Pacific Training on Sampling Methods for Producing Core Data Items for Agricultural and Rural Statistics

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Module 2: Review of Basics of Sampling Methods
Session 2.5: Objectives & Uses of Stratification

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Topics Covered

* What is stratification?
* How surveys can benefit from stratification
* Estimation formula for stratified samples

What is Stratification?

* Stratification is the process of taking a population and dividing it in to sub-populations. It is commonly used to take a heterogenous population and divided it in to M homogenous sub-populations
  * Heterogeneous: Units are all very different in nature
  * Homogenous: Units are similar to each other

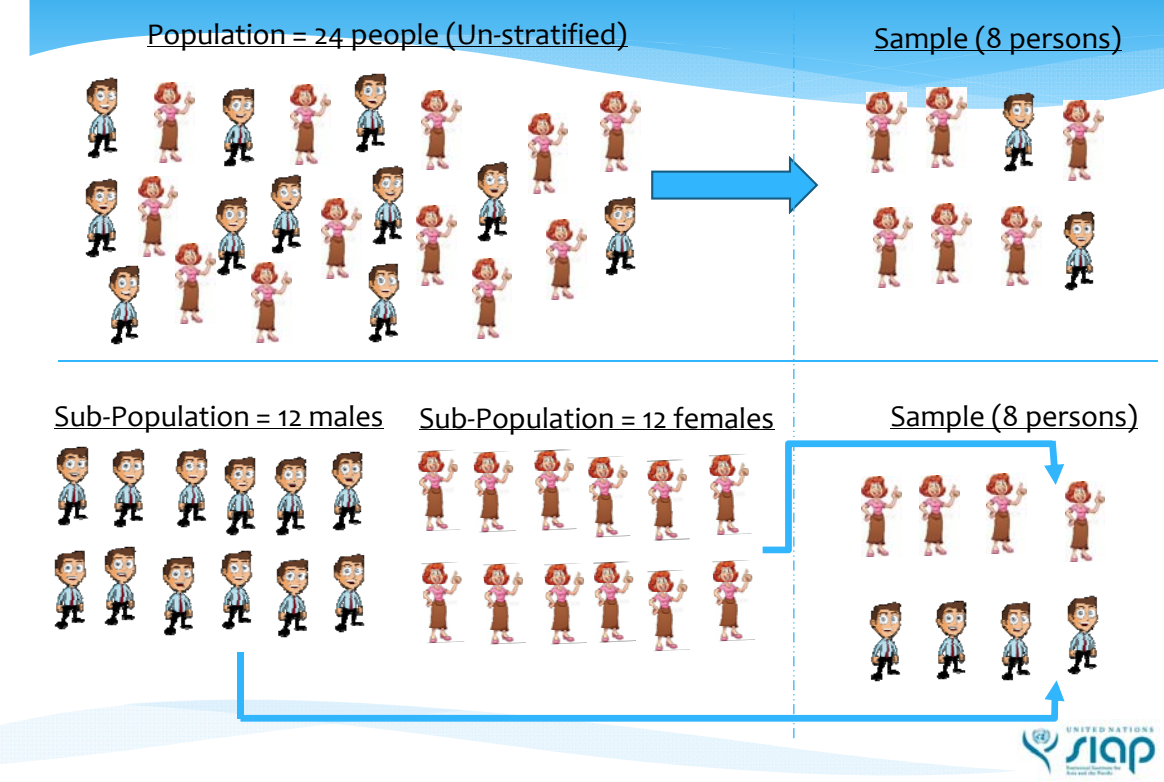
Why would we want to do this?

* Helps us control sample sizes for different sub-populations
* Helps us ensure a more representative sample is selected
* Allows us to use different sample strategies within each sub-population

Stratification

* Divide the population into distinct groups (strata) based on auxiliary information (*stratification variables*)
* The division of the population into strata is termed "stratification"
* Each "stratum" is composed of homogeneous units in regards with stratifying variable.

Example of stratifying a population



Handy things to know about stratification

- Strata can be created based on any auxiliary information available
  - Geography
  - Age or Sex
  - Farm size
- Sampling fractions can be different in different strata
- Sampling selection method can be different in different strata
- The total sample size is distributed over all strata
- Stratum results are combined to produce results for the entire population of interest

Advantages & Disadvantages – Stratified Sampling

* Advantages
  * Can control sample sizes for different sub-populations (eg, Regions)
  * Generally produces low SE's
  * Can adopt different sampling strategies for each stratum

* Disadvantages
  * Can be expensive in that you must sample from every stratum

Estimation in Stratified Sampling

* For stratified samples, the weights are determined separately within each stratum

Example (for 2 strata)

- Population (N) = 200, N_1 = 150, N_2 = 50
- Sample (n) = 15, n_1 = 10, n_2 = 5
  - (assume simple random sampling)
- Weights are derived as follows:

  $w_1 = N_1/n_1 = 150/10 = 15$

  $w_2 = N_2/n_2 = 50/5 = 10$

Estimation in Stratified Sampling (cont)

Estimate of a total

$$\hat{Y} = \sum_{h=1}^{H} \hat{Y}_h$$

where

$$\hat{Y}_h = N_h \times \sum_{i=1}^{n_h} \frac{y_{h,i}}{n_h} = \sum_{i=1}^{n_h} w_h y_{h,i} \quad \text{where} \quad w_h = \frac{N_h}{n_h}$$

Estimation in Stratified Sampling (cont)

Estimate of a mean

$$\hat{\bar{Y}} = \frac{\sum_{h=1}^{H} N_h \bar{y}_h}{N}$$