

Sampling Theory



Statistical Survey & Collection of data



Sources of data

- Primary Data
- Secondary data



Methods of collecting primary data

- Direct personal interviews
- Indirect oral interview
- Information through correspondents
- Mailed questionnaires



Secondary data

- Published sources
 - Official publications
 - Pub. Of research institutions
 - International pub.
 - Professional bodies
 - Pub. of economic & trade journals
 - Reports of various committee and commission
- Unpublished sources



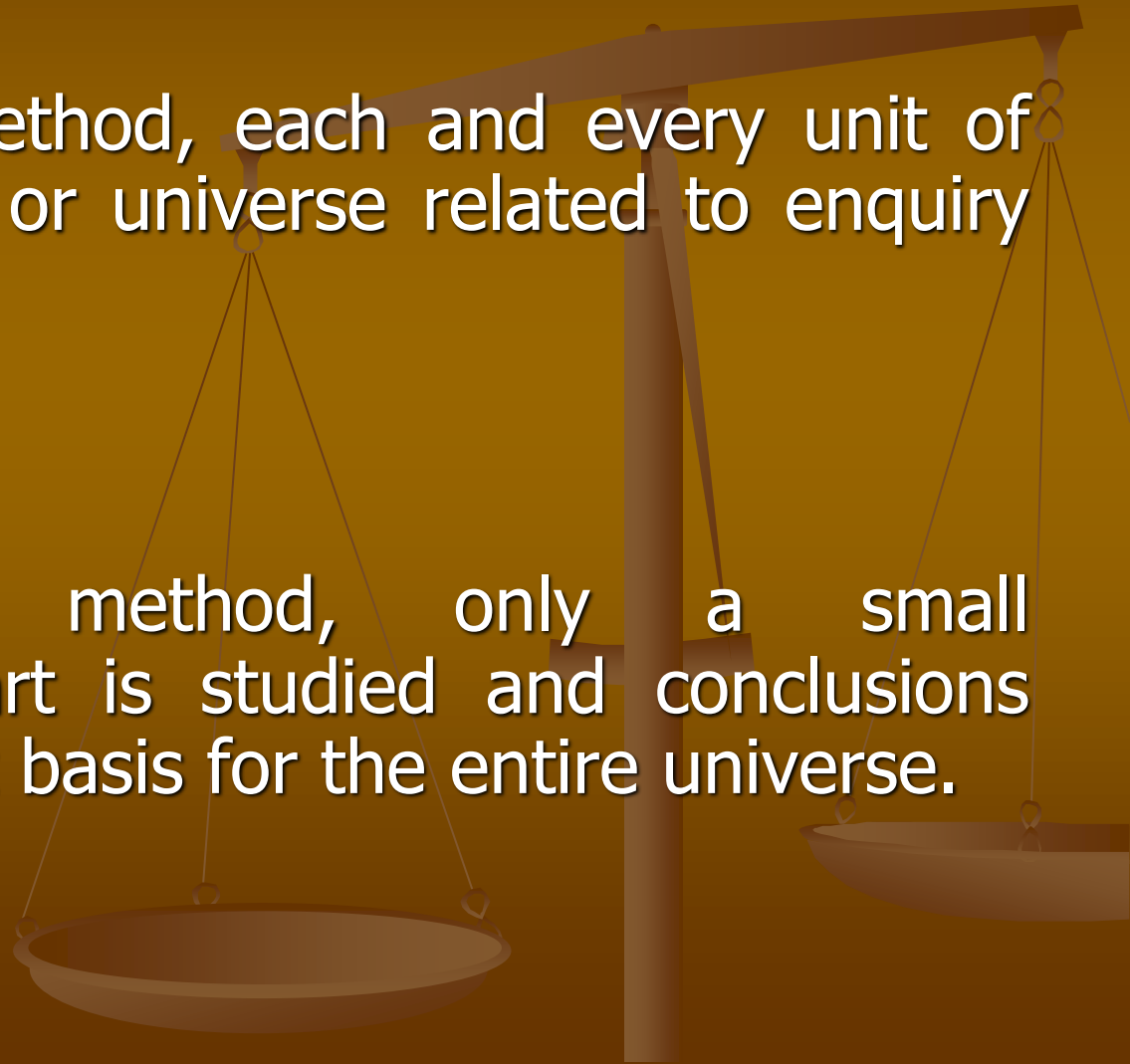
Techniques of Data collection

■ Census Method

Under census method, each and every unit of the population or universe related to enquiry is studied

