

A Study On Applied Statistics

T. Usha Durga

Assistant Professor
M.Sc., B.Ed.
Rishi UBR Women's College

Abstract

Applied statistics analysis plays major role in desperate issues of social sciences, agricultural sciences, health sciences, and business analysis. The technique of sampling and determination of sample size have crucial role in survey-based analysis issues in applied statistics. Specific sampling techniques square measure used for specific analysis issues as a result of one technique might not be applicable for all issues. Similarly, if the sample size is inappropriate it should cause inaccurate conclusions. The study is descriptive in nature. the current paper offers an outline of choose sampling ways like purposive sampling, sampling, stratified sampling, systematic sampling and quota sampling for specific analysis functions. This methodology used for the study state of affairs Analysis. the utilization case situations for every of the sampling techniques are delineate within the study. The study adds to the prevailing body of information.

Keywords: Information Assortment, Sampling Studies, Sampling Bias, Population, Likelihood, Random Allocation, Sampling, Sample Size

Introduction

In any analysis study, the most effective strategy is to research the matter within the whole population. however much, it's continuously impossible to check the complete population. instead, we tend to study a "sample" that is sufficiently giant and representative of the complete population. A sample could be a set of the population, chosen therefore on be representative of the larger population.

- (a) Investigations is also disbursed on a complete cluster or a representative taken out from the cluster.
- (b) Whenever a sample is chosen it ought to be a random sample.
- (c) whereas choosing the samples the heterogeneousness among the cluster ought to be unbroken in mind and correct sampling technique ought to be applied.

Key Points

1. Sampling could be a method in applied math analysis during which a preset variety of observations where square measure taken from a bigger population.
2. The methodology of accustomed sample from a bigger population depends on the sort of study being performed, however it's going to embody straightforward sampling or systematic sampling.

Review Of Literature

- Ajay Shankar Singh(2014), has studied about the Sampling Techniques & Determination of sample size in Applied statistics research.
- Sanjoy Datta (2018), has explained about the Concept of Sampling Methods & Different type of Sampling.
- Cochran(1963), Determining the sample size for a study is a crucial component.

Objectives

- To Estimate the parameters of the population like Mean, Median, Mode etc.
- To Test the valid statements regarding population.
- To Investigate the changes in population over time.

Research Methodology

- Sources of information: Secondary data: The data have been collected from textbooks, websites, internet, articles, journals.
- The methodology used for the study is Scenario Analysis.
- The use case scenarios for each of the sampling techniques have been described in the study.
- This study adds to the prevailing body of knowledge

Data Analysis

Distinguishing between a Sample and a Population

A population is that the entire cluster that you simply need to draw conclusions regarding. A sample is that the specific cluster that you simply can collect information from. the dimensions of the sample is often but the full size of the population. Population sample size denoted by “N”, And sample size is denoted by “n”. The population is also infinite or infinite however the sample is often finite.

Types of sampling

- (1) Probability sampling ways
- (2) Non-probability sampling ways

Definition of probability Sampling

In statistics, probability sampling refers to the sampling methodology within which all the members of the population encompasses a pre-specified and an equal probability to be a vicinity of the sample. This system relies on the organization principle, whereby the procedure is thus designed, that guarantees that every and each individual of the population has an equal choice chance. This helps to scale back the likelihood of bias.

Types of probability sampling

- Simple random sampling
- Stratified Sampling
- Cluster Sampling
- Systematic Sampling
- Multistage sampling

Definition of Non-Probability Sampling

When in an exceedingly sampling technique, all the people of the universe aren't given a chance of selecting the sample, this tactic is claimed to be Non-probability sampling. Below this system, there's no likelihood hooked up to the unit of the population and therefore the choice depends on the subjective judgment of the investigator.

Types of Non-probability sampling

- Convenience Sampling
- Quota Sampling
- Judgment or Purposive Sampling
- Snowball Sampling

Probability Sampling Types

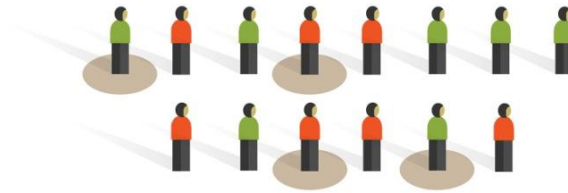
1. Simple random sampling

During this methodology, each individual has an equal chance of probability of being selected within the sample from the population. It can even be done by lottery methodology. During this methodology, a sampling frame is needed. All the people within the population have to be compelled to be expatiate either in ascending or descending order. The advantages of this method are that minimal knowledge of the population is required, the internal as well as external validity is high and it is easy to analyse data.

