

SAMPLING TECHNIQUES



SARASWATHI S
Asst. Professor
PG Dept of Studies in Commerce
JSS College for Women, Kollegal

OUTLINES



- ▶ Introduction
- ▶ Sample definition
 - ▶ Sampling
 - ▶ Need of Sampling
- ▶ Stages in the selection of a sample
 - ▶ Theoretical basis of sampling
 - ▶ Scope or Importance
 - ▶ Role or Uses
 - ▶ Reasons
 - ▶ Advantages & Disadvantages
- ▶ Types of sampling in quantitative & qualitative researches
 - ▶ Methods of sampling
 - ▶ Sampling errors
 - ▶ Sampling distributions
- ▶ Ethical Considerations in Data Collection

INTRODUCTION

Sampling is an integral part of our day-to-day life. The theory of sampling is not new. In our developed countries, the theory of sampling is not new. In our every-day life, we have been using sampling theory without knowing about it.

Example:-

1. a housewife tests a small quantity of rice to see whether it has been well cooked but will not inspect all the rice.
2. a fruit merchant does not inspect each fruit but inspects only a few of them.

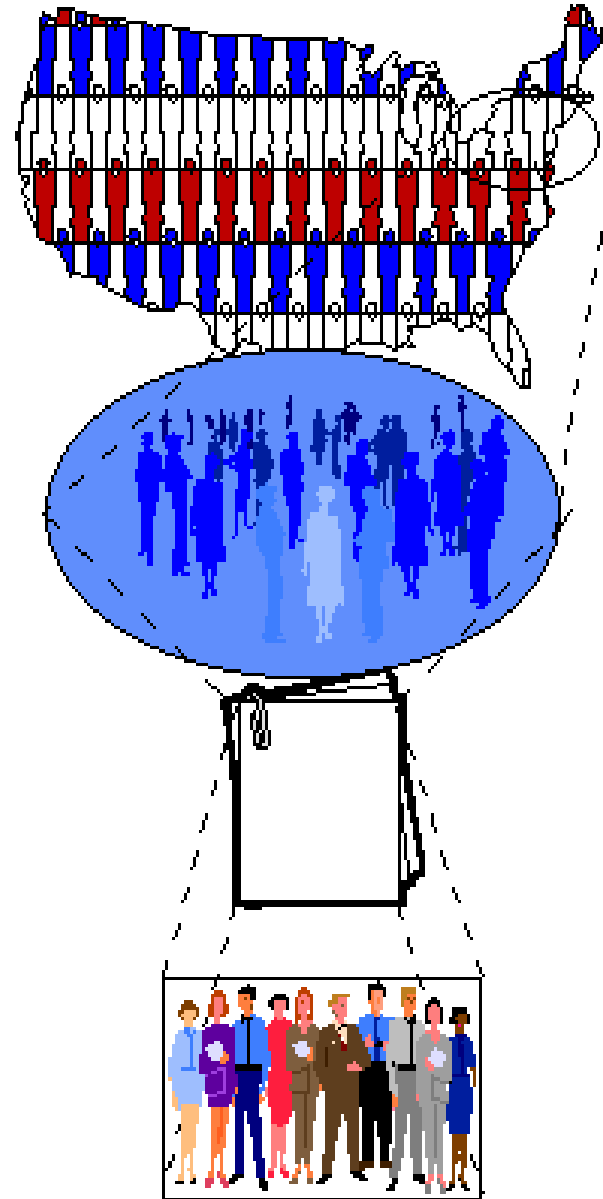
Thus sampling is simply a process of learning about a universe or population on the basis of a sample drawn from it. The sampling technique takes a small lot of the universe as representative of the whole population & draws conclusions applicable to all the units of the universe or populations.

Who do you want to generalize to?

What population can you get access to?

How can you get access to them?

Who is in your study?



The Theoretical Population

The Study Population

The Sampling Frame

The Sample

UNIVERSE OR POPULATION

- ▶ In statistics denotes the aggregate from which sample (items) is to be taken.
- ▶ A population can be defined as including all people or items with the characteristic one wishes to understand.

STATISTICS

- ▶ It is a values obtained from study of a sample.

PARAMETERS

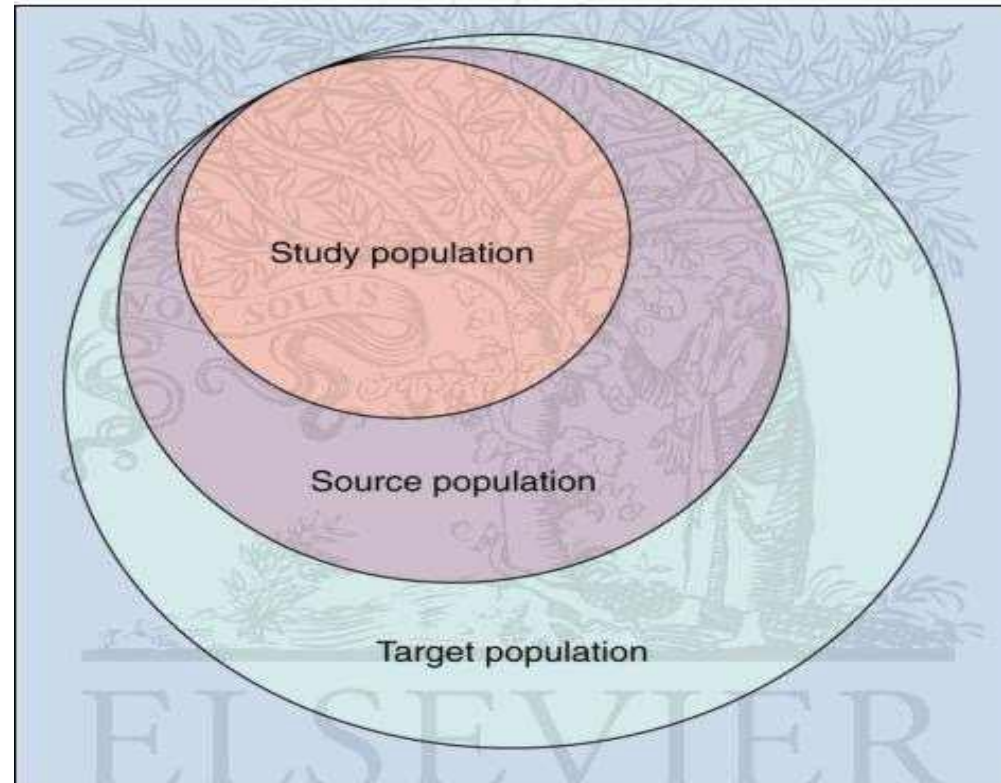
- ▶ such values from study of population.

SAMPLE

- ▶ A sample is a small picture or cross section of whole group or aggregate from which a portion is drawn.
- ▶ A subset of a population used to study the population as a whole

SAMPLING FRAME

- ▶ It is the list from which the potential respondents are drawn . A list of all elements or other units containing the elements in a population.