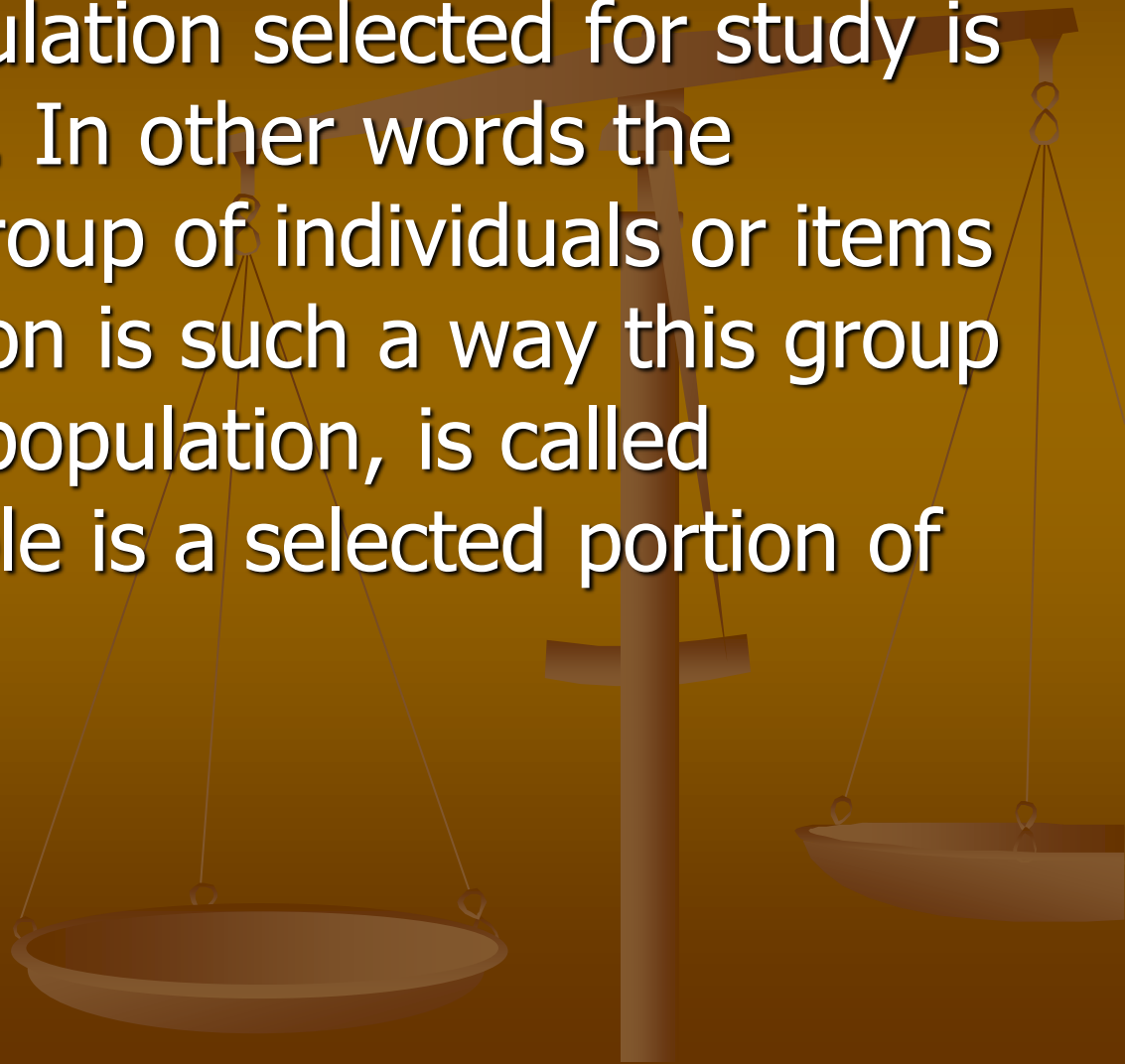
■ Sample Method

Under sample method, only a small representative part is studied and conclusions are drawn on that basis for the entire universe.



