# ASSESSMENT OF DIFFERENT METHODS OF SAMPLING TECHNIQUES: THE STRENGTHS AND WEAKNESS

**BY**

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## *ABSTRACT*

*The study sought to assess the different methods of sampling techniques. Sampling is a critical aspect of research and data analysis, and the choice of sampling method can significantly influence the validity and generalizability of study findings. Sampling is useful in these instances because it provides a wide range of non-probability sampling techniques for the researcher to draw on. The study analysed the different sampling techniques, i.e., quota sampling, judgmental or purposeful sampling, snowball sampling, and convenient sampling. The study analysed their strengths and weaknesses. The paper concluded that sampling helps a lot in surveys and research, where we have to take a sample from a large population. Different techniques of sampling are available to give different types of desired results. It is used to form conclusions about populations based on samples, and it allows us to identify the features of a population.*

**KEYWORDS: Different, Method Sampling, Determination**

## INTRODUCTION

A crucial component of research and data analysis is sampling, and the choice of sampling technique can have a big impact on the validity and generalizability of study results. There are numerous sampling techniques, each having advantages and disadvantages. We will discuss various sampling techniques that are frequently applied in research and provide references to back up the information provided.

Random sampling, according to Cochran (2015), ensures that every member of the population has an equal chance of being chosen, reducing bias and boosting sample representativeness. This technique is well known for producing accurate and transferable outcomes. There are many different kinds of sampling methods, including stratified, cluster, systematic, convenient, purposeful (judgmental), and snowball sampling, etc. However, stratified sampling, according to Lohr (2019), entails segmenting the population into discrete subgroups or strata before choosing samples from each stratum. This approach guarantees the proportionate representation of various groups within the population, enabling more precise estimates of subgroup traits.

Cluster sampling, as defined by Kish (2016), involves grouping the population into clusters or groups and choosing full clusters as the sampling units. When the population is geographically

separated or arranged into natural clusters, this strategy is helpful. In comparison to other methods, cluster sampling can improve efficiency while decreasing expenses. Additionally, Thompson (2012) asserts that systematic sampling entails choosing every nth element from the population after deciding on a beginning point at random. In the event that there is no underlying order in the population, this method is simple to use and yields a representative sample.

Convenience sampling, according to Etikan et al. (2016), comprises choosing people who are easily accessible or readily available. Although practical, this approach might add bias because the sample might not be entirely representative of the population. Even though convenience sampling is frequently employed in exploratory research or pilot projects, care should be used when extrapolating the results. Purposeful sampling, according to Palinkas et al. (2015), is choosing individuals based on certain traits pertinent to the research goals. When conducting qualitative research or looking at specific communities, this method is widely used. However, researchers need to be cautious of any bias that may be introduced during participant selection due to subjective judgement. However, snowball sampling, according to Biernacki and Waldorf (1981), is frequently used to research obscure or challenging-to-reach populations. Initial participants help recruit other participants from their social networks after being chosen based on established criteria for the initial participants. Snowball sampling may cause selection bias even if it is effective for researching marginalised populations.

## Judgment or Purposive Sampling

A non-probability sampling technique known as authoritative sampling, purposive sampling or judgmental sampling selects the sample members solely based on the researcher's expertise and judgement. There is a likelihood that the results will be extremely accurate with a small margin of error because the researcher's knowledge is essential for creating a sample in this sampling technique. When choosing a sample using judgmental sampling, the researchers carefully select each person who will be a part of the sample. Since the sample's participants are not selected at random, the researcher's expertise is crucial in this sampling procedure. Judgmental sampling is most effective in situations where there are only a restricted number of people in a population who possess qualities that a researcher expects from the target population.

When other sampling methods seem to take more time and the researcher feels confident in their ability to choose a sample for research, they prefer to use judgemental sampling. When highly intelligent people make up the target population and no other probability or non-probability sampling approach can be utilised to select them, judgmental or expert sampling is typically used. Additionally, it is employed when the sample chosen using another sampling technique needs to be authorised or filtered. Purposive sampling is utilised when there is a deadline for creating samples and the relevant authorities would rather rely on their expertise than alternative sampling methods. However, it is important to remember that a researcher may or may not possess the necessary skills to carry out a successful sampling method. The only drawback of purposive sampling is this. Each researcher who accepts the challenge of developing a sample via expert sampling will need to have unwavering confidence in their knowledge and abilities (Question Pro Survey Software, 2023).

Purposive sampling, sometimes referred to as judgement, selective, or subjective sampling, is a sampling strategy where the researcher uses his or her own discretion to pick participants from the population for the study. The term "purposeful sampling" refers to a non-probability sampling technique where "items picked for the sample are chosen by the researcher's discretion. According to John Dudovskiy (2023), "Researchers frequently feel that they can get a representative sample by exercising good judgement, which will result in time and money savings. A collection of non-

probability sampling strategies known as "purposive sampling" involve choosing units for your sample based on their possession of specific qualities. In other words, in purposive sampling, units are chosen "on purpose". This sampling technique, also known as judgemental sampling, focuses on the researcher's judgement when determining and choosing the people, cases, or events that can provide the most information to meet the study's goals. In qualitative research and mixed-methods research, purposeful sampling is typical. Although there is a high danger of research biases like observer biases, it is particularly helpful if you need to locate information-rich examples or make the most of scarce resources (Kassiani-Nikolopoulou, 2022).

