Sample and Sampling Procedure in Research for Tertiary Institutions

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Abstract

Most research books/works are not detailed in comprehensive coverage of sampling procedure. As a result, students/teachers' researchers are not expose to the concept and techniques that could assist in doing quality work and good sampling choice. The paper attempt to give descriptive and explanatory guidelines on the best way to undertake sample procedure. Definition of population sample and process of sample selection given, sampling techniques and sampling type (probability and non-probability) were given. Simple random sampling, stratified sampling, systematic sampling, cluster and multi stage sample were also discussed with illustration in probability sample, while non-probability samples of convenience, purposive, with illustrations, quota samples and snow ball/chain/ referral samples were equally discussed. Other non-probability sample of volunteer, captive, accidental sampling was also briefly discussed. All the procedure for sample taking were also discussed.

Keywords; population, sampling, research, techniques, procedure

Introduction

In most studies, it is not logically possible or even necessary to collect data on all the elements of the study population. One of the principal use of

statistics is to make generalization from a set of data on a small number of events/people to a larger set of events/people. What is normally done is to collect data on a small subset that is representative of the whole population. The process of identifying this subset representative is called "Sampling". Example: Federal Ministry of Health officials declares that 'six million Nigerians are living with HIV/AIDS'. They did not test every Nigerian to come to that conclusion, but uses survey reports from various heath offices to deduct and make generalization.

Sampling technique involves a process whereby every element of the population has an equal chance of being part of the selected sample (probability sample). Three basic terms are necessary in taking sample;

a- Population; is the collection of the elements which has some or other characteristics in common. Number of elements in the population is the size of the population

b- Sample is the subset of the population.

c- The process of selecting a sample is known as sampling. Number of elements in the sample in the sample size. (Ahmed, 2009).

Population and Sample

In research, population refers to people, objects and events that have a common characteristic. Abdulsalami, (2009) defined population as all the elements in a well-defined collection that have at least one common attribute or characteristic or set of values. The population of a study therefore represents the target group a researcher is interested in studying. Population of the study is defined by the aims and objectives of the study. Thus, the population to which a researcher intends to generalize his or her findings is known as the target population. The population of a study can be small or large, when the population is small and the entire population can be easily reached, the entire population may be studied. However, when the population is large, the focus can be on a part, a portion or a sub-set of the whole target population. This sub-set or portion of the target population that is being studied is called the sample. This thus means that the portions of populations that are studied on the bases of which conclusions are made on the entire populations are called samples. (Morenikeji, 1999)

It is pertinent to note that it is often impossible to focus on an entire population due to its size. It is therefore essential for the sample to be similar to the

population in significant aspects. The process of selecting the sample as a representative of the population is called sampling.

Sampling Techniques and Sampling type

Sampling technique is defined as methods of drawing samples from total population. These methods are classified into probability sampling and non-probability sampling. Principally, there are two major sampling techniques:

1. Probability sampling technique involves process of taking sample from a larger population using random selection. The most important requirement of probability sampling is that everyone in the population has a known and an equal chance of getting selected. For example, if you have a population of 100 people every person would have odds of 1 in 100 for getting selected. Probability gives you the best chance to create a sample that is truly representative of the population.

Types of probability sample

a. Sample Random
b. Stratified Sample
c. Systematic Sampling
d. Cluster sample and multistage sampling

2. Non-Probability Sample does not rely on randomization; it does not give all individuals in the population equal chance of being selected. It relies most on the researcher's ability to tactically select elements for sample. The researcher selects samples based on the subjective judgment of their need; thus, the outcome may be bias.

Types of non-probability sample

a. Convenience Sampling
b. Purposive or judgmental Sampling
c. Quota Sampling
d. Chain / Snowball / Referral Sampling (Nicholas, *et. al.* 2010).