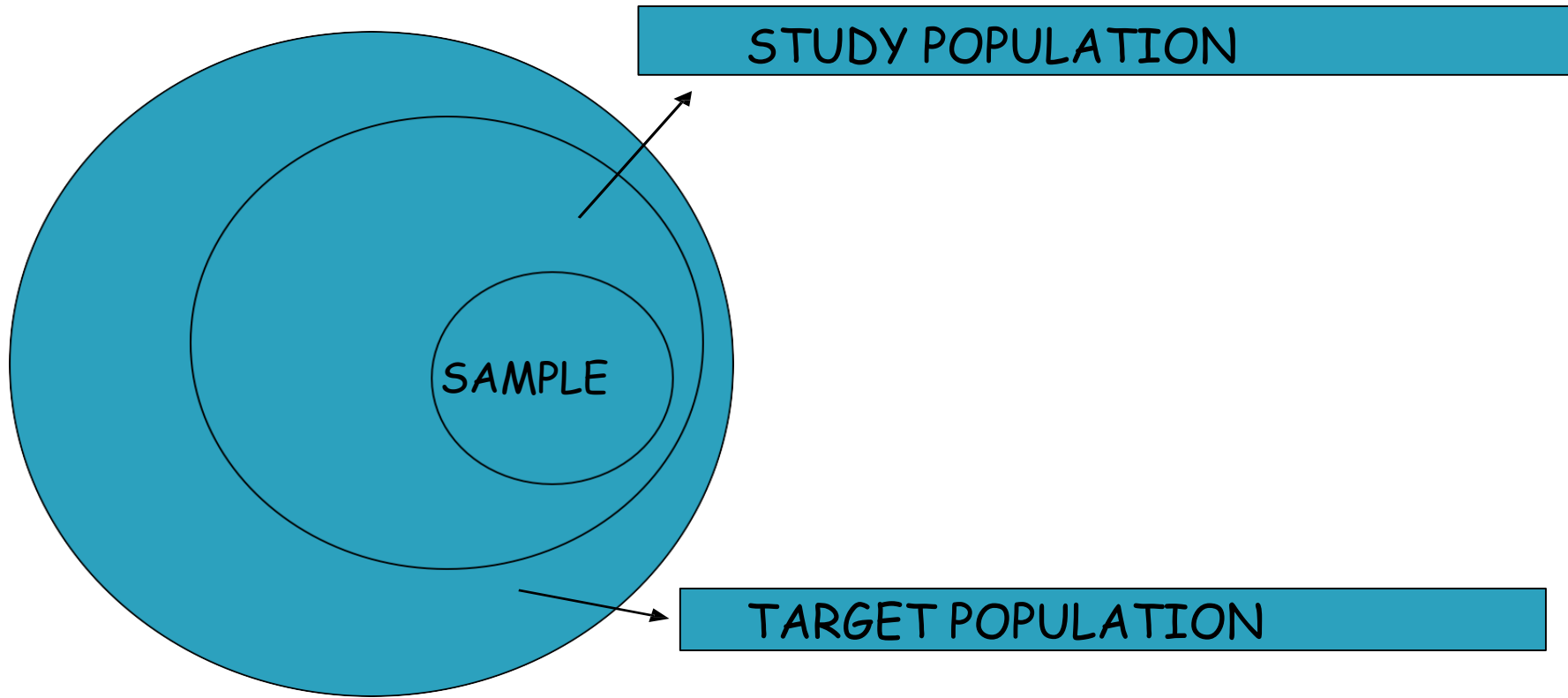
©ELSEVIER, INC. – ELSEVIERIMAGES.COM

Populations vs. Samples

- ▶ Who = Population:
 - ▶ all individuals of interest
 - ▶ US Voters, Dentists, College students, Children
- ▶ What = Parameter
 - ▶ Characteristic of population
- ▶ Problem: can't study/survey whole pop
- ▶ Solution: Use a sample for the "who"
 - ▶ subset, selected from population
 - ▶ calculate a statistic for the "what"



SAMPLING.....



SAMPLING

It may be defined as the selection of some part of an aggregate or totally on the basis of which a judgement or inference about the aggregate or totally is made.

Primary objective of sampling is to obtain maximum, accurate & reliable information about the universe with the minimum sacrifice of money, time & energy.

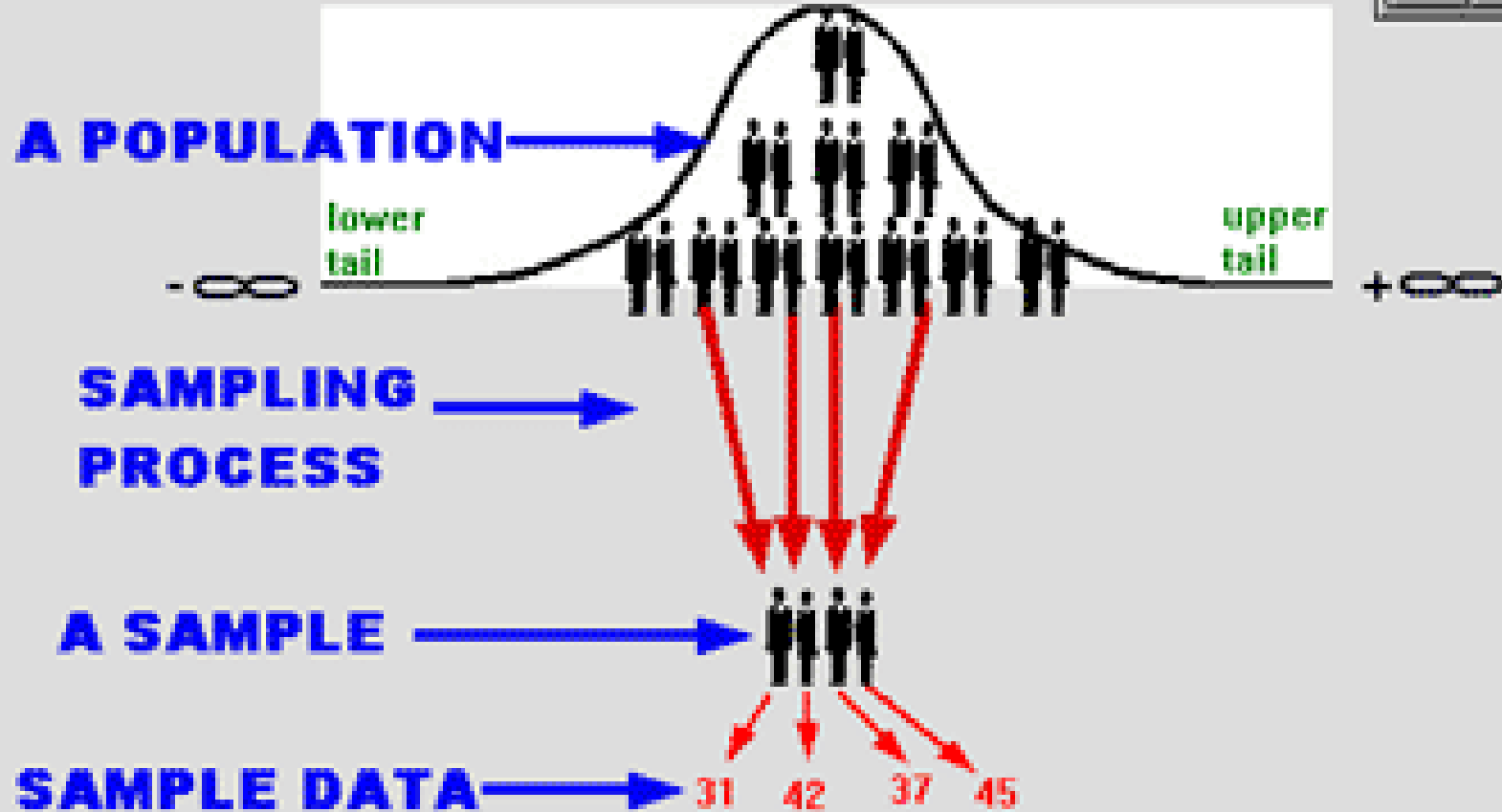
The process of obtaining information from a sample of a larger group (population).

- ▶ The process of selecting a number of individuals for a study in such a way that the individuals represent the larger group from which they were selected.
- ▶ Three elements in process of sampling:
 - (a) Selecting the sample
 - (b) Collecting the information
 - (c) Making inference about population



Sampling from a Population

Continue

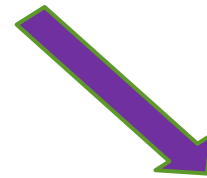
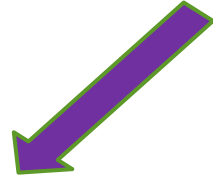


WHAT IS DATA?

Drawing a random sample from a Normal Population and measuring each person

NEED FOR SAMPLING

DATA
(acc. to source)