## Strength of Judgment or Purposive Sampling

Purposive Sampling provide direct access to the target market for researchers. Apart from the preferences of the researcher, there are no factors used in sample selection. As a result, they are able to speak with their intended audience directly and achieve their goals. Real-time results are provided. Since the sample's members will be knowledgeable and knowledgeable about the topic, a quick poll or survey can be carried out with them utilising judgemental sampling. While the objectives of the various purposive sampling procedures vary, they can give researchers the rationale to extrapolate generalisations from the sample under study, regardless of whether these generalisations are theoretical, analytical, or logical in nature. However, multiple phases can be included in qualitative research designs, with each phase building on the one before it. In such cases, various sample strategies might be needed at each stage. In these situations, purposeful sampling is advantageous since it gives the researcher access to a wide variety of non-probability sampling approaches. Before using an expert sample approach to further analyse specific concerns, for instance, critical case sampling may be used to determine whether a phenomenon is worth further investigation.

## Weakness of Judgment or Purposive Sampling

Purposive samples can be extremely susceptible to researcher bias, regardless of the form of purposive sampling used. When it comes to mitigating potential researcher biases, the claim that a purposeful sample has been established based on the researcher's judgment is not a strong justification, especially when contrasted to probability sampling approaches that are designed to remove such biases. The judgmental, subjective nature of purpose sampling only becomes a significant drawback when judgments are poorly made or poorly thought out, that is, when decisions are not based on clear standards, such as theoretical frameworks, expert elicitation, or other generally accepted standards.

It might be challenging to argue for the representativeness of the sample due to the subjectivity and non-probability-based nature of unit selection in purposive sampling (i.e., choosing individuals, cases, organizations, etc.). In other words, it can be challenging to persuade the reader that the judgment you used to choose the study units was sound. It can also be challenging to persuade the reader that research using purposive sample led to theoretical, analytical, or logical generalization for this reason (Lund Research Ltd., 2012)

## Overview of Quota Sampling

To choose participants for a study, quota sampling, a non-probability sampling approach, is frequently used in research and surveys. It entails setting quotas or fixed targets for various population segments according to attributes like age, gender, occupation, or geography.

Here is an overview of how quota sampling works:

- ***Defining target characteristics:*** The researcher chooses the precise traits or variables of concern that must be reflected in the sample. These traits frequently reflect the researcher's understanding of or presumptions about the population under study.
- ***Setting quota sizes:*** Quotas are established for each attribute to guarantee that the right amount of people are chosen for each group. The size of the quotas may be determined by the population's distribution of each feature or by the researcher's discretion.
- ***Participant selection:*** After that, researchers seek out volunteers to meet the requirements. To locate people who fit the relevant qualities, they frequently employ convenience sampling techniques, such as approaching people in public or using internet panels. Up until the quotas for each attribute are filled, the researcher keeps on recruiting volunteers.
- ***Monitoring quotas:*** The researcher maintains track of the number of participants in each quota group throughout the data collection process to make sure they are fairly represented. Additional efforts may be undertaken to recruit participation from such categories if particular quotas are challenging to fill.
- ***Data analysis:*** The gathered data is examined after the necessary sample size has been reached and data gathering is finished. Because participants are not chosen at random, quota sampling does not ensure that the population is representative, researchers must take this into account. As a result, when extrapolating the findings to a larger population, care should be taken.
- ***Possible biases:*** The sample may contain biases as a result of quota sampling. The sampling procedure may unintentionally introduce the researcher's personal biases or presumptions due to their subjectivity when setting quotas and choosing participants. For instance, the final sample might not be accurately representative if the researcher's population assumptions are unreliable or lacking.
- ***Lack of randomness:*** Unlike probability sampling approaches like simple random sampling or stratified random sampling, quota sampling does not include the random selection of participants. The sample might not be statistically statistically representative of the population in the absence of randomization, which limits the generalizability of the results.
- ***Insufficient coverage:*** The success of quota sampling depends on the researcher's ability to find individuals who possess the desired traits. The final sample may not sufficiently represent specific demographic segments if those segments are hard to reach or are underrepresented in the researcher's recruiting efforts, which could result in biased conclusions.
- ***Limited control over sample composition:*** With quota sampling, a specific distribution of attributes is sought to be achieved in the sample. However, because participants are frequently self-selected or easily accessible, the researcher has little control over the precise people that are recruited. The researcher's capacity to guarantee a sample that is truly representative may be constrained by this lack of control over sample makeup.
- ***Reporting limitations:*** It is crucial to make the constraints of the sampling method crystal obvious when reporting the findings of a study that made use of quota sampling. To prevent

incorrect interpretations or overgeneralizations of the results, researchers should be open and honest about any potential biases and the limitations of generalizability associated with quota sampling.

- ***Alternatives:*** Researchers may take into account probability sampling approaches such simple random sampling, stratified sampling, or cluster sampling if the objective is to obtain a representative sample that can be generalized to the population. These techniques use random selection, provide researchers more control over the sample's makeup, and improve the representativeness of the results. Comparing quota sampling to other sampling techniques, it has the advantages of being relatively simple and inexpensive. When examining particular subgroups, it helps to ensure that certain demographic segments are represented in the sample. However, quota sampling has limitations. Since it is a non-probability sampling technique, the sample may not be representative of the entire population, leading to potential biases. Additionally, the researcher's subjectivity in setting quotas and selecting participants may introduce bias into the sample selection process.