The samples will be drawn in 2 ways. The sampling units square measure chosen while not replacement as a result of the units once square measure chosen aren't placed back within the population. The sampling units

square measure chosen with replacement as a result of the chosen units square measure placed back within the population.

Simple random sampling



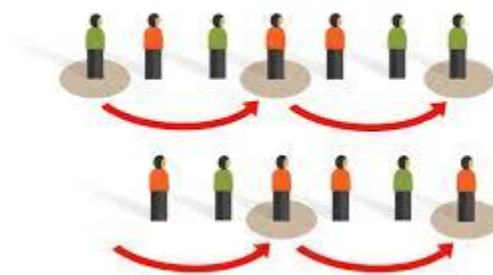
Example of easy random sample with replacement: Example of a straightforward random sample would be the names of 25 staff being chosen out of a hat from a corporation of 250 staff. during this case, the population is all 250 staff, and therefore the sample is random as a result of every worker has associate degree equal probability of being chosen.

Example of easy random sample without replacement: In sampling without replacement, every sample unit of the population has only 1 probability to be selected within the sample. for instance, if one attracts a straightforward random sample specified no unit happens over just one occasion within the sample, the sample is drawn without replacement.

2. Systematic random sampling

In systematic sampling, the choice of the primary subject is finished willy-nilly so remaining square measure elect by a repeated method. a scientific random sample is one within which each k^{th} item is selected; k is set by dividing the quantity of things within the sampling frame by the specified sample size. associate initial place to begin is chosen by a random method, so each k^{th} range on the list is chosen.

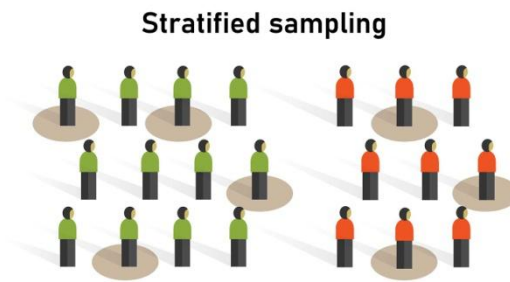
Systematic sampling



Example: If we have a tendency to take a similar example as above, $N=200$ and $n=50$, therefore, $k = N/n$, i.e. 4, that becomes the sampling interval. currently we have a tendency to choose a random range between 1 to 4. Suppose it's "3", thus range "3" participant is our initial subject. Then we have a tendency to press on adding "4" to the present range. Our resulting subjects would be 7, 11, 15, 19, 23, 27, 31 and so on, until we have a tendency to complete the requisite sample size of 50.

3. Stratified random sampling: An Information is split into numerous sub-groups (strata) sharing common characteristics like age, sex, race, income, education, and quality. A random sample is taken from every strata. The benefits are- it assures illustration of all teams within the population required. The characteristics of every stratum may be calculable and comparisons may be created. It conjointly reduces variability from

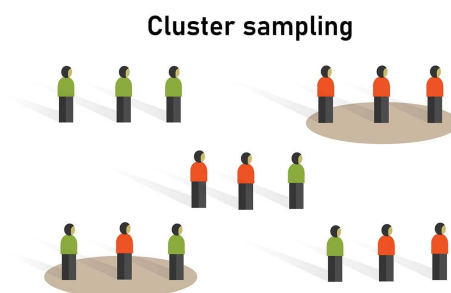
systematic sampling. the restrictions area unit that it needs correct data on proportions of every stratum; conjointly stratified lists area unit costly to arrange.



Example: In learning the prevalence of diabetes in an adult population in associate adult population, it'd be potential to stratify the population consistent with gender and so having equal variety of subjects from each males and females. this may yield sex-wise prevalence of polygenic disorder. The sample might even be stratified by place of residence like urban, rural or sub urban, which would provide America area-wise prevalence of diabetes with equal illustration from every cluster.

