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Pros and cons of different sampling techniques

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Abstract
In the field of research different sampling technique are used for different fields. It is very essential to choose the adequate technique of sampling. In this paper first we clarify the proper meaning of sampling. Further we discus about the different techniques and types of sampling. We mainly concentrate on two types of probability and non- probability and their sub categories. Further we discus about the pros and cons of these techniques. Pros are the primary positive aspect of an idea process or thing. Cones are the primary negative aspects. It is very necessary to choose the write sampling technique for a specific research work. Before we choose the sampling technique it is necessary to know about the 'Pros' and 'Cons' of sampling technique. If the researcher know about the 'Pros' and 'Cons' he/she will select the adequate technique of sampling for his research work.

Keywords: Sampling, Pros, Cons.

Introduction

Pros and Cons

"Pros" are the primary positive aspects of an idea, process or thing; "Cons" are the primary negative aspects. The term Pros and Cons means both the primary positive and negative aspects of an idea, process or thing and is often used to clarify or decide whether that idea, process or thing is mainly positive or mainly negative.

Sampling

Sampling is a technique (procedure or device) employed by a researcher to systematically select a relatively smaller number of representative items or individuals (a subset) from a pre-defined population to serve as subjects (data source) for observation or experimentation as per objectives of his or her study. For example, if, by using some systematic device, you pick up a group of 100 undergraduates from out of a total of 1500 on the rolls of a college for testing their physical fitness, you have selected a desired sample from a particular population. Researchers usually use sampling for it is impossible to be testing every single individual in the population. Although it is a subset, it is representative of the population and suitable for research in terms of cost, convenience and time. Still, every researcher must keep in mind that the ideal scenario is to test all the individuals to obtain reliable, valid and accurate results. If testing all the individuals is impossible, that is the only time we rely on sampling techniques.

True to the science of research and statistics, the sampling procedures must be carried out in consideration of several important factors such as (a) population variance, (b) size of the universe or population, (c) objectives of the study, (d) precision in results desired, (e) nature of the universe i.e. homogeneity or heterogeneity in the constituent units, (f) financial implications of the study, (g) nature and objectives of the investigation, (h)techniques of the sampling employed, (i) accuracy needed in making inference about the population being studied, and so on.

Types of Sampling Techniques

1. **Probability Sampling**: - Probability sampling is any sampling scheme in which the probability of choosing each individual is the same (or at least known, so it can be readjusted mathematically). These are also called random sampling. They require more work, but are much more accurate.

2. **Non-Probability Sampling**: - Non-probability sampling technique is totally based on judgement.

Probability Sampling	Non-Probability Sampling
Simple Random Sampling	Quota Sampling
Systematic Sampling	Purposive Sampling
Stratified Sampling	Self-Selection Sampling
Cluster Sampling	Snowball Sampling

Probability Sampling

1. Simple Random Sampling

In this technique, each member of the population has an equal chance of being selected as subject. The entire process of sampling is done in a single step with each subject selected independently of the other members of the population.

Pros of Simple Random Sampling

- One of the best things about simple random sampling is the ease of assembling the sample. It is also considered as a fair way of selecting a sample from a given population since every member is given equal opportunities of being selected.
- Another key feature of simple random sampling is its representativeness of the population. Theoretically, the only thing that can compromise its representativeness is luck. If the sample is not representative of the population, the random variation is called sampling error.
- An unbiased random selection and a representative sample are important is drawing conclusions from the results of a study. Remember that one of the goals of research is to be able to make conclusions pertaining to the population from the results obtained from a sample. Due to the representativeness of a sample obtained by simple random sampling, it is reasonable to make generalizations from the results of the sample back to the population.

Cons of Simple Random Sampling

One of the most obvious limitations of simple random sampling method is its need of a complete list of all the members of the population. Please keep in mind that the list of the population must be complete and up-to-date. This list is usually not available for large populations. In cases as such, it is wiser to use other sampling technique.

2. Systematic Sampling

Suppose that the N units in the population are numbered 1 to N in some order. To select a sample on N units, we take a unit at random from the first K units and every kith unit thereafter. For instance, if K is 15 and if the first unit drawn is number 13, the subsequent units are numbers 28, 43, 58 and so on. The selection of the first unit determines the whole sample. This type is called an every kith systematic sample.

Pros of Systematic Sampling

- Spreads the sample more evenly over the population.
- Easier to conduct than a simple random sample.

Cons of Systematic Sampling

The process of selection can interact with a hidden periodic trait within the population. If the sampling technique coincides with the periodicity of the trait, the sampling technique will no longer be random and representativeness of the sample is compromised.

