SAMPLING DESIGN

Dr. Mutua Kilai, PhD

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Department of Pure and Applied Sciences

Introduction

- A sample design is a definite plan for obtaining a sample from a given population.
- It refers to the technique or the procedure the researcher would adopt in selecting items for the sample.
- Sample design is determined before data are collected. There are many sample designs from which a researcher can choose.
- Some designs are relatively more precise and easier to apply than others.

Steps in Sample Design

- While developing a sampling design the researcher may pay attention to the following:

  i. **Type of Universe** The first step in developing any sample design is to clearly define the set of objects, technically called the Universe, to be studied.

  ii. **Sampling Unit** A decision has to be taken concerning a sampling unit before selecting sample. Sampling unit may be a geographical one such as state, district, village, etc., or a construction unit such as house, flat, etc., or it may be a social unit such as family, club, school, etc., or it may be an individual.

  iii. **Source list** It is also known as ‘sampling frame’ from which sample is to be drawn. It contains the names of all items of a universe (in case of finite universe only).

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- A continuation of the steps:

iv. **Size of sample**: This refers to the number of items to be selected from the universe to constitute a sample.

v. **Parameters of interest**: In determining the sample design, one must consider the question of the specific population parameters which are of interest.

Cont'd

- Continuation

vi. **Budgetary constaint**: Cost considerations, from practical point of view, have a major impact upon decisions relating to not only the size of the sample but also to the type of sample.

vii. **Sampling Procedure**: Finally, the researcher must decide the type of sample he will use i.e., he must decide about the technique to be used in selecting the items for the sample.

Sampling Techniques

- **Sampling** is the process or technique of selecting a study sample of appropriate characteristics and of adequate size.

Why use sampling in research

- Unable to study all members of a population
- Reduce selection bias
- Feasibility, save time and money
- Measurements may be better in sample than in entire population

Definitions

Population

The group to which the results of the study will be generalized or applicable. A set which includes all measurements of interest to the researcher.

Target population

The group from which the sample ultimately is selected. Who you will approach to collect your data

Study sample

The individuals who will volunteer or be selected from the target population and are the final source of data, and the final group from whom complete data will be collected. Must be similar to population on characteristic being investigated, and it’s a subset of the population.

Sampling Frame

- This is the complete list of sampling units (study subjects) in the target population to be subjected to the sampling procedure.

- Completeness and accuracy of this list is essential for the success of the study.

Sampling Units

- These are the individual units / entities that make up the frame just as elements are entities that make up the population.

- E.g., Each member from the sampling frame is sampling unit.

Sampling Error

- This arises out of random sampling and is the discrepancies (inconsistency) between sample values and the populations' value.

Sampling Variation

- Due to infinite variations among individuals and their surrounding conditions.
- Produce differences among samples from the population and is due to chance.

Decisions required for selecting sample

- Specify what is the target population. This is entirely determined by the research objective.
- Specify what is the study population. (e.g., who are eligible for inclusion in the study).
- Select a sampling design (technique) for obtaining a sample for study.
- Strategy to ensure high response or participation rate, otherwise inference must take account of non-responses.

Study Participants

- Study participants may still be not representative of the target population even with random sampling because of:

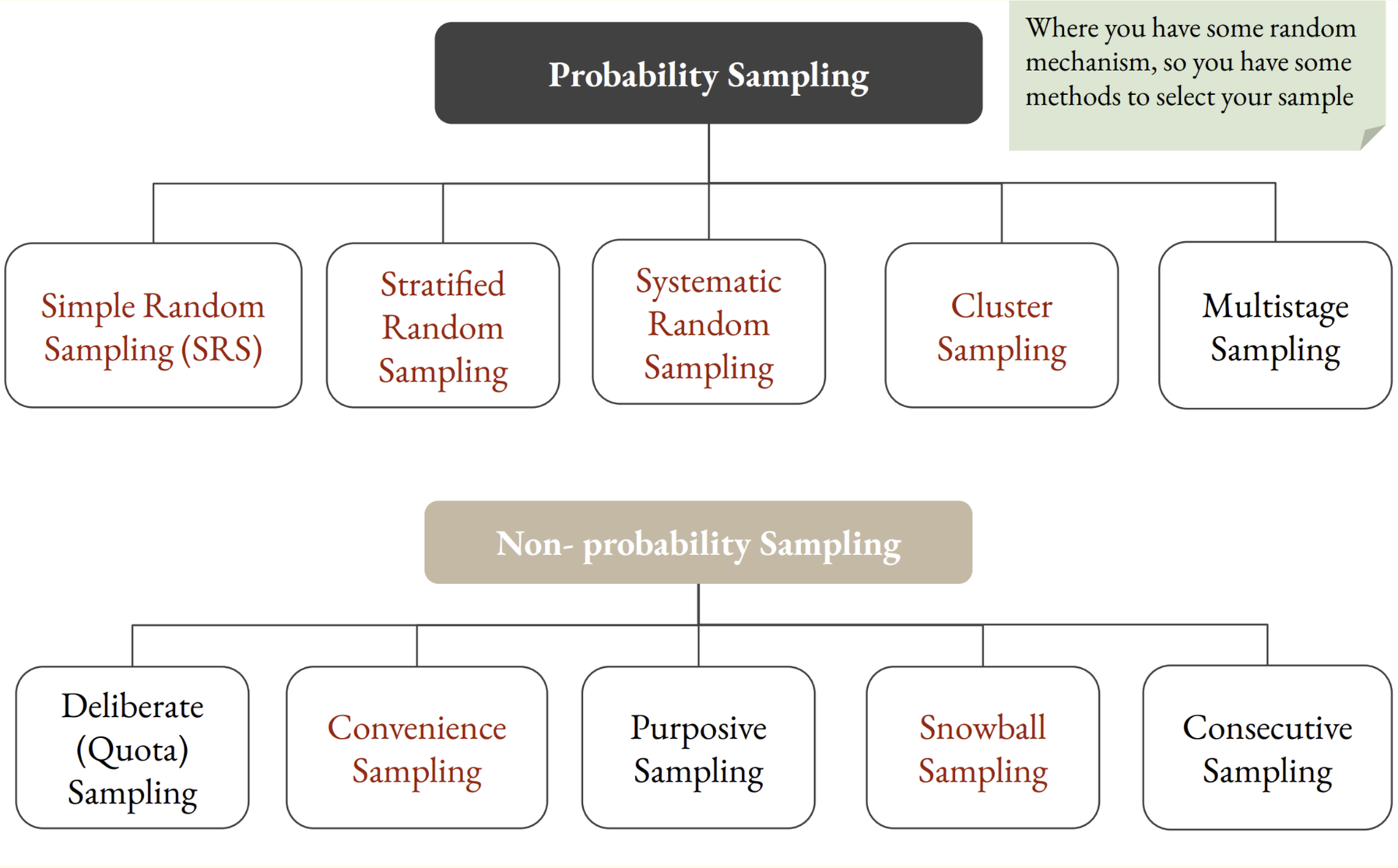
  i. Sampling frame is out of date

  ii. Failure to recruit eligible subjects

  iii. Non consent or non-response

  iv. Drop Out/Withdrawal

Types of Sampling Techniques



Simple Random Sampling

- There is equal probability of being selected.
- The techniques employed are lottery method and random table method

Advantages

- Simple process and easy to understand
- Easy calculation of means and variance
- Most representative group, Avoids selection bias

Disadvantages

- Not most efficient method, that is, not the most precise estimate for the cost
- Cannot always be certain that there is an equal chance of selection
- Non-respondents or refusal

Systematic Random Sampling

- The sample is chosen by selecting a random starting point and then picking every i th element in succession from the sampling frame.

- The sampling interval i, is determined by dividing the population size N by the sample size n and rounding to the nearest integer.

Advantages

- Sampling frame does not need to be defined in advanced
- Easier to implement in the field
- If there is unrecognized trends in the sample frame, the systematic sample ensure coverage of the spectrum of units

Disadvantages

- Variance cannot be estimated unless assumptions are made

Stratified Random Sampling

- A two-step process in which the population is partitioned into sub populations, or strata.
- The strata should be mutually exclusive and collectively exhaustive in that every population element should be assigned to one and only one stratum and no population elements should be omitted.
- Next, elements are selected from each stratum by a random procedure, usually simple random sampling.
- The sampling frame comprises groups, or strata, with certain characteristics
- A sample of units are selected from each group or stratum

Advantages

- Assures that certain subgroups are represented in a sample
- Allows investigator to estimate parameters in different strata
- More precise estimates of the parameters because strata are more homogeneous.
- Strata of interest can be sampled most intensively, e.g. groups with greatest variance
- Administrative advantages

Disadvantages

- Loss of precision if small number of units is sampled from strata

Cluster Random Sampling

- The population is first divided into mutually exclusively groups of elements called clusters.
- Ideally, each cluster is a representative small-scale version of the population (i.e., heterogeneous group)
- A simple random sample of the clusters is then taken.
- All elements within each sampled (chosen) cluster form the sample

Advantages

- The entire sampling frame need not be enumerated ni advance, just the clusters once identified

- More economical in terms of resources than simple random sampling

Disadvantages

- Loss of precision, i.e., weather variance, but can be accounted for with larger number of clusters.

Non-Probability Sampling

Convenience Sampling

- Convenience sampling attempts to obtain a sample of convenient elements.
- Often, respondents are selected because they happen to be in the right place at the right time.
- “Take them where you find them”, nonrandom.

Purposive (Judgemental Sampling)

- Purposive sampling (criterion-based sampling)
- Establish criteria necessary for being included in study and find sample to meet criteria.
- Solution: Screening
- Obtain a sample of larger population and then those subjects that are not members of the desired population are screened or filtered out.
- E.g., if you want to study smokers but can’t identify all smokers.

Deliberate (Quota Sampling)

- Quota sampling may be viewed as two-stage restricted judgmental sampling.
- Technique:
  i. The first stage consist of developing control categories, or quotes, of population elements.
  ii. In the second stage, sample elements are selected based on convenience or judgment.

Snowballing Sampling

- In snowball sampling, an initial group of respondents are selected, usually at random.
- After being interviewed, these respondents are asked to identify others who belong to the target population of interest.
- Subsequent respondents are selected based on the referrals.

Consecutive Sampling

- Consecutive series of consecutive patients with a condition of interest.

- Consecutive series means all patients with the condition within hospital or clinic, not just the patient that investigators happen to know about