Primary

Secondary



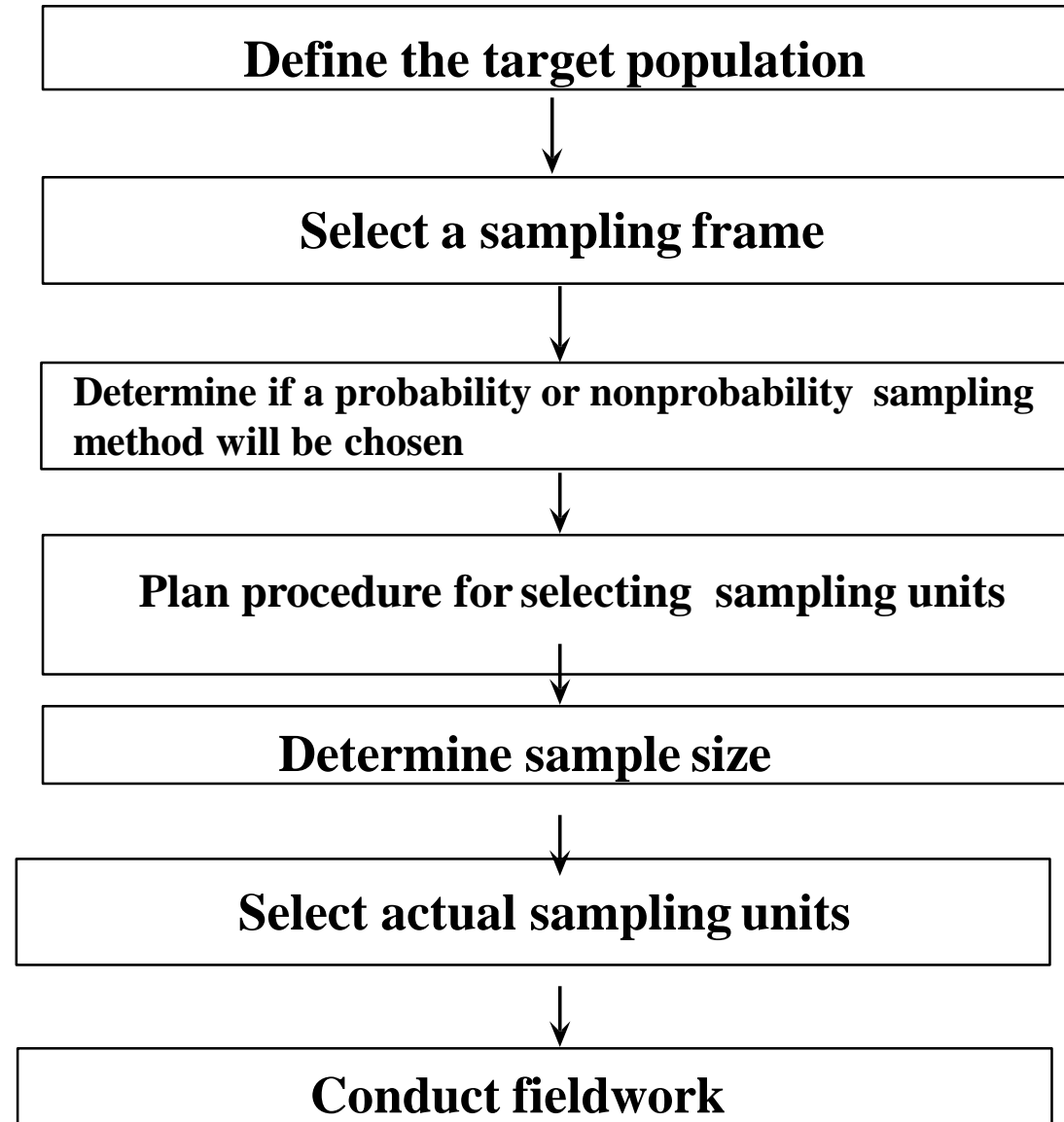
- 1.ORIGINAL IN CHARACTER**
- 2.GENERATED IN LARGE NO. OF SURVEYS**

- OBTAINED FROM**
- 1.PUBLISHED SOURCES**
 - 2.UNPUBLISHED SOURCES**

CONT'D

- ▶ When secondary data are not available for the problem under study , primary data is collected.
- ▶ Two methods –
 - Census method or complete enumeration method
 - Sample method

STAGES IN THE SELECTION OF A SAMPLE



THEORETICAL BASIS OF SAMPLING

On the basis of sample study we can predict and generalize the behavior of mass phenomena. There is no statistical population whose elements would vary from each other without limit.

1] Law of Statistical Regularity-

- ▶ Sample is taken at random from a population, it is
- ▶ likely to possess same characteristics as that of population.

2] Law of inertia of large numbers-

- ▶ Larger the size of sample, more accurate the results are likely to be.

SCOPE OR IMPORTANCE OF SAMPLING

- ▶ Study the representative units only
- ▶ Study large area
- ▶ Scrutiny of available information possible
- ▶ Intensive study possible
- ▶ Facility to collect information
- ▶ Attainment of valuable results.

ROLE / USES OF SAMPLING

- ▶ Sampling minimize the time of the study
- ▶ Sampling reduces the cost of the study
- ▶ Sampling helps in collecting detailed information
- ▶ Sample study gives more accurate results
- ▶ Population study may not be possible in all area.

REASONS FOR SAMPLING

- ▶ Sampling can save money.
- ▶ Sampling can save time.
- ▶ For given resources, sampling can broaden the scope of the data set.
- ▶ Because the research process is sometimes destructive, the sample can save product.
- ▶ If accessing the population is impossible; sampling is the only option.

ADVANTAGES OF SAMPLING

- ▶ Prof. A. C. Rosander has summed up the advantages as “ the sample has many advantage over a censes or complete enumeration”.
- ▶ Prof. R. A. Fisher has summed up in just 4 words - speed, economy, adoptability & scientific approach.

The main advantages are given below-

- ▶ Economy or reduced cost
- ▶ Speed or less time
- ▶ Administrative convenience
- ▶ Greater scope & accuracy
- ▶ Reliability
- ▶ Scientific approach
- ▶ Detailed enquiry
- ▶ Indispensability

DISADVANTAGES OF SAMPLING

- ▶ Prof. Frederick .F. Stephen says the words on disadvantages of sampling,-
- ▶ “ samples are like medicines. They can be harmful when they are taken carelessly or without adequate knowledge of their effects”

Main disadvantages are-

- ▶ Illusory conclusions
- ▶ Lack of representativeness of the sample
- ▶ Lack of specific or specialized knowledge
- ▶ Impossibility to draw a sample
- ▶ Sampling error.

Quantitative Sampling

Purpose

To identify participants from whom to seek some information Issues.

- Nature of the sample (random samples)
- Size of the sample
- Method of selecting the sample
 - ▶ Probability sampling / Random sampling
 - ▶ Non Probability sampling / Non Random sampling

Sampling in Qualitative Research

Researchers in qualitative research select their participants according to their :

- 1) **characteristics**
- 2) **knowledge**



➤ Purpose

It is when the researcher chooses persons or sites which provide specific knowledge about the topic of the study.

- 1) Maximal Variation Sampling
- 2) Typical Sampling
- 3) Theory or Concept Sampling
- 4) Homogeneous Sampling
- 5) Critical Sampling
- 6) Opportunistic Sampling
- 7) Snowball Sampling

