

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/325846982>

SAMPLE AND SAMPLING DESIGNS

Chapter · July 2016

CITATION

1

READS

221,852

1 author:



[Syed Muhammad Sajjad Kabir](#)

Curtin University

107 PUBLICATIONS 522 CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:



Others Writings [View project](#)



Article [View project](#)

CHAPTER - 7

SAMPLE AND SAMPLING DESIGNS

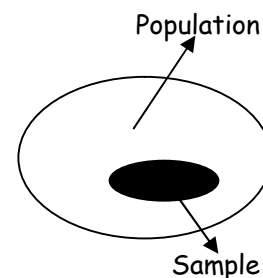
Topics Covered

- 7.1 Concept of Sampling: Population, Sample, Sampling, Sampling Unit, Sampling Frame, Sampling Survey, Statistic, Parameter, Target Population, Sampled Population, Sampling With and Without Replacement, Sample Design
- 7.2 Purpose of Sampling
- 7.3 Stages of Sampling Process
- 7.4 Types of Sampling
 - 7.4.1 Probability Sampling
 - 7.4.2 Non-probability Sampling
- 7.5 Sampling Error and Survey Bias
- 7.6 Determination of Sample Size

7.1 CONCEPT OF SAMPLING

Population: Total of items about which information is desired. It can be classified into two categories- finite and infinite. The population is said to be finite if it consists of a fixed number of elements so that it is possible to enumerate in its totality.

Examples of finite population are the populations of a city, the number of workers in a factory, etc. An infinite population is that population in which it is theoretically impossible to observe all the elements. In an infinite population the number of items is infinite. Example of infinite population is the number of stars in sky. From practical consideration, we use the term infinite population for a population that cannot be enumerated in a reasonable period of time.



Sample: It is part of the population that represents the characteristics of the population.

Sampling: It is the process of selecting the sample for estimating the population characteristics. In other words, it is the process of obtaining information about an entire population by examining only a part of it.

Sampling Unit: Elementary units or group of such units which besides being clearly defined, identifiable and observable, are convenient for purpose of sampling are called sampling units. For instance, in a family budget enquiry, usually a family is considered as the sampling unit since it is found to be convenient for sampling and for ascertaining the required information. In a crop survey, a farm or a group of farms owned or operated by a household may be considered as the sampling unit.

Sampling Frame: A list containing all sampling units is known as sampling frame. Sampling frame consists of a list of items from which the sample is to be drawn.

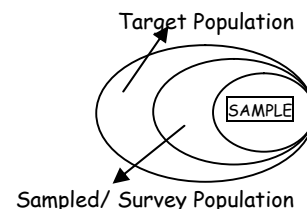
Sample Survey: An investigation in which elaborate information is collected on a sample basis is known as sample survey.

Statistic: Characteristics of the sample. For example, sample Mean, proportion, etc.

Parameter: Characteristics of the population. For example, population Mean, proportion, etc.

Target Population: A target population is the entire group about which information is desired and conclusion is made.

Sampled Population: The population, which we actually sample, is the sampled population. It is also called survey population.



Sampling With and Without Replacement: Sampling schemes may be *without replacement* ('WOR' - no element can be selected more than once in the same sample) or *with replacement* ('WR' - an element may appear multiple times in the one sample). For example, if we catch fish, measure them, and immediately return them to the water before continuing with the sample, this is a WR design, because we might end up catching and measuring the same fish more than once. However, if we do not return the fish to the water (e.g. if we eat the fish), this becomes a WOR design.

Sample Design: Sample design refers to the plans and methods to be followed in selecting sample from the target population and the estimation technique formula for computing the sample statistics. These statistics are the estimates used to infer the population parameters.

