**Simple Random Sampling:**

**Definition**

Simple random sampling is a sampling technique where every item in the population has an equal chance and likelihood of being selected in the [sample.](https://www.questionpro.com/audience/) Here the selection of items completely depends on chance or by [probability](https://www.questionpro.com/blog/probability-sampling/) and therefore this sampling technique is also sometimes known as a method of chances.

This process and technique is known as simple random sampling, and should not be confused with [systematic random sampling](https://www.questionpro.com/blog/systematic-sampling/). A simple random sample is a fair sampling technique.

Simple random sampling is a very basic type of sampling method and can easily be a component of a more complex sampling method. The main attribute of this sampling method is that every sample has the same probability of being chosen.

The sample size in this sampling method should ideally be more than a few hundred so that simple random sampling can be applied in an appropriate manner. It is sometimes argued that this method is theoretically simple to understand but difficult to practically implement. Working with large sample size isn’t an easy task and it can sometimes be a challenge finding a realistic sampling frame.

### ****Simple random sampling methods****

The following steps are involved in selecting simple random sampling:

1. A list of all the members of the population is prepared initially and then each member is marked with a specific number ( for example, there are nth members then they will be numbered from 1 to N).

2. From this population, random samples are chosen using two ways: random number tables and random number generator software. A random number generator software is preferred more as the sample numbers can be generated randomly without human interference.

There are two approaches that aim to minimize any biases in the process of simple random sampling:

* **Method of lottery**

Using the method of the lottery is one of the oldest methods and is a mechanical example of random sampling. In this method, each member of the population has to number systematically and in a consequent manner by writing each number on a separate piece of paper. These pieces of paper are mixed and put into a box and then numbers are drawn out of the box in a random manner.

* **Use of random numbers**

The use of random numbers is an alternative method that also involves numbering the population. The use of a number table similar to the one below can help with this sampling technique.

### Simple Random Sampling Example

An organization has 500 employees. We want to extract a sample of 100 from them.

* Step 1: **Make a list**of all the employees working in the organization. (as mentioned above there are 500 employees in the organization, the list must contain 500 names).
* Step 2: **Assign a sequential number**to each employee (1,2,3…n). This is your sampling frame (the list from which you draw your simple random sample).
* Step 3: **Figure out what your sample size is going to be**. (In this case, the sample size is 100).
* Step 4: **Use a random number generator**to select the sample, using your sampling frame (population size) from Step 2 and your sample size from Step 3. For example, if your sample size is 100 and your population is 500, generate 100 random numbers between 1 and 500.

### Simple Random Sampling in research

Today, the market research projects are much larger and sometimes an indefinite number of item are involved. It is practically not possible to study the thought process of every member of the population and derive interference from the study.

If as a researcher, you want to save your time and money simple random sampling is one of the best probability sampling methods that you can use. Getting data from a sample is more advisable and practical

Whether to use a census or a sample depends on a number of factors, such as the type of census, the degree of homogeneity/heterogeneity, costs, time, feasibility to study, the degree of accuracy needed, and some others.

### ****Advantages of Simple Random Sampling****

1.It is a fair method of sampling and if applied appropriately it helps to reduce any bias involved as compared to any other sampling method involved.

2. Since it involves a large sample frame it is usually easy to pick smaller sample size from the existing larger population.

3. The person who is conducting the research doesn’t need to have a prior knowledge of the data being collected. One can simply ask a question to gather the researcher need not be a subject expert.

4. This sampling method is a very basic method of collecting the data. There is no technical knowledge required and need basic listening and recording skills.

5. Since the population size is large in this type of sampling method there is no restriction on the sample size that needs to be created. From a larger population, you can get a small sample quite easily.

6. The data collected through this sampling method is well informed, more the samples better is the quality of the data.

### Disadvantages of Simple Random Sampling

1. It is a costlier method of sampling as it requires a complete list of all potential respondents to be available beforehand.

2. This sampling method is not suitable for studies involving face-to-face interviews as covering large geographical areas have cost and time constraints.

3. A sample size that is too large is also problematic since every member of the population has an equal chance of selection. The larger population means a larger sample frame. It is difficult to manage the large population.