Sample Taking in Research

The researcher(s) should describe in details how the sample was selected. It is important that the sample should be selected carefully. Since all analysis and inferences depend on the conditions obtained and the on the total study

population sample. It should be noted that the sampling technique chosen, sample method and sample design must be defensible in relation to the problem statement, study population, study area and sampling frame. Nsofor, (2015). So that others (researchers) can follow similar procedure to achieve desired results.

Procedures involve
  ➢ Choosing sample; element/objects on which a measure is taken
  ➢ A population; consist of collection of elements about which we wish to make reference
  ➢ A target population; focused population of interest
  ➢ A sample population; selecting from within target population
  ➢ Sampling unit; is where sample is selected from within
  ➢ Sample frame; list of sampling unit (selected)

The above can easily be explained further in simpler steps:
  ➢ Define the total population
  ➢ Define the target population
  ➢ Out of the target population select some community to form sample population
  ➢ Define the sample unit
  ➢ List members (character) of this sample unit to form sample frame
  ➢ Determine the sample design or method to be use in selecting members of the sample
  ➢ Conduct the sample selection from the frame of the members
  ➢ Collect the data, code the data, analysis the data and report the result of the sample. (Morenikeji, 1999).

Procedures in probability sampling
1. Sample Random Sampling
In sample random sampling, every element has an equal chance of being selected to be part of the sample. In practice, a simple random sample is drawn unit by unit. Series of random numbers drawn and allocated to members of the population, then a random table generated by random numbers or computer program drawn and use in selecting the sample. Each member of the population

is given a number and then random table use to pick individual units, until target is reached. (Morenikeji, 1999).
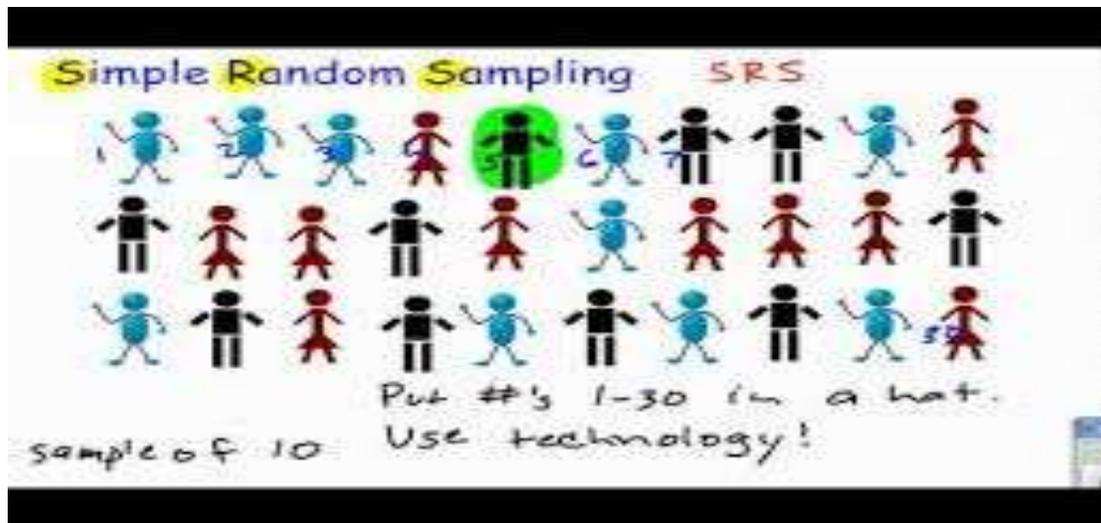

Figure 1

To use random table, all members of the sampling frame are given numbers. Random numbers are selected arbitrary from the table of random number or by the use of definable appropriate calculation elements whose number coincides with the generated random numbers are selected as element of the sample. A random number that does not coincide with any of the assigned numbers in the sampling frame is discarded as shown on figure 1.

 Example using FCE student registration numbers as given numbers, select some students whose registration numbers digits tally with number on the random table first row / column, select 3 or 4, then select from the second raw / column, this is to be maintained until target is reached. The basic characteristics of random selection are independence of selection and equation of population of being selected.

