Introduction to Sampling Theory

Lecture 4
Simple Random Sampling

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Slides can be downloaded from
http://home.iitk.ac.in/~shalab/sp
Simple Random Sampling:

Simple random sampling (SRS) is a method of selection of a sample comprising of \( n \) number of sampling units from the population having \( N \) number of units such that every sampling unit has an equal chance of being chosen.
Simple Random Sampling Without Replacement:

SRSWOR

The sampling units are chosen without replacement in the sense that the units once chosen are not placed back in the population.
Simple Random Sampling With Replacement:

SRSWR

The sampling units are chosen with replacement in the sense that the chosen units are placed back in the population.
Simple Random Sampling:

**SRSWOR**

SRSWOR is a method of selection of $n$ units out of the $N$ units one by one such that at any stage of selection, any one of the remaining units have the same chance of being selected, i.e. $1/N$.

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Procedure of Selection of a Random Sample:

Suppose there are $N$ units in the population and out of which $n$ units are to be selected.

1. Identify the $N$ units in the population with the number 1 to $N$.

2. Choose any random number arbitrarily from the random numbers table and start reading numbers.

3. Choose the sampling unit whose serial number corresponds to the random number drawn from the table of random numbers.
Procedure of Selection of a Random Sample:

4. In case of SRSWR, all the random numbers are accepted even if repeated more than once.

4. In case of SRSWOR, if any random number is repeated, then it is ignored and more numbers are drawn.
Simple Random Sampling:

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Simple Random Sampling in Software:

Such a process can be implemented through programming and using the discrete uniform distribution.

Any number between 1 and $N$ can be generated from this distribution, and the corresponding unit can be selected into the sample by associating an index with each sampling unit.

Many statistical software like R, SAS, etc. have inbuilt functions for drawing a sample using SRSWOR or SRSWR.

Generated random numbers are pseudo random numbers.
Simple Random Sampling Without Replacement:

Population of balls of size 10

Sample 1: 7 4 9 1

Sample 2: 2 7 1 5

No unit is repeated.
Simple Random Sampling Without Replacement:

Population of balls of size 10

Sample 1

Sample 2

No unit is repeated

No unit is repeated
Simple Random Sampling With Replacement:

Population of balls of size 10

Sample 1: 7 7 9 1  Unit 7 is repeated
Sample 2: 8 5 3 6  No unit is repeated
Simple Random Sampling With Replacement:

Population of balls of size 10

Sample 1: 3 6 6 9 7
  Unit 6 is repeated

Sample 2: 2 5 8 2 8
  Units 2 and 8 are repeated