A Manual for Selecting Sampling Techniques in Research

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PREFACE

The **Manual for Sampling Techniques used in Social Sciences** is an effort to describe various types of sampling methodologies that are used in researches of social sciences in an easy and understandable way. Characteristics, benefits, crucial issues/ draw backs, and examples of each sampling type are provided separately.

The manual begins by describing **What is Sampling and its Purposes** then it moves forward discussing the two broader types: probability sampling and non-probability sampling. Later in the text various types of each of the broader category are discussed.
Reading the manual from beginning to the end you will find some points are repeated under various headings. This is done to make each topic exclusively a complete whole so that there might not remain any requirement to read other topics for understanding the one.

Also, similar examples with a little modification are used in the description of different sampling techniques. The purpose behind doing this is to clarify the minor distinction in the applicability and usage of different types of sampling techniques.

I have also included a section **Comparison of some Resembling Sampling Techniques,** the purpose of which is to eliminate confusions among the techniques that look somewhat similar to each other. Both types of characteristics are described: that make the techniques resembling, and that create the difference between them.

In the section **Which Sampling Technique to use in your Research,** it has been tried to describe what techniques are most suitable for the various sorts of researches. So one may easily decide which particular technique is applicable and most suitable of his or her research project.

There are three appendices in the manual which are giving a concise view of all the techniques discussed in the text. Appendix I is giving a comparison of two broader categories of sampling methods: probability, and non probability. Appendix II is portraying a brief summary

of various types of probability sampling technique. Appendix III is presenting a brief summary of various types of non-probability sampling technique.

A glossary is also provided in the manual. The words that are used as synonyms to one another are mentioned. Moreover, definitions of the terms that are repetitively used throughout the manual are provided. The words defined in the glossary are written with *italic letters* in the text.

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POPULAION, SAMPLE AND SAMPLING

POPULATION AND A SAMPLE

Population

- Target population refers to all the members who meet the particular criterion specified for a research investigation.
- For example a population of schools of Canada means all the schools built under the boundary of the country. A population of OCD means all the people having clinical diagnosis of the disorder.
- A single entity of any given population which is not decomposable further is called as an element.
- An element may be an individual, a household, a factory, a market place, a school, etc.
- What an element is going to be depends on the nature of population.
- What a population is going to be depends on the nature of investigation.
- A population may be *homogenous* or *heterogeneous*.
- A population is said to be *homogenous* when its every element is similar to each other in all aspects.
- In other words, every element has all the characteristics that meet the described criteria of target population.
- A population is said to be *heterogeneous* when its elements are not similar to each other in all aspects.
- In other words, one characteristic variable is not same among all the elements while they meet the rest of the criteria that defines the target population.
- Variables that make a population *heterogeneous* vary greatly from research to research.
- Common variables that make a population *heterogeneous* are gender, age, ethnicity, socioeconomic status etc.
- Moreover, the homogeneity and heterogeneity of population depends on the goal and nature of your research.
- Same population may be *homogenous* for one research project and *heterogeneous* for the other.
- For instance, if the goal of a research is to investigate average IQ of the employs of XYZ Company. The population is *homogenous* which is composed of people who work at the

company. It does not matter for the research purpose whatever socioeconomic, religious or gender group the workers may belong to.

- Now consider another research the purpose of which is to find if the environment of the Company is satisfactory for its employs. In this case, men and women are likely to keep different opinions (as our prior knowledge tells us women encounter issues of harassment, gender indiscrimination etc. at work places). Now the population needs to be divided into two groups: male workers of XYZ Company and female workers of XYZ Company.
- In this way, the same population that was *homogenous* for the former research becomes *heterogeneous* on gender basis for the later.

Sample

- A sample can be defined as a group of relatively smaller number of people selected from a population for investigation purpose.
- The members of the sample are called as *participant*s

SAMPLING AND ITS PURPOSE

- The process through which a sample is extracted from a population is called as sampling.
- In investigation it is impossible to assess every single element of a population so a group of people (smaller in number than the population) is selected for the assessment.
- On the basis of information obtained from the sample, the inferences are drawn for the population.
- The more the sample is representative of the population, the higher is the accuracy of the inferences and better are the results *generalisable*.
- A sample is said to be representative when the characteristics of elements selected are similar to that of entire target population.
- The results are said to be *generalisable* when the findings obtained from sample are equally true for the entire target population.
- Sampling process may encounter the problem of *systematic errors* and *sampling bias*es.
- *Systematic errors* can be defined as incorrect or false representation of the sample.

- These errors are caused by over representation of one characteristic and/or under representation of the others.
- *Sampling bias* is said to occur when the selected sample does not truly reflect the characteristics of population.
- For instance, a research takes into account the people at a hospital; the researches judges which person might be willing to be a *participant* of his research. In this way people who look friendly and less disturbed are more likely to be a part of the research.
- This sample would not be reflective of the whole hospital population; more aggressive, unfriendly and disturbed people are also a part of the target population.
- Thus this sampling is biased by researcher's subjective judgment.
- Systematic error has occurred by the over representation of friendly people.

TYPES OF SAMPLING

Sampling techniques are broadly categorized into two major types:

1) Probability sampling methods
2) Non-probability sampling methods

1) Probability Sampling Methods

- Probability sampling is also called as random sampling or representative sampling.
- In probability sampling every member of the population has a known (non zero) probability of being included in the sample.
- Some form of random selection is used.
- The probabilities can be assigned to each unit of the population objectively.
- These techniques need population to be very precisely defined.
- These techniques cannot be used for the population that is too general a category found almost everywhere in the world.
- For instance if our target population is defined as college students. It means person studying at any college of the world is an element of our population.
- In this case how a sample can be extracted through probability sampling technique.