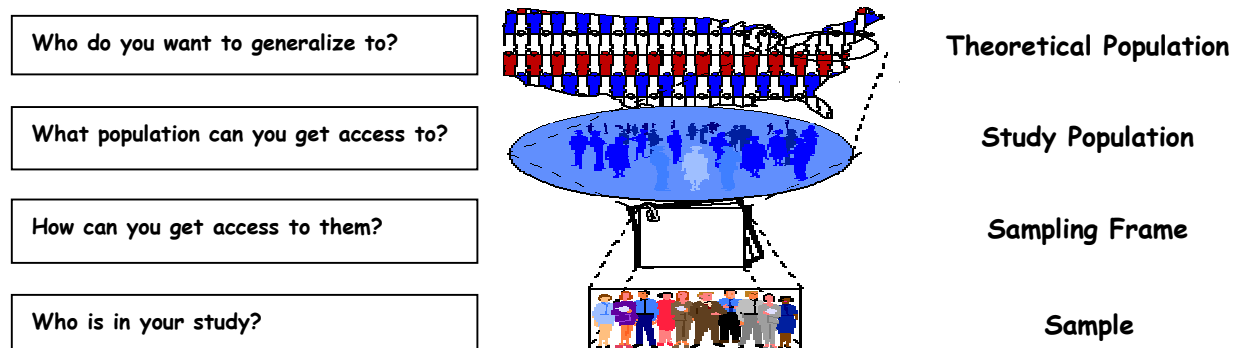


Figure 7.1. Sampling Breakdown.

7.2 PURPOSE OF SAMPLING

The basic purpose of sampling is to provide an estimate of the population parameter and to test the hypothesis. Advantages of sampling are -

- Save time and money.
- Enable collection of comprehensive data.
- Enable more accurate measurement as it conducted by trained and experienced investigators.
- Sampling remains the only way when population contains infinitely many members.
- In certain situation, sampling is the only way of data collection. For example, in testing the pathological status of blood, boiling status of rice, etc.
- It provides a valid estimation of sampling error.

7.3 STAGES OF SAMPLING PROCESS

The sampling process comprises several stages-

1. Define the population.
2. Specifying the sampling frame.
3. Specifying the sampling unit.
4. Selection of the sampling method.
5. Determination of sample size.
6. Specifying the sampling plan.
7. Selecting the sample.

Define the Population: Population must be defined in terms of elements, sampling units, extent and time. Because there is very rarely enough time or money to gather information from everyone or everything in a population, the goal becomes finding a representative sample (or subset) of that population.

Sampling Frame: As a remedy, we seek a sampling frame which has the property that we can identify every single element and include any in our sample. The most straightforward type of frame is a list

of elements of the population (preferably the entire population) with appropriate contact information. A sampling frame may be a telephone book, a city directory, an employee roster, a listing of all students attending a university, or a list of all possible phone numbers.

Sampling Unit: A sampling unit is a basic unit that contains a single element or a group of elements of the population to be sampled. The sampling unit selected is often dependent upon the sampling frame. If a relatively complete and accurate listing of elements is available (e.g. register of purchasing agents) one may well want to sample them directly. If no such register is available, one may need to sample companies as the basic sampling unit.

Sampling Method: The sampling method outlines the way in which the sample units are to be selected. The choice of the sampling method is influenced by the objectives of the research, availability of financial resources, time constraints, and the nature of the problem to be investigated. All sampling methods can be grouped under two distinct heads, that is, probability and non-probability sampling.

Sample Size: The sample size calculation depends primarily on the type of sampling designs used. However, for all sampling designs, the estimates for the expected sample characteristics (e.g. mean, proportion or total) desired level of certainty, and the level of precision must be clearly specified in advanced. The statement of the precision desired might be made by giving the amount of error that we are willing to tolerate in the resulting estimates. Common levels of precisions are 5% and 10%.

Sampling Plan: In this step, the specifications and decisions regarding the implementation of the research process are outlined. As the interviewers and their co-workers will be on field duty of most of the time, a proper specification of the sampling plans would make their work easy and they would not have to reverting operational problems.

Select the Sample: The final step in the sampling process is the actual selection of the sample elements. This requires a substantial amount of office and fieldwork, particularly if personal interviews are involved.

7.4 TYPES/ PRPCEDURES/ APPROACHES/ METHODS/ TECHNIQUES OF SAMPLING

There are two basic approaches to sampling: Probability Sampling and Non-probability Sampling.

7.4.1 PROBABILITY SAMPLING

Probability sampling is also known as random sampling or chance sampling. In this, sample is taken in such a manner that each and every unit of the population has an equal and positive chance of being selected. In this way, it is ensured that the sample would truly represent the overall population. Probability sampling can be achieved by random selection of the sample among all the units of the population.

Major random sampling procedures are -

- ❖ Simple Random Sample
- ❖ Systematic Random Sample
- ❖ Stratified Random Sample, and
- ❖ Cluster/ Multistage Sample.

Simple Random Sample: For this, each member of the population is numbered. Then, a given size of the sample is drawn with the help of a random number chart. The other way is to do a lottery. Write all the numbers on small, uniform pieces of paper, fold the papers, put them in a container and take

out the required lot in a random manner from the container as is done in the kitty parties. It is relatively simple to implement but the final sample may miss out small sub groups.