4. Cluster sampling

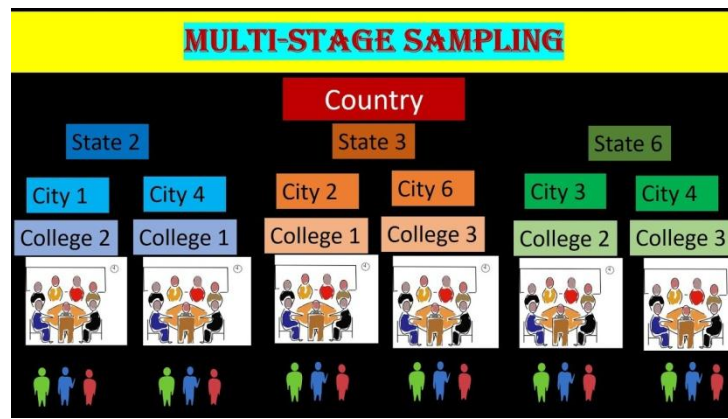
A cluster random sample is a two-step process in which the entire population is divided into clusters or groups, usually geographic areas or districts like villages, schools, wards, blocks, etc. It's most sensible to be utilized in massive national surveys. The clusters are chosen randomly. All people within the cluster are taken within the sample. Typically, it needs a bigger sample size. Cluster sampling is incredibly helpful once the population is incredibly massive.



Example: A sample may well be taken from initial year school students mensuration their information of breast cancer. Suppose all the colleges in Delhi are clusters. we tend to choose twenty schools either by straightforward random or systematic sampling, so each school becomes a cluster. we tend to might then interview all the scholars or randomly choose students in every selected cluster for his or her information on individual.

5. Multistage sampling

In Multistage sampling, or time period cluster sampling, you draw a sample from a population victimisation smaller and smaller teams (units) at every stage. It's usually wont to collect information from an outsized, geographically unfold cluster of individuals in national surveys.



Example: A research worker needs to grasp the various consumption habits in western Europe. it's much not possible to gather information from each family. The research worker can 1st select the countries of interest. From these countries, he/she chooses the regions or states to survey. And from these regions, he/she any narrows down his analysis by selecting specific cities and cities that represent the region. The research worker doesn't interview all the residents of city|town} or town. He/she any chooses explicit respondents from the chosen cities to participate in analysis. Here we have a tendency to see that clusters square measure designated at varied stages till the research worker narrows down to the sample needed.

Definition of Non-Probability Sampling

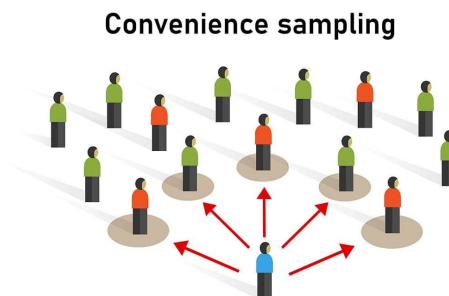
When in a sampling method, all the individuals of the universe are not given an equal opportunity of becoming a part of the sample, the method is said to be Non-probability sampling. Under this technique as such, there is no probability attached to the unit of the population and the selection relies on the subjective judgment of the researcher.

Types of Non-probability sampling

- Convenience Sampling
- Quota Sampling
- Judgment or Purposive Sampling
- Snowball Sampling

1. Convenience sampling

This is often the foremost ordinarily used sampling technique. The sample is chosen on the premise of the convenience of the investigator. Usually the respondents area unit hand-picked as a result of they're at the proper place at the proper time. Convenience sampling is most ordinarily utilized in clinical analysis wherever patients World Health Organization meet the inclusion criteria area unit recruited within the study. The advantages area unit that they're most ordinarily used, more cost-effective and there's no want for a listing of all the population parts.

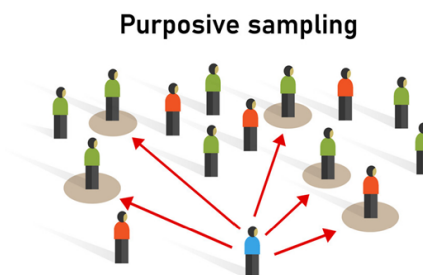


Example: Patients returning to the out-patient department of a hospital and meeting the inclusion criteria, college students, members of a structure etc.

Example: If a corporation needs to collect feedback on their new product, they might head to the native mall and approach people to fire their opinion on the merchandise.