Sampling Method

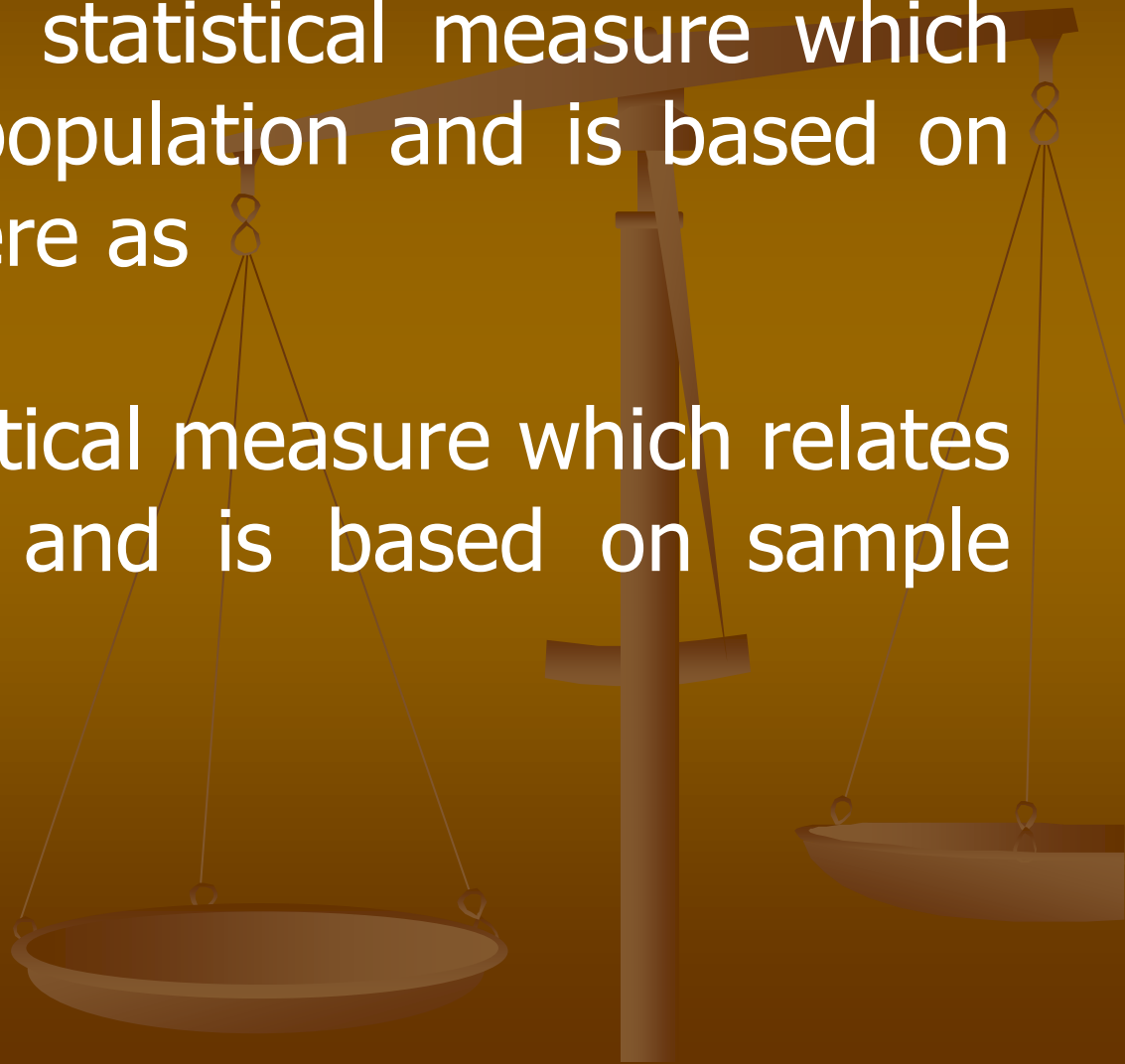
A part of the population selected for study is called a sample. In other words the selection of a group of individuals or items from a population is such a way this group represents the population, is called sample. A sample is a selected portion of the population.