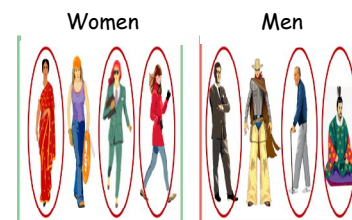
Advantages:	The sample will be free from Bias (i.e. it's random!).
Disadvantages:	Difficult to obtain. Due to its very randomness, "freak" results can sometimes be obtained that are not representative of the population. In addition, these freak results may be difficult to spot. Increasing the sample size is the best way to eradicate this problem.

Systematic Random Sample: It also requires numbering the entire population. Then every nth number (say every 5th or 10th number, as the case may be) is selected to constitute the sample. It is easier and more likely to represent different subgroups.



Advantages:	Can eliminate other sources of bias.
Disadvantages:	Can introduce bias where the pattern used for the samples coincides with a pattern in the population.

Stratified Random Sample: At first, the population is first divided into groups or strata each of which is homogeneous with respect to the given characteristic feature. From each strata, then, samples are drawn at random. This is called stratified random sampling. For example, with respect to the level of socio-economic status, the population may first be grouped in such strata as high, middle, low and very low socio-economic levels as per pre-determined criteria, and random sample drawn from each group.



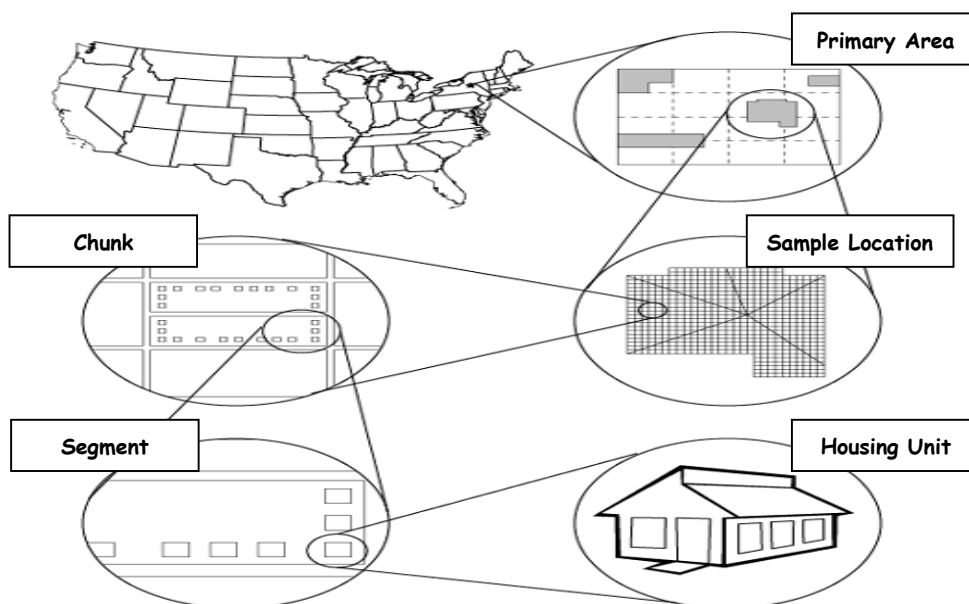
The sample size for each sub-group can be fixed to get representative sample. This way, it is possible that different categories in the population are fairly represented in the sample, which could have been left out otherwise in simple random sample.

Advantages:	Yields more accurate results than simple random sampling. Can show different tendencies within each category (e.g. men and women).
Disadvantages:	Nothing major, hence it's used a lot.

As with stratified samples, the population is broken down into different categories. However, the size of the sample of each category does not reflect the population as a whole. The Quota sampling technique can be used where an unrepresentative sample is desirable (e.g. you might want to interview more children than adults for a survey on computer games), or where it would be too difficult to undertake a stratified sample.

Cluster/ Multistage Sample: In some cases, the selection of units may pass through various stages, before you finally reach your sample of study. For this, a State, for example, may be divided into districts, districts into blocks, blocks into villages, and villages into identifiable groups of people, and then taking the random or quota sample from each group. For example, taking a random selection of 3 out of 15 districts of a State, 6 blocks from each selected district, 10 villages from each selected block and 20 households from each selected village, totaling 3600 respondents. This design is used for large-scale surveys spread over large areas.

The advantage is that it needs detailed sampling frame for selected clusters only rather than for the entire target area. There are savings in travel costs and time as well. However, there is a risk of missing on important sub-groups and not having complete representation of the target population.