- Contrastingly, if the target population is defined as students of 2015-16 badge of Royal College. It means only those students constitute our population who study at the college during the mentioned period.
- In this case probability sampling can be done as the population is precisely defined and limited to an infinite number of elements.
- **Advantages:**
  - This sampling technique reduces the chance of *systematic errors*.
  - The methods minimize the chance of *sampling bias*es.
  - A better representative sample is produced using probability sampling techniques.
  - Inferences drawn from sample are *generalisable* to the population.
- **Disadvantages:**
  - The techniques need a lot of efforts
  - A lot of time is consumed.
  - They are expensive.

2) <u>Non-Probability Sampling Methods</u>

- Probability sampling is also called as judgment or non-random sampling.
- Every unit of population does not get an equal chance of participation in the investigation.
- no random selection is made
- The selection of the sample is made on the basis of subjective judgment of the *investigator*.
- These techniques need not population to be very precisely defined.
- These techniques can be used for both types of population: the population that is too general a category, and the population that is a specific category (precisely defined).
- For instance if our target population is defined as college students. It means person studying at any college of the world is an *element* of our population. It is too general a category consisting of infinite number of *element*s.
- Contrastingly, if the target population is defined as students of 2015-16 badge of Royal College. It means only those students constitute our population who study at the college during the mentioned period. It is a specific type consisting of finite number of elements.

- Thus, non probability techniques make it possible to take a sample of population the elements of which are infinite in number.
- Non-probability sampling is well suited for exploratory research intended to generate new ideas that will be systematically tested later.
- Probability sampling is well suited for research that is intended to develop the understanding of a population.
- **Advantages:**
    - The techniques need less effort.
    - These techniques need less time to finish up.
    - They are not much costly.
- **Disadvantages:**
    - The sampling techniques are prone to encounter with *systematic errors* and *sampling bias*es.
    - The sample cannot be claimed to be a good representative of the population.
    - Inferences drawn from sample are not *generalisable* to the population.

VARIOUS TYPES
OF
PROBABILITY SAMPLING METHOD

TYPES OF PROBABILITY SAMPLING METHODS

Following methods are used for probability sampling

1. Simple Random Sampling
2. Systematic Random Sampling
3. Stratified Random Sampling
4. Cluster Sampling
5. Multistage Sampling

1) Simple Random Sampling:

- In this type of sampling each and every element of the population has an equal chance of being selected in the sample.
- The population must contain a finite number of elements that can be listed or mapped.
- Every element must be mutually exclusive i.e. able to distinguish from one another and does not have any overlapping characteristics.
- The population must be homogenous i.e. every element contains same kind of characteristics that meets the described criteria of target population.

- **Method:**
  - Before taking a sample the population is needed to be defined. In other words, one must know what characteristics constitute the population of interest.
  - A list of all the elements of population is required.
  - One needs to prepare the list if the readymade is not available.
  - The list must be exhaustive i.e. it must contain the name of each and every element of the population.
  - One method for the selection of participants is lottery method: each element is first given a number and then numbers are individually written on slips of paper. The slips are put and mixed thoroughly in some bag or bowl. Then the decided number of slips is drawn out of it.
  - Other methods may be the use of any random table generated through computer or any other resource.
  - The selected participants are approached and investigation is done.

- **Benefits:**
    - There is not the possibility of sampling biases.
    - The sample is a good representative of the population.
- **Crucial Issues/ Draw Backs:**
    - It may be very costly and time consuming especially in those cases when the participants are widely spread geographically and difficult to approach
    - It needs a lot of efforts especially for a large population.
    - In many circumstances it is not possible to get or prepare an exhaustive list of elements. Even apparently complete lists may also exclude some of the potential elements. For instance, we randomly select the population of a town using telephone list. Is it sure that everybody in the town has a connection?
- **Example:**
    - The owner of Company XYZ wants to know if his employs are satisfied with the quality of food provided in the company.
    - In this case, the target population is every person who works at the company.
    - Thus population is precisely defined, is specific and elements are finite in number.
    - The population is homogenous because people belonging to different groups (age, sect, gender) are not very much likely to be different over the issue.
    - There are 1000 employs in the company.
    - To draw a sample of 100 participants, the researcher uses an exhaustive list of the employs (it means the list contains the names of all the 1000 employs).
    - He allots a number to each name.
    - He now follows a computer generated table containing 100 numbers in between 1 to 1000.
    - The participants whose names are corresponding to the selected numbers are approached and investigated.

2) Systematic Random Sampling

- This type of sampling is also used for homogenous population.
- It is a bit different from simple random sampling.
- Unlike simple random sampling, there is not an equal probability of every element been included.
- In this type of sampling the elements are selected at a regular interval.
- The interval may be in terms of time, space or order. For instance, element appearing after every 30 minutes, or present at a distance of two meters, or every 5th element present on a list.
- Thus this regularity and uniformity in selection makes the sampling systematic.
- The list of elements may or may not be required before the conduction of research.
- Sometimes it is not even possible to create a list because of the nature of population. Say, if it is possible to tell who is going to visit the coffee shop today.

- **Method:**
  - Before taking a sample the population is needed to be defined. In other words, one must know what characteristics constitute the population of interest.
  - In case where exhaustive list of elements of the target population is available, the list is arranged and numbered in an order 1 to N.
  - To find an appropriate interval suppose population contains N number of elements and we need a sample of n size.
  - Divide N by n. the number obtained through this division, say k, is an appropriate interval size to produce a representative sample.
  - For instance if population is consisted of 300 elements and we need a sample of 30 participants, then interval size will be 10 so we need to select every tenth element
  - Then first element, say 5th, is selected at random then every 10th is selected.
  - In this way the sample will be composed of 5th, 15th, 25th 35th and so on elements.
  - Selected numbered elements are then approached and the investigation is done.
  - In case where the list is not possible to make an interval size is decided and then participants appearing with that interval are approached.