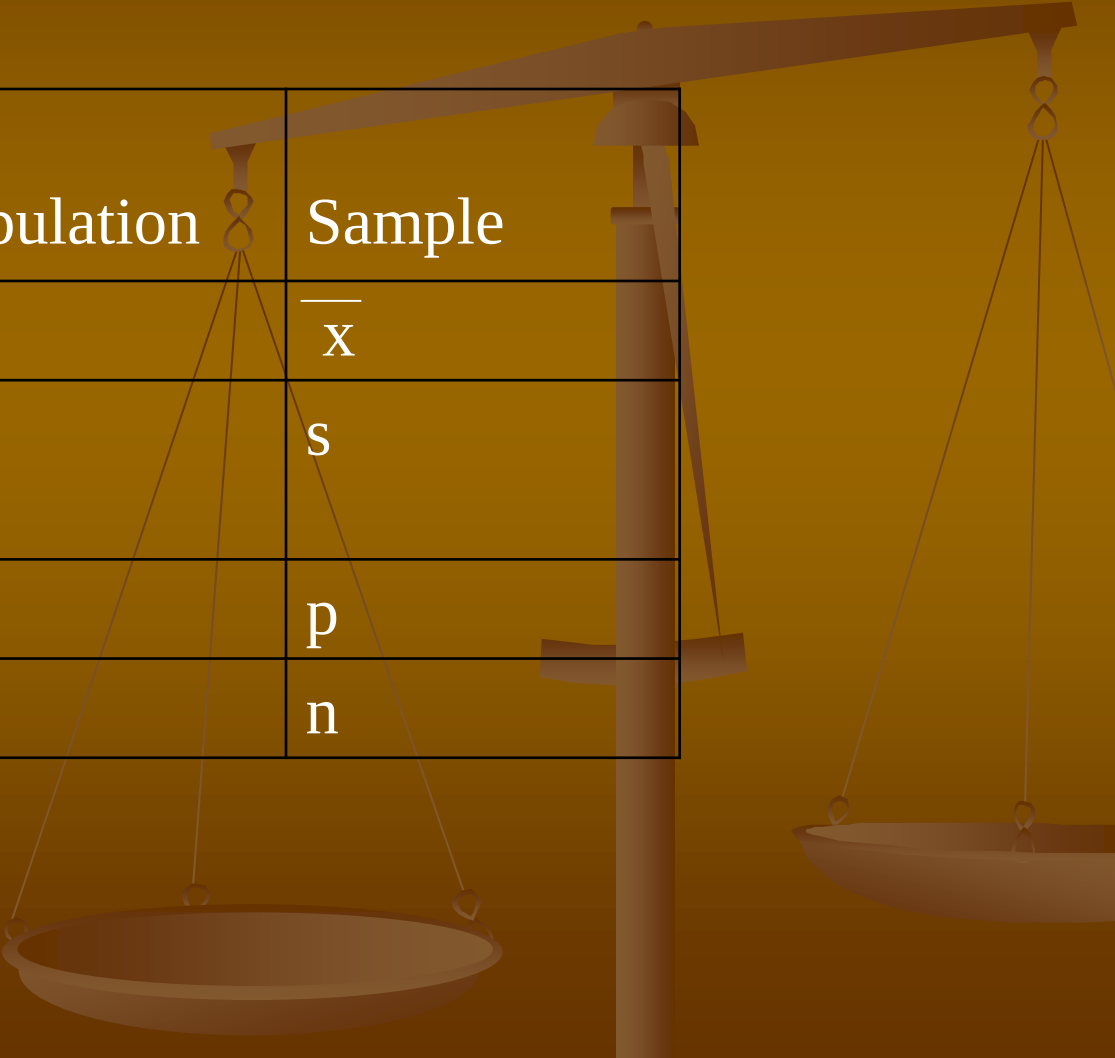
Parameter and statistic

A **parameter** is a statistical measure which relates of the population and is based on population, where as

statistic is a statistical measure which relates to the sample and is based on sample data.



The usual notation used for parameter (population data) and statistic (sample data) are given below



	Population	Sample
Mean	μ	$\bar{x}$
Standard Deviation	σ	s
Proportions	P	p
Size	N	n

Methods of Sampling

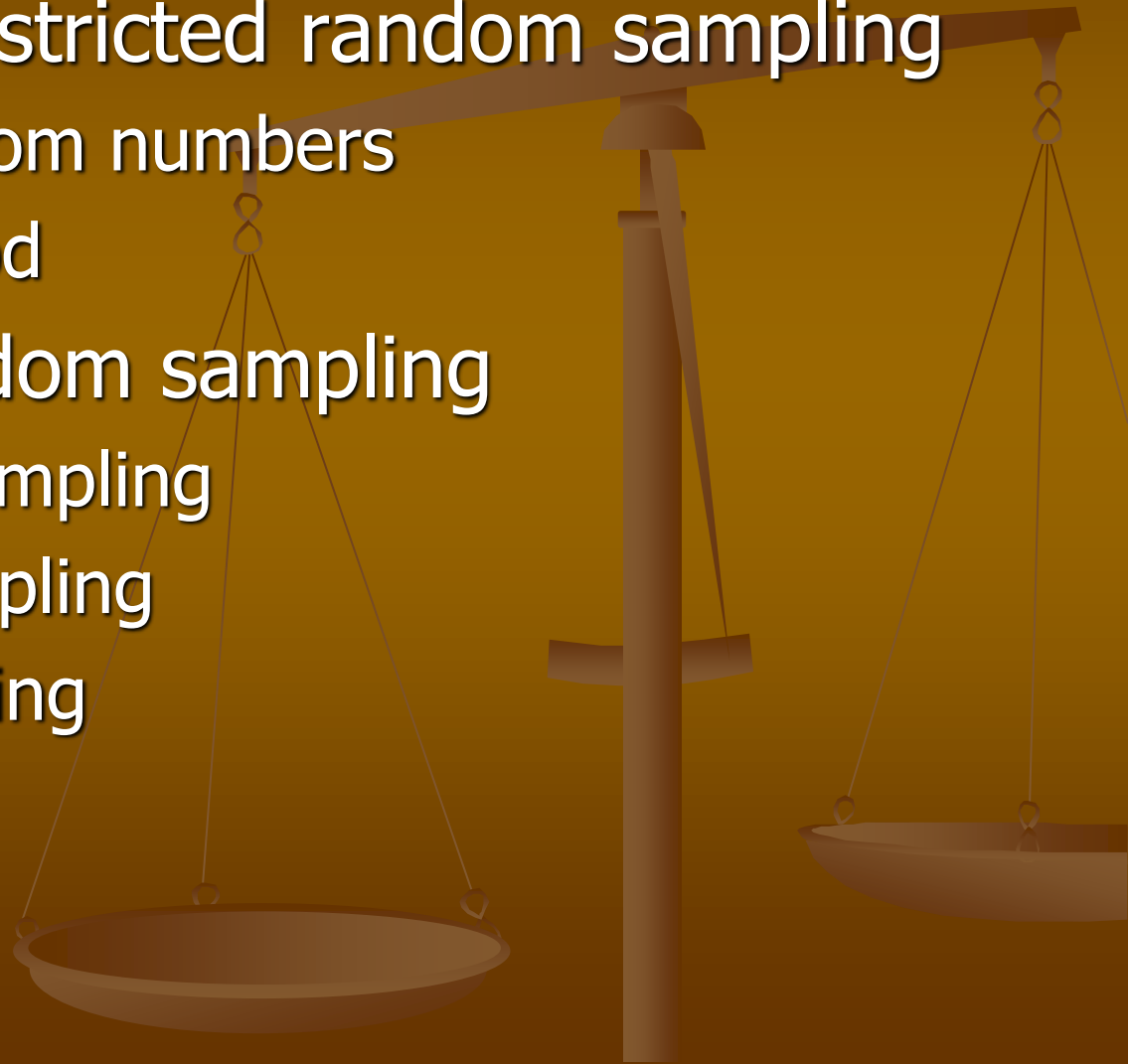
- Random Sampling Methods
- Non-Random Sampling Methods