Advantages:	Less expensive and time consuming than a fully random sample.
	Can show 'regional' variations.
Disadvantages:	Not a genuine random sample.
	Likely to yield a biased result (especially if only a few clusters are sampled).

7.4.2 NON-PROBABILITY SAMPLING

Non-probability sampling is any sampling method where some elements of the population have no chance of selection (these are sometimes referred to as 'out of coverage'/'under covered'), or where the probability of selection can't be accurately determined. It involves the selection of elements based on assumptions regarding the population of interest, which forms the criteria for selection. Hence, because the selection of elements is nonrandom, non-probability sampling does not allow the estimation of sampling errors.

Non-probability sampling is a non-random and subjective method of sampling where the selection of the population elements comprising the sample depends on the personal judgment or the discretion of the sampler. Non-probability sampling includes -

- ❖ Accidental/ Convenience/ Opportunity/ Availability/ Haphazard/ Grab Sampling
- ❖ Quota Sampling
- ❖ Judgment/ Subjective/ Purposive Sampling
- ❖ Snowball Sampling.

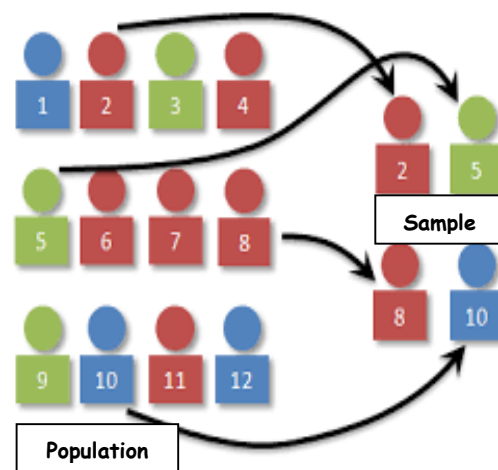
Convenience/ Accidental Sampling: Accidental sampling (sometimes known as grab, convenience or opportunity sampling) is a type of non-probability sampling which involves the sample being drawn from that part of the population which is close to hand. That is, a sample population selected because it is readily available and convenient. The researcher using such a sample cannot scientifically make generalizations about the total population from this sample because it would not be representative enough. For example, if the interviewer was to conduct such a survey at a shopping center early in the morning on a given day, the people that s/he could interview would be limited to those given there at that given time, which would not represent the views of other members of society in such an area, if the survey was to be conducted at different times of day and several times per week. This type of sampling is most useful for pilot testing.

The primary problem with availability sampling is that you can never be certain what population the participants in the study represent. The population is unknown, the method for selecting cases is haphazard, and the cases studied probably don't represent any population you could come up with.



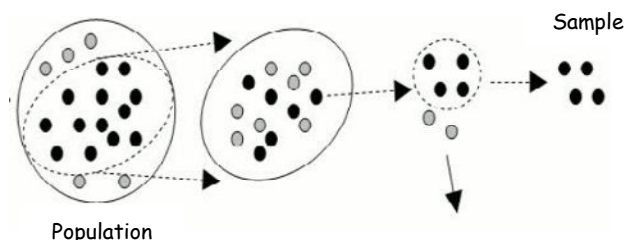
However, there are some situations in which this kind of design has advantages - for example, survey designers often want to have some people respond to their survey before it is given out in the 'real' research setting as a way of making certain the questions make sense to respondents. For this purpose, availability sampling is not a bad way to get a group to take a survey, though in this case researchers care less about the specific responses given than whether the instrument is confusing or makes people feel bad.

Quota Sampling: In quota sampling, the population is first segmented into mutually exclusive sub-groups, just as in stratified sampling. Then judgment is used to select the subjects or units from each segment based on a specified proportion. For example, an interviewer may be told to sample 200 females and 300 males between the age of 45 and 60. In quota sampling the selection of the sample is non-random. For example interviewers might be tempted to interview those who look most helpful. The problem is that these samples may be biased because not everyone gets a chance of selection. This random element is its greatest weakness and quota versus probability has been a matter of controversy for many years.



Subjective or Purposive or Judgment Sampling: In this sampling, the sample is selected with definite purpose in view and the choice of the sampling units depends entirely on the discretion and judgment of the investigator.

This sampling suffers from drawbacks of favoritism and nepotism depending upon the beliefs and prejudices of the investigator and thus does not give a representative sample of the population.