- **Benefits:**
  - It ensures the extension of sample to the whole population
  - It provides the way to get a random and representative sample in the situation where prior listing up of elements is not possible.
- **Crucial Issues/ Draw Backs:**
  - It may be very costly and time consuming especially in those cases when the participants are widely spread geographically and difficult to approach
  - It needs a lot of efforts especially for a large population.
  - If the order of the list is biased in some way, systematic error may occur. For instance, you are going to select every 15th element from a list compiled of groups of fifteen members where the first name in each group is that of the Prime Minister.
- **Example:**

Example 1 (when list of elements cannot be prepared)

- A super market has been advertised through bill board a few meters away from its existence.
- The owner wants to know how much this advertisement has contributed to bring the costumer to the market.
- Thus population in this research is constituted by every person who visits the market.
- The goal of research does not need population to be divided into groups, so the population is homogenous.
- The list is not possible to prepare.
- The researcher sets a regular interval in terms of order.
- First he includes the third costumer who enters the market.
- Now he includes every 10th from the first selection.
- In this way he includes 3rd, 13th, 23rd, 33rd, and so on costumer.

Example 2 (when lists are available)

- The owner of Company XYZ wants to know if his employs are satisfied with the quality of food provided in the company.
- In this case, the target population is every person who works at the company.

- There are 1000 (N) employs in the company working in 4 different departments A, B, C, D.
- The population is homogenous because people belonging to different groups are not very much likely to be different over the issue.
- However the elements are already grouped.
- So in order to ensure the extension of sample to the whole population systematic sampling is used
- To draw a sample of 100 (n) participants, the researcher uses an exhaustive list of the employs from all the four departments.
- He arranges the lists in order and compiles them to one.
- There are 234 employs in A, 345 in B, 156 in C, 265 in D
- He allots a number to each name.
- In this way the name that was first on the individual list B is now 235th on the compiled list.
- Dividing N by n, researcher gets a number for the interval to be used i.e. 10.
- Looking into the list, he selects 7th employ at random.
- Then every 10th from the 7th is included.
- In this way the sample is composed of employs whose names are corresponding to number 7, 17, 27, 37…..997.

3) <u>Stratified Random Sampling</u>

- This type of sampling method is used when population is heterogeneous. i.e. every element of population does not matches all the characteristics of the predefined criteria.
- Instead the elements differ from one another on a characteristic.
- So the sub groups are formed that are homogenous i.e. all the elements within a group contains same kind of characteristics (keep in mind, those characteristics are to be taken into account that defines the target population).
- The sub groups are called as strata (single stratum)
- The topic and nature of the investigation tells on what criterion the strata are to be made.

- Common criterions used for stratification are gender, age, ethnicity, socioeconomic status. However, the criterion vary greatly investigation to investigation
- This formation of strata can also be called a mini reproduction of population as each stratum consists of elements that are different from other strata's element in some characteristics.
- For instance if an investigation is taking young adults into account, so this population may need to be divided (of course, on the basis of what the investigation is about)into sub groups like male young adults and female young adults, educated young adults and uneducated young adults, high income young adults and low income young adults etc. in this way each stratum is a different population
- The sample is selected from each stratum randomly.
- There are two techniques that are used to allocate sample from strata: proportional allocation technique and equal allocation technique.
- Using proportional allocation technique the sample size of a stratum is made proportional to the number of elements present in the stratum.
- Using equal allocation technique same number of participants are drawn from each stratum regardless of the number of elements in each stratum.
- **Method:**
    - Before taking a sample the population is needed to be defined. In other words, one must know what characteristics constitute the population of interest.
    - On the basis of nature and purpose of investigation it is decided which criterion has to be taken into account to make the sub groups (strata)
    - Then on the basis of decided criterion stratification is done
    - A list of all the elements of each strata is required.
    - One needs to prepare the list if the readymade is not available.
    - The list must be exhaustive.
    - The participants are then selected from each stratum through lottery method or using any random table (as in simple random sampling)
    - Or in case if it is not possible to prepare the list because of the nature of population every nth element is selected from each stratum (as in systematic random sampling)

- **Benefits:**
  - For a heterogeneous population it produces a representative sample as it captures the diversity which otherwise is likely to be undermined through simple random or systematic random sampling.
- **Crucial Issues/ Draw Backs**
  - It needs a lot of efforts.
  - It is costly and time consuming
  - If the criterion characteristic/ variable used for classification is not selected correctly, the whole research may go in vain.
- **Example:**
  - The owner of a chain of schools wants to know what percentages on an average have been obtained by his grade 10 students in the Board examination.
  - He has six branches of his schools.
  - The target population is every student who studies in grade 10 of any branch of the school.
  - This population is heterogeneous for the schools are headed by different person and different teachers teach in each.
  - These factors are likely to impact the quality of education and thus the results of the students.
  - So the 6 schools are divided into 6 sub groups or strata.
  - Students are now randomly selected from each stratum using systematic random or simple random sampling.

4) <u>Cluster Sampling</u>

- The group of elements residing in one geographical region is called as cluster.
- And sampling of clusters is called as cluster sampling.
- This sampling technique is used when the elements of population are spread over a wide geographical area.
- The population is divided into sub-groups called as clusters on the basis of their geographical allocation.