2. Stratified sampling

This technique divides the element of the population into small sub-groups (strata) based on the similarity in such a way that, the elements within the groups are either homogenous or heterogeneous among the subgroups formed. In other words; it is obtained by first separating the population into non-overlapping groups (strata) and then selecting a simple random sample from each stratum Murray, (2008). Example in a research on exam malpractice in FCE Katsina, a

sample frame of 1000 students was decided. To collect the information using stratified sampling technique. The college is divided into 5 sub-groups (strata) using schools as a guide, each school is allocated 200 slots of equal male and female i.e. Voc & Tech, Science, ANF, PES and SASS. We then apply sample random sampling technique in choosing the target population from the stratum. In strata allocation, other variables can be used as model, example; sex, state, tribe, religion, even color of skin. What is important is choosing definite and clear means before using random technique to select the target. It has advantage of reducing human induced bias in the selection process. Put it simple, selecting based on reason, set a stratum then apply random selection as shown in figure 2.
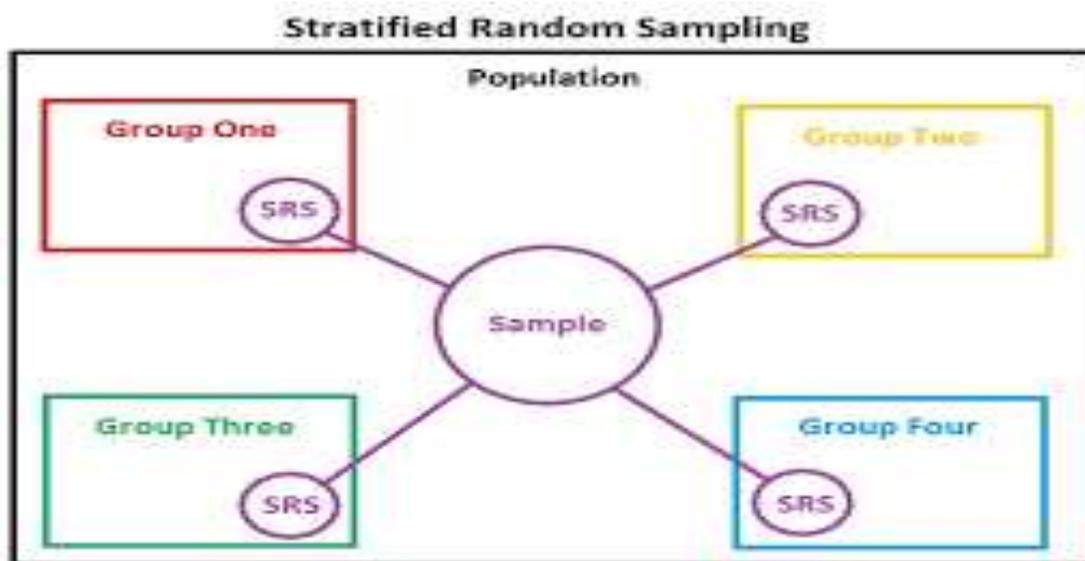

Figure 2

3. Cluster Sampling

As the name implies, a cluster is a sample random sample in which each sample unit is a collection or clusters of heterogeneous elements. Cluster sample is an effective design for obtaining a specific amount of information at minimum cost. The entire population is divided into clusters or section and then the clusters are randomly selected. All the elements of the cluster are used for sampling as indicated in figure 3. Clusters are identified using details such as age, sex, location, e.t.c we have two stages of clustering:

- Single stage cluster where the entire cluster is selected randomly for sampling.

- Multistage (two stage) cluster sample. Here first we randomly select clusters and then from those selected clusters we randomly select elements for cluster sampling. (Murray, 2008).

To select cluster, one need to follow step;

➢ Specify the appropriate cluster

➢ If all the clusters cannot be sampled then adopt multistage, since they are many. Then randomly select the clusters from the sample elements.