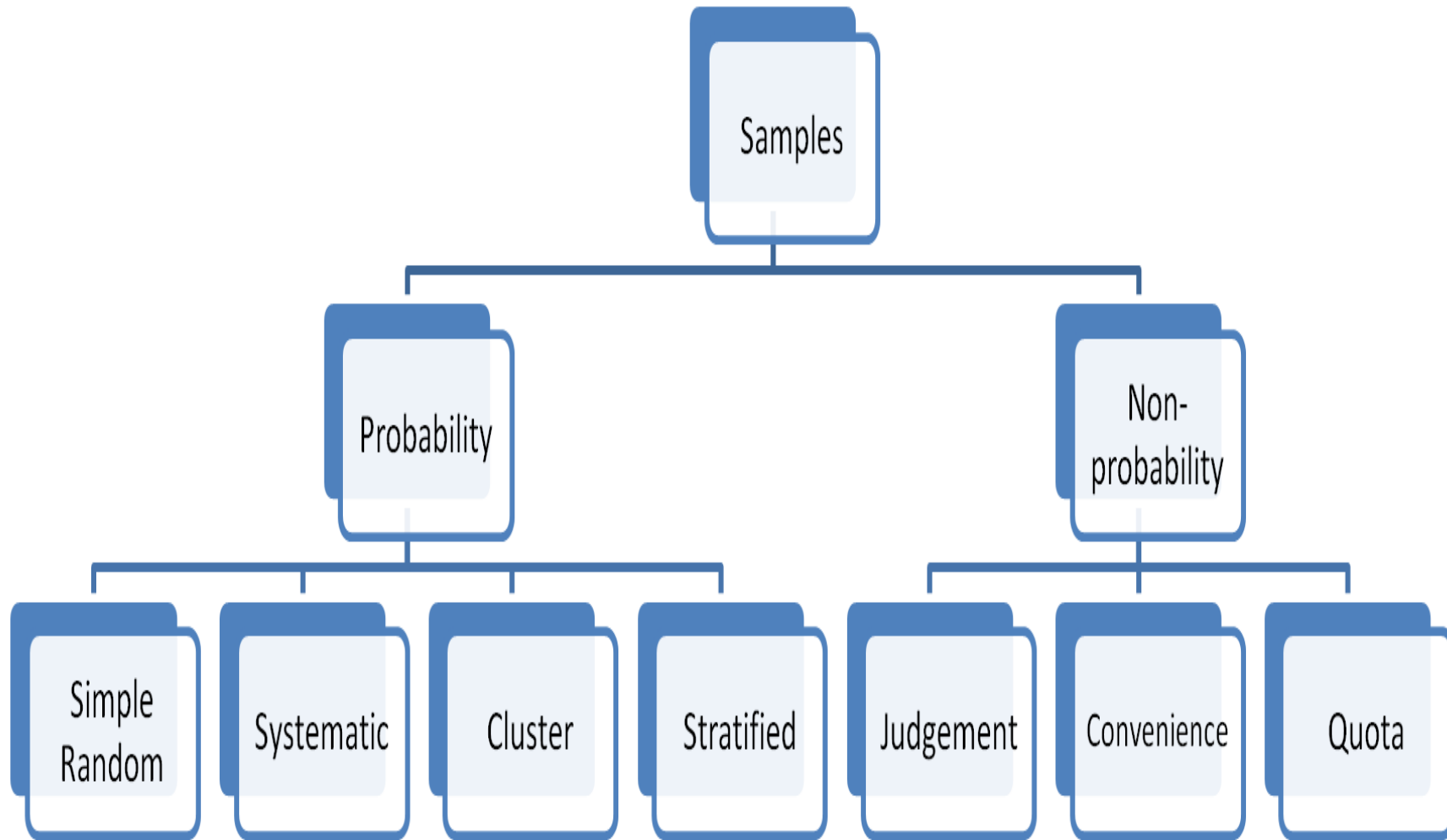




METHODS OF SAMPLING

Non-Random Sampling ●

Random Sampling ●





Probability Sampling

PROBABILITY SAMPLING

Probability sample, every unit in the population has equal chances for being selected as sample unit.

The equal chance of being included in the sample (random)

Advantages

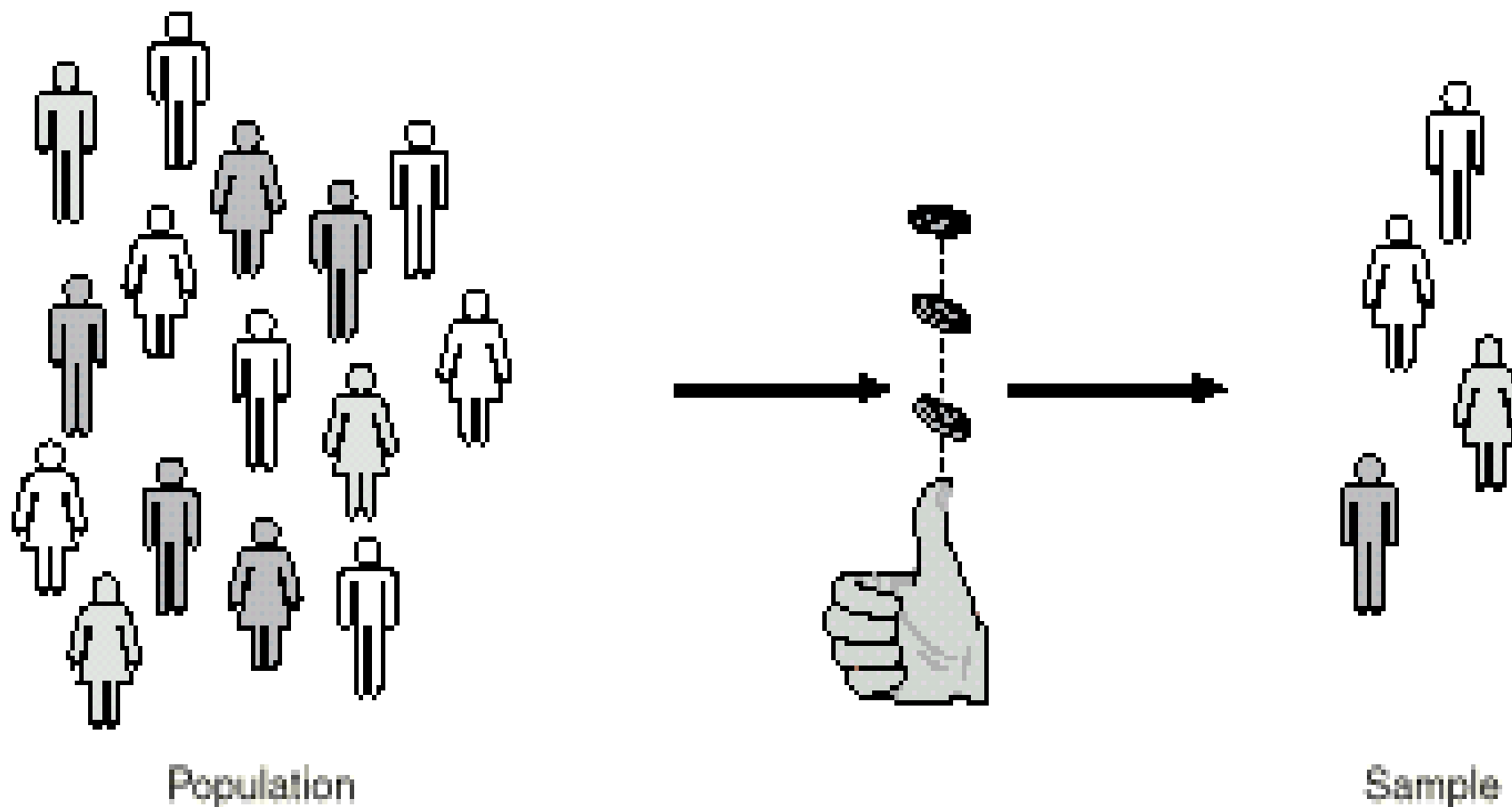
- Unbiased
- Quantification is possible in probability sampling
- Less knowledge of universe is sufficient.

Disadvantages

- ▶ It takes time
- ▶ Costly
- ▶ More resources are required to design & execute than in non probability design.

Random sampling (a tool for ensuring generalizability):

Individuals are randomly selected from a population to participate in a study.



1] SIMPLE RANDOM SAMPLING [or] UNRESTRICTED RANDOM SAMPLING

- ▶ A sampling procedure in which every element in the population has a known and equal chance of being selected as a subject.
- ▶ Simple random sampling can identify on the basis of chance.
 - ▶ Lottery method
 - ▶ Table of random numbers

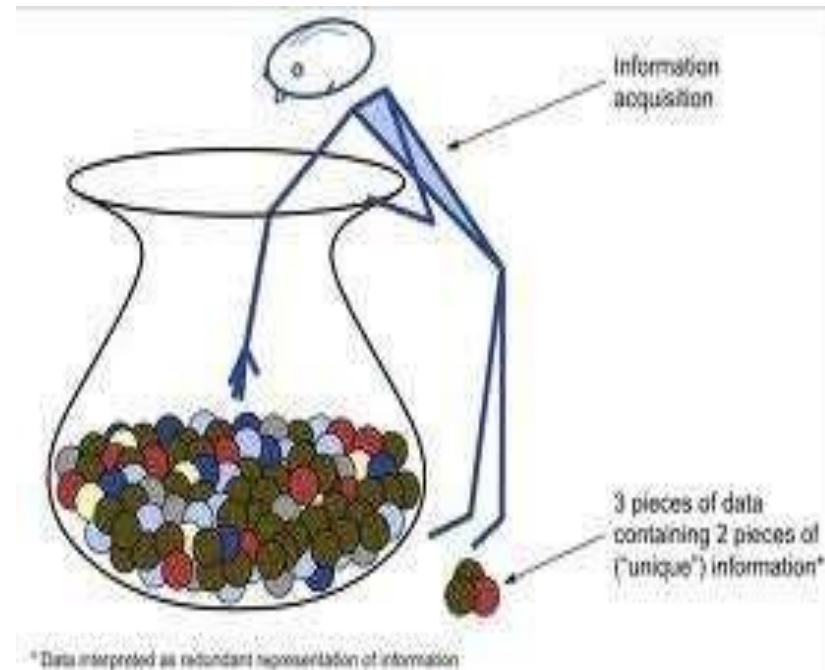


Simple Random Sampling



(A) Lottery method

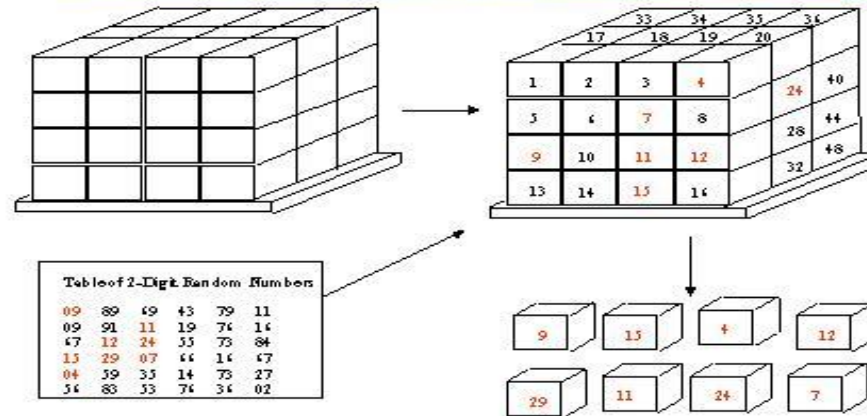
- ▶ It is most primitive & mechanical method.
- ▶ Each member of the population is assigned a unique number.
- ▶ Each number is placed in a bowl or hat & mixed thoroughly.
- ▶ The blind-folded researcher then picks numbered tags from the hat.
- ▶ All the individuals bearing the numbers picked by the researcher are the subjects for the study.