- Usually this division of population is similar to what the standard of division has been used yet.
- For instance population spread over a country is clustered up into cities, population spread over a city is clustered up into towns etc.
- The clusters ought to be homogenous among them on the characteristic variable of the research.
- However for being truly representative sample, the selected clusters must capture the heterogeneity of population.
- For instance if in the selection of towns only small towns are selected leaving behind the bigger towns, the sample is not going to be a true representative of the population

- **Method**
  - First of all the population is divided into clusters.
  - The clusters are selected randomly using simple random or systematic random sampling techniques.
  - The selected clusters are visited.
  - All the elements (may be individuals, households, schools, markets etc. depending on the nature of investigation) within the selected clusters are investigated.
- **Advantage:**
  - In cases where the population is spread over a wide geographical region, cluster sampling is used to reduce cost as compare to simple random or systematic random sampling.
  - It consumes less time and efforts than the aforementioned techniques.
  - For instance the list of elements of the population is not required.
  - Moreover, instead of going place to place over a widely spread area for randomly selecting elements, you get a group of elements in one geographical region.
- **Crucial Issues/ Draw Backs:**
  - It may sometimes lead to sampling biases and systematic errors.
  - For instance, in the selection of markets only big markets may be selected, though randomly. So this selection is likely to impact the results. The results may be different if there were small markets in the selection too.

- If clusters are not homogeneous among them, the final sample may not be representative of the population.

- **Example:**
  - Education department wants to inspect quality of education in schools of ABC City.
  - There are twenty five thousand schools in the city; the researcher wants to take a sample of 1000 schools.
  - In this case if simple random or systematic random sampling is used it will demand to move around the whole city locating the selected schools that are dispersed.
  - Of course, it would consume more time, efforts and money.
  - So, instead the researcher chooses cluster sampling for his research.
  - He divides the city's population into 21 towns; thus into 21 clusters.
  - A number is allotted to each cluster.
  - Then 7 clusters are selected using simple random sampling.
  - This is the crucial time of the sampling technique, where systematic errors may occur.
  - Say, for instance, if the selected clusters are only smaller towns (there is under representation of the bigger town) and/ or if selected clusters only belong to higher economic class (there is under representation of lower economic group)
  - These variables are likely to impact the results of the present research
  - Thus there is a requirement of careful assessment of the selection.
  - Once the selection is finalized, the researcher goes to the selected clusters and examines each and every element (school) of them.

5) <u>Multistage Sampling</u>

- It is a sampling technique where two or more probability techniques are combined.
- It is used when the elements of population are spread over a wide geographical region and it is not possible to obtain a representative sample with only one aforementioned technique.
- It can be described as sampling within the sample.

- The final unit or element of population which is used in investigation is obtained after sampling at several stages.
- **Method:**
  - Usually at the first stage target population is divided into clusters.
  - The clusters are selected randomly.
  - These clusters are called as first stage units or primary units
  - These clusters are homogenous among them but may be heterogeneous inside.
  - To overcome this heterogeneity, homogenous sub groups called as strata are formed.
  - So the strata are called the second stage units or sub-units.
  - The formation of these strata can be done using cluster sampling technique or stratified random sampling technique depending on the nature of investigation.
  - In each stratum the units may need to be further divided, for instance market places into shops, buildings into houses etc.
  - The final units obtained are investigated.
- **Advantages:**
  - It increases cost and time efficacy.
  - For instance instead of investigating all the elements within a cluster, if a sample is randomly drawn from each cluster, the results will be similar but with lesser efforts. This particular sampling method where random sampling is done within the selected clusters is called as two stage sampling.
  - The technique is also useful in overcoming the heterogeneity problem within the clusters.
- **Crucial Issues/ Draw Backs:**
  - If the selected clusters do not capture the characteristic diversity of population, the sample would not be representative of the population.
  - If the characteristic variable used for making strata (in case of heterogeneity) at any stage is not appropriately selected depending on the nature of investigation, the whole research may go in vain.

- **Example:**
  - The purpose of a research is to find out the best seller food products brands of the year in the country.
  - In this case the target population is constituted by every market where the food products are sold.
  - So the population is not only spread over a wide geographical region of the country but is also dispersed.
  - The researcher first divides the country into cities; there is a formation of 150 clusters
  - He selects 30 clusters randomly; these form the first stage units
  - Care is needed to be taken in the selection so that there must be a representation from smaller as well as bigger cities.
  - The sale of a food product is likely to be impacted by its price; so there is a possibility that people belonging to lower and higher income groups are different in their preference of food products.
  - Thus the researcher divides each city into 3 strata: residence of lower class, middle class and upper class; these strata form the second stage units.
  - Even now it is not possible to take a random sample of elements from each stratum because the strata are spread over a wide geographical region.
  - So, the researcher makes clusters within each stratum and then randomly selects clusters from each of the 3 strata.
  - These clusters form the final units of the sample.
  - Each element (i.e. food products selling shops and markets) within the selected clusters are now approached and investigated.

VARIOUS TYPES
OF
NON-PROBABILITY SAMPLING
METHOD

TYPES OF NON-PROBABILITY SAMPLING TECHNIQUES

Following methods of sampling are included in the non probability sampling:

1. Volunteer sampling
2. Convenient sampling
3. Purposive sampling
4. Quota sampling (proportional and non proportional)
5. Snowball sampling
6. Matched Sampling
7. Genealogy Based Sampling

1) Volunteer Sampling

- The members of the sample self-select themselves for being the part of the study.
- In other words it is not the investigator who approaches the participants rather participants themselves reach the investigator.
- Method**:**
  - Participants are told about the investigation through advertisements and announcements.
  - Whosoever is interested contacts the investigator.
- **Crucial Issues/ Draw Backs:**
  - This type of sampling often encounters the problem of generalization.
  - This technique encounter with systematic errors.
  - The people who take part in are those who have an interest in the topic and thus they cannot be a representative of the people who are indifferent to it.
- **Advantage:**
  - It is inexpensive.
  - It is less time consuming
  - It helps in gathering a big amount of data in very limited time with small efforts.
  - The researcher does not need to put any efforts for search of participants.