➢ Members of a sample are selected individually to determine members of each of group should be distinct from one another. Put simple, select clusters, choose clusters randomly for sampling.
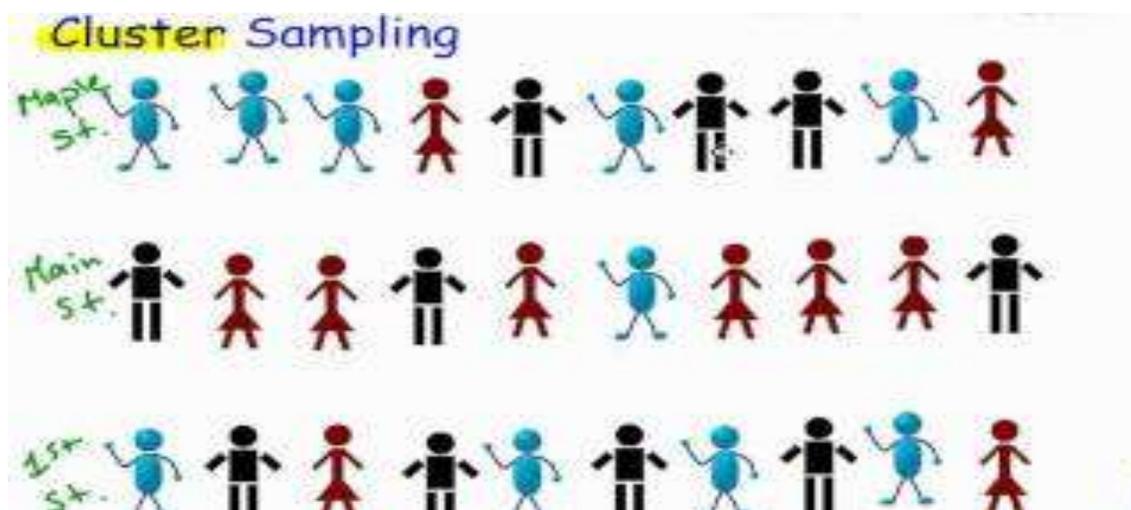

Figure 3

The main difference between stratified and cluster sample is that, the strata are homogenous as possible within, but should differ as much as possible from one another with respect to characteristics being measured, while cluster on the other hand should look very much like others in order for economic advantage of cluster to be obtained. Cluster sampling simply means grouping the target sample and applying random sampling, (Nsofor, 2015).

4. Systematic sampling.

In systematic sampling we select an initial object from the sampling frame randomly and then choose all subsequent members of the sample in a regular sequence starting with the initial object. Here the selection of element is systematic and not Random except the first/initial object. Objects / Elements of

a sample are chosen at regular interval of population. All the elements are put together in a sequence first, where each element / object has equal chance of being selected. (Nicholas, *et al* (2010).
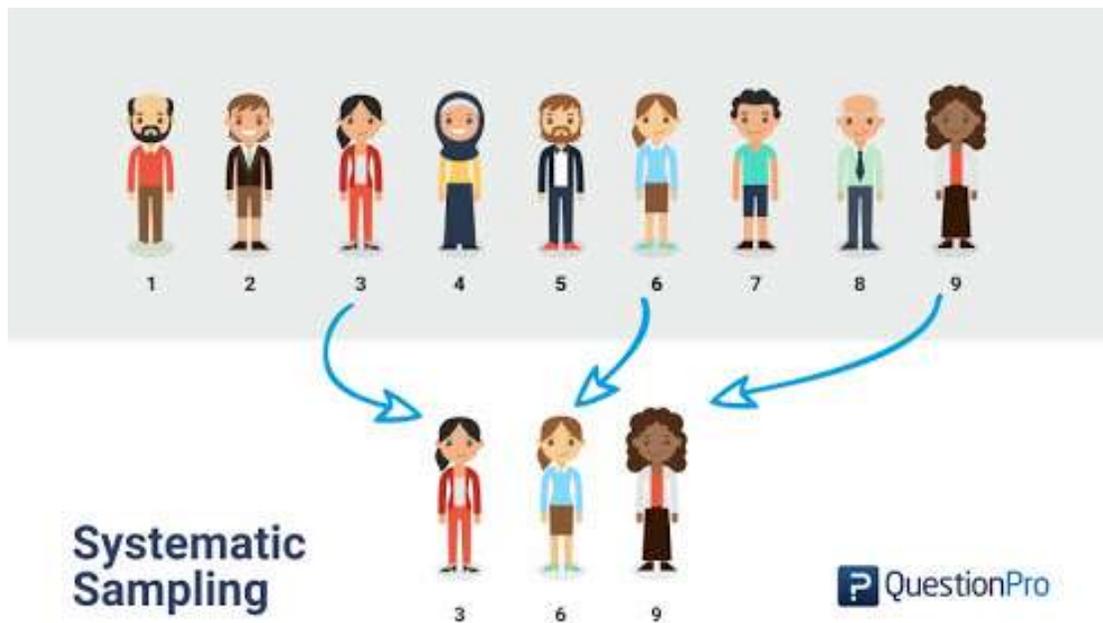