(B) TABLE OF RANDOM NUMBERS

- ▶ This is most commonly & accurately used method in simple random sampling.
- ▶ Random table present several numbers in rows & columns.
- ▶ Researcher initially prepare a numbered list of the members of the population, & then with a blindfold chooses a number from the random table.
- ▶ The same procedure is continued until the desired number of the subject is achieved.
- ▶ If repeatedly similar numbers are encountered, they are ignored & next numbers are considered until desired numbers of the subject are achieved.

Using Random Number Table to Select Samples



Using a Table of Random Numbers

54463 22662 65905 70639
 15389 85205 18850 39226
 85941 40756 82414 02015
 61149 69440 11286 88218
 05219 81619 10651 67079

...

...

...

...

select if equal or less than 380

do not select if larger than 380

380 horses to choose
from a sample of 100

Selected horses from
380 possible

149 226
 219 015
 205 218
 286 079

continue until you
have 100 horses

Advantages

- ▶ scientific method
- ▶ More representative of the population
- ▶ Sampling error can be measured
- ▶ Theory of probability is inapplicable, if a sample is random
- ▶ Economical, as it saves times, money, labour

Disadvantages

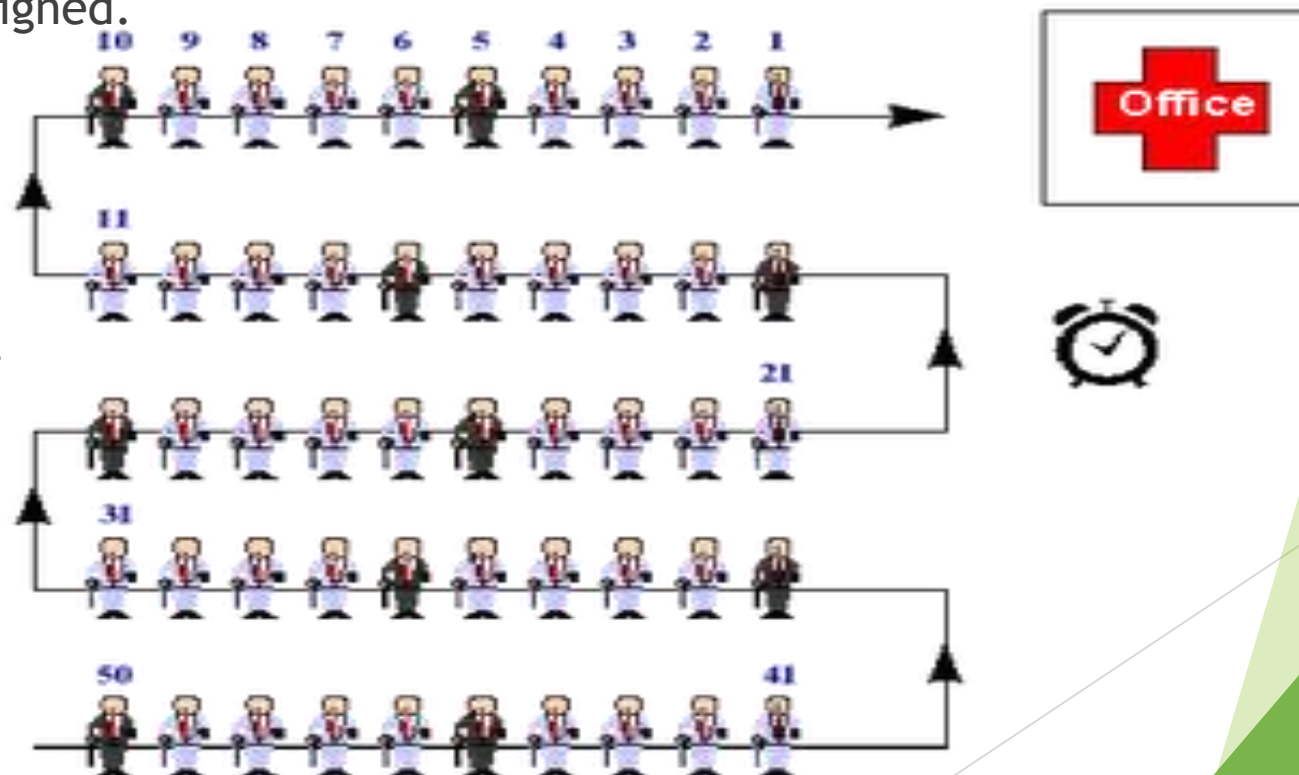
- ▶ Requires a complete list of the population but such up to data lists are not available in many enquires.
- ▶ If size of sample is small, then it will not be representative of the population
- ▶ When the distribution between items is very large, this method cannot be used

RESTRICTED RANDOM SAMPLING : It as 3 types are, 2] SYSTEMATIC SAMPLING [OR] QUASI SAMPLING

- ▶ It is unit of the population is arranged in order & the samples units are distributed at equal & regular intervals. Then requires number of a sample should be selected on a systematic basis.
- ▶ The items of population are arranged in a continuous order. Serial number for the items should be assigned.

▶ EXAMPLE:

every 10th person is selected from a list of all population members.



Advantages

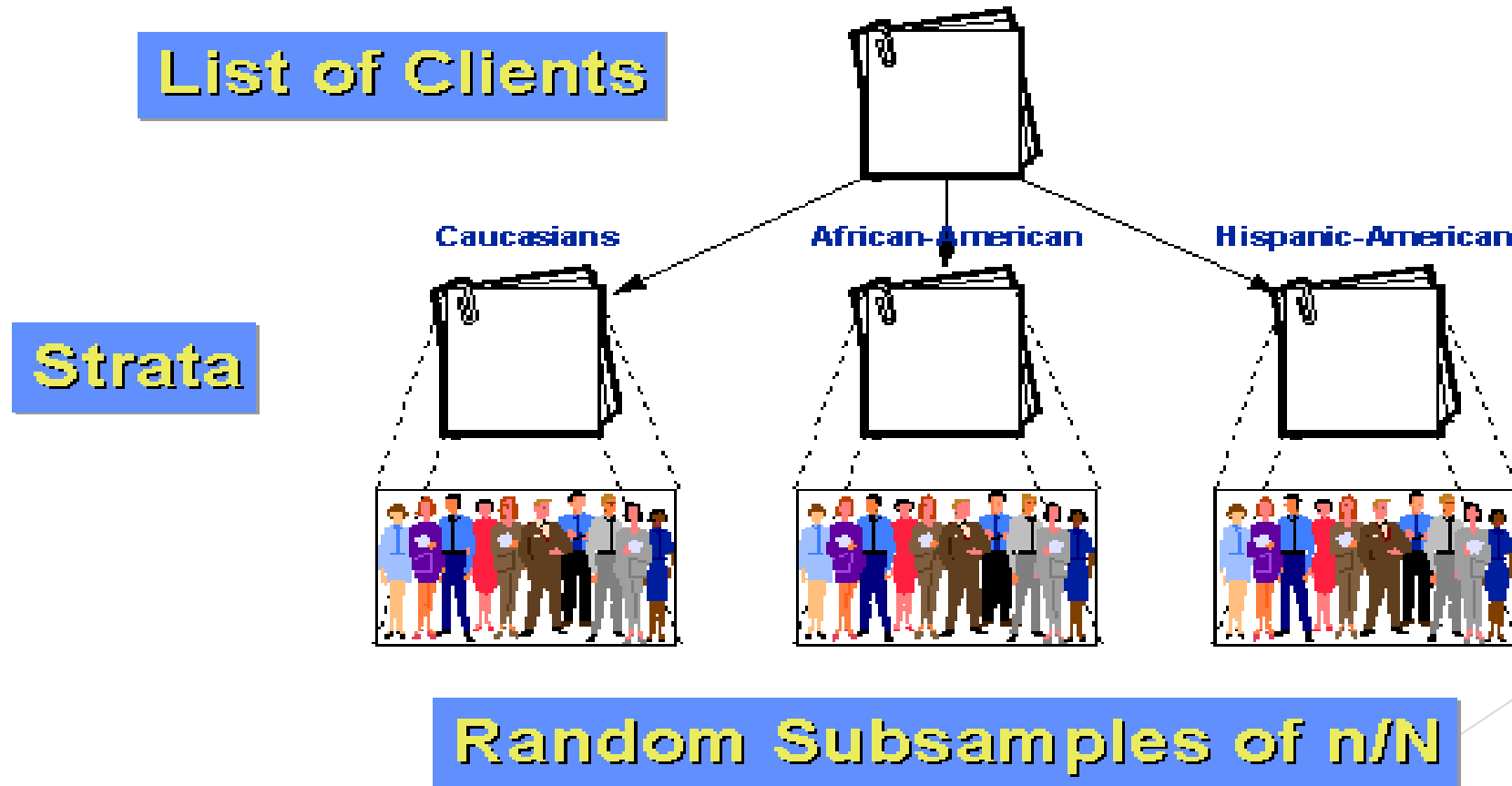
- ▶ Simple & convenient
- ▶ Time & work is reduced much
- ▶ Result will be a satisfactory one
- ▶ It can also be used in infinite population.

