PHYSICAL EDUCATION

Subject : Physical Education
Semester : 4th
Paper No. and Title : (401) Test, Measurement and Evaluation in Physical Education

Sampling Technology

1.0 Objective:

In Statistics, formation of an adequate sample is a tough task as sample is that subset of the population, by analyzing which one can predict the population characteristics. This unit considers various sampling procedures. After reading this unit, we will be able to:

- Know what is sample
- Know what is population
- Different sapling techniques with their advantages and disadvantages.

1.1 Some terms Used in Sampling Technology :

Population : Population is the aggregate of living or non-living being of similar types.

Sample: Sample is a part or fraction of a population selected on some basis. Sample consist few items of a population. In principle a sample should be such that it is a true representative of the population.

Sampling Method: Sampling method means the manner or scheme under which the required number of units are selected in a sample from a population

Sampling Unit: The constituents of a population which are the individuals to be sampled from the population and cannot be further subdivided for the purpose of sampling at a time are called sampling units. For example, in studying the average income per family, a household may be the sampling unit.

Sampling Frame: For adopting any sampling procedure it is essential to have a list or map identifying each sampling unit by a number. Such a list is called sampling frame.

1.2 Sampling Techniques:

Different types of sampling are-

- ✓ Non-probability Sampling

- ✓ Probability Sampling
- ✓ Non-probability or Judgment Sampling

Here, the selection of sampling units entirely depends on the choice of the investigator. This type of sampling is adopted when it is not possible to adopt any random procedure for selection of sampling units.

Some of the Non Probability Samplings are:

- ❖ **Purposive Sampling-** Here, a sample is drawn from a population based entirely on the personal judgment of the investigator.
- ❖ **Quota Sampling-** Here, quotas are fixed according to the basic parameters of the population determined earlier and each field investigator is assigned with quotas of number of elementary units to be interviewed.
- ❖ **Convenience Sampling-** Here, a sample is obtained by selecting convenient population elements from the population.
- ❖ **Sequential Sampling-** Here, a number of sample lots are drawn one after another from the population depending on the results of the earlier samples drawn from the same population.

Probability Sampling

Here, all the sample units have some probability of selecting in the sample.

- ❖ Simple random sampling
- ❖ Stratified Random Sampling
- ❖ Systematic Sampling
- ❖ Cluster Sampling
- ❖ Multi-stage sampling
- ❖ Probability Proportional to size Sampling

1.2.1 Simple Random Sampling (SRS)

When equal probability of selection is attached to each sampling unit at each draw, the selection procedure is known as simple random sampling. If there are N units in the population, then the probability of selection of each unit is 1/N.

Advantages of simple random sampling

a) It is simple to conceptualize.

b) Because every unit in the population has equal chance of being included in the sample, the sample is assured of being representative and subject only to sampling error.

c) Estimates are easy to calculate.

d) Sample size calculations are easy.

Disadvantages of simple random sampling

a) All *N* enumeration units in the population must be identified and labelled prior to sampling. This process is potentially so expensive and time consuming that it becomes unrealistic to implement in practice.

b) Sampled individuals may be highly dispersed. This suggests that visiting each of the sampled individuals may be a time-consuming and expensive process.

c) Minority subgroups of interest in the population may not be present in the sample in sufficient numbers for study.

e) It ignores prior information that may be related to the variable being studied.

1.2.2 Stratified Random Sampling

In this type sampling method first the whole population is divided into homogenous groups according to a characteristic of interest, for example, sex, age, geographic location, etc.. These groups are termed as *strata*. Then the sample is drawn randomly from each strata.

How to draw samples using Stratified Random Sampling

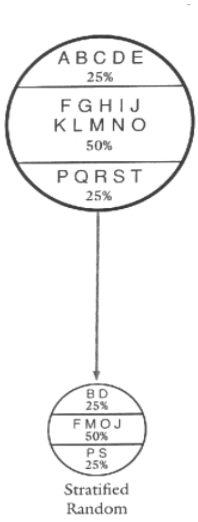
- The population is first divided into groups or strata according to a characteristic of interest, for example, sex, age, geographic location, etc.
- A sample is then selected from each stratum using the same sampling fraction, unless otherwise prescribed for special reasons.

- In order to obtain the highest precision, elements within the strata should be as homogenous as possible, while stratum-to-stratum variation should be relatively large.

- Suppose, A population of N units is sub-divided into k strata, the i^{th} sub-population having N_i units $(i=1,2,\ldots,k)$.
- These sub-population are non-overlapping such that, $N_1+N_2+\ldots+N_k=N$
- A sample is drawn from each stratum independently, the i^{th} stratum being $n_i(i=1,2,\ldots,k)$ such that

$$n_1+n_2+\ldots+n_k=n$$

Diagram showing sample selection from a Population comprising of three strata in different proportion



Advantages

- Using the same sampling fraction for all strata ensures proportionate representation in the sample of the characteristic being stratified.
- Adequate representation of minority subgroups of interest can be ensured by stratification and by varying the sampling fraction between strata as required.
- Information concerning estimates within each stratum is easily obtainable.

- For either administrative or logistic reasons, it may be easier to select a stratified sample than a simple random sample.

Disadvantages

- Stratified sampling requires advance knowledge of the characteristic in the population used for stratification.
- The sampling frame of the entire population has to be prepared separately for each stratum.
- Stratified sampling may not be less expensive than simple random samplings since detailed frames must be constructed for each stratum prior to sampling.

1.2.3 Systematic Sampling

In some sampling situations, especially those with large population, it is often time-consuming to select a SRS. An alternative approach to SRS is Systematic sampling procedure. Here, the first element is selected at random and then the rests are selected according to some predefined pattern. For example, if N(population Size)= 20 and n= 5.

Here, 20=5 x 4
or , N = n x k
In systematic sampling, we draw one unit at random from first 4 (k) units. Then every subsequent forth (k^{th}) units would be selected for the sample. Depending on first unit the selected sample will be any one of the following-

1st unit selected	Subsequent units	Sampling units
1	5,9,3,17	1,5,9,3,17
2	6,10,14,18	2,6,10,14,18
3	7,11,15,19	3,7,11,15,19
4	8,12,16,20	4,8,12,16,20

1.2.4 Cluster Sampling

- Here, the population is first divided into separate groups of elements called clusters. Each element of the population belongs to one and only one cluster.
- A SRS of the clusters is then taken. Elements within the sampled cluster are the elements included in the sample.
- It provides best result whenever the elements within the clusters are heterogeneous. In case, if each cluster is alike, sampling a small number of clusters will provide good estimates of the parameters.

1.2.5 Multi Stage Sampling

Multistage sampling refers to sampling plans where the sampling is carried out in stages using smaller and smaller sampling units at each stage.

1.2.6 Probability Proportional to size Sampling

Probability proportional to size (PPS) is a sampling technique in which the probability of selecting a sampling unit (e.g., village, zone, district, health center) is proportional to the size of its population. It gives a probability (i.e., random, representative) sample.These are six different probability sampling methods.

Summary:

Sampling is a part of daily life. A quality checker takes a few items or a few amount of a items and decides whether the lot is in accordance of its desired specification or not. Even in those situations where complete enumeration is possible, it is not prefer because of the cause time. So, complete enumeration is done in case of various censuses and where the population is small