This sampling method is seldom used and cannot be recommended for general use since it is often biased due to element of subjectivity on the part of the investigator. However, if the investigator is experienced and skilled and this sampling is carefully applied, then judgment samples may yield valuable results.

Some purposive sampling strategies that can be used in qualitative studies are given below. Each strategy serves a particular data gathering and analysis purpose.

Extreme Case Sampling: It focuses on cases that are rich in information because they are unusual or special in some way. e.g. the only community in a region that prohibits felling of trees.

Maximum Variation Sampling: Aims at capturing the central themes that cut across participant variations. e.g. persons of different age, gender, religion and marital status in an area protesting against child marriage.

Homogeneous Sampling: Picks up a small sample with similar characteristics to describe some particular sub-group in depth. e.g. firewood cutters or snake charmers or bonded laborers.

Typical Case Sampling: Uses one or more typical cases (individuals, families / households) to provide a local profile. The typical cases are carefully selected with the co-operation of the local people/ extension workers.

Critical Case Sampling: Looks for critical cases that can make a point quite dramatically. e.g. farmers who have set up an unusually high yield record of a crop.

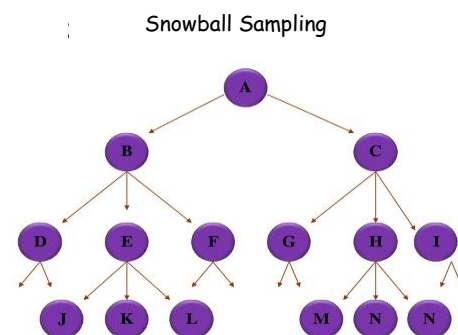
Chain Sampling: Begins by asking people, 'who knows a lot about _____'. By asking a number of people, you can identify specific kinds of cases e.g. critical, typical, extreme etc.

Criterion Sampling: Reviews and studies cases that meet some pre-set criterion of importance e.g. farming households where women take the decisions.

In short, purposive sampling is best used with small numbers of individuals/groups which may well be sufficient for understanding human perceptions, problems, needs, behaviors and contexts, which are the main justification for a qualitative audience research.

Snowball Sampling: Snowball sampling is a method in which a researcher identifies one member of some population of interest, speaks to him/her, and then asks that person to identify others in the population that the researcher might speak to.

This person is then asked to refer the researcher to yet another person, and so on. This sampling technique is used against low incidence or rare populations. Sampling is a big problem in this case, as the defined population from which the sample can be drawn is not available. Therefore, the process sampling depends on the chain system of referrals. Although small sample sizes and low costs are the clear advantages of snowball sampling, bias is one of its disadvantages. The referral names obtained from those sampled in the initial stages may be similar to those initially sampled.



Therefore, the sample may not represent a cross-section of the total population. It may also happen that visitors to the site or interviewers may refuse to disclose the names of those whom they know.

Some Other Sampling Methods -

Matched Random Sampling: A method of assigning participants to groups in which pairs of participants are first matched on some characteristic and then individually assigned randomly to groups. The Procedure for Matched random sampling can be briefed with the following contexts- (a) Two samples in which the members are clearly paired, or are matched explicitly by the researcher. For example, IQ measurements or pairs of identical twins. (b) Those samples in which the same attribute, or variable, is measured twice on each subject, under different circumstances. Commonly called repeated measures.

Mechanical Sampling: Mechanical sampling is typically used in sampling solids, liquids and gases, using devices such as grabs, scoops; thief probes etc. Care is needed in ensuring that the sample is representative of the frame.

Line-intercept Sampling: Line-intercept sampling is a method of sampling elements in a region whereby an element is sampled if a chosen line segment, called a 'transect', intersects the element.

Panel Sampling: Panel sampling is the method of first selecting a group of participants through a random sampling method and then asking that group for the same information again several times over a period of time. Therefore, each participant is given the same survey or interview at two or more time points; each period of data collection is called a 'wave'. This sampling methodology is often chosen for large scale or nation-wide studies in order to gauge changes in the population with regard to any number of variables from chronic illness to job stress to weekly food expenditures. Panel sampling can also be used to inform researchers about within-person health changes due to age or help explain changes in continuous dependent variables such as spousal interaction.

Rank Sampling: A non-probability sample is drawn and ranked. The highest value is chosen as the first value of the targeted sample. Another sample is drawn and ranked, the second highest value is chosen for the targeted sample. The process is repeated until the lowest value of the targeted sample is chosen. This sampling method can be used in forestry to measure the average diameter of the trees.

