679} + \frac{1}{1366} \right)}} \\ &= 0.54 \end{aligned}$$

The P -value is:

$$P = P(Z \leq -0.54 \text{ or } Z \geq 0.54) = 2P(Z \leq -0.54) = 2(.2946) = .5892$$

This is not convincing evidence that the proportion of freshmen who have used anabolic steroids is different from the proportion of seniors who have used anabolic steroids.

Problem 19.19

(a) The count in Europe is

$$12178(0.63) \doteq 7672$$

while the count in the United States is

$$863(0.46) \doteq 397$$

(b) A 95% confidence interval for the difference (Europe minus United States) is:

$$\begin{aligned} (0.63 - 0.46) \pm 1.96 \sqrt{\frac{0.63(1 - 0.63)}{12178} + \frac{0.46(1 - 0.46)}{863}} \\ 0.17 \pm 0.0343 \end{aligned}$$