4. The quality of the data depends on the researcher and his/her perspective. If the researcher is experienced then there are fair chances the quality of data collected is of a superior quality. But if the researcher is inexperienced then the data collected may or may not be upto the mark.

**Difference between SRSWOR and SRSWR ( Simple random sampling without replacement and simple random sampling with replacement)**

* 1. If the selected units are not being replaced in the population before the next draw, it is called SRSWOR ,
  2. If the selected units are being replaced in the population before the next draw, it is called SRSWR ,
  3. There may be some chances of having the same units of the population in the sample,
  4. Therefore, SRSWOR is superior to SRSWR, because the variance of sample mean in SRSWOR is found to be always less rather than that of SRSWR and no chances of repetitions of the units in the selection.

Total number of Samples in SRSWOR: 

Total number of Samples in SRSWR : Nn

Where N= Population size and n= Sample size

Example 1:

Objective: Showing the unbiased estimator for population mean and biased estimator for population mean square in SRSWR with the help of an example

Kinds of data: Consider a finite population of size N=4 including the values of sampling units as ( 1,2,3,4). Enumerate all possible samples of size n=2 using SRSWR.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S.No. | Possible samples | Sample mean yn | Sample mean square s2 | Sampling error |
| 1. | 1,2 | 1.5 | 0.50 | -1.0 |
| 2. | 1,3 | 2.0 | 2.00 | -0.5 |
| 3. | 1,4 | 2.5 | 4.50 | 0.0 |
| 4. | 2,3 | 2.5 | 0.50 | 0.0 |
| 5. | 2,4 | 3.0 | 2.00 | 0.5 |
| 6. | 3,4 | 3.5 | 0.50 | 1.0 |
| 7. | 2,1 | 1.5 | 0.50 | -1.0 |
| 8. | 3,1 | 2.0 | 2.00 | -0.5 |
| 9. | 4,1 | 2.5 | 4.50 | 0.0 |
| 10, | 3,2 | 2.5 | 0.50 | 0.0 |
| 11. | 4,2 | 3.0 | 2.00 | 0.5 |
| 12. | 4,3 | 3.5 | 0.50 | 1.0 |
| 13. | 1,1 | 1.0 | 0.00 | 1.5 |
| 14. | 2,2 | 2.0 | 0.00 | -0.5 |
| 15. | 3,3 | 3.0 | 0.00 | 0.5 |
| 16. | 4,4 | 4.0 | 0.00 | 1.5 |
| Total |  | 40.0 | 20.00 | 0.0 |

E[yn] =40.0/16=2.5

Population mean= YN =(1+2+3+4)/4 = 2.5

It indicates that sample mean in SRSWR provides an unbiased estimator of population mean i.e. sample mean is so strong and true that we can have true information regarding population mean. Similarly

E[ s2] =20/16=1.25

And population mean square S2==5/3=1.67

It shows that in SRSWR, sample mean square is a biased estimator of population mean square, because 1.25 is not equal to 1.67.

Example 2:

Objective: Showing the unbiased estimator for population mean and population mean square in SRSWOR with the help of same example given above

Kinds of data: Consider a finite population of size N=4 including the values of sampling units as ( 1,2,3,4). Enumerate all possible samples of size n=2 using SRSWOR

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S.No. | Possible samples | Sample mean yn | Sample mean square s2 | Sampling error |
| 1. | 1,2 | 1.5 | 0.50 | -1.0 |
| 2. | 1,3 | 2.0 | 2.00 | -0.5 |
| 3. | 1,4 | 2.5 | 4.50 | 0.0 |
| 4. | 2,3 | 2.5 | 0.50 | 0.0 |
| 5. | 2,4 | 3.0 | 2.00 | 0.5 |
| 6. | 3,4 | 3.5 | 0.50 | 1.0 |
| Total |  | 15.0 | 10.0 | 0.0 |

E[yn] =15.0/ 6=2.5

Population mean= YN =(1+2+3+4)/4 = 2.5

It indicates that sample mean in SRSWOR provides an unbiased estimator of population mean i.e. sample mean is so strong and true that we can have true information regarding population mean. Similarly

E[ s2] =10/6=1.67

And population mean square S2==5/3=1.67

It shows that in SRSWOR, sample mean square is an unbiased estimator of population mean square, because 1.67 is equal to 1.67.