## Strength of Quota Sampling

Quota sampling, despite its limitations, does offer some strengths and advantages in certain research contexts. Here are some of the strengths of quota sampling:

- ***Cost-effective:*** When compared to probability sampling techniques, quota sampling is frequently more economical. Particularly when conducting extensive surveys or research, it can be easier and less expensive to implement.
- ***Convenient sample method:*** Quota sampling enables researchers to quickly choose participants in accordance with predetermined criteria or quotas. This approach is reasonably simple and open to researchers because it doesn't call for elaborate randomization processes or sampling frames.
- ***Better representation of particular groups:*** Quota sampling allows researchers to make sure that particular demographic segments or subgroups are adequately represented. In order to guarantee that certain groups are represented in the sample, researchers can create quotas for specific demographic or other pertinent factors. When researching smaller subpopulations that might be underrepresented in probability samples, this can be helpful.
- ***Targeted data collection:*** Quota sampling allows researchers to target specific characteristics or variables of interest. By setting quotas based on relevant variables, such as age, gender, or occupation, researchers can collect sufficient data from different groups to conduct meaningful subgroup analyses.
- ***Flexibility and adaptability:*** Quota sampling provides flexibility in adjusting quotas during the data collection process. If certain quotas are challenging to fulfill, researchers can allocate more resources or modify the sampling strategy to ensure representation across all desired characteristics.
- ***Practical in certain settings:*** Quota sampling is especially helpful in circumstances when probability sampling techniques may be problematic or impossible. Quota sampling, for instance, enables researchers to contact people in particular areas or venues while conducting field surveys or in-person interviews, streamlining the data gathering process. While these advantages could be useful in some research situations, it's crucial to take into

account the restrictions and potential biases that quota sampling introduces. Researchers should carefully consider whether the benefits of quota sampling are compatible with their study's needs for representativeness and research goals.

**Weakness of Quota Sampling**

Quota sampling, like any sampling method, has its limitations and weaknesses. It's important to be aware of these drawbacks when considering the use of quota sampling. Here are some of the weaknesses of quota sampling:

- ***Non-Probability Sampling:*** Because participants in quota sampling are not chosen at random from the population, it is a non-probability sampling technique. As a result, the sample might not exactly reflect the total population, and the results might not be applicable to a wide range of situations. The possibility of bias is introduced by the lack of randomness in participant selection.
- ***Subjectivity in Quota Setting:*** The researcher's opinion is used to create quotas for various qualities in quota sampling. If the researcher's expectations or assumptions about the population are unreliable or incomplete, this subjectivity may induce bias. The selection of participants may be influenced by the researcher's own biases, resulting in a sample that may not accurately represent the population distribution.
- ***Limited Control over Sample Composition:*** While quota sampling aims to achieve specific proportions for different characteristics, the researcher has limited control over the specific individuals selected within each quota. Participants are often self-selected or conveniently available, which may not fully represent the target population. This lack of control over the sample composition can compromise the representativeness of the findings.
- ***Potential Sampling Bias:*** Quota sampling may introduce sampling bias if certain population segments are underrepresented or overrepresented in the sample. If the researcher encounters difficulty filling certain quotas, they may unintentionally prioritize convenience over representativeness. This can lead to biased results and limited generalizability.
- ***Difficulty in Estimating Sampling Error:*** Unlike probability sampling methods, quota sampling does not provide a basis for estimating sampling error or calculating confidence intervals. As a result, it can be challenging to assess the precision or reliability of the findings obtained through quota sampling.
- ***External Validity Concerns:*** Due to the lack of random selection and the potential for bias, the external validity of findings from quota sampling may be limited. It is important to consider the specific context and population being studied and carefully assess the extent to which the findings can be generalized beyond the sample. Given these weaknesses, researchers should carefully consider the goals of their study and the level of representativeness required. Depending on the research objectives, alternative probability sampling methods, such as simple random sampling or stratified sampling, may be more appropriate for obtaining representative and generalizable results.
- ***Sampling bias and non-representativeness:*** Quota sampling can introduce sampling bias if the selection of participants within each quota is not truly random. The researcher's subjectivity and convenience in selecting participants may result in a sample that does not

accurately reflect the characteristics of the target population. This lack of representativeness can undermine the external validity and generalizability of the findings.

- ***Lack of statistical inference:*** Quota sampling does not provide a basis for statistical inference. Since the sample is not selected using randomization, it becomes challenging to make statistical inferences about the population or calculate measures of precision such as confidence intervals. This limits the ability to draw robust conclusions from the data.
- ***Inability to assess sampling error:*** Without random selection, it is difficult to estimate sampling error or quantify the degree of uncertainty associated with the findings. The absence of this information makes it challenging to evaluate the reliability and validity of the results.
- ***Overrepresentation or underrepresentation of certain groups:*** Quota sampling relies on setting quotas for specific characteristics to achieve proportional representation. However, if the researcher has inaccurate or outdated information about the population or lacks understanding of relevant factors, certain groups may be overrepresented or underrepresented in the sample. This can lead to distorted results and biased conclusions.
- ***Limited scope for population inference:*** For descriptive studies that concentrate on particular subgroups or exploratory research, quota sampling may be appropriate. However, the lack of random selection and possible biases impair the validity of such inferences when the aim is to draw conclusions about the entire population. When considering the use of quota sampling, it is crucial to be aware of these limitations and carefully assess if it is appropriate for a particular research topic. When publishing their findings, researchers should be open and honest about the method they utilized as well as any biases and restrictions brought on by quota sampling.

