p. 812 #25, 27

(25) 90% conf interval for 2-sample props

$\hat{p}_1$ = proportion of mice in breeding condition in good acorn years

$\hat{p}_2$ = proportion of mice in breeding condition in bad acorn years

$\hat{p}_1 = 54/72 = 0.75$ $\hat{p}_2 = 10/17 = 0.5882$

1) SRS -

2) Normalcy - $n_1\hat{p}_1 > 5$ $n_1\hat{p}_2 > 5$

$54 > 5$ ✓ $10 > 5$ ✓

$n_1(1-\hat{p}_1) > 5$ $n_1(1-\hat{p}_2) > 5$

$18 > 5$ ✓ $7 > 5$ ✓

3) Independence pop > 10(72) pop > 10(17)

$$(\hat{p}_1 - \hat{p}_2) \pm 1.645\left(\sqrt{\frac{(.75)(.25)}{72} + \frac{(.5882)(.4118)}{17}}\right) =$$

$$(.75 - .5882) \pm 1.645\left(\sqrt{.0026 + .0142}\right)$$

$$.1618 \pm 1.645(.1296)$$

$$.1618 \pm .2132$$

$$(-.0514, .375)$$ calc $(-.0518, .37529)$

We are 90% confident that the percent of mice ready for breeding in the good acorn years will be between 5.18% lower and 37.5% higher than the percent of mice ready for breeding in the bad acorn years

(27) $\hat{p}_{NR} = \frac{5690}{12931} = .44003$ $\hat{p}_R = \frac{1051}{3285} = .3199$

a) 95% conf int for $\hat{p}_{NR}$:

1) SRS

2) Normality $n\hat{p}_{NR} \geq 5$ $n(1-\hat{p}_{NR}) \geq 5$

$5690 > 5$ $7241 > 5$

3) Independence

$$0.44003 \pm 1.96\sqrt{\frac{(.44003)(.55997)}{12931}} = 0.44003 \pm 1.96(.00437)$$

$$0.44003 \pm .00856$$

$$(.43147, .4486)$$

We are 95% confident the true percent of cars that go faster than 65 mph when no radar is present is between 43.15% and 44.86%.

b) 95% conf int for $\hat{p}_{NR} - \hat{p}_R$: $(.44003 - .3199) \pm 1.96\sqrt{\frac{(.44003)(.55997)}{12931} + \frac{(.3199)(.6801)}{3285}}$

$$0.12013 \pm 1.96(.00924)$$

$$0.12013 \pm .0181$$

$$(0.10203, 0.1382)$$

We are 95% confident the true percent of cars that go faster than 65 mph when no radar is present compared to when a radar is present is between 10.2% and 13.8%.

c) In a cluster of cars, one driver's behavior can affect the others, thereby eliminating independence among the drivers.

p. 819 #29, 30

29 • Parameter p_T = proportion of athletes at schools which test for drugs who said they were using drugs.

p_{NT} = proportion of athletes at schools which do not test for drugs who said they were using drugs.

• Test: 2 sample z-test for proportions

$\hat{p}_T = 7/135 = .0519$ $\hat{p}_{NT} = 27/141 = .1915$ $\hat{p}_C = \frac{7+27}{135+141} = 34/276 = .1232$

• Conditions: 1) SRS - questionable

2) Normality - $n_1\hat{p}_C \geq 10$ $n_2\hat{p}_C \geq 10$

$135(.1232) \geq 10$ $141(.1232) \geq 10$

$16 \geq 10$ ✓ $17 \geq 10$ ✓

$n_1(1-\hat{p}_C) \geq 10$ $n_2(1-\hat{p}_C) \geq 10$

$135(.8768) \geq 10$ $141(.8768) \geq 10$

$119 \geq 10$ ✓ $124 \geq 10$ ✓

3) Independence pop $\geq 10(n_1)$ pop $\geq 10(n_2)$

• Hypothesis: $H_0: p_T = p_{NT}$

$H_a: p_T < p_{NT}$

• Test Statistic: $z = \dfrac{.0519 - .1915}{\sqrt{(.1232)(.8768)\left(\frac{1}{135} + \frac{1}{141}\right)}} = -3.55$

• P-value $P(z < -3.55) = 0.0002$ $\boxed{\text{Calc used prop z-test}}$

Since p-value 0.0002 is significant at $\alpha = 0.01$, we have evidence to reject H_0 and conclude that drug use among athletes is lower at schools which drug test.

(30) a) Patients were randomly assigned to two groups. The first group of 1649 patients received only aspirin. The second group of 1650 received aspirin and dipyridamole.

b) • Parameters p_A = proportion of stroke victims who received aspirin only
p_{AD} = proportion of stroke victims who received aspirin and dipyridamole

• Test: 2 sample z-test for proportions

$\hat{p}_A = 206/1649 = .1249$ $\hat{p}_{AD} = 157/1650 = .0952$ $\hat{p}_C = \frac{206+157}{1649+1650} = \frac{363}{3299}$

$= .11$

• Hypothesis: $H_0: p_A = p_{AD}$
$H_a: p_A \neq p_{AD}$

• Test statistic: $z = \frac{.1249-.0952}{\sqrt{(.11)(.89)\left(\frac{1}{1649}+\frac{1}{1650}\right)}} = 2.726$

• P-value $2P(z > 2.726) = 2(.00321) = .0064$ calc 2prop ztest

Since p-value .0064 is significant at $\alpha = .01$, we have evidence to conclude there is a difference in the proportion of strokes between aspirin only and aspirin plus dipyridamole patients.

c) 95% conf int for deaths

p_A = proportion of deaths for patients on aspirin
p_{AD} = proportion of deaths for patients on aspirin + dipyridamole

$\hat{p}_A = 182/1649 = .1104$
$\hat{p}_{AD} = 185/1650 = .1121$

$(.1104 - .1121) \pm 1.96\left(\sqrt{\frac{(.1104)(.8896)}{1649} + \frac{(.1121)(.8879)}{1650}}\right)$

$-.0017 \pm 1.96(.01095)$

$-.0017 \pm .0215$ $(-.0232, .0198)$

calc $(-.0232, .01971)$

30 cont'd
p 820 30, 31, 32

30 cont'd We are 95% confident the difference in proportion of deaths for patients taking aspirin only and taking aspirin + dipyridamole is between -2% and 2%.

d) Type I error - reject Ho when in fact Ho is true.
Researchers conclude there is a significance difference in the proportions of strokes with these two treatments, when in fact there is no difference.

Type II error - fail to reject Ho when in fact Ho is false.
Researchers conclude there is no difference in the proportion of strokes with these two treatments, when in fact there is a difference.

Type II error more serious - patients will not receive treatment and possibly suffer from strokes.
No patients harmed with Type I error.

31 • Parameter: p_B = proportion of black families earning at least \$40,000 who own a home computer
p_W = proportion of white families earning at least \$40,000 who own a home computer

• Test: 2 sample z-test for proportions

$\hat{p}_B = 86/131 = .6565$ $\hat{p}_W = 1173/1916 = .6122$ $\hat{p}_C = \frac{86+1173}{131+1916} = 1259/2047 = .615$

• Conditions: 1) SRS
2) $n_1\hat{p}_c \geq 10$ $n_1(1-\hat{p}_c) \geq 10$ $n_2\hat{p}_c \geq 10$ $n_2(1-\hat{p}_c) \geq 10$