Random Sampling methods

(Probability sampling)

- Simple or unrestricted random sampling
 - ❖ Table of random numbers
 - ❖ Lottery Method
- Restricted random sampling
 - ❖ Systematic sampling
 - ❖ Stratified sampling
 - ❖ Cluster sampling



Non- Random Sampling (non- probability sampling)

- * Judgement sampling
- * Convenience sampling
- * Quota sampling

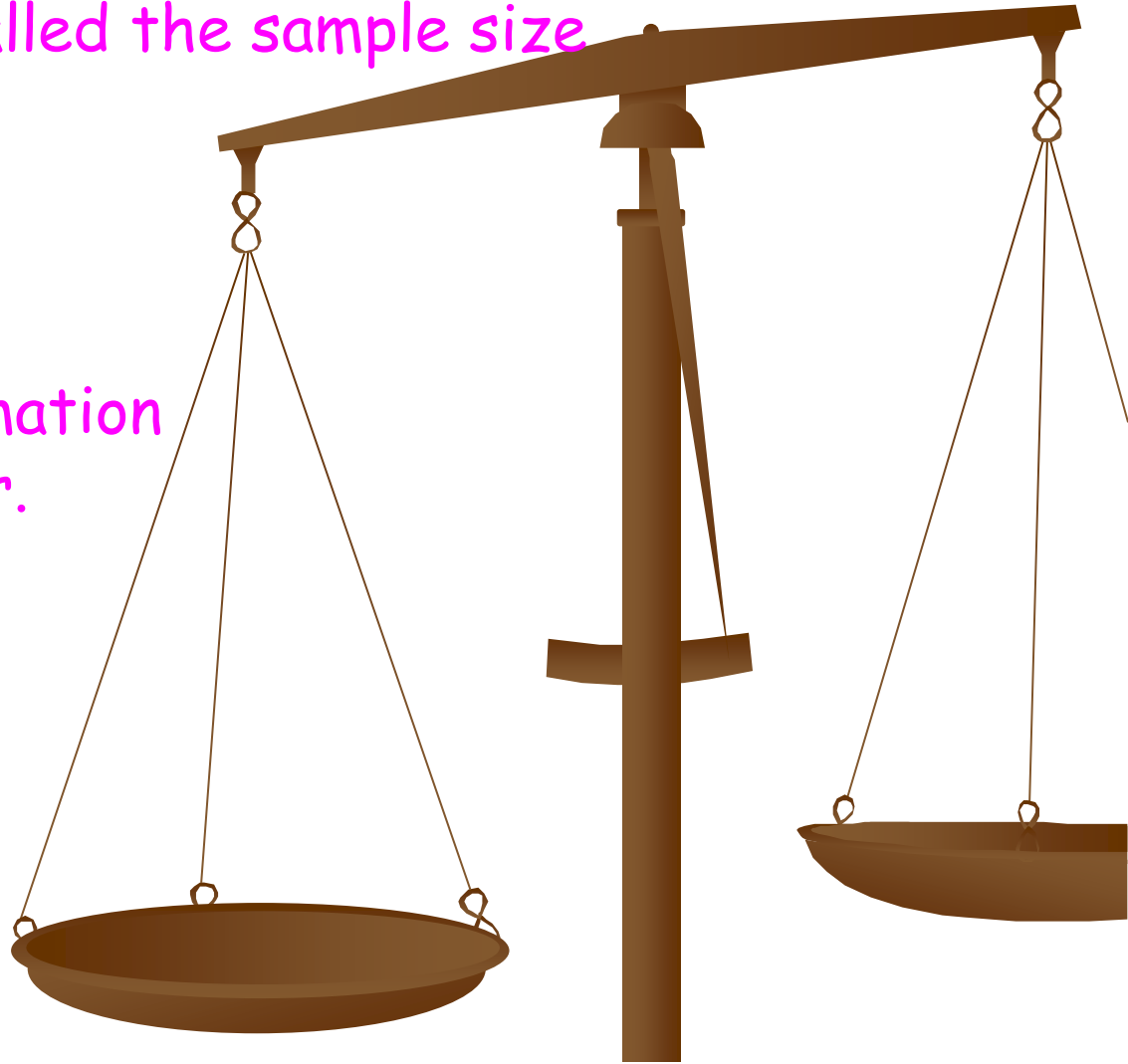


Sample size

Number of individual is called the sample size

Sampling Error

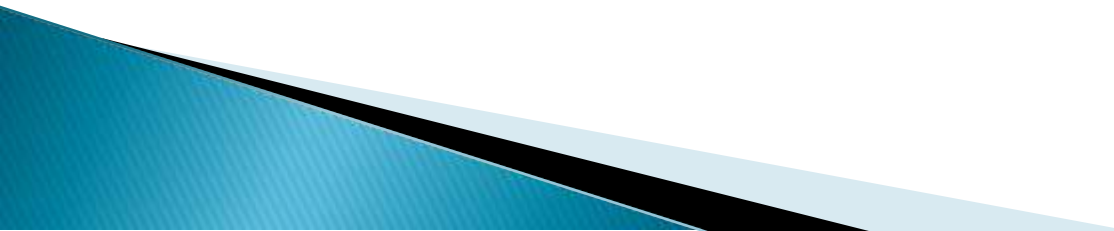
Error involved in approximation is known as sampling error.