Voluntary Sample: A voluntary sample is made up of people who self-select into the survey. Often, these folks have a strong interest in the main topic of the survey. Suppose, for example, that a news show asks viewers to participate in an on-line poll. This would be a volunteer sample. The sample is chosen by the viewers, not by the survey administrator.

7.5 SAMPLING ERROR AND SURVEY BIAS

Survey results are typically subject to some error. Total errors can be classified into sampling errors and non-sampling errors. The term 'error' here includes systematic biases as well as random errors.

Sampling errors and biases: Sampling errors and biases are induced by the sample design. They include-

1. Selection bias: When the true selection probabilities differ from those assumed in calculating the results.
2. Random sampling error: Random variation in the results due to the elements in the sample being selected at random.

Non-sampling error: Non-sampling errors are other errors which can impact the final survey estimates, caused by problems in data collection, processing, or sample design. They include-

1. Over-coverage: Inclusion of data from outside of the population.
2. Under-coverage: Occurs when some members of the population are inadequately represented in the sample. Under-coverage is often a problem with convenience samples.
3. Measurement error: When respondents misunderstand a question, or find it difficult to answer.
4. Processing error: Mistakes in data coding.
5. Non-response: Failure to obtain complete data from all selected individuals.

After sampling, a review should be held of the exact process followed in sampling, rather than that intended, in order to study any effects that any divergences might have on subsequent analysis. A particular problem is that of *non-response*.

Two major types of non-response exist: unit non-response (referring to lack of completion of any part of the survey) and item non-response (submission or participation in survey but failing to complete one or more components/questions of the survey). In survey sampling, many of the individuals identified as part of the sample may be unwilling to participate, not have the time to participate (opportunity cost), or survey administrators may not have been able to contact them. In this case, there is a risk of differences, between respondents and non-respondents, leading to biased estimates of population parameters. This is often addressed by improving survey design, offering incentives, and conducting follow-up studies which make a repeated attempt to contact the unresponsive and to characterize their similarities and differences with the rest of the frame. The effects can also be mitigated by weighting the data when population benchmarks are available or by imputing data based on answers to other questions.

Non-response is particularly a problem in internet sampling. Reasons for this problem include improperly designed surveys, over-surveying (or survey fatigue), and the fact that potential participants hold multiple e-mail addresses, which they don't use anymore or don't check regularly.

Bias Due to Measurement Error: A poor measurement process can also lead to bias. In survey research, the measurement process includes the environment in which the survey is conducted, the way that questions are asked, and the state of the survey respondent. Response bias refers to the bias that results from problems in the measurement process. Some examples of response bias are given below.

Leading questions: The wording of the question may be loaded in some way to unduly favor one response over another. For example, a satisfaction survey may ask the respondent to indicate where she is satisfied, dissatisfied, or very dissatisfied. By giving the respondent one response option to express satisfaction and two response options to express dissatisfaction, this survey question is biased toward getting a dissatisfied response.

Social desirability: Most people like to present themselves in a favorable light, so they will be reluctant to admit to unsavory attitudes or illegal activities in a survey, particularly if survey results are not confidential. Instead, their responses may be biased toward what they believe is socially desirable.

Increasing the sample size tends to reduce the sampling error; that is, it makes the sample statistic less variable. However, increasing sample size does not affect survey bias. A large sample size cannot correct for the methodological problems (under-coverage, non-response bias, etc.) that produce survey bias.

7.6 DETERMINATION OF SAMPLE SIZE

Determination of sample size is probably one of the most important phases in the sampling process. Generally the larger the sample size, the better is the estimation. But always larger sample sizes cannot be used in view of time and budget constraints. Moreover, when a probability sample reaches a certain size the precision of an estimator cannot be significantly increased by increasing the sample size any further. Indeed, for a large population the precision of an estimator depends on the sample size, not on what proportion of the population has been sampled. It can be stated that whenever a sample study is made, there arises some sampling error which can be controlled by selecting a sample of adequate size. For example, a researcher may like to estimate the mean of the universe within ± 3 of the true mean with 95 percent confidence. In this case, we will say that the desired precision is ± 3 , i. e., if the true mean is Tk 100, the estimated value of the mean will be no less than Tk. 97 and no more than Tk. 103. In other words, all this means that the acceptable error, e , is equal to 3. Keeping this in view, we can now explain the determination of sample size so that specified precision is ensured.