3. Stratified Sampling

A method of sampling that involves the division of a population into smaller groups known strata. In stratified random sampling, the strata are formed based on members shared attributes or characteristics. A random sample from each stratum is taken in a number proportional to the stratum's size when compared to the population. These subsets of the strata are then pooled to from a random sample.

Pros of Stratified Sampling

The aim of the stratified random sample is to reduce the potential for human bias in the selection of cases to be included in the sample. As a result, the stratified random sample provides us with a sample that is highly representative of the population being studied, assuming that there is limited missing data.

Since the units selected for inclusion in the sample are chosen using probabilistic methods, stratified random sampling allows us to make generalizations (i.e. statistical inferences) from the sample to the population. This is a major advantage because such generalizations are more likely to be considered to have external validity.

Cons of Stratified Sampling

Stratified sampling is not useful when the population cannot be exhaustively partitioned into disjoint subgroups. It would be misapplication of the technique to make subgroups sample sizes proportional to the amount of data available from the subgroups, rather than scaling sample sizes to subgroup sizes (or to their variances, if known to vary significantly e.g. by means of an F test). Date representing each subgroup is taken to be of equal importance if suspected variation among them warrants stratified sampling. If, on the other hand, the very variances vary so much, among subgroups that the data need to be stratified by variance, there is no way to make the subgroup sample sizes proportional (at the same time) to the subgroups sizes with in the total population. (What is the most efficient way to partition sampling resources among groups that vary in both their means and their variances?

4. Cluster Sampling or Multi-Stage Sampling

The naturally occurring groups are selected as samples in cluster sampling. All the other probabilistic sampling methods (like simple random sampling, stratified sampling) require sampling frames of all the sampling units, but cluster sampling does not require that. Once the clusters are selected, they are compiled into frames. Now, various probabilistic researches and observations are performed on these frames and require conclusions are drawn.

Pros of Cluster Sampling

- **Economy:** - The two major concerns of expenditure when it comes to sampling are travelling and listing. They are greatly reduced when it comes to cluster sampling. For example: Compiling research information about every house hold in the city would be a very difficult, whereas compiling information about

various blocks of the city will be easier. Here travelling as well as listing efforts will be greatly reduced.

- **Reduced Variability: -** When you considering the estimates by any other method of probabilistic sampling, reduced variability in results are observed. This may not be an ideal situation every time. Increased variability in results is observed in cluster sampling.

- **Feasibility: -** Again, as I mentioned before, cluster sampling is such a method of probabilistic sampling that takes into account large populations. Since these groups are so large, devploying any other sampling technique would be very difficult task. Cluster sampling is very feasible when you are dealing with large population.

Cons of Cluster Sampling

- **Biased Sampling: -** If the group in population that is chosen as a cluster sample has a biased opinion then the entire population is inferred to have the same opinion. This may not be the actual case. This is a major disadvantage as far as cluster sampling is concerned.

- **Sampling Errors: -** The other probabilistic methods give less error than cluster sampling. For this reason, cluster sampling is discouraged for beginners.

Non-Probability Sampling

1. Quota Sampling

With proportional quota sampling, the aim is to end up with a sample where the strata (groups) being studied (e.g. males vs. females students) are proportional to the population being studied. If we were to examine the differences in male and female students.

Pros of Quota Sampling

Quota sampling is particularly useful when you are unable to obtain a probability sample, but you are still trying to create a sample that is as representative as possible of the population being studied. In this respect, it is the non-probability based equivalent of the stratified random sample. Unlike probability sampling techniques, especially stratified random sampling, quota sampling is much quicker and easier to carry out because it does not require a sampling frame and the strict use of random sampling techniques (i.e. probability sampling techniques). This makes quota sampling popular in undergraduate and master's level dissertations where there is a need to divide the population being studied into strata (groups).

The quota sample improves the representations of particular strata (groups) within the population, as well as ensuring that these strata are not over-represented. For example, it would ensure that we have sufficient male students taking part in the research (60% of our sample size of 100; hence, 60 male students). It would also make sure we did not have more than 60 male students, which would result in an over-representation of male students in our research.

The use of quota sample, which leads to stratification of a sample (e.g. male and female students), allows us to more easily compare these groups (strata)

Cons of Cluster Sampling

In quota sampling, the sample has not been chosen using random selection, which makes it impossible to determine the possible sampling error. Indeed, it is possible that the selection of units to be included in the sample will be based on ease of access and cost considerations, resulting in sampling bias. It also means that it is not possible to make generalizations (i.e. statistical inferences) from the sample to the population. This can lead to problems of external validity.