They could have individuals participate during a short survey and raise queries like ‘have you detected of x brand?’ or ‘what does one think about x product?’

2. Purposive Sampling: Purposive sampling refers to a group of non-probability sampling techniques within which units area unit designated as a result of, like characteristics that you just need in your sample. In alternative words, units area unit designated “on purpose” in purposive sampling. Also known as judgmental sampling, this sampling methodology depends on the researcher’s judgment once characteristic and choosing the people, cases, or events that may give the most effective data to realize the study’s objectives.

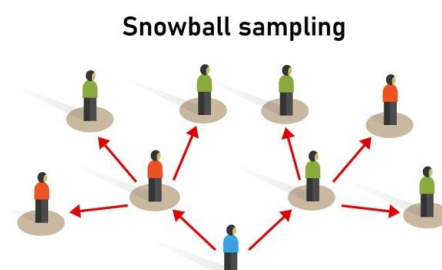


Example: Your analysis objective is to work out the patterns of use of social media by international IT consulting firms based mostly within the US. instead of applying sampling and selecting subjects UN agency might not be on the market, you'll be able to use purposive sampling to decide on IT firms whose convenience and perspective area unit compatible with the study.

Purposive sampling may be employed in instructional analysis. Suppose you wish to gather feedback from students on the education ways in their faculty. You act to handpick the brightest students UN agency will give relevant data for your systematic investigation.

3. Snow-ball sampling: Snowball sampling or chain-referral sampling is outlined as a non-probability sampling technique during which the samples have traits that square measure rare to search out. this can be a sampling technique, during which existing subjects give referrals to recruit samples needed for a research study.

This sampling technique will maintain and on, rather like a snowball increasing in size (in this case the sample size) until the time a man of science has enough knowledge to research, to draw conclusive results which will facilitate a corporation build informed selections.



Example: Your analysis objective is to see collect responses from patients who are suffering from a rare sort of cancer. during this case, alternative sampling techniques may prove inadequate for gathering relevant

subjects—you cannot simply walk into the hospital and request patients' contact data or medical records. What you'll do, however, is place out a decision to talk with 1 or 2 patients with the condition, then raise them to refer you to alternative potential subjects United Nations agency could be willing to participate in your study. Patients will continue a chain-referral method till there's enough population to make your sample frame.

4. Quota sampling: Quota sampling could be a non-probability sampling methodology that depends on the non-random choice of a preset range or proportion of units. this can be known as a quota. you initially divide the population into reciprocally exclusive subgroups (called strata) then recruit sample units till you reach your quota.



Example- As an example, a group of tobacco company desires to search out what people prefers what complete of cigarettes during a specific town. They apply survey quota on the age teams of 21-30, 31-40, 41-50, and 51+. From this info, the man of science gauges the smoking trend among the population of the town.

Conclusion

Research investigation is completed with the assistance of acceptable analysis styles provides the unbiased estimation of parameters through the health status of community may be monitored. Within the different hand analysis investigation is that the part of a wider development of any nation with relation to finance, education, public health, and agriculture, etc.

Key Points

- The sampling technique chosen depends on the population of interest.
- Careful designing is that the key for generating reliable results.
- Likelihood sample square measure is the most common place in sampling methodology.
- Likelihood sampling means that one will generalize to the population outlined by the sampling frame.
- Non-probability sampling means that one cannot generalize beyond the sample study, it's vital to decide on a sound and scientific sampling methodology. Ideally, likelihood sampling strategies ought to be accustomed guarantee representativeness of the sample and additionally for generalisibility of the results to the target population. If they're not used, caution should be exercised in decoding the study results.

Suggestions

- Sampling study is that each one of the characteristics of the population may be found in less time, through less effort and with least value.
- More information may be obtained concerning the total population through sampling.

References:

1. Sampling introduction and related topics for making inferences about data , In Fundamental of Statistics by Gupta and Kapoor textbook. <https://www.mygreatlearning.com/blog/introduction-to-sampling-techniques/>
2. Choosing the type of probability sampling. <https://www.questionpro.com/blog/probability-sampling/>

3. Choosing the type of Non probability sampling. <https://www.qualtrics.com/au/experience-management/research/non-probability-sampling/>
4. <https://research-methodology.net/sampling-in-primary-data-collection/purposive-sampling/>