Sociologist Emory S. Bogardus is one well-known person associated to the creation of quota sampling. Bogardus developed the idea of quota sampling in the 1920s to overcome the drawbacks of conventional random sampling techniques. To guarantee the representation of various groups in the sample, he suggested implementing predetermined quotas based on particular population characteristics, such as age, gender, or ethnicity. It's crucial to remember, though, that the concept of choosing samples based on predetermined quotas or proportions dates back considerably further. Researchers like Charles Booth, who performed sociological surveys in the late 19th century, and H. L. Hollingworth, who used a type of proportional quota sampling in his educational studies during the early 20th century, have all had an impact on the use of quotas in sampling.

In order to ensure that various subgroups within a community are represented, quota sampling is a non-probability sampling strategy that involves choosing a sample based on predefined quotas or proportions. The English statistician and brewer Sir William Gosset is sometimes cited as the originator of the idea of quota sampling. The idea was first put forth by Gosset, who also wrote under the pen name "Student," in the early 20th century. He created the idea of using quotas to choose samples from various groups in order to obtain a representative sample. It's crucial to remember that while Sir William Gosset was instrumental in creating the idea of quota sampling, the method has since been improved and developed by other experts in statistics and research techniques. In summary, while Emory S. Bogardus is often credited with popularizing and refining the concept of quota sampling, the technique has evolved through the contributions of multiple researchers over time.

## Quota Sampling Model

There is not a specific individual referred to as the "quota sampling model." Quota sampling itself is a sampling technique or method used in research that involves selecting a sample based on predetermined quotas or proportions. Quota sampling is a non-probability sampling approach that aims to create a sample that mirrors the characteristics of the target population. The process typically involves setting quotas for specific demographic or subgroup categories and then selecting individuals who fit those quotas until they are fulfilled. While there may be researchers or statisticians who have contributed to the development and refinement of quota sampling methodology over time, it is not associated with a single person or model in the same way that some statistical techniques are named after their creators. To summarise, quota sampling is a sampling technique employed in research, but it does not have a specific individual or model tied to its name.

## Overview of Snowball Sampling

In research investigations, the non-probability sampling method known as snowball sampling is often utilised, particularly when examining populations that are challenging to discover or contact. In this sampling technique, initial participants are chosen based on predetermined criteria, and they then assist in locating and recruiting new participants who fulfil the same criteria. When the researcher hits saturation, no more participants can enter any new data, the process is repeated until the necessary sample size is reached. The term "snowball sampling" refers to the way the sample expands over time, like a snowball rolling down a hill, adding new participants as it progresses. This sampling technique is often used in social science research, particularly in studies involving hidden populations or groups that are hard to access, such as drug users, homeless individuals, or members of specific subcultures.

Here's an overview of the steps involved in snowball sampling:

- ***Identify the initial participants:*** The researcher chooses a few initial volunteers who satisfy the requirements of the study. These people are frequently picked because they are familiar with or connected to the target group.
- ***Contact initial participants:*** The researcher gets in touch with the initial participants and describes the study's objectives. In addition to asking for their participation, they also ask for help in finding and referring additional potential volunteers who fit the study's requirements.
- ***Recruit additional participants:*** The first participants introduce or recommend other prospective participants. These recommendations may come from their friends, acquaintances, or ties in the local community. The researcher then gets in touch with these individuals, describes the study, and extends an invitation for them to take part.
- ***Repeat the process:*** The process of participant referral and recruitment continues with each newly recruited participant. The researcher asks each participant to refer others who fit the study's criteria. This iterative process allows the sample size to grow progressively.
- ***Saturation:*** The researcher continues recruiting participants until reaching a point of data saturation. Saturation occurs when new participants do not provide any substantially different information or perspectives compared to the existing participants. At this point, the researcher may decide to stop recruiting and consider the sample sufficient for the study's objectives.

- ***Data collection and analysis:*** The researcher collects data from the participants using interviews, surveys, observations, or other acceptable methods until the necessary sample size is obtained or saturation is achieved. Following data analysis, conclusions and inferences regarding the target population are drawn. Snowball sampling has a number of benefits, including the ability to research hidden populations, ease, and affordability. It does have some restrictions, though. As participants are chosen based on recommendations and contacts, the sample may be biassed and not fully representative of the population. Furthermore, because participants might make references to people who are similar to themselves or who they think meet the study's criteria, there is a chance of social desirability bias.

**Strength of Snowball Sampling**

- ***Access to difficult-to-reach communities:*** Snowball sampling is especially helpful for researching populations that are hard to contact or find. These could be people who exhibit stigmatised behaviours, marginalised communities, or hidden populations. Snowball sampling enables researchers to access people who might not be readily identifiable or reachable through conventional sampling approaches because participants are recruited through referrals from existing participants.