- **Example:**
  - A T.V program wants to know how many people of the country are in favor of a particular political ideology.
  - An announcement is made in the program and the viewers respond to the question through phone call or message.
  - The sample is restricted and non representative of the country's population in a way only those people are the respondents who were watching the program at that moment.
  - People who were busy in some other tasks could not take part. Moreover, the viewers are those who already have an interest in the ongoing topic.

2) <u>Convenient Sampling</u>

- It is also called as accidental sampling or opportunity sampling.
- The researcher includes those participants who are easy or convenient to approach.
- The technique is useful where target population is defined in terms of very broad category.
- For instance the target population may be girls and boys, men and women, rich and poor etc.
- **Method:**
  - Any member of the target population who is available at the moment is approached.
  - He or she is asked for participation in the research.
  - If the person shows consent, the investigation is done.
- **Crucial Issues/ Draw Backs:**
  - It is subjected to sampling biases and systematic errors.
  - The categories of target population are broader enough to be divisible into infinite number of categories within themselves which are contrastingly different from one another and cannot at any cost be representative of each other.
- **Advantage:**
  - It consumes fewer efforts.
  - It is inexpensive.

- It is less time consuming as the sample is quick and easy to approach.

- **Example:**
  - A student enrolled in school ABC wants to investigate how men and women are different in expression of love.
  - For his convenience, he selects the sample from the same school.
  - The problem with this sampling is how these students can be representative of all men and women.

Note: convenient sampling is not always a *mutually exclusive* category of non-probability sampling techniques rather it is used in various other types of it. For instance, a researcher wants to investigate difference in aesthetic sense among people belonging to different educational domains. A quota is made for every domain of arts and science faculties in a university. The researcher reaches every department in the morning and assesses the students who were sitting free in the lawn. In this way the sample is chosen on the convenience of the *investigator* for he was free in the morning. Moreover, he approached the students who were free at that time and did not have any classes.

3) <u>Purposive Sampling:</u>

- It is not a mutually exclusive category of the sampling technique rather many other non probability techniques are purposive in nature.
- In fact William M. Trochim divided non-probability techniques into two broader categories: convenient and purposive
- Thus all the other types of sampling techniques are described under the heading of purposive sampling.
- In purposive sampling the sample is approached having a prior purpose in mind.
- The criteria of the elements who are to include in the study is predefined.
- So we do not include everyone who is available to us rather those available are included who meet the defined criteria.
- **Example:**
  - The purpose of a research is to investigate which type of clothing middle age women prefer.

- The investigator visits a cloth market.
- There are many women in the place but the investigator goes to only those women who appear of middle age group and ask them to participate in his research.
- It is because the researcher had a purpose of doing such a selection.
- He had set the criteria for his elements i.e. they should be women, and should be of middle age.

4) Quota Sampling

- This type of sampling method is used when population is heterogeneous i.e. every element of population does not matches all the characteristics of the predefined criteria.
- Instead the elements differ from one another on a characteristic.
- So the sub groups are formed that are homogenous i.e. all the elements within a group contains same kind of characteristics (keep in mind, those characteristics are to be taken into account that defines the target population).
- The topic and nature of the investigation tells on what criterion quota is to be set.
- Common criterions used for quota are gender, age, ethnicity, socioeconomic etc.
- However, the criterion vary greatly investigation to investigation.
- The participants are selected non-randomly from each sub group on the basis of some fixed quota.
- **Method:**
  - First of all there is a need to identify the variable which makes the target population heterogeneous.
  - On the basis of the identified variable sub groups are made.
  - A quota is set for each sub group.
  - Then the sample is approached on the basis of set quota
- **Advantage:**
  - It ensures the presence of every sub group of the population in the sample.
  - There is not the requirement of any lists of the elements of population.
  - It is less time consuming and low in cost than stratified random sampling.

- **Crucial Issues/Draw Backs:**
  - Like all other non-probability techniques, the sample is not representative and thus encounters the problem of generalisability.
- **Example:**
  - The purpose of a research is to investigate if students of natural Sciences are different from students of Social Sciences in aesthetic sense.
  - The researcher selects 3 universities where both type of subjects are taught. (a purposive selection it is)
  - There are two target populations: students belonging to natural sciences, and students belonging to social sciences.
  - Both the populations are heterogeneous.
  - Natural science is divided into Biology, Chemistry, Physics, Mathematics and many more; similarly, social science is divided into Sociology, Philosophy, Psychology, Education and many more.
  - It is important for the research to include representation from every sub group.
  - So the researcher sets a quota for each of the fields of natural sciences and social sciences taught in the selected universities.
- **Types of quota sampling**

  There are two types of quota: proportionate, and non-proportionate

  - **Proportionate quota sampling**

    In proportionate quota sampling the percentage of every sub group is set on the basis of their actual proportion present in the population.

    Example: if quota is made on the basis of age and the population comprises of 30% young, 40% middle age, and 30% old individuals, so the quota will be made in the same proportion. In this way the sample of 200 *participant*s will contain 60 young, 80 middle age and 60 old individuals
  - **Non-proportionate quota sampling:**

    In non-proportional quota sampling the percentage of quota does not go with the proportion of the sub-group present in the population rather a minimum percentage is set that is to be included.

Example: the researcher wants to include all the ethnic minority groups present in the country. So a quota is set like this: at least 3% Hindus, 3% Christians and so on.

5) Snowball Sampling:

- It is also called as chain sampling.
- One element of the population is approached at a time and then is asked to refer the investigator to the other elements of the population.
- **Method:**
  - The investigator selects a person who matches the criteria of the research
  - The first participant is now asked to refer the investigator to another person who meets the same criteria.
  - Now the second participant approached is asked to refer the researcher to another one. In this way a chain is made.
- **Advantage:**
  - This technique is useful in approaching the type of population which is not readily available or present in a very small quantity.
- **Crucial Issues/Draw Backs:**
  - It is subjected to sampling biases and systematic errors due to network connection.
- **Example:**
  - The purpose of a research is to investigate what kind of personality billionaires posses.
  - In this case the target population is every person found anywhere in the world who is owner of billions.
  - The elements of this population, however, are rarely found.
  - So the investigator find one person, Mr. A, having the required characteristic (i.e. a billionaire) and approach him.
  - After completing his investigation from Mr. A, the researcher asks him to refer him to another billionaire he knows.
  - Mr. A refers him to Mr. B.