Also, with quota sampling is must be possible to clearly divide the population into strata; that is, each unit from the population must only belong to one stratum. In our example, this would be fairly simple, since our strata are male and female students. Clearly, a student could only be classified as either male or female. No student could fit into both categories (ignoring transgender issues).

Furthermore, imagine extending the sampling requirements such that we were also interested in how career goals changed depending on whether a student was an undergraduate or postgraduate. Since the strata must be mutually exclusive, this means that we would need to sample four strata from the population: undergraduate males, undergraduate females, postgraduate males and postgraduate females. This will increase overall sample size required for the research, which can increase costs and time to carry out the research.

2. Purposive Sampling

Purposive sampling, also known as judgmental, selective or subjective sampling, reflects a group of sampling techniques that rely on the judgement of the researcher when it comes to selecting the units (e.g. people, case/organisations, events, pieces of data) that are to be studied. These purposive sampling techniques include maximum variation sampling, homogeneous sampling and typical case sampling; extreme (deviant) case sampling, total population sampling ad expert sampling.

Pros of Purposive Sampling

- Whilst the various purposive sampling techniques each have different goal, they can provide researchers with the justification to make generalisations from the sample that is being studied, whether such generalisations are theoretical, analytic and logical in nature. However, since each of these types of purposive sampling differs in terms of the nature and ability to make generalisations you should read the articles on each of these purposive sampling techniques to understand their relative advantages.
- Qualitative research designs can involve multiple phases, with each phase building on the previous one. In such instances different types of sampling techniques may be required at each phase. Purposive sampling is useful in these instances because it provides a wide range of non-probability sampling techniques for the researcher to draw on. For example critical case sampling may be used to investigate whether a phenomenon is worth investigating further, before adopting an expert sampling approach to examine specific issues further.

Cons of Purposive Sampling

- Purposive samples, irrespective of the type of purposive sampling used, can be highly prone to researcher bias. The idea that a purposive sample has been created based on the judgement of the researcher is not a good

defence when it comes to alleviating possible researcher biases, especially when compared with probability sampling techniques that are designed to reduce such biases. However, this judgemental subjective component of purpose sampling is only a major disadvantage when such judgements are ill-conceived or poorly considered; that is, where judgements have not been based on clear criteria, whether a theoretical framework, expert elicitation or some other accepted criteria.

- The subjectively and non-probability based nature of unit selection (i.e. selecting people, cases/organisations etc.) in purposive sampling means that it can be difficult to defend the representativeness of the sample. In other words, it can be difficult to convince the reader that the judgement you used to select units to study was appropriate. For this reason, it can also be difficult to convince the reader that research using purposive sampling achieved theoretical/analytic/logical generalisation. After all, if different units had been selected, would the results and any generalisations have been the same?

3. Self-Selection Sampling

Self-selection sampling is appropriate when we want to allow units or cases, whether individuals or organisations to choose to take part in research on their own accord. The key component is that research subjects volunteer to take part in the research rather than being approached by the researcher directly.

Pros of Self-selection Sampling

- This can reduce the amount of time necessary to search for appropriate units (or cases); that is, those individuals or organisations that meet the selection criteria needed for your sample.
- The potential units or cases are likely to be committed to take part in the study, which can help in improving attendance and greater willingness to provide more insight into the phenomenon being studied.

Cons of Self-selection Sampling

Since the potential research subjects (or organisations) volunteer to take part in the survey:

- There is likely to be a degree of self-selection bias. For example, the decision to participate in the study may reflect some inherent bias in the characteristics/traits of the participants (e.g. an employee with a 'chip of his shoulder' wanting to give an opinion).
- This can either lead to the sample not being representative of the population being studied or exaggerating some particular finding from the study.

4. Snowball Sampling

In sociology and statistics research, snowball sampling or chain sampling, chain-referral sampling is a non-probability sampling technique where existing study subjects recruit future subjects from among their acquaintances. Thus the sample group appears to grow like a rolling snowball. As the sample builds up, enough data is gathered to be useful for research. This sampling technique is often used in hidden populations which are difficult for researchers to access.

Pros of Snowball Sampling

- It can be difficult to identifying units to include in your sample, perhaps because there is no obvious list of the population you are interested in. For example, there are no lists of drug users or prostitutes that a researcher could get access to, especially lists that could be considered representative to the population of drug users or prostitutes.
- There may be no other way of accessing your sample, making snowball sapling the only viable choice of sampling strategy.

Cons of Snowball Sampling

Since snowball sampling does not select units for inclusion in the sample based on random selection, unlike probability sampling technique, it is impossible to determine the possible sampling error and make generalizations (i.e. statistical inferences) from the sample to the population. As such, snowball samples should not be considered to be representative of the population being studied.

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