- ***Cost-effectiveness:*** Snowball sampling is a potentially economical sampling technique. Researchers can cut down on the time and resources required to find and reach populations who are difficult to access by using current participants to find and recruit new participants. This can be helpful when researching communities that are spread geographically or have scarce resources.

- ***Enhanced trust and rapport:*** Snowball sampling often relies on social networks and personal connections. When participants are referred by someone they know or trust, they may feel more comfortable and willing to participate in the study. This can result in stronger rapport between participants and researchers, leading to more open and honest responses during data collection.

- ***Identification of key informants:*** Snowball sampling allows for the identification of key informants within a target population. These informants are individuals who possess unique or specialized knowledge and insights that are valuable to the study. By starting with a few initial participants and expanding the sample through referrals, researchers have the opportunity to identify and include key informants who can provide valuable perspectives and expertise.

- ***Examining concealed networks and behaviours:*** Using snowball sampling, researchers can examine concealed networks and behaviours within a community. Researchers can access social networks and subgroups that might not be obvious or accessible through traditional sampling approaches by making use of the social connections of individuals. This can offer insightful understandings of social dynamics, connections, and behaviours that could otherwise go unnoticed or unreported.

It is crucial to remember that while snowball sampling offers certain advantages, it also has drawbacks, such as the possibility of bias, a lack of generalizability, and the chance of particular features being overrepresented in the sample. When assessing if snowball sampling is suitable for

their study goals and target population, researchers should carefully consider these strengths and limitations.

## Weakness of Snowball Sampling

- It is usually impossible to determine the sampling error or make inferences about populations based on the obtained sample.
- Chances of bias: The serious limitation of the sampling method is that it involves biased selection and thereby leads us to draw erroneous conclusions. Bias arises when the method of selection of sample employed is faulty. Relative small samples properly selected may be much more reliable than large samples poorly selected.
- Difficulties in selecting a truly representative sample: Difficulties in selecting a truly representative sample produces reliable and accurate results only when they are representative of the whole group. Selection of a truly representative sample is difficult when the phenomena under study are of a complex nature. Selecting good samples is difficult.
- In adequate knowledge in the subject: Use of sampling method requires adequate subject specific knowledge in sampling technique. Sampling involves statistical analysis and calculation of probable error. When the researcher lacks specialized knowledge in sampling, he may commit serious mistakes. Consequently, the results of the study will be misleading.
- Changeability of units: When the units of the population are not in homogeneous, the sampling technique will be unscientific. In sampling, though the number of cases is small, it is not always easy to stick to the, selected cases. The units of sample may be widely dispersed.
- Some of the cases of sample may not cooperate with the researcher and some others may be inaccessible. Because of these problems, all the cases may not be taken up. The selected cases may have to be replaced by other cases. Changeability of units stands in the way of results of the study.
- Impossibility of sampling: Deriving a representative sample is difficult, when the universe is too small or too heterogeneous. In this case, census study is the only alternative. Moreover, in studies requiring a very high standard of accuracy, the sampling method may be unsuitable. There will be chances of errors even if samples are drawn most carefully

## Development of Snowball Sampling

As described in Leo Goodman's (2011) comment, snowball sampling was developed by Coleman (1958–1959) and Goodman (1961) as a means for studying the structure of social networks. Sampling these populations is difficult because standard statistical sampling methods require a list of population members (i.e., a "sampling frame") from which the sample can be drawn. Yet for a hidden population, constructing the frame using methods such as household surveys is infeasible when the population is small relative to the general population, geographically dispersed, and when population membership involves stigma or the group has networks that are difficult for outsiders to penetrate (Sudman & Kalton, 1986). Groups with these characteristics are relevant to research in many areas, including public health (e.g., drug users), public policy (e.g., illegal immigrants), and arts and culture (e.g., musicians).

Several years after Coleman's and Goodman's development of snowball sampling, what was also termed snowball sampling emerged as a non-probability approach to sampling design and inference in hard-to-reach, or equivalently, hidden populations.

## Model of Snowball Sampling

Non probability sampling technique commonly used in research and surveys to select participants for a study.

## Overview of Convenience Sampling

Utilising respondents who are "convenient" for the researcher is known as convenience sampling. There is absolutely no pattern in how these respondents are found; they could be found by simply asking persons who are in the street, in a public building, or at work. Because it is frequently misapplied, convenience sampling is the most popular type of non-probabilistic sampling. Taking samples that are conveniently placed near a location or Internet service is referred to as convenience sampling. Everybody has seen studies that take advantage of students taking computer science courses. This is incorrect use of a convenience sample. A proper use of convenience sampling would be sampling of craigslist, the Silk Road, or other black market services to study cyber crime communication. Selecting a set of found communications would adequately represent other criminal communication where computer science students do not represent the general public very well, (Edgar and Manz, 2017). It is also a non-probability sampling method where units are selected for inclusion in the sample because they are the easiest for the researcher to access.

This can be due to geographical proximity, availability at a given time, or willingness to participate in the research. Sometimes called accidental sampling, convenience sampling is a type of non-random sampling, (Nikolopoulou, 2022). Convenience sampling (also known as availability sampling) is a specific type of non-probability sampling method that relies on data collection from population members who are conveniently available to participate in study. Facebook polls or questions can be mentioned as a popular example for convenience sampling. Convenience sampling is a type of sampling where the first available primary data source will be used for the research without additional requirements. In other words, this sampling method involves getting participants wherever you can find them and typically wherever is convenient. In convenience sampling no inclusion criteria identified prior to the selection of subjects.