Determination of Sample Size When Estimating a Mean

For quantitative variables the formula used for estimating the confidence interval for the population mean can also be used for determining the sample size.

A. For Unknown Population Size

The confidence interval for the universe mean, μ is given by -

$$\bar{X} \pm Z * \sigma / \sqrt{n}$$

Where, \bar{X} = Sample mean; σ = Population standard deviation; Z = The value of the standard normal variate at a given confidence level; n = Size of sample

The margin of error is -

$$e = Z * \sigma / \sqrt{n} \text{ or } ne^2 = Z^2 \sigma^2$$

$$\therefore n = \frac{Z^2 \sigma^2}{e^2}$$

Where n is the first approximation of the sample size.

B. For Finite Population

In case of finite population the confidence interval for μ is given by -

$$\bar{X} \pm Z * \sigma / \sqrt{n} * \sqrt{(N - n) / (N - 1)}$$

Where, $\sqrt{(N - n) / (N - 1)}$ is the finite population multiplier and all other terms mean the same thing as stated above.

If the precision is taken as equal to 'e', then we have

$$e = Z * \sigma / \sqrt{n} * \sqrt{(N - n) / (N - 1)}$$

$$\text{or } e^2 = Z^2 * \sigma^2 / n * (N - n) / (N - 1)$$

$$\text{or } (N - 1)e^2 + Z^2 * \sigma^2 = (Z^2 * \sigma^2 * N) / n$$

$$\therefore n = \frac{Z^2 * \sigma^2 * N}{(N - 1)e^2 + Z^2 * \sigma^2}$$

Where, N = Size of population; n = Size of sample; e = Acceptable error; σ = Standard deviation of population; Z = Standard normal variate at a given confidence level.

Example-7.1: Determine the size of the sample for estimating the per capita income for the universe with $N=5000$ on the basis of the following information:

1. The standard deviation of per capita income on the basis of past records = 0.75.
2. The estimate should be within 5% error of the true income with 95% confidence level. Will there be a change in the size of the sample if we assume infinite population in the given case? If so, explain by how much?

Solution: In the given problem we have the following-

$N=5000$, $\sigma = 0.75$, $e = 0.05$, $Z = 1.96$

The sample size can be worked out as under-

$$n = \frac{Z^2 \sigma^2 N}{(N - 1) e^2 + Z^2 \sigma^2}$$

$$= \frac{(1.96)^2 (0.75)^2 5000}{(5000 - 1)(0.05)^2 + (1.96)^2 (0.75)^2} = \frac{10804.5}{14.6584}$$

$$\therefore n = 737$$

But if we take population to be infinite, the sample size will be worked out as under-

$$n = \frac{Z^2 \sigma^2}{e^2}$$

$$= \frac{(1.96)^2 (0.75)^2}{(0.05)^2}$$

$$= 864$$

Thus, in case of infinite population the sample size becomes larger.

Determination of Sample Size when Estimating a Percentage or Proportion

The confidence interval for the universe proportion, P , is given by -

$$P \pm Z \sqrt{pq/n}$$

Where, P = Sample proportion; Z = The value of the standard normal variate at a given confidence level; n = Size of sample.

The acceptable error, "e" can be explained as-

$$e = Z \sqrt{pq/n} \text{ or } e^2 = \frac{Z^2 pq}{n}$$

$$\therefore n = \frac{Z^2 pq}{e^2}$$

The formula gives the size of the sample in case of infinite population.

But in case of finite population the above selected formula will be changed as under-

$$\therefore n = \frac{Z^2 pq N}{(N - 1) e^2 + Z^2 pq}$$

Where,

n = Sample size;

z = the value of the standard variate at a given confidence level and to be worked out from table showing area under Normal Curve. It would be considered standard normal deviate at 95% confidence level = 1.96;

p = sample proportion, which may either be based on personal judgment, experience or may be result of a pilot study. In absence of such estimation one method may be to take the value of $p = 0.50$ in which case 'n' will be the maximum and the sample will yield at least the desired precision.

$q = 1 - p$

e = acceptable margin of error (the precision), usually considered 0.05

N = size of population.

Adjustment of Sample Size

After the sample size is calculated, if it is found that it represents a sizeable fraction of the population, then the adjustment is made by introducing the finite population correction. The final sample of size n' is then obtained as -

$$\therefore n' = \frac{n}{1 + \frac{n}{N}}$$

Where, N is the population size. In general, if a sample represents 5 percent or more of the population, the adjustment is made by the finite population correction.

