第四章

4.14 $\hat{p} = \dfrac{\sum y_i}{n} = \dfrac{25}{30} = \dfrac{5}{6} = 0.83$

$$B = 2\sqrt{\frac{\hat{p}\hat{q}}{n-1}\left(\frac{N-n}{N}\right)} = 2\sqrt{\frac{(5/6)(1/6)}{29}\left(\frac{300-30}{300}\right)} = .131$$

4.15 $B = .05 \quad D = B^2\ /\ 4 = (.05)^2 / 4 = .000625$

From Equation (4.19), we have

$$n = \frac{Npq}{(N-1)D + pq} = \frac{300\ (5/6)\ (1/6)}{299\ (.000625) + (5/6)\ (1/6)} = 127.90 \approx 128$$

4.18 $N\hat{p} = N\dfrac{1}{n}\sum y_i = 250\ \dfrac{1}{50}(20) = 100$

$$B = 2\sqrt{N^2\ \frac{\hat{p}\hat{q}}{n-1}\left(\frac{N-n}{N}\right)} = 2\sqrt{(250)^2\ \frac{.4(.6)}{49}\left(\frac{250-50}{250}\right)} = 31.30$$

4.19 $N = 1000,\ n = 10$

$$\bar{y} = \frac{\sum y_i}{n} = \frac{20}{10} = 2.0$$

$$s^2 = \frac{\sum (y_i - \bar{y})^2}{n-1} = \frac{\sum y_i^2 - n\bar{y}^2}{n-1} = \frac{60 - 10(4)}{9} = \frac{20}{9} = 2.22$$

$$\hat{\mu} = \bar{y} = 2$$

$$B = 2\sqrt{\frac{s^2}{n}\left(\frac{N-n}{N}\right)} = 2\sqrt{\frac{2.22}{10}\left(\frac{1000-10}{1000}\right)} = .938$$

4.20 $\hat{p} = \dfrac{1}{n}\sum y_i = \dfrac{1}{1000}430 = .430$

$$B = 2\sqrt{\frac{\hat{p}\hat{q}}{n-1}\left(\frac{N-n}{N}\right)} = 2\sqrt{\frac{.430(.570)}{999}\left(\frac{99000-1000}{99000}\right)} = .0312$$

4.21 $B = .02,\ \ D = B^2\ /\ 4 = (.02)^2\ /\ 4 = .0001$

$$n = \frac{Npq}{(N-1)D + pq}$$

$$= \frac{99000\ (.43)\ (.57)}{98999\ (.0001) + .43\ (.57)} = 2391.8 \approx 2392$$

4.22 **(a)** $N = 10{,}000 \quad n = 500$

$$\hat{\mu}_1 = \bar{y}_1 = 2.3$$

$$\hat{\mu}_2 = \bar{y}_2 = 4.52$$

$$B_1 = 2\sqrt{\frac{s_1^2}{n_1}\left(\frac{N_1 - n_1}{N_1}\right)} = 2\sqrt{\frac{.65}{500}\left(\frac{10000 - 500}{10000}\right)} = .070$$

$$B_2 = 2\sqrt{\frac{s_2^2}{n_2}\left(\frac{N_2 - n_2}{N_2}\right)} = 2\sqrt{\frac{.97}{500}\left(\frac{10000 - 500}{10000}\right)} = .086$$

(b) An approximate 95% confidence interval on the difference between means for the two populations is shown below. The mean for rabbits is larger than the mean for deer by an amount between 2.11 and 2.33 units.

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

$$(2.30 - 4.52) \pm 2\sqrt{\frac{0.65}{500} + \frac{0.97}{500}}$$

$$-2.22 \pm 0.11$$

4.23 $\bar{y} = 2.1 \quad s = .4 \quad N = 200, \quad n = 20$

$$\hat{\mu} = \bar{y} = 2.1$$

$$B = 2\sqrt{\frac{s^2}{n}\left(\frac{N - n}{N}\right)} = 2\sqrt{\frac{(.4)^2}{20}\left(\frac{200 - 20}{200}\right)} = .17$$

4.26 $\sigma = 1, \quad B = 1, \quad D = B^2 / 4 = 1/4 = .25$

$$n = \frac{N\sigma^2}{(N-1)D + \sigma^2} = \frac{200(1)^2}{199\ (.25) + 1^2} = 3.94 \approx 4$$

4.27 $\hat{\tau} = N\bar{y} = 1500(25.2) = 37{,}800$

$$B = 2\sqrt{N^2\left(\frac{s^2}{n}\right)\left(\frac{N - n}{n}\right)} = 2\sqrt{(1500)^2\left(\frac{136}{100}\right)\left(\frac{1500 - 100}{1500}\right)} = 3379.94$$

4.34 By using s^2 to estimate σ^2 in Equation (4.14),

$$n = \frac{N s^2}{(N-1)D + s^2} = \frac{1500\ (136)}{1499(4) + 136} = 399.4 \approx 400$$

where

$$D = \frac{B^2}{4N^2} = \frac{(1500)^2}{4(1500)^2} = 4$$

4.50 The proportion choosing "blamed the players" is dependent on the proportion choosing "blamed the owners" for the baseball strike. Thus, an approximate estimate of the true difference is

$$.29 - .34 \pm 2\sqrt{\frac{(.29)(.71)}{600} + \frac{(.34)(.66)}{600} + 2\frac{(.29)(.34)}{600}}$$

$$-.05 \pm .06 \text{ or } -.11 \text{ to } .01$$

There is no evidence to suggest that the true proportions who blame the players and owners are really different. The observed difference could be simply due to chance.