## Strength of Convenient Sampling

According to Louise Gaille (2020) convenience sampling is an affordable way to gather data. It doesn't take much effort to start a convenience sampling effort. You can post a survey link to a social media page, ask questions in a public space, or have a poll in which people can vote online. That is why it is one of the most affordable options of information gathering that exists right now. If you need to complete convenience sampling for a project, assignment, or professional need, then it may not cost anything but time and the supplies needed to have people fill out a survey or answer questions.

- It is useful as an intervention to correct dissatisfaction:

Convenience samples are an excellent way to intervene when someone had an unsatisfactory experience with a company. People are hesitant to confront poor service in person, but they will often take a survey or answer questions to provide information about a negative

experience. Preserving anonymity while providing a possible incentive, like a drawing for a gift card, can help to turn adverse energy into something more positive. The feedback companies receive in these circumstances can help them to improve consumer experiences in the future to avoid additional problems. Something as simple as placing a survey request on a receipt can help you make use of this advantage.

- This sampling method provides a wealth of qualitative information

Convenience sampling offers a way to receive specific feedback from individual perspectives. You can approach people about specific topics to collect needed data in just minutes when using this method. Surveys can even get tailors to help provide more details about an individual's demographic profile so that it becomes possible to build generalizations about a larger group in the future. That's why some will argue that a benefit of convenience sampling includes accurate correlations. It explores the relationship between variables while gathering information about specific individuals and their demographic groups.

- This research method saves time when gathering data.

Convenience sampling involves speed and convenience. You don't need to research any demographic groups or find pain points that require a value proposition to solve. This work wants to find specific feedback points or data on specific subjects to help gain new perspectives about products, services, or ideas. Then the information can get reviewed for validity, applied as necessary, and items updated based on the results achieved. Most willing participants will complete a convenience sampling questionnaire or survey in less than ten minutes. Even if you decide to take an interview based approach,

- The research process is easier with convenience sampling.

When researchers don't have a need to obtain accurate sampling, then the grab method allows them to collect data before moving on to the other aspects of their study. The usual approach taken with this method involves the creation of a questionnaire that gets distributed to the targeted group. Then researchers can use this method to collect their information in less than a day, free from worry because accurate representation isn't necessary. That means it a lot easier to analyze the info instead of worrying about participant selection and interviews.

- The data is immediately available when using this method.

Almost all forms of convenience sampling involve collecting data from the on-hand population. That means the information is readily available for the researcher for collection. It is not usually necessary to travel long distances or approach specific demographics to get the info needed to further a research project. Researchers just pull whoever is willing to participate from the closest physical location or through their website. This advantage makes it much easier for researchers to meet their data quotas quickly. It even allows for the completion of multiple studies simultaneously or in an expeditious manner since one participant can provide data on multiple subjects in just a few minutes when using this method.

- Limited rules exist on how the data should be gathered.

Convenience sampling is quite easy to carry out for most researchers. Although there can be rules and stipulations put onto this process to collect data from specific demographics, typically few rules are in place that govern how to gather the information. That makes it much easier for someone

to become a willing participant in the work. It only takes a few minutes of time to get rich info about specific topics. That's why it tends to be the preferred method of data gathering, even when scientific studies are under consideration. Only 5% of the published works in the last decade used probability sampling instead of the convenience method.

- Notations about potential bias can improve the validity of the work.

When researchers decide to use convenience sampling, then they often describe how their data collection methods would differ from an ideal, randomly selected sample. This step is necessary to describe the people who might get left out from the selection process since they may not be as easy to contact for this information gathering work. Although this advantage doesn't change the fact that over-representation can exist in the info, it does give researchers the opportunity to describe the possible effects of a population sample.

## Weakness of Convenience Sampling

- A convenience sample doesn't provide a representative result:

The information you receive from a convenience sample doesn't reflect the way a generalized population group feels about anything specific. Even if you work with a large group of people to collect a massive amount of data, you cannot extract any generalities from the specificities given with an answer. That means the feedback you receive is useful from an individualized standpoint, but it cannot offer any information about an entire group of people. The concerns from this disadvantage often involve over-representation, but there can also be issues with under-representation with convenience sampling. Since there isn't a feasible way to determine if either circumstance exists, there is a level of uncertainty in the information that will never go away.

- It is easier to provide false data with a convenience sample:

The average person doesn't want to be bothered when they are shopping, having fun, or trying to run errands. Engaging someone in these circumstances creates a higher risk of receiving inaccurate data. People will say what they feel is necessary to extract themselves from that situation. Although you can get pieces of authentic feedback, it is up to the researcher to determine if the information is useful. If the researcher determines that accurate information is false, then the exclusion of that data will adversely influence the results of the convenience sampling. This disadvantage applies if false information gets included because it is believed to be true.

- Some researchers don't understand the specificity of convenience sampling.