Simple Random Sampling

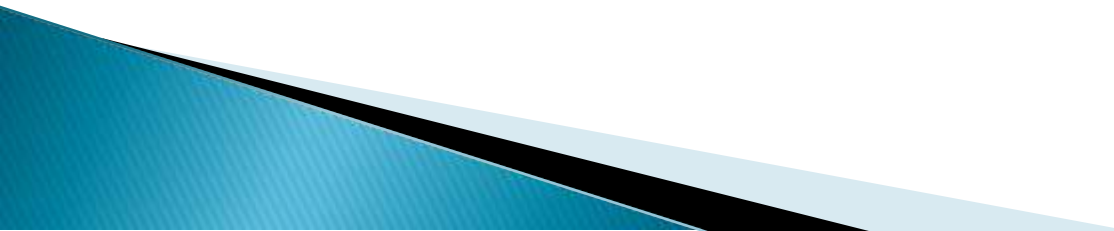
Simple random sampling is a method of probability sampling in which every unit has an equal nonzero chance of being selected

This is the ideal choice as it is a 'perfect' random method. Using this method, individuals are randomly selected from a list of the population and every single individual has an equal chance of selection.

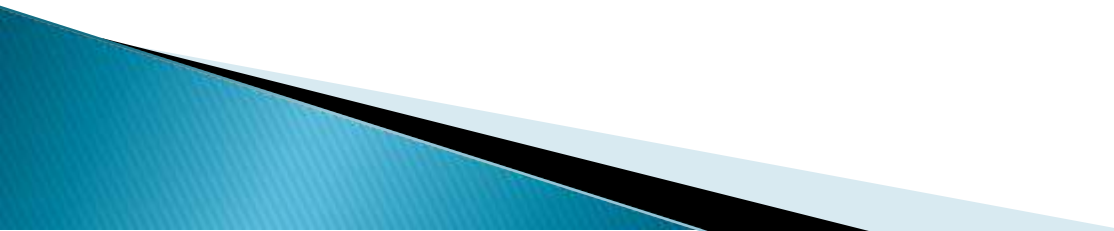


Systematic Random Sampling

Systematic random sampling is a method of probability sampling in which the defined target population is ordered and the sample is selected according to position using a skip interval



Steps in Drawing a Systematic Random Sample

- ▶ 1: Obtain a list of units that contains an acceptable frame of the target population
 - ▶ 2: Determine the number of units in the list and the desired sample size
 - ▶ 3: Compute the skip interval
 - ▶ 4: Determine a random start point
 - ▶ 5: Beginning at the start point, select the units by choosing each unit that corresponds to the skip interval
- 

Systematic Sampling

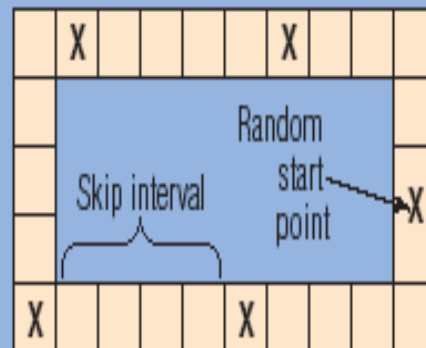
Population

Directory of the population
(sample frame)



Sample Method

Selection via skip interval with a
random starting point



Resulting Sample



Every member of the sample
frame has an equal chance
of being selected into the sample

Stratified Random Sampling

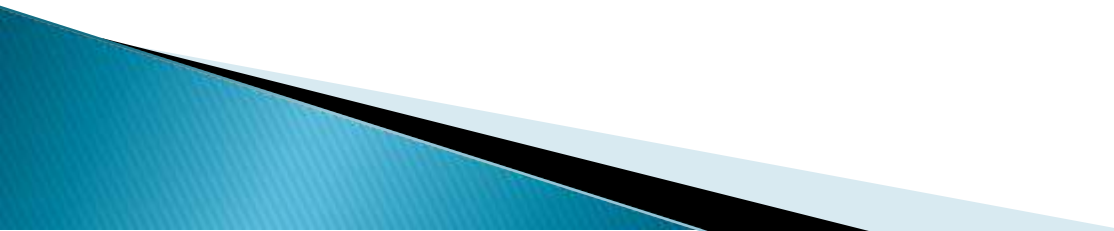
Stratified random sampling is a method of probability sampling in which the population is divided into different subgroups and samples are selected from each

