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

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

4.16 $\hat{\mu} = \bar{y} = 12.5$

$$B = 2\sqrt{\frac{s^2}{n}\left(\frac{N-n}{N}\right)} = 2\sqrt{\frac{1252}{100}\left(\frac{10000-100}{10000}\right)} = 7.04$$

4.17 $\hat{\tau} = N\bar{y} = 10000(12.5) = 125{,}000$

$$B = 2\sqrt{N^2\left(\frac{s^2}{n}\right)\left(\frac{N-n}{N}\right)} = 2\sqrt{10000^2\ \frac{1252}{100}\ \frac{10000-100}{10000}} = 70{,}412.50$$

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

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

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

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

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

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

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

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