Although media outlets don't typically report the results of convenience sampling as a demographic reflection, some organizations will report this information internally or through marketing as proof of concept materials. If there isn't a description of the methodology used to gather data, then trusting its reliability shouldn't be the first priority. If researchers take specific feedback as a demographic representation, then it can lead to decision making circumstances that lead people and organizations in the wrong direction. That's why this method is useful for specific information point's more than general characteristics.

- It is challenging to replicate the results of convenience samples.

Because a convenience sample literally grabs willing participants from nearby, it is impossible to replicate the circumstances of each question. That's why there can be dramatic differences in the results of different efforts, even when the same questions get asked by

researchers. Each person has a unique set of priorities and perspectives that cannot be predicted since there isn't a qualification standard beyond agreeability with this process. This weakness can even apply when the same researchers contact the same individual with the same questions on a different day. How a person thinks and feels in any given moment is a reflection of their environment. If someone is having a stressful day at work after a sleepless night, their responses will be different than they would be on a day without those elements in their life.

- Researcher bias can enter into the sampling technique.

Researchers that perform convenience sampling soon find out that the average person doesn't want to speak with them or fill out an online survey. They begin to look for commonalities that let them approach someone comfortably with a high likelihood of success. That means a bias begins to enter into the data because only certain types of individuals receive an opportunity to become an agreeable participant instead of approaching the situation randomly. Because the bias of a convenience sample cannot be measured, any inferences based on the information can only be about the group of people involved in the work. If researchers outsource this task, then they have zero control over this issue.

- Convenience sampling does not identify subgroup differences.

Researchers can structure a convenience sampling effort to identify subgroups within their targeted population area. What their data cannot pick out are the differences that exist between the multiple subgroups. This insufficient power can lead to false estimations or generalizations about particular demographics because it only looks at the individual feedback offered at the time of information collection. Because the convenience method asks people questions about their subgroup instead of identifying them before conducting research, willing participants can provide misleading information about their presence in a specific demographic.

- This research method has a significant problem with dependence.

Dependence in convenience sampling means that the sample items have connections to each other in some way. This issue creates interference problems with statistical analysis. A majority of hypothesis tests, including the chi-square and t-test, have an underlying assumption of random selection. Since this research method can't provide that outcome, the p-values produced by the samples become quite misleading in most circumstances. The best way to reduce bias in convenience sampling is to use it with probability sampling as it provides a measurement parameter that wouldn't be available otherwise. It is also essential to avoid judgment when conducting research. According to Creswell (2012), convenience sampling is a sampling that the researcher selects participants because they are willing and available to be studied.

## Overview of Systematic Sampling

In statistics, systematic sampling refers to is a statistical method involving the selection of elements from an ordered sampling frame. The systematic sampling is an important concept used done correctly on a large population of a defined size.It usually regular, fixed intervals a sample of large population and also a sampling method that is basic, clear-cut, and simple to use, all things being equal. The most common form of systematic sampling is an equiprobability method. The sampling starts by selecting an element from the list at random and then every kth element in the frame is selected, where k, is the sampling interval (sometimes known as the skip): this is calculated as:

$$K = \frac{N}{n}$$

where n is the sample size, and N is the population size (Ken, 2004). For example: **Population size (N)** = 1000; **Desired sample size (n)** = 200; Sampling **interval (I)** = N / n 1000 / 200 = 5.So every 5th item will be selected for the sample.

In statistics, a sampling method is systematic if it involves selecting individuals or items for a sample in such a way that every nth item is selected. These intervals are known as skip or sampling intervals. This interval is calculated by dividing the population size by the desired sample size.

Different types of systematic sampling that can be used for single or multi-phase surveys.

*1. Systematic Random Sampling*

Simple systematic sampling is the most basic type. You just need to select from a random starting point but with a fixed, periodic sampling interval.

Example: Suppose a supermarket wants to study their customers' buying habits.

With systematic random sampling, they can choose every 10th or 15th customer entering the supermarket. Then, they can conduct the study on this sample.

*2. Stratified Systematic Sampling*

Stratified sampling divides your audience into sub-groups called strata. Any characteristic can be the basis for this strata, like age, ethnicity, religion, etc. Then, using sampling intervals, you can choose sample members from each strata.

Example: Let's say you're researching the factors that influence consumer preferences towards bread.

Age does play a role here, so you would want to divide your audience into age groups like 18-25, 25-40 etc. From each strata, you can select individuals to study using sampling intervals.

*3. Linear Systematic Sampling*

This type treats the audience list as a fixed line divided at periodic sampling intervals. So once you reach the end of the line, you have exhausted your list and the sampling ends there.

Example: This is a helpful sampling type if you require only a one-time sample and know exactly how many units are there in your audience.

For example, if you are sampling for a work stress study within your organization between March-December, you can easily find out the current number of employees and apply the linear method.

*4. Circular Systematic Sampling*

This type treats the audience as a circular list. Once you reach the end of the list, you can continue the selection from the beginning. You can visualize this as a clock, with the hour lines symbolizing intervals.

Example: What if you have a huge population to draw from? Or you need multiple sets of samples?

Circular systematic sampling is the best option. Because assuming the total audience is N, you can potentially get an N number of samples to work with.

*5. Proportionate Systematic Sampling*

In proportionate sampling, the sample size from each strata is proportional to the strata size.

Example: When you're doing a Teacher Feedback survey among three classes of 30 students each. To save time, you choose proportional samples of 10 students from each class.