- Then Mr. B let him know about Mr. C.
- In this way a sample of population which was very difficult to approach is obtained

6) Matched Sampling

- This technique is used in experimental researches.
- The main purpose of this sampling is to take a control group to assess the effects of an intervention.
- Two groups of elements that resemble on a variety of variables are selected.
- Intervention is introduced on only one group.
- The other group is used to compare with the first one to see what impacts the intervention produced.
- **Method:**
  - First one element is judged to be a part of the research.
  - Then, another element is explored that resembles the first one on a variety of important variable.
- **Benefits:**
  - The technique makes it possible to examine if an intervention is really useful or not.
- **Draw backs/ Crucial issues:**
  - In the selection of the matching element care must be taken and the elements must be matched on every possible influencing factor so that it may be claimed that the changes in the two elements are due to introduced intervention and not something else.
- **Example:**
- The researcher wants to see if the presence of a park in an area affects the mental health of its residence.
- He chooses one area where the park was not present.
- He then finds out another area where not only the park is unavailable but also the noise conditions, environmental pollution, population size, houses and street construction, socioeconomic status are same.

- Intervention (i.e. the construction of a park) is introduced in one area and the other is kept as control.

7) <u>Genealogy Based Sampling</u>

- This sampling technique has been mostly used for taking samples from rural areas
- Using this technique, instead of selecting household in an area, the members of the entire families are selected (whether or not living in the same house)
- It gives a reasonable cross section of the community by age and sex.
- **Method:**
  - First a participant is approached and is convinced to take part in the research.
  - This participant is now asked to refer the researcher to his close relatives who may be living in other areas.
- **Benefits:**
  - This sampling technique is useful in taking the sample from traditional rural areas where there are not much social and economic differences between families; you do not need to persuade each participant to be part of research instead you get the participants through references.
- **Crucial Issues/Draw backs:**
  - There are higher chances of systematic errors in the cases where members from a family tend to be similar in comparison to members from different families.

COMPARISON
OF
SOME RESEMBLING SAMPLING TECHNIQUES

Comparison of Stratified Sampling with Quota Sampling

- Both the techniques are used when the target population is *heterogeneous*
- Using both the techniques the population is divided into *sub group*s.
- The prime difference in the two techniques is how the *participant*s are selected.
- In stratified random sampling, *participant*s are selected randomly while in quota sampling, *participant*s are selected non-randomly.

Comparison of Stratified Random Sampling with Cluster Sampling

- Both the techniques are the type of probability sampling method and thus random selection is done in the two.
- Using both of them the population is divided into groups.
- However, the two techniques differ in a number of ways.
- Stratified random sampling is done when population is *heterogeneous* while in cluster sampling the population is *homogenous*.
- In stratified random sampling the *sub group*s are made on the basis of variable that makes the population *heterogeneous*; while in cluster sampling the grouping is done on the basis of geographical allocation of the population.
- In stratified sampling, elements are randomly selected from every sub group; while in cluster sampling *sub groups* are randomly selected and all the elements of the selected *sub groups* are sampled.

Comparison of Stratified Sampling and Cluster Sampling with Multistage Sampling

- Both stratified sampling and cluster sampling involve two major steps: first groups are made and then selection of the sample is randomly done.
- However the sample is selected only for once in both the techniques while in multistage sampling, the sample is selected at least twice using different types of sampling techniques at each stage.

Comparison of Chain Sampling and Genealogy Based Sampling

- Both the techniques require first approached participant to refer to the other participants
- However, in genealogy based sampling the participant to whom the reference is made must have blood relationship with the referring person; for chain sampling there is not such requirement

WHICH
SAMPLING TECHNIQUE TO USE
IN RESEARCH?

Which Sampling Technique to Use in Research?

The use of an appropriate sampling technique is very important to make a research project beneficial, meaningful and successful.

Although representative samples are produced by probability sampling, however there are many instances in which it is simply impossible to use a probability sampling technique.

The *element*s of target population may be so widely dispersed and/or apparently infinite in number that capturing a probability is not possible. Probability techniques can be used only for finite population. For a population that is composed of infinite elements, non probability techniques are used.

Probability sampling is also not possible for a population that is not very precisely defined and is too general a category: found almost everywhere in the world, and divisible into innumerable *heterogeneous sub groups*. These techniques cannot be used for the population that is too general a category found almost everywhere in the world. For instance, if our target population is defined as college students, it means person studying at any college of the world is an element of our population. In this case how a sample can be extracted through probability sampling technique. So, one must use a non probability technique.

Moreover, the prime goal of research also affects the decision of sampling technique. If the research is meant at exploring an idea rather than understanding a population, non-probability techniques are well suited; if the research is intended to develop the understanding about the population, probability sampling is suggested.

Furthermore, it depends on the availability of resources (i.e. time, cost and efforts) which sampling technique can be used. Where enough resources are available, probability techniques are preferred; where resources are not enough non probability techniques are suggested.

Which Probability Sampling is Appropriate for Your Research?

When you decide to use probability sampling technique on the basis of goal of your research and availability of your resources (i.e. time, money, and efforts), now you need to select an appropriate type of the sampling technique to produce a representative sample. Here are some guide lines to select an appropriate sampling technique:

- If you target population is *homogenous*[*] and an *exhaustive* list of *element*s id available/ possible to prepare, simple random sampling is appropriate. For example, if target

population is workers of ABC Agency; this population is *homogenous* and *exhaustive* list can easily be prepared.

