BASIC STATISTICS UN MEDICAL PRACTICE

Pages with reference to book, From 199 To 200

Syed Ejaz Alam (PMRC Research Centre, Jinnah Postgraduate Medical Centre, Karachi.)

SAMPLING TECHNIQUES

Sampling is a process of selecting a part of an aggregate of material in the belief that the part selected will show the relevant characteristics of the whole aggregate. This representative part in statistical terminology is called a sample and the whole aggregate from which the sample is drawn is called Population or universe[1].

The basic aims of sampling are:

1. To get the maximum information about a population without examining each and every individual.
2. To collect and analyse the data quickly and cheaply. Thus sampling saves a lot of time which is very important factor in all types of investigations or surveys.
3. To use as a check on the accuracy and completeness of the total examination.
4. To find the reliability of estimates derived from the sample.

Methods of Sampling:

Sampling methods may be classified into two types:

1. Probability sampling:
2. Nonprobability sampling

In probability sampling each and every member in the population has a known probability of its being included in the sample.

This type of sampling includes:

a. Simple random sampling
b.Stratified random sampling c. Systematic sampling
d. Cluster sampling
e. Multistage sampling

In non-probability sampling the selection is not based on probability theory but the personal judgement of the person who draws the sample plays a significant role in the selection of the sample.

The type of sampling:

a. Purposive sampling
b. Quota sampling

PROBABILITY SAMPLING:

Simple Random Sampling

It is an important technique in which each defined unit/part or a member has an equal probability of being included in the sample. This procedure first of all requires a preparation of list of all units in the population and giving them numbers in serial order. This is then known as frame. 1Frame should include all units of population There should not be any duplication. All units must be similar and of similar size according to definition of units. Then keeping these serial numbers in mind we look into the random number tables and pick up the numbers which are found in the table and contain in our frame, avoiding any duplication. One can start from any page, any column, either row wise or column wise on the random number table. However, once starting from one point one should move in sequence, jumping will not give the random sample. When we complete the selection of number of derived size then we stop. These days in place of random number tables we can take help of computers. Computers also generate random numbers through simulation programming.

Stratified Sampling

In large population, if we use simple random sampling then there could be a situation the coverage may not be comprehensive. Therefore in order to get more comprehensive coverage of a large population

which can easily be divided into different groups or sectors known as strata, sampling is done independently in each strata. For example if we wish to get information about indoor patients of a hospital then it would be better to divide the total indoor patients (population) into different groups of wards (strata); then sample may be selected from each ward. If simple random sampling is adopted in selection from each strata, then it is said Stratified Random Sampling. The total sample size 'n' maybe divided into different strata in many ways. One, which is most common, is proportional allocation according to size of strata. If Ni is strata size and N is total population size i.e. Ni = N, n is the total sample size then

ni = nx(Ni/N)

Where ni is sample size of ith Strata (ni = n)

Example: Selàct a stratified random sample of size n = 5 by proportional allocation from the following population (Hb. level of students)

Stratum

I: 12 14 13 10

Stratum

II: 11 10 15 14 12 13

According to proportional allocation i.e. ni = nx (Ni/N), we shall select the following sub-samples:

'nl = nx (Ni/N) = 5x (4/10) = 2

n2 = nx (N2/N) = 5x (6/10) = 3

using a table of random sampling numbers, we get from

Stratum 1: 12 14

Stratum II: 11 15 13

Hence the sample mean = Xi/n

= (12+14+11+15+13)/5 = 65/5 = 13

Systematic Sampling:

Another probability sampling commonly used is the systematic sampling. This type of selection procedure is used when population is arranged in sequence, line or file. It is not necessary in this procedure to know the exact population size, a rough estimate will do the needful. For example if in a ward 100 patients are admitted and then beds are lined up in sequence. If we wish to obtain a sample of size 20, then from the group (100/20 = 5) of first 5 units, a unit will be selected randomly say it comes out as

1: then rest of the sample units will be determined by adding 5 successively i.e. sample will be 49 14 19 24 29 34 39 44 49 54 59 64 69 74 79 84 89 94 99.

This type of sample selection is used in people standing in queue, coming out of any place, lined up in sequence etc.

Cluster Sampling

This is a process of sampling in which the sampling units are to be found in groups of individuals or the natural units such as household or a family which comprises human beings. These groups are clusters. Each cluster is treated as a single unit in the selection process. Clusters are also known as primary units constituting a cluster, are called the secondary sampling units. Sometimes, the clusters relate to geographical regions, then the sampling is known as area sampling.

Multistage Sampling

In this design, the population is divided into a number of first stage units, which are sampled by some suitable method such as random or stratified sampling. The selected units are then subdivided into secondary stage units and a sample is taken against by some suitable method from these units. The selected second stage units can further be divided into third stage units which are again to be sampled and so on. Since the sampling is done in stages, we call it Multistage sampling. For example in a population survey, we can select a random sample of ni districts, then we take a sub-sample of n2villages from each of the selected districts, again we draw a sub-sample of n3 households from each

of the selected villages and soon.

NON-PROBABILITY SAMPLING

Purposive Sampling

This is a technique in which the selection of a sample is made by some purposive method. The investigator's inclination plays major part in selecting a sample. In this case the reliability of an estimate derived from such a sample cannot be ascertained.

Quota Sampling

A quota sample is a type of non-probability or judgement sample in which the information is collected from the specified number of individuals, i.e., the quotas of the population, e.g., the quotas of old and young, urban and rural, upper, middle and lower income group etc. These characteristics are known as "quota control factors", the purpose of which is to reduce bias. Bias creeps in because the investigators are free to select particular individuals within the quotas. They usually look for persons who either agree with their points of view or are personally known to them or can easily be contacted. Quota sampling, being a very quick form of investigation, is widely used in public opinion polls and market research surveys.

ADVANTAGES OF SAMPLING

1. Reduce Cost: If data secured from only a small fraction of the aggregate, expenditures may be expected to be small than if a complete coverage is attempted.
2. Greater Speed: For the same reason, the data can be collected and summarised more quickly when a sample is used.
3. Greater Scope: In certain types of inquiry, highly trained personnel or specialized equipment with limited availability may be used to obtain the data where complete census may then be impracticable.
4. Greater accuracy: Because personnel of higher quality can be given intensive training, a sample may actually produce more accurate results.

REFERENCE

1. Chaudhzy, S.M. Introduction to Statistical Theoiy Part-I, Markazi Kutub Khana Urdu Bazar, Lahore, 1975, pp. 178-182.