Disadvantages

- ▶ May not represent whole population.
- ▶ Element of personal bias of investigators
- ▶ May not provide a desirable result due to large variation in items selected.

3] STRATIFIED RANDOM SAMPLE

- ▶ The population is divided into strata [group] before the sample is drawn. When the population is heterogeneous then the population should be classified into different types of strata with common character.



- ▶ The two or more groups called strata, according to some criterion, such as geographic location, grade level, age, or income, and subsamples are randomly selected from each strata.

- ▶ Example:

Population is divided on the basis of characteristic of interest in the population e.g. male and female may have different consumption patterns.

Women



Men



Advantages

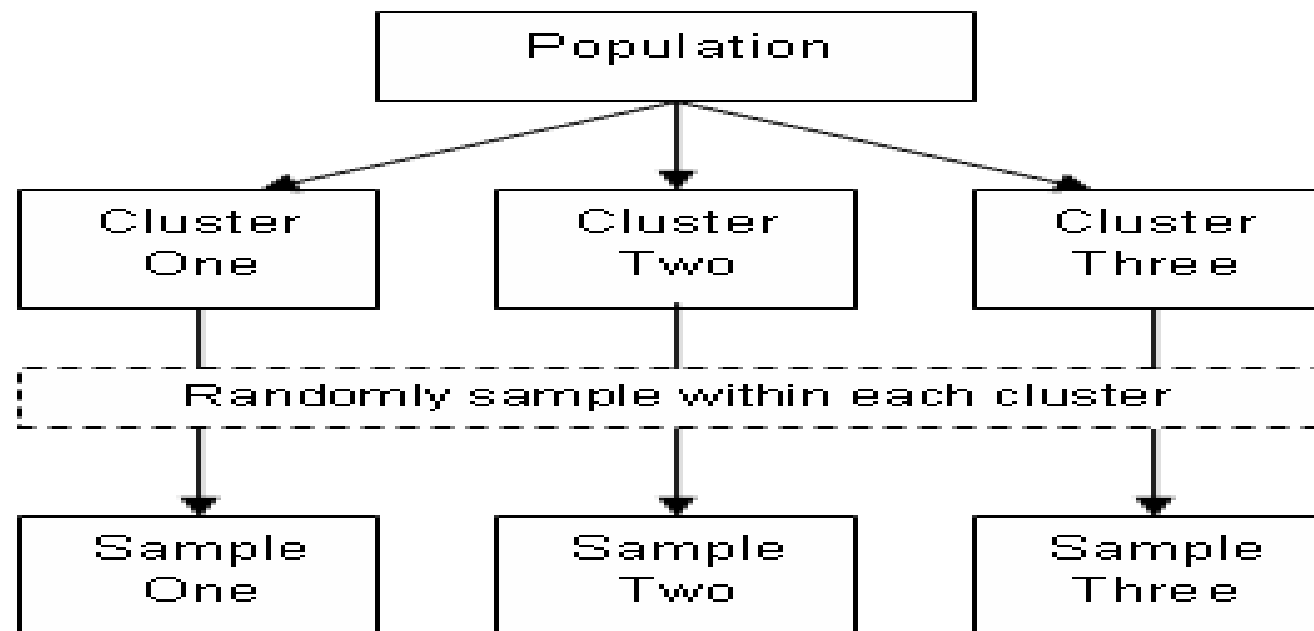
- ▶ More representative
- ▶ Ensures greater accuracy
- ▶ Easy to administer as the universe is sub - divided.
- ▶ Greater geographical concentration reduces the time & expenses
- ▶ Original population is badly skewed, this method is an appropriate one.

Disadvantages

- ▶ Divide population to strata, it requires more money, time & statistical experience which is a difficult one.
- ▶ Proper stratification is not done, the sample will an effect of bias.
- ▶ May be difficult to divide the population into heterogeneous groups
- ▶ May be over lapping of different strata.

4] CLUSTER SAMPLE

- ▶ It is a method of sampling which is carried out in several stages. It is also called as sampling stages.
- ▶ The whole population is divided into sampling units & these units are again divided into sub units. This process will continue when we reach a lease.
- ▶ The population is divided into subgroups (clusters) like families. A simple random sample is taken of the subgroups and then all members of the cluster selected are surveyed.



Cluster samples often involve multiple stages, with clusters within clusters, as when a national study of middle school students might involve first sampling states, then counties, then schools, and finally students within each selected school .

Advantages

- ▶ Introduces flexibility in sampling method
- ▶ It help in large scale survey where the preparation of list is difficult, time consuming or expensive
- ▶ It is valuable in underdeveloped countries, where no detailed & accurate framework is available.

Disadvantages

- ▶ It is less accurate than other methods.

