BIOS 7250 - Chapter 10 – Two-Stage Cluster Sampling: Clusters Sampled with Equal Probability

I. Simple Two-Stage Cluster Sampling

A. More efficient than single stage cluster sampling when clusters are homogeneous within.

B. Selection:

1. Select a simple random sample of clusters at the first stage.
2. At the second stage, select a simple random sample of listing units from each cluster chosen in the first stage. The fraction of listing units is the same (or nearly the same) for each sample cluster.

C. Example of selecting a simple two-stage cluster sample – page 271, table 10.1. Two frames are needed – 1 for health centers and 1 for nurse practitioners.

D. Example: Pages 272-273.

E. Notation: Boxes 10.1, 10.2, pages 274-275.

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II. Estimation of Population Characteristics

A. Estimation of Population Totals X

1. $$x'_{clu} = \frac{x}{f} = \frac{x}{f_1 f_2} = \left[\frac{M\bar{N}}{m\bar{n}}\right] x$$

M = the number of clusters in the population
m = the number of clusters in the sample
N = the total number of listing units in the population
$\bar{n}$ = the number of listing units sampled from each cluster
$\bar{N} = \frac{N}{M}$ = the average number of listing units in the population
$f_1 = \frac{m}{M}$ = the 1st stage sampling fraction
$f_2 = \frac{\bar{n}}{\bar{N}}$ = the 2nd stage sampling fraction
x = the sample total for characteristic X.

Example X: Estimation of population total X
the number of patients seen
$M = 5,\ m = 3,\ N = 15,\ \bar{N} = 3,\ \bar{n} = 2$

$$x = (44+18)+(42+10)+(16+32) = 62+52+48 = 162$$

$$x'_{clu} = \frac{x}{f} = \frac{x}{f1 * f2} = \left[\frac{M\bar{N}}{m\bar{n}}\right] x = \left[\frac{(5)(3)}{(3)(2)}\right](162) = 405$$

Mean per health center
405/M=405/5=81
Mean per nurse praction
405/N=405/15=27

y=(6+6)+(3+2)+(5+14)=36
r=y/x=36/162=0.2222

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