- If your target population is *homogenous*[*] and list of elements cannot be produced for any reason, systematic sampling is best suited. For example, if a research takes into account the costumers who visit Hotel XYZ, it is not possible to prepare a list of people who are going to visit the hotel. So the researcher may interview every n^{th} costumer who enters the hotel. Or may take a costumer who enters after every half an hour (any time interval may be used).
- Systematic random sampling has also an edge over simple random in the situation where the target population is *homogenous* but is already grouped within itself. The reason of this preference is the ability of systematic sampling to ensure the extension of sample to the whole population. For example, suppose the target population is of students studying in school A. there are already existing groups in the form of classes and sections. In this case, the lists of students studying in each class and section will be arranged one after the other and compiled into one list. And then every nth element will be selected. The method ensures the presence of elements from each group (classes and sections). Consider we use simple random sampling here, there are chances of *systematic errors*; because elements of some groups may be under or over represented.
- If your target population is *heterogeneous*[*] and is not very much widely spread geographically, stratified random sampling is used.
- If your target population is *homogenous*[*] but is spread in a wide geographical area, cluster sampling is used.
- Sometimes it happens that the clusters are very big and inclusion of all the elements is not possible; in this case *participant*s are randomly selected within the cluster (using simple random or systematic random sampling). This sampling technique is called as double staged sampling.
- If you target population is spread over a wide geographical area and is also *heterogeneous*[*], multistage sampling is most effective.

Which Non- Probability Sampling is Appropriate for Your Research?

When you decide to use non-probability sampling technique on the basis of goal of your research and availability of your resources (i.e. time, money, and efforts), now you need to select an appropriate type. Below are some guide lines:

- If you have shortage of time and/or efforts cannot be utilized in search of participants, volunteer sampling is most feasible.
- If your target population is a very general category: found everywhere and not precisely defined, convenient sampling is used.
- If your target population is heterogeneous and it is important to take representation from every sub group, quota sampling is the method to use
- If your target population is the type of people who are not easily available, lesser in number and rare to find, snowball sampling technique is used.

Note: The homogeneity and heterogeneity of population depends on the goal and nature of your research. Same population may be *homogenous* for one research project and *heterogeneous* for the other. For instance, if the goal of a research is to investigate average IQ of the employs of XYZ Company; the population is *homogenous* because it does not matter for the research purpose whatever socioeconomic, religious or gender group the workers may belong to. Now consider another research the purpose of which is to find if the environment of the Company is satisfactory for its employs. In this case, men and women are likely to keep different opinions (as our prior knowledge tells us women encounter issues of harassment, gender indiscrimination etc. at work places). Now the population needs to be divided into two groups: male workers of XYZ Company and female workers of XYZ Company. So the same population becomes *heterogeneous*.

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GLOSSARY

- **Element –** *a single indivisible entity of a population.*
- **Exhaustive list –** *a list which contains each and every element in a way that not a single element is left.*
- **Generalizability-** *the extent to which inferences drawn from a sample are true for the population.*
- **Heterogeneous population –** *a population the elements of which are not similar to each other.*
- **Homogenous population –** *a population whose every element is similar regarding the variables required for the research.*
- **Investigator = researcher –** *one who is conducting a research.*
- **Lottery method –** *method of selecting elements by taking out the slips from a bowl, box etc.*
- **Mutually exclusive category–***a category of sampling technique which is totally different and is not a sub or super category of other types.*
- **Participant –** *a person taking part in a research.*
- **Sampling bias –** *a situation where the selected sample does not truly reflect the characteristics of population.*
- **Sub groups –** *groups within a population that differ from one another on some variables.*

- **Systematic errors –** *the errors that are caused by over or under representation of some characteristics of population in the sample.*

APPENDIX I

COMPARISON OF

PROBABILITY SAMPLING

AND

NON PROBABILITY SAMPLING

domain of comparison	probability sampling Technique	non probability Sampling Technnique
requirement of resources	Require more resources in terms of time, cost and efforts.	lesser resources are required
selection of sample	random; no subjective judgment of researcher is involved	non random subjective judgments of researcher is involved
Quality of inferences drawn	generalizale to the population	not generalizable to the population
best suited for researches	the goal of which is to understand a population	the goal of which is to understand or develop a concept or idea
Applicable to the kind of poulation	elements of which are finite in number which is precisely defined and a specific category	elements of which are finite elements of which are infinite which is a too general category, not very precisely defined which is precisely defined
chances of error and biases	sampling errors and systematic biases are less likely to occur	prone to encounter with systematic errors and sampling biases
Types	• Simple random sampling • Systematic random sampling • Stratified random sampling • Cluster sampling • Multistage sampling	• Volunteer sampling • Convenient sampling • Purposive sampling • Quota sampling (proportional and non proportional) • Snowball sampling • Matched Sampling • Genealogy Based Sampling