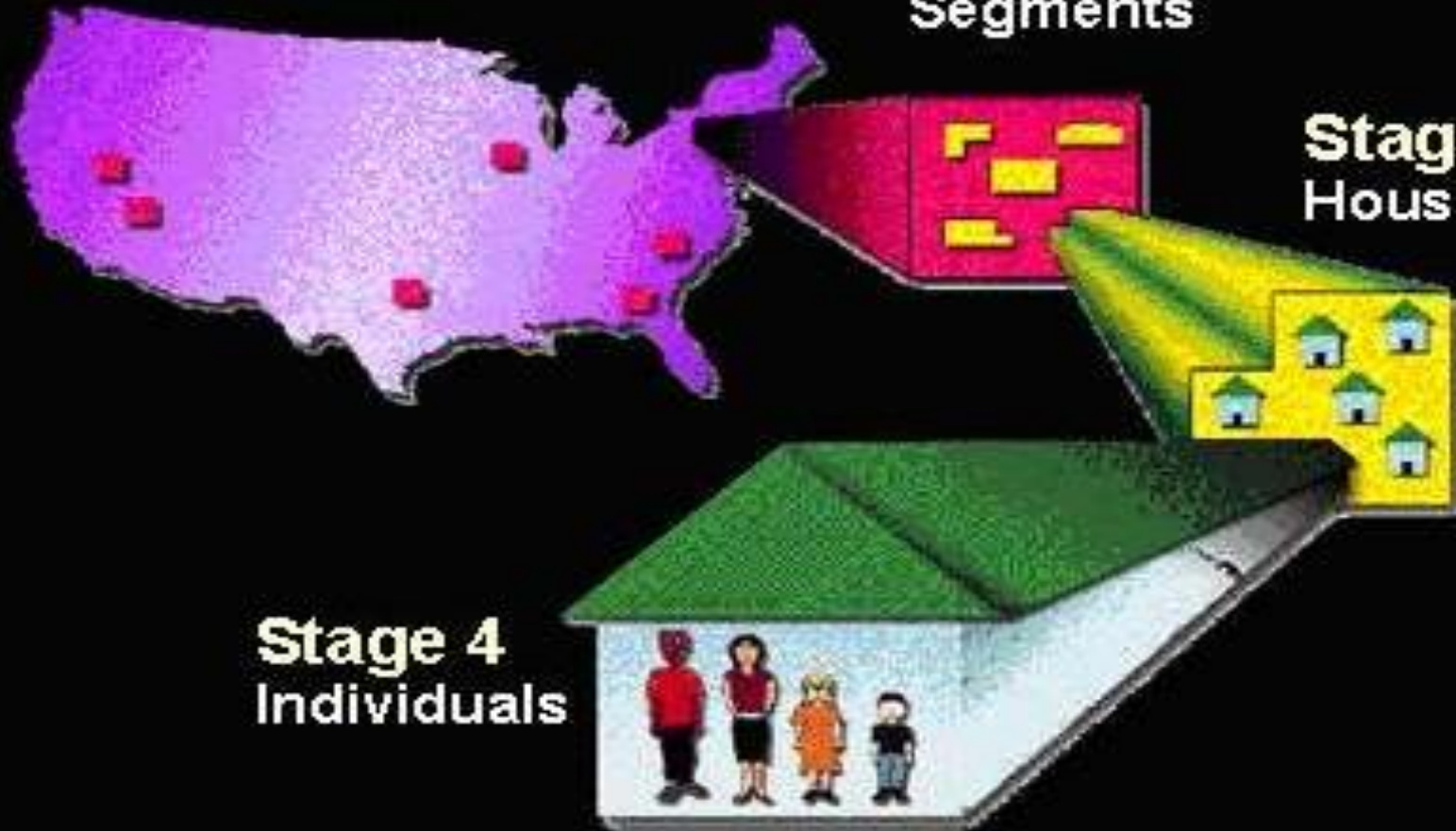
Cluster SAMPLING

Stage 1
Counties

Stage 2
Segments

Stage 3
Households

Stage 4
Individuals



EXAMPLE : RANDOM SAMPLING METHODS

In a class of 18 students, 6 are chosen for an assignment

Sampling Type	Example
Simple	Pull 6 names out of a hat
Systematic	Selecting every 3 rd student
Stratified	Divide the class into 2 equal age groups. Randomly choose 3 from each group
Cluster	Divide the class into 6 groups of 3 students each. Randomly choose 2 groups



Non-Probability Sampling



NON PROBABILITY SAMPLING

- ▶ unequal chance of being included in the sample (non-random)
- ▶ It means the units in the population have unequal or negligible, almost no chances for being selected as a sample unit.

Advantages

- ▶ Simplicity, convenience & low cost
- ▶ Does not ensure a selection chance to each population unit
- ▶ Selection probability is unknown
- ▶ It is not a representative one
- ▶ Does not perform inferential function I,e parameters cannot be estimated
- ▶ Suffers from sampling bias.

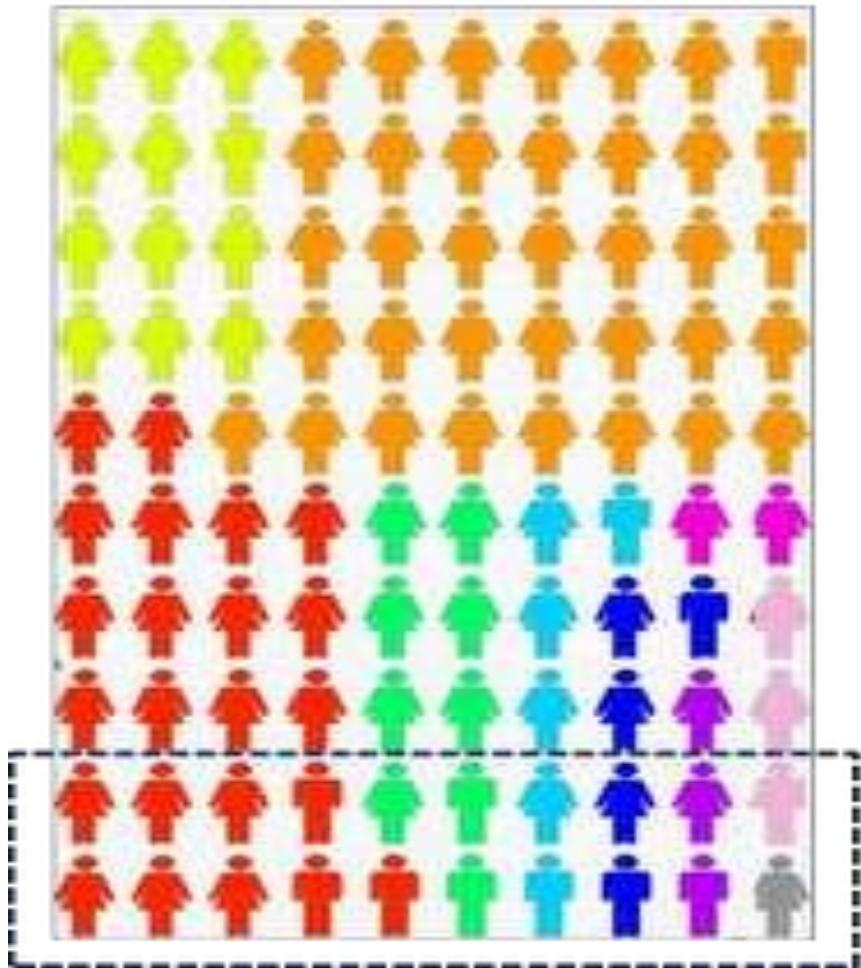
1] CONVENIENCE SAMPLING

- ▶ Sometimes known as grab or opportunity sampling or accidental or haphazard sampling.
- ▶ 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, readily available and convenient.
- ▶ A sample is obtained by selecting convenient population elements from the population.



Class of 100 students

Population



20 Students selected as per convenience

Convenience Sampling



Advantages

- ▶ Suitable when the universe is not clearly defined
- ▶ Sample unit is not clear
- ▶ Complete source list is not available
- ▶ Ex:- telephone directories, automobile registration etc..

Disadvantages

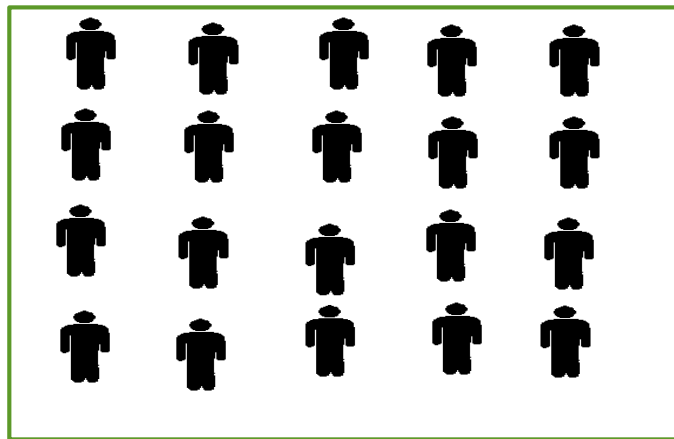
- ▶ The results of this sampling cannot be representative
- ▶ They are unsatisfactory, they are biased
- ▶ They are used for pilot studies.

2] JUDGMENT [or] PURPOSIVE SAMPLING

The process whereby the researcher selects a sample based on experience or knowledge of the group to be sampled called “judgment” sampling

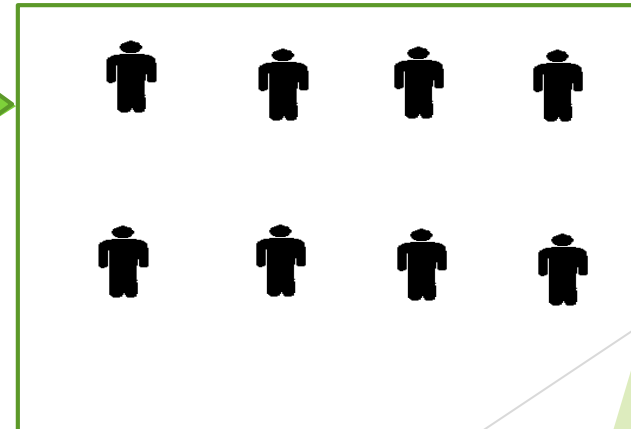
The sampling decision of the investigator alone decides the selection of sample. Investigator may select the sample as per his will & desire. The investigator has the power to select or reject any item in an investigation.

Sample size for a study = 8



CLASS OF 20 STUDENTS

JUDGEMENT



SAMPLE OF 8 STUDENTS

Advantages

- ▶ Simple method
- ▶ Used to obtain a more representative sample
- ▶ Very helpful to make public policies, decisions etc

Disadvantages

- ▶ Due to individual to get correct sampling errors
- ▶ Estimates are not accurate
- ▶ Results can not be compared with other sampling studies.