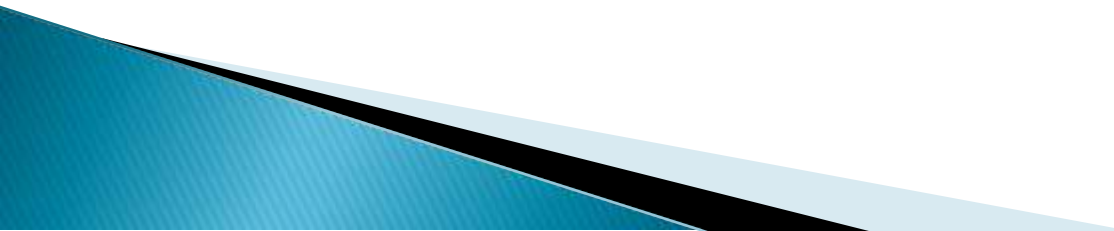


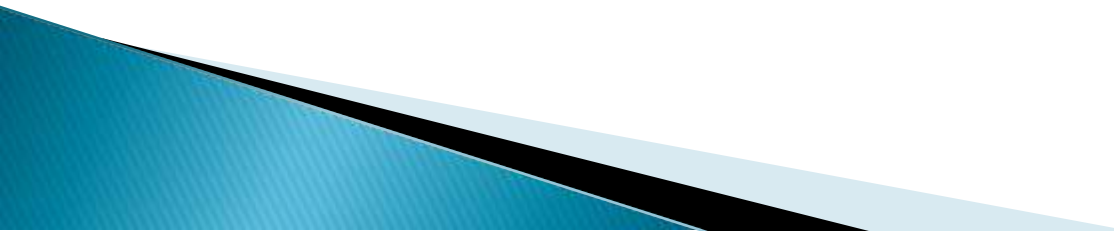
Stratified Random Sampling

Population	Sample Method	Resulting Sample																																																													
The population is separated into (e.g.) two subgroups (strata) <table><tr><td rowspan="3">I</td><td>☹️</td><td>😊</td><td>😐</td><td>😊</td><td>😊</td></tr><tr><td>😊</td><td>😐</td><td>😊</td><td>☹️</td><td>😊</td></tr><tr><td>😊</td><td>☹️</td><td>😊</td><td>😊</td><td>😊</td></tr></table> <table><tr><td rowspan="2">II</td><td>😊</td><td>😊</td><td>😊</td><td>😊</td><td>☹️</td></tr><tr><td>☹️</td><td>😊</td><td>☹️</td><td>😊</td><td>😊</td></tr></table>	I	☹️	😊	😐	😊	😊	😊	😐	😊	☹️	😊	😊	☹️	😊	😊	😊	II	😊	😊	😊	😊	☹️	☹️	😊	☹️	😊	😊	Random selection of a proportional number of stratum members from each stratum <table><tr><td rowspan="3">I</td><td></td><td></td><td></td><td>X</td><td></td></tr><tr><td></td><td>X</td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td>X</td></tr></table> <table><tr><td rowspan="2">II</td><td></td><td></td><td>X</td><td></td><td></td></tr><tr><td>X</td><td></td><td></td><td></td><td></td></tr></table>	I				X			X								X	II			X			X					<table><tr><td>I</td><td>😊</td><td>☹️</td><td>😊</td></tr></table> <table><tr><td>II</td><td>😊</td><td>☹️</td></tr></table> Every member of each stratum (I or II) in the population has an equal chance of being selected into the sample (proportional sampling)	I	😊	☹️	😊	II	😊	☹️
I		☹️	😊	😐	😊	😊																																																									
		😊	😐	😊	☹️	😊																																																									
	😊	☹️	😊	😊	😊																																																										
II	😊	😊	😊	😊	☹️																																																										
	☹️	😊	☹️	😊	😊																																																										
I				X																																																											
		X																																																													
					X																																																										
II			X																																																												
	X																																																														
I	😊	☹️	😊																																																												
II	😊	☹️																																																													

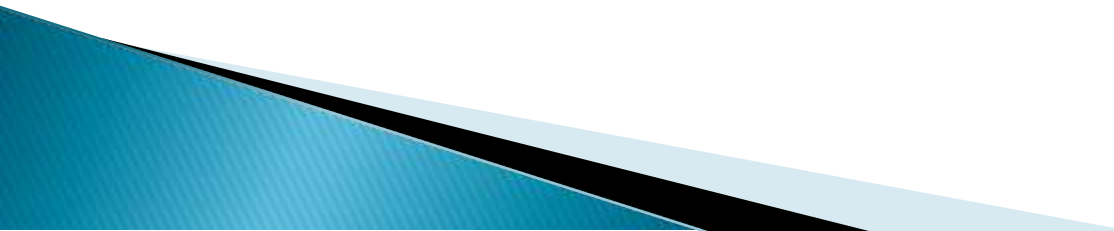
Steps in Drawing a Stratified Random Sample

- ▶ 1: Divide the target population into homogeneous subgroups or strata
 - ▶ 2: Draw random samples from each stratum
 - ▶ 3: Combine the samples from each stratum into a single sample of the target population
- 

- ▶ Cluster sampling is an example of 'two-stage sampling' .
 - ▶ First stage a sample of areas is chosen;
 - ▶ Second stage a sample of respondents *within* those areas is selected.
 - ▶ Population divided into clusters of homogeneous units, usually based on geographical contiguity.
 - ▶ Sampling units are groups rather than individuals.
 - ▶ A sample of such clusters is then selected.
 - ▶ All units from the selected clusters are studied.
- 

