BIOS 7250 Stratified Random Sampling

I. Estimation of Population Mean, Total, and Proportion

A. Estimation of Population Mean $\overline{X}$

1. $\hat{\mu}_x = \bar{x}_{str} = \sum_{h=1}^{L}\left(\frac{N_h}{N}\right)\bar{x}_h$

2. $E(\bar{x}_{str}) = \overline{X}$ (6.2)

3. $SE(\bar{x}_{str}) = \left[\frac{1}{N^2}\sum_{h=1}^{L} N_h^2\left(\frac{\sigma_{hx}^2}{n_h}\right)\left(\frac{N_h - n_h}{N_h - 1}\right)\right]^{\frac{1}{2}}$ (6.2)

4. $S\hat{E}(\bar{x}_{str}) = \left[\frac{1}{N^2}\sum_{h=1}^{L} N_h^2\left(\frac{s_{hx}^2}{n_h}\right)\left(\frac{N_h - n_h}{N_h}\right)\right]^{\frac{1}{2}}$ (6.7)

5. 100(1-α)% Confidence Interval for $\overline{X}$

$$\bar{x}_{str} \pm Z_{1-\frac{\alpha}{2}} S\hat{E}(\bar{x}_{str})$$

B. Estimation of Population Totals $X = N\bar{X}$

1. $\hat{X} = x'_{str} = \sum_{h=1}^{L} x'_h = \sum_{h=1}^{L} N_h \bar{x}_h$

2. $E(x'_{str}) = X$ (6.1)

3. $SE(x'_{str}) = N[SE(\bar{x}_{str})] = \left[\sum_{h=1}^{L} N_h^2 \left(\frac{\sigma_{hx}^2}{n_h}\right)\left(\frac{N_h - n_h}{N_h - 1}\right)\right]^{\frac{1}{2}}$ (6.1)

4. $S\hat{E}(x'_{str}) = \left[\sum_{h=1}^{L} N_h^2 \left(\frac{s_{hx}^2}{n_h}\right)\left(\frac{N_h - n_h}{N_h}\right)\right]^{\frac{1}{2}}$ (6.6)

5. 100(1-α)% Confidence Interval for X

$$x'_{str} \pm Z_{1-\frac{\alpha}{2}} S\hat{E}(x'_{str})$$

C. Estimation of Population Proportions P_Y

1. $\hat{P}_Y = p_{y,str} = \sum_{h=1}^{L} \left(\frac{N_h}{N} \right) p_{hy}$

3. E($p_{y,str}$) = P_Y (6.3)

3. SE($p_{y,str}$) = $\left[\frac{1}{N^2} \sum_{h=1}^{L} N_h^2 \left(\frac{P_{hy}(1- P_{hy})}{n_h} \right) \left(\frac{N_h - n_h}{N_h - 1} \right) \right]^{\frac{1}{2}}$ (6.3)

4. $S\hat{E}$ ($p_{y,str}$) = $\left[\frac{1}{N^2} \sum_{h=1}^{L} N_h^2 \left(\frac{p_{hy}(1- p_{hy})}{n_h - 1} \right) \left(\frac{N_h - n_h}{N_h} \right) \right]^{\frac{1}{2}}$ (6.8)

4. 100(1-α)% Confidence Interval for P_Y

$$p_{y,str} \pm Z_{1-\frac{\alpha}{2}} S\hat{E}(p_{y,str})$$