

Second Regional Training Course on Sampling Methods for
Producing Core Data Items for Agricultural and Rural Statistics

Module 2: Review of Basics of Sampling Methods: Probability Sampling, Sample Selection and Sample Design and Estimation

Session 2.2: Systematic sampling

9 – 20 November 2015,
Jakarta, Indonesia



Systematic Sampling

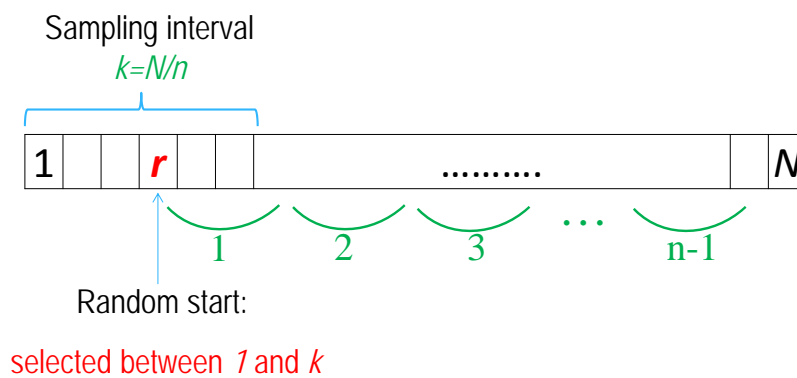
- Linear systematic sampling
- Circular systematic sampling

Linear Systematic Sampling

- * Systematic Sampling (SYS), like SRS, involves selecting n sampling units from a population of N units
- * Instead of randomly choosing the n units in the sample, a skip pattern is run through a list (frame) of the N units to select the sample
- * The skip or sampling interval, $k = N/n$

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Linear Systematic Sampling



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Linear Systematic Sampling

Selection Procedure

- 1) Form a **sequential list** of population units
- 2) Decide on a sample size n and compute the skip (**sampling interval**), $k = N/n$
- 3) Choose a random number, r (**random start**) between 1 and k (inclusive)
- 4) Add “ k ” to selected random number to select the second unit and continue to add “ k ” repeatedly to previously selected unit number to select the remainder of the sample

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Linear Systematic Sampling

Problem

$k = N/n$ is integer

- N is a multiple of n
- N units can be grouped into k samples of exactly n units each
- Sampling design is **epsem**.

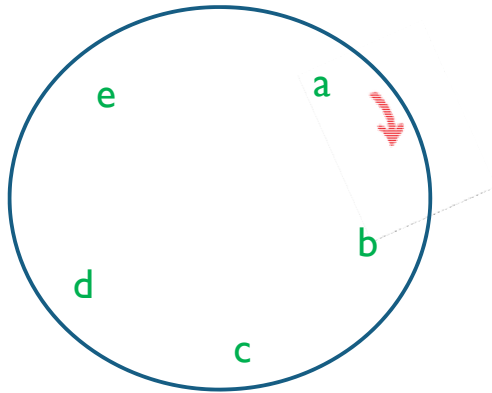
$k = N/n$ is **NOT** integer

- Number of units selected with the sampling interval k
[= nearest integer to N/n] – no longer **epsem**.

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Circular Systematic Sampling

Solution



$$K=5/2=2.5$$

a) If $k=2$ possible samples are:

ac ; bd ; ce ; da and eb

b) If $k=3$ possible samples are:

ad ; be ; ca ; db and ec .

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Circular Systematic Sampling

Selection procedure

- 1) Determine the interval k – rounding down to the integer nearest to N/n
(If $N = 15$ and $n = 4$, then k is taken as 3 and not 4)
- 2) Take a random start between 1 and N
- 3) Skip through the circle by k units each time to select the next unit until n units are selected
- 4) Thus there could be N possible distinct samples instead of k

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Systematic Sampling

To remember that SYS

- * Often used as an alternative to SRS.
- * Requires ordering of the population units
 - * For SYS sample to be more representative
 - * Geographical ordering ensures fair spread of sample
 - * Ordering by age ensures representativeness of all ages
- * Ensures each population unit equal chance of being selected into sample

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Systematic Sampling

Advantages

- Easier to draw a sample
- Distributes sample more evenly
- Likely to be more efficient than SRSWOR, particularly when ordered by characteristics related to variable of interest

Disadvantages

- Requires complete list of the population
- A bad arrangement of the units may produce a very inefficient sample
- Variance estimates cannot be obtained from a single systematic sample**

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Use of systematic selection:

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implicit stratification

- * Make use of the order available to achieve a *better spread*
- * Normally geographical location of the units
- * *Implicit stratification*: strata with size k (sampling interval)

Implicit stratification

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* $N=15$, $n=3$, $k=15/3=5$

$r=2$ (random number between 1 &5)