Figure 4

For example; School of Arts and Social Sciences F C E Katsina has a population of 3,000 in three departments: GEO has 300, ISS with 1,000 and SOS has 1,700 students respectively. The whole population will be divided into 100 elements, we are to systematically select 3 element in every 100 (GEO – 9, ISS – 30, SOS 51 total 90 element/ objects) to start selecting, we rank the elements and start from GEO taking 1 element / object from the first 10 element, then we pick another one element after 30, this is to be maintain until target is achieved then move to ISS and SOS, selecting 1 element at an interval of 30 until target is achieved.

Procedures in Non-Probability Sampling
1. Convenience Sample
Here the sample is selected based on the availability; this method is used when the availability of sample is rare and maybe costly. They are sampled base on convenience. Example researchers prefer this during initial stage of survey

research (Recommences survey) as it's quick, easy to declare results. (Ahmed, 2009).

2. Purposive Sample

This is based on the intention or purpose of the study, only those needed elements will be selected from the population which suits the best for the purpose of the study. Example, if an NCE students wants to understand the incidence of girl child drop out in schools, then the selection criteria would be on girls child that drop out of primary and junior schools only (Ahmad, 2009).

3. Quota Sampling

This type of sampling depends on some pre-set standard. It select's the representatives sample from the population. The proportion of characteristics/ traits in the sample should be same as population. Elements/objects are selected until exact proportion of certain types of data is obtained or sufficient data in different categories is collected as shown in figure 4. Example, if an exact population in the study area consists of 60% males and 40% female, then our sample should reflect the same percentage of male and female population. (Schaeffer *et al* 2011).
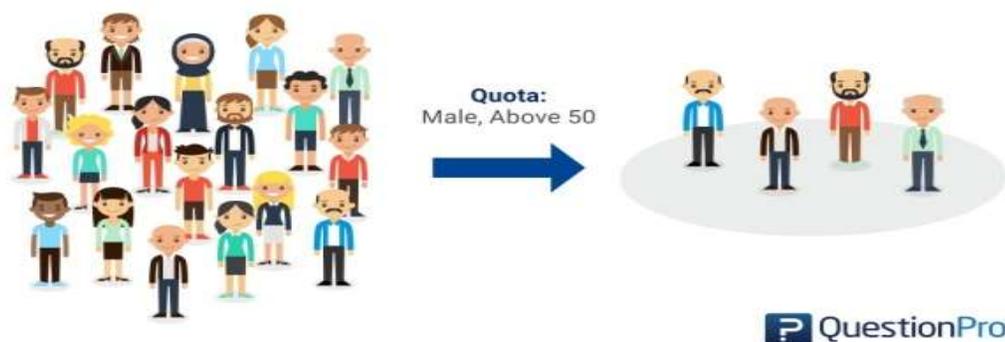

Figure 5

4. Chain / Snowball / Referral Sampling

This technique is used when the population is completely unknown, rare or dubious. Therefore, we will take the help from the first known element which we selected fr the population and request him/her to recommend other elements that will fit the description of the needed sample. The chain/referrals technique goes on increasing based on the first identified known element like snow ball or chain (Schaeffer *et al* 2011).