**Weakness of Systematic Sampling**

- ***Success Relies on Population Count:*** The effectiveness of systematic sampling depends on the initial count of the population. After all, that's the number that is divided by the desired sample size to determine the fixed interval for sample selection. When the population isn't measurable or available, researchers have to be able to make a close approximation. If the population is estimated to be smaller or larger than its actual number, this can affect the samples and produce inaccurate results.
- ***Patterns Can Be Predicted:*** When a smaller population is being surveyed, the fixed integer pattern used to select samples can be predicted. This can cause bias among the participants, and some could provide erroneous responses to increase the chance that the study will end with a specific outcome. Rather than organic results, the study could result in an undetected bias. This would result in a compromised study with false, untrustworthy results.
- ***Unequal Selection is Possible:*** Because systematic sampling makes inferences from a representative subset of a population, there is a chance that results won't be completely accurate. Systematic sampling relies on a numbering system to choose sample participants. Especially in circular systematic sampling, it's possible for individuals to be overlooked due to their position in the periodic interval. The perspectives of these people won't be included in the responses, so the results can't be complete. This means researchers will always miss feedback that could lead to a new discovery, (Checkmarket, 2022).

**Strength of Systematic Sampling**

***It is Simple and Quick to Implement:*** The structure of systematic sampling enables researchers to build, assess, and manage samples easily. Because the formula to choose sample subsets is predetermined, the only random aspect of the study is choosing the initial subject. From there, the selection process follows a fixed pattern until the desired sample group is complete. Additionally, since systematic sampling builds representative data for the overall group, researchers don't need to number each subject. This means sample selection and data analysis are quick and easy (Checkmarket, 2022).

***Less Opportunity for Manipulated Data:*** In some sampling methods, there's a distinct possibility that certain individuals will be sampled more than others. This can affect data and produce inaccurate results. With systematic sampling, each participant is a fixed distance from the next. This means that samples are clearly separated and helps minimize the chance for bias (Checkmarket, 2022). Also, by using a fixed interval, researchers have no influence over which individuals are chosen for sampling. Samples are more precise, which helps protect data collection from favoritism, m inimizes the risk of error, and reduces the chance of data manipulation. With systematic sampling, you can trust the data you gather.

***Samples are Evenly Distributed:*** In some random selection processes, subjects are located too close together. This can contaminate data and result in inaccurate findings. Systematic sampling is highly

structured, resulting in a more authentic representation of the overall population. No matter how diverse the group is, this selection process produces an evenly distributed collection of subjects. This makes their results easier to compare, execute, and analyze.

Systematic sampling design with probability proportional to size were derived by Hartley & Rao (1962), who were then able to obtain estimates of the variance of 'YHT that are accurate enough for large populations, provided that the units are listed in random order.

## Model of Systematic Sampling

Systematic sampling is a type of probability sampling method in which sample members from a larger population are selected according to a random starting point but with a fixed, periodic interval. This interval, called the sampling interval, is calculated by dividing the population size by the desired sample size (Hayes, 2022).

## Stratified Sampling Method

Stratified sampling is a method of random sampling that divides the whole population of samples into smaller subsets of samples, known as strata. In this method, the strata are formed based on the characteristics of basic variables X, such as load effect, resistance and environmental factors. In the stratified sampling method, the entire population of basic variables is divided into homogeneous strata of samples. Then samples are randomly taken from these strata selectively to represent the whole population, (Chun-Qing, Li & Yang, W. 2020)

## Strength of Stratified Sampling Method

The strength of stratified random sampling is that it captures key population characteristics in the sample. Similar to a weighted average, this method of sampling produces characteristics in the sample that are proportional to the overall population, (HAYES, A. 2023).

## Weakness of Stratified Sampling Method

According to Anjaneyulu (2023), one major weakness of stratified sampling is that the selection of appropriate strata for a sample may be difficult. A second downside is that arranging and evaluating the results is more difficult compared to a simple random sampling.

## CONCLUSION

The paper concluded that sampling helps a lot in surveys and research, where we have to take a sample from a large population. Different techniques of sampling are available to give different types of desired results. Sampling is used to form conclusions about populations based on samples, and it allows us to identify the features of a population by directly seeing only a subset (or sample) of the population. It takes less time to select a sample than it does to select every item in a population. The study emphasises the significance of sampling and the determination of sample size in statistical research. The most common methods for sample size determination employed in recent statistical studies are the normal distribution, confidence interval (risk of error in the statistical hypothesis testing), and permissible error in the estimate. An investigator or researcher can calculate the appropriate sample size according to the design of the study mentioned above and measure the result. Attention to sample size will hopefully result in a more meaningful study whose results and interpretation will eventually receive high priority for publication.

## RECOMMENDATIONS

1. All sampling techniques are useful but each is selective based on the nature of the research. Hence, researchers should be very careful when selecting a particular sampling technique for a study in order to guarantee accuracy in application of the sampling technique for the production of correct result.

2. It is pertinent to note that probability sampling methods, such as simple random sampling or stratified sampling are more scientific in nature and appropriate for obtaining representative and generalizable results. Hence, researcher should apply them more often than the non-probability sampling methods, except in some cases where the latter is more appropriate and necessary for the study.

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