- ▶ Advantages :
 - ▶ Cuts down on the cost of preparing a sampling frame.
 - ▶ This can reduce travel and other administrative costs.
 - ▶ Disadvantages: sampling error is higher for a simple random sample of same size.
 - ▶ Often used to evaluate vaccination coverage in EPI
- 

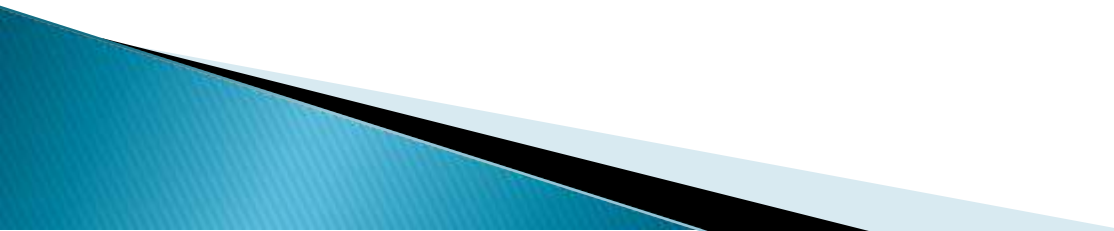
- **Identification of clusters**

- List all cities, towns, villages & wards of cities with their population falling in target area under study.
 - Calculate cumulative population & divide by 30, this gives sampling interval.
 - Select a random no. less than or equal to sampling interval having same no. of digits. This forms 1st cluster.
 - Random no.+ sampling interval = population of 2nd cluster.
 - Second cluster + sampling interval = 4th cluster.
 - Last or 30th cluster = 29th cluster + sampling interval
- 

Two types of cluster sampling methods.

One-stage sampling. All of the elements within selected clusters are included in the sample.

Two-stage sampling. A subset of elements within selected clusters are randomly selected for inclusion in the sample.



Difference Between Strata and Clusters

- ▶ Although strata and clusters are both non-overlapping subsets of the population, they differ in several ways.
- ▶ All strata are represented in the sample; but only a subset of clusters are in the sample.
- ▶ With stratified sampling, the best survey results occur when elements within strata are internally homogeneous. However, with cluster sampling, the best results occur when elements within clusters are internally heterogeneous

Non random sampling

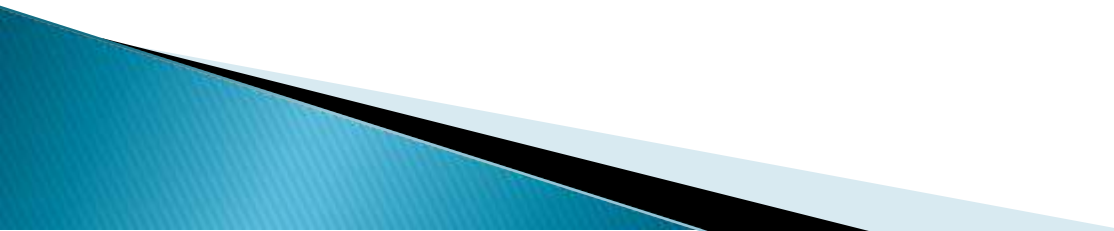
Under this method sample is selected according to the judgement of the investigator. The investigator selects those items which he considers as the most representative of the universe.



Convenience Sampling

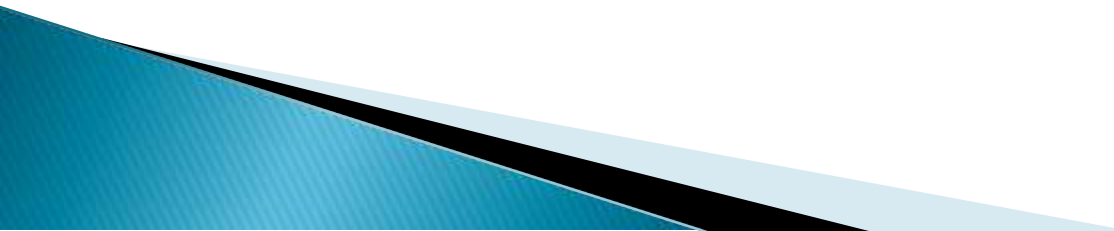
Convenience sampling attempts to obtain a sample of convenient elements. Often, respondents are selected because they happen to be in the right place at the right time.

- use of students, and members of social organizations
- mall intercept interviews without qualifying the respondents
- department stores using charge account lists
- “people on the street” interviews



Judgmental Sampling

Judgmental sampling is a form of convenience sampling in which the population elements are selected based on the judgment of the researcher.

- test markets
 - purchase engineers selected in industrial marketing research
 - bellwether precincts selected in voting behavior research
 - expert witnesses used in court
- 

Quota Sampling

Quota sampling may be viewed as two-stage restricted judgmental sampling.

- The first stage consists of developing control categories, or quotas, of population elements.
- In the second stage, sample elements are selected based on convenience or judgment.