What would be the size of the sample if a simple random sample from a population of 6000 items is to be drawn to estimate the percent defective within 3 percent of the true value with 95 percent probability? What would be the size of the sample if the population is assumed to be infinite in the given case?

References

- Kabir, S.M.S.** (2016). *Basic Guidelines for Research: An Introductory Approach for All Disciplines*. Book Zone Publication, ISBN: 978-984-33-9565-8, Chittagong-4203, Bangladesh.
- Kabir, S.M.S.** (2017). *Essentials of Counseling*. Abosar Prokashana Sangstha, ISBN: 978-984-8798-22-5, Banglabazar, Dhaka-1100.
- Kabir, S.M.S.,** Mostafa, M.R., Chowdhury, A.H., & Salim, M.A.A. (2016). *Bangladesher Samajtattwa (Sociology of Bangladesh)*. Protik Publisher, ISBN: 978-984-8794-69-2, Dhaka-1100.
- Kabir, S.M.S.** (2018). Psychological health challenges of the hill-tracts region for climate change in Bangladesh. *Asian Journal of Psychiatry, Elsevier*, 34, 74–77.
- Kabir, S.M.S.,** Aziz, M.A., & Jahan, A.K.M.S. (2018). Women Empowerment and Governance in Bangladesh. *ANTYAJAA: Indian journal of Women and Social Change*, SAGE Publications India Pvt. Ltd, 3(1), 1-12.
- Alam, S.S. & **Kabir, S.M.S.** (2015). Classroom Management in Secondary Level: Bangladesh Context. *International Journal of Scientific and Research Publications*, 5(8), 1-4, ISSN 2250-3153, www.ijsrp.org.
- Alam, S.S., **Kabir, S.M.S.,** & Aktar, R. (2015). General Observation, Cognition, Emotion, Social, Communication, Sensory Deficiency of Autistic Children. *Indian Journal of Health and Wellbeing*, 6(7), 663-666, ISSN-p-2229-5356,e-2321-3698.
- Kabir, S.M.S.** (2013). Positive Attitude Can Change Life. *Journal of Chittagong University*

Teachers' Association, 7, 55-63.

- Kabir, S.M.S. & Mahtab, N.** (2013). Gender, Poverty and Governance Nexus: Challenges and Strategies in Bangladesh. *Empowerment a Journal of Women for Women*, Vol. 20, 1-12.
- Kabir, S.M.S. & Jahan, A.K.M.S.** (2013). Household Decision Making Process of Rural Women in Bangladesh. *IOSR Journal of Humanities and Social Science (IOSR-JHSS)*, ISSN: 2279-0845, Vol. 10, Issue 6 (May. - Jun. 2013), 69-78. ISSN (Online): 2279-0837.
- Jahan, A.K.M.S., Mannan, S.M., & **Kabir, S.M.S.** (2013). Designing a Plan for Resource Sharing among the Selected Special Libraries in Bangladesh, *International Journal of Library Science and Research (IJLSR)*, ISSN 2250-2351, Vol. 3, Issue 3, Aug 2013, 1-20, ISSN: 2321-0079.
- Kabir, S.M.S. & Jahan, I.** (2009). Anxiety Level between Mothers of Premature Born Babies and Those of Normal Born Babies. *The Chittagong University Journal of Biological Science*, 4(1&2), 131-140.
- Kabir, S.M.S., Amanullah, A.S.M., & Karim, S.F.** (2008). Self-esteem and Life Satisfaction of Public and Private Bank Managers. *The Dhaka University Journal of Psychology*, 32, 9-20.
- Kabir, S.M.S., Amanullah, A.S.M., Karim, S.F., & Shafiqul, I.** (2008). Mental Health and Self-esteem: Public Vs. Private University Students in Bangladesh. *Journal of Business and Technology*, 3, 96-108.
- Kabir, S.M.S., Shahid, S.F.B., & Karim, S.F.** (2007). Personality between Housewives and Working Women in Bangladesh. *The Dhaka University Journal of Psychology*, 31, 73-84.
- Kabir, S.M.S. & Karim, S.F.** (2005). Influence of Type of Bank and Sex on Self-esteem, Life Satisfaction and Job Satisfaction. *The Dhaka University Journal of Psychology*, 29, 41-52.
- Kabir, S.M.S. & Rashid, U.K.** (2017). Interpersonal Values, Inferiority Complex, and Psychological Well-Being of Teenage Students. *Jagannath University Journal of Life and Earth Sciences*, 3(1&2), 127-135.