Example: this type of survey technique is used in situation of highly sensitive areas; HIV/AIDS, Drug Abuse, Exams Malpractice, Rape etc. where people will not openly discuss or participate in survey to share information about these behaviors.

Not all the victims will voluntarily agree to responds to the question asked, so the researchers can contact people he/she know or volunteer to get in touch with the victims to collect information. This type of survey helps in situation where we do not have access to sufficient people with the characteristics we are seeking. It starts with finding people to study, build confidence and trust with the respondents for next stage as displayed in figure 6. (Ahmad, 2009)
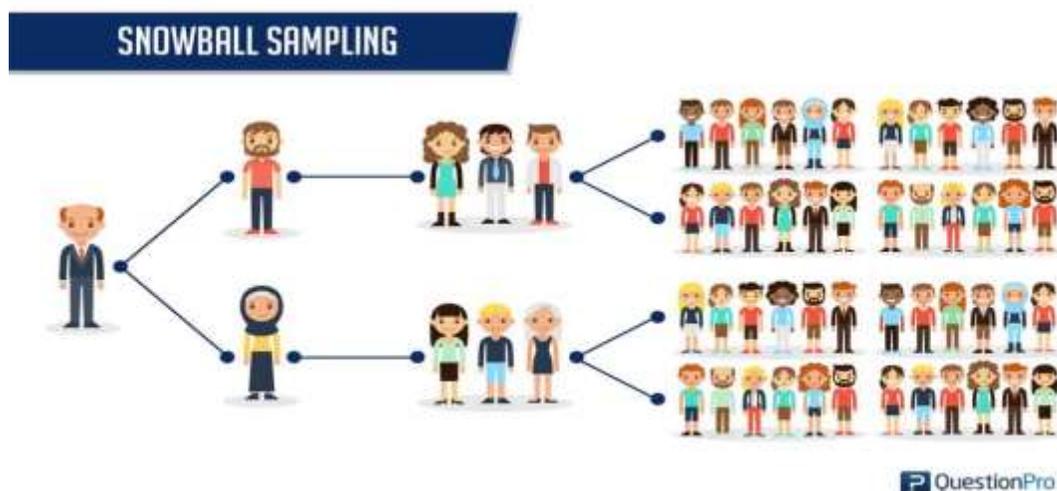
Figure 6

Since sampling is the acquisition of information about relatively small part of the larger group or population with the aim of making generalization about the larger group. Taking sample is necessary because it is often not possible or desirable to obtain information from the entire population thus, sampling.

Other Non-Probability Sampling
This can be called biased sampling or non-random sampling technique. It is the process whereby the chances of an element, person, object, event, thing of being included in the sample are not same. Some may have more advantages than the

others. It does not involve randomization and therefore may have high sampling error. The non-probability sampling techniques are further subdivided into:

- **Volunteer Sampling**
  This is used when every member of the population cannot comply with the demands of the investigation. Therefore, the individuals who are willing to comply with the demands of the investigations are used.

- **Captive Audience**
  This is just like an intact class used by the teacher for a research purpose. Therefore, generalizations here do not go beyond the class.

- **Accidental Sampling**
  This is also known as availability sampling because it makes use of the respondents available at the time. Participation is based on availability.

Conclusion

Sampling and sampling procedure in research forms part ofintegrated curriculum and unifies knowledge through accurate data collection procedure in social sciences and equip recipients with the necessary knowledge needed to solve societal problems. Therefore, in order for the researcher(s) to be capable of solving these problems adequately, there is the need for the researcher(s) to also be exposed to scientific ways of precise data collection, finding solution to problems through approaches to social sciences research.

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