3] QUOTA SAMPLING

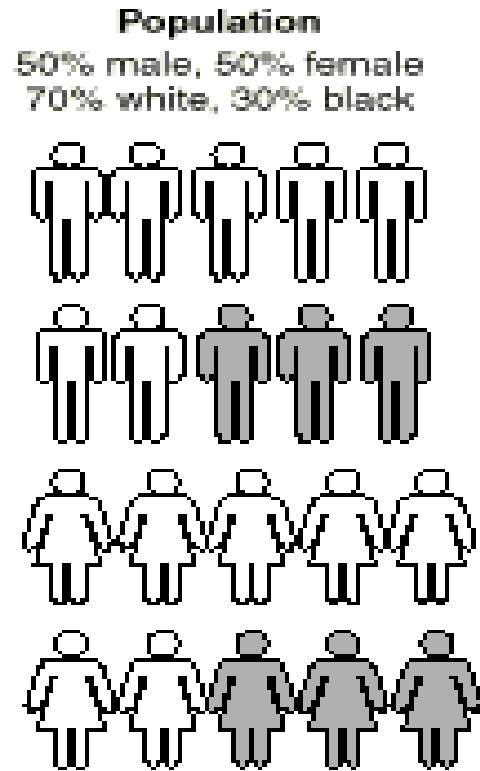
- ▶ It is just like the stratified sampling.
- ▶ The population is divided into various quota with some character.
- ▶ Quotas are fixed according to the basic parameters of the population determined earlier & each field investigator is assigned with quotas of number of elements from the population.
- ▶ A quota sample is a type of non-probability sample in which the researcher selects people according to some fixed standard. That is, units are selected into a sample on the basis of pre-specified characteristics so that the total sample has the same distribution of characteristics assumed to exist in the population being studied.

For example,

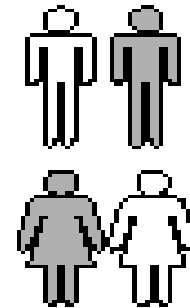
- ▶ an interviewer may be told to sample 200 females and 300 males between the age of 45 and 60.
- ▶ This means that individuals can put a demand on who they want to sample (targeting).

The quotas have been set for gender only. Under the circumstances, it's no surprise that the sample is representative of the population only in terms of gender, not in terms of race. Interviewers are only human.

Exhibit 5.9 Quota Sampling



Quota sample
50% male, 50% female



Representative of gender distribution
in population, not representative of
race distribution.



Advantages

- ▶ Saving of time & money
- ▶ If there are trained investigators, sampling will give quite reliable

Disadvantages

- ▶ Personal & individual bias are there. It is not based on random sampling so sampling error cannot be estimated.

EXAMPLE : NON RANDOM SAMPLING METHODS

SAMPLING

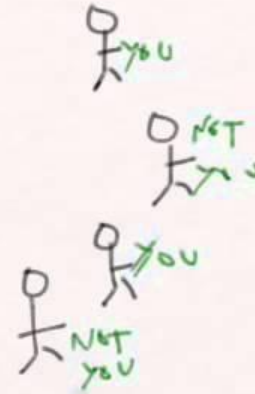
NON-PROBABILITY SAMPLING

convenience (Accidental)



4pm-7pm

Purposive Sampling



Snowball Sampling



Comparison Factors	Probability Sampling	Nonprobability Sampling
List of the Population Elements	Complete List Necessary	None Necessary
Information about the Sampling Units	Each Unit Identified	Need Detail on Habits, Activities, Traits, etc.
Sampling Skill Required	Skill Required	Little Skill Required
Time Requirement	Time-Consuming	Low Time Consumption
Cost per Unit Sampled	Moderate to High	Low
Estimates of Population Parameters	Unbiased	Biased
Sample Representativeness	Good, Assured	Suspect, Undeterminable
Accuracy and Reliability	Computed with Confidence Intervals	Unknown
Measurement of Sampling Error	Statistical Measures	No True Measure Available



As for sampling error
happen because:

**SAMPLE
FRAME**

where the interviewer
interview the wrong
respondents.

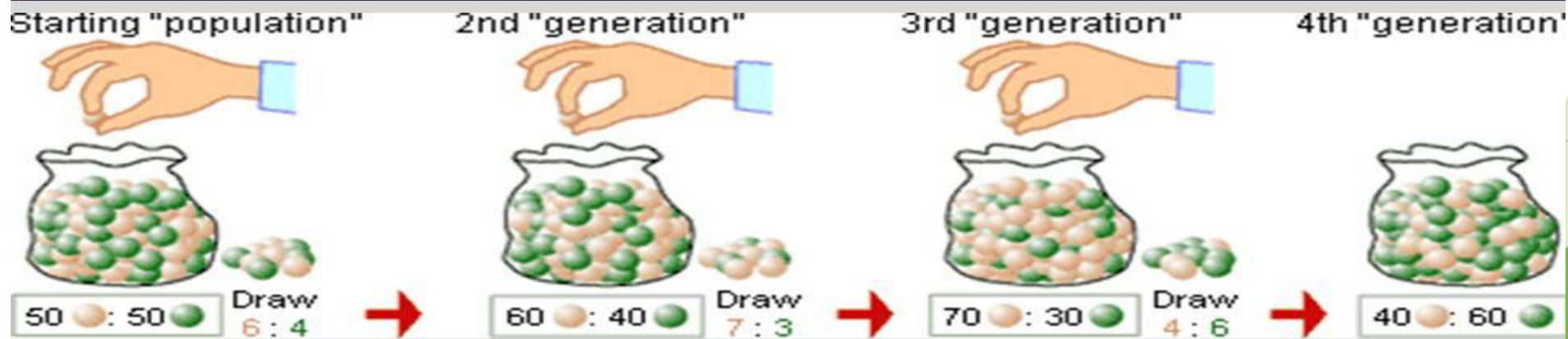
SELECTION

or bias error, where only
the interested
respondents respond.

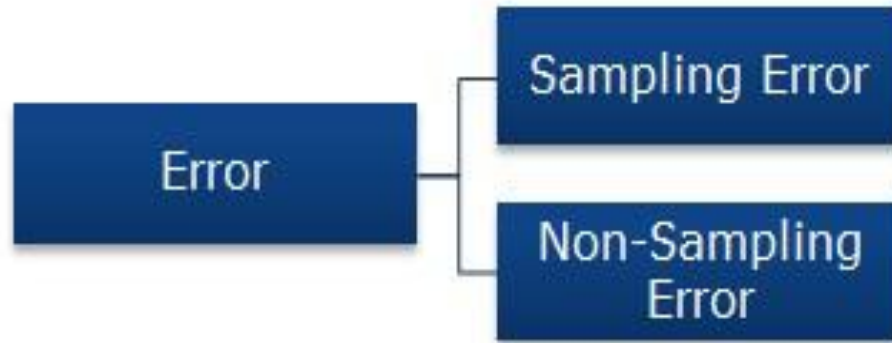
SAMPLING ERROR

- ▶ There may be fluctuation in the values of the statistics of characteristics from one sample to another, or even those drawn from the same population.
- ▶ In complete enumeration & sample survey there may be errors. The errors arising in the study of sample is called sampling errors
- ▶ This errors arise when inferences about the population is drawn or the basis of few observations i.e sample.

Genetic Drift ('sampling error')



- ▶ Errors in sampling are of 2 types they are,



1] Non-sampling Sampling Error

- ▶ Errors are those errors which arise at the stage of ascertainment & processing of data.
- ▶ This error may arise both in census method & sample method.
- ▶ Systematic Error
- ▶ The level of it is *not* controlled by sample size.

2] Random Sampling Error

- ▶ The results derived from a sample study, may not be exactly equal to the true value in the population
- ▶ This difference in value of sample & population.
- ▶ the sample selected is not representative of the population due to chance.
- ▶ The level of it is controlled by sample size.
- ▶ A larger sample size leads to a smaller sampling error.

There are 2 types, -

- ▶ Biased errors:-

If there is any bias on the selection of a sample, sampling errors may occur.

- ▶ Unbiased errors:-

The results of the sample may vary with the actual results of the population.



Ethical Considerations in Data Collection

- It is the researcher's ethical responsibility to safeguard the story teller by maintaining the understood purpose of the research...
- The relationship should be based on trust between the researcher and participants.
- Inform participants of the purpose of the study.



- Being respectful of the research site, reciprocity, using ethical interview practices, maintaining privacy, and cooperating with participants.

Patton (2002) offered a checklist of general ethical issues to consider, such as:

- ❖ reciprocity
- ❖ assessment of risk
- ❖ confidentiality,
- ❖ informed consent
- ❖ data access and ownership.

- Qualitative researchers must be aware of the potential for their own emotional turmoil in processing this information
- During the interview process, participants may disclose sensitive and potentially distressing information in the course of the interview..



SAMPLING DISTRIBUTION

- ▶ In sampling analysis, sampling distribution are concerned various statistical measures to compute certain number of sample. Each sample may give its value for the statistics.

There are various types of sampling distribution

- ▶ Sampling distribution of Mean
- ▶ Sampling distribution of Proportion
- ▶ Student t distribution
- ▶ Chi square distribution
- ▶ Students F distribution