APPENDIX II
VARIOUS TYPES OF
PROBABILITY SAMPLING TECHNIQUE
IN A GLANCE

Name of Type	Characteristics	Method	Benefits	Draw backs/ Crucial Issues
Simple Random Sampling	Every element has an equal chance of been selected Exhaustive lists of elements are essential Elements are selected randomly	Exhaustive list of elements is produced Each element is allotted a number Numbers are randomly selected through lottery method or using computer generated random table	Omits the chance of systematic errors and sampling biases Representative sample is produced	Difficult for very large population
systematic Random Sampling	elements are selected at a regular interval (may be time, order or space) Exhaustive list may or may not be required is used when a homogenous population is grouped within itself	in the case where the lists are available, the lists are compiled to form a single list each element is given a number to select an appropriate interval, N^{*} is divided by n^{**}; number obtained by this division (say k) is the size of interval first an element is selected at random and then every k^{th} element from the first selection is included in the sample	ensures the extension of sample to the whole population make it possible to get a probable sample where list of elements cannot be produced	If the existing grouping is biased in some way the sample may not be representative difficult for very large population
stratified Random Sampling	is used when a population is heterogeneous	first the population is divided into homogenous sub groups called as strata then elements are	ensures a representative sample for a heterogeneous population	it requires more resources in terms of time and efforts if the variable used for making strata is not

		randomly selected from each stratum		appropriate depending on the research, the whole working may go in vain
cluster sampling	is used when the target population is homogenous but is spread over a wide geographical region instead of elements clusters are randomly selected a cluster is defined as a group of elements residing together in one geographical region	first the population is divided into clusters each cluster is allotted a number then the decided number of clusters are selected randomly	make the probability sampling possible for a large population	there is possibility of systematic error if the selected clusters fail to capture the characteristic diversity of the target population, the sample cannot be claimed to be representative of the population
multistage sampling	it can be defined as sampling within the sample two or more probability sampling techniques are combined first a sample is extracted randomly and then from the selected sample another sample is extracted thus the to reach a final sample there are at least two stages	first the target population is divided into clusters clusters are randomly selected out of the selected clusters, there may be a formation of clusters or strata (in case of heterogeneity of population) now a random selection of clusters is done/ or there occurs a selection of elements from each strata	a representative sample is produced for a population that is spread over a wide geographical region and is also heterogeneous	if the characteristic criterion used for the formation of strata at any stage is not appropriate, the sample cannot be representative of the population if also there occurs a systematic error in the selection of clusters, the results would not be able to generalize

		the final units selected are investigated		

*N is total number of elements in the population

**n is number of participants required for the sample

APPENDIX III

VARIOUS TYPES OF

NON-PROBABILITY SAMPLING TECHNIQUE

IN A GLANCE

Name of Type	Characteristics	Method	Benefits	Draw backs/ Crucial Issues
Volunteer Sampling	Participants self select themselves for the researcher	The researcher makes an announcement about his/ her research. Interested people approach the researcher	It helps in gathering a big amount of data in a very short time with small efforts	Sample is not representative of the population as the people who come to the researcher are those who already have an interest in the topic
Convenient Sampling	The elements of population who are easy or convenient to approach are selected It is used when the target population is defined in terms of a very broad category; for example, men, women, college students, business men etc.	Any member of the target population who is available at the moment is approached and is asked for participation in the research.	It is easy, inexpensive, consumes less efforts.	It is subjected to sampling biases and systematic errors.
Purposive Sampling	It is not a mutually exclusive category of the sampling technique rather all the techniques other than the aforementioned are purposive in nature The participants are selected with a purpose (a criterion of selection) in mind. In other words, not any available person can be			

	included but only those availables are included who meet the criteria			
Quota Sampling	It is used when population is heterogeneous	Heterogeneous population is divided into homogenous sub groups A quota for each sub group is set.	It captures the characteristic diversity of population Ensures the representation from minority groups	Sampling biases are possible to occur
Snow ball Sampling	It is used when the target population is not readily available and difficult to approach	First approached participant is asked to refer to the others. Next is asked to refer to another and so on.	It makes possible to approach a rarely available population.	Systematic errors are likely to occur because of chain networking.
Matched Sampling	is used in experimental researches A pair of two matched elements is selected	One element is judged to be a part of the research. Then, another element is explored that resembles the first one on a variety of variables important for the research	It provides a control group for the experiment	The two elements must be matched on every possible influencing factor so it may be claimed that the intervention and not something else has produced the change
Genealogy based Sampling	Instead of selecting household in an area, the members of the entire families are selected, whether or not living in the same house)	One element is persuaded for the research Then, first participant is asked to refer to his/her close relatives	Gives a reasonable cross section of the community by age and sex. Saves time and efforts	

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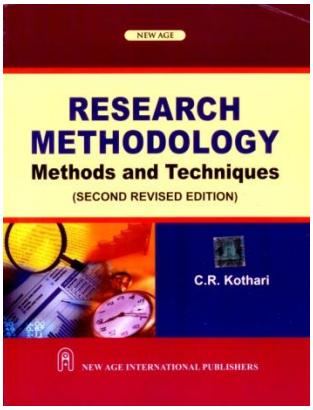

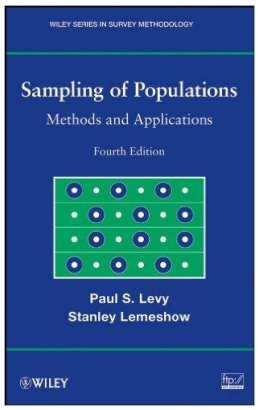

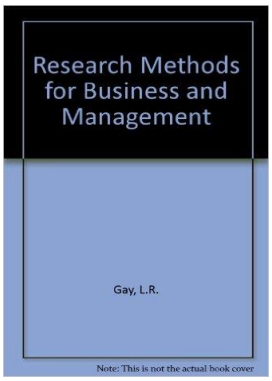

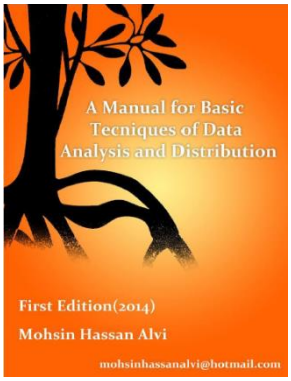

Few recommended books for more knowledge about Research Methodology

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Bachelor of Commerce
University of Karachi, Karachi, Pakistan

Master of Business Administration (Marketing & Finance)
Iqra University, Main Campus, Karachi, Pakistan

Doctorate in Public Administration
University of Karachi, Karachi, Pakistan