

EPIDEMIOLOGY

The word epidemiology means:

epi = upon,
demos = the people,
logos=science.

Def. "a science concerned with the occurrence, distribution and determinants of states of health and disease in human groups and populations."

Epidemiology is chiefly concerned with the *diagnostic procedure in mass disease*, and other conditions in human populations where the group rather than the individual is the unit of interest.

Epidemic dental problems:

1. Dental caries.
2. Periodontal diseases.
- 3- Dental stain and calculus.
4. Enamel opacities and fluorosis.
5. Malocclusions
6. Dentofacial anomalies.
7. Oral neoplasm.

Types of epidemiological studies

**Non-experimental
(Observational)**

Experimental

Descriptive

Analytical

**Incidence
(Longitudinal)**

**Prevalence
(cross-sectional)**



1. Descriptive epidemiology:

It is concerned with the observation and reporting of the *distribution of a disease or condition* in a population.

Later, **hypotheses** may be formulated to explain those observations.

2. Analytical epidemiology:

It is designed to test the hypothesis formulated to explain these observations or studies.

In this type the epidemiologists seek to discover factors and mechanisms associated with the distribution and prevention of the disease.

Types of Descriptive study

1. Prevalence Study Or Cross Sectional Study

population is expressed at a given point of time, so prevalence study means "the condition existing at a particular point of time" i.e. the state of the population at the time of examination.

Prevalence studies are commonly used for making comparison between two or more populations.

2. Incidence Or Longitudinal Study

The amount of new disease in a population is measured over a period of time usually one year.

It is the change in a condition over a period of time.

In a progressive disease such as dental caries, it is necessary to measure the increase by the extent of new disease, often referred to as the increment.

This is obtained by observing the same groups of individuals on two occasions and subtracting the extent found at the first examination from that observed at the second.

Epidemiologic investigation should follow the following scientific pattern:

- I. Establishing the objectives.
- II. Design of the investigation.
- III. Selection of the sample.
- IV. Conducting the examinations.
- V. Drawing the conclusions.
- VI. Publishing the report

I- Establishing the objectives:

The investigator must be absolutely clear 'about 'the objectives of the investigation before considering its design.

In many scientific studies the objectives can be stated in the form of a **hypothesis** which is to be tested.

The starting point of study is frequently the expression of a "**null hypothesis**", that is the assumption, for example, that there is **no differences in the extent of dental disease** between the groups to be investigated (descriptive surveys)

or in cases of clinical trial (experiment), that **one method is not better than another** in preventing or treating disease or condition.

The objective of the study is then to test this hypothesis.

II. Design of the Investigation:

Control:

To study the effect of a factor on the prevalence or incidence of disease in a group of individuals, it is not enough to confine the examination to the group exposed to the factor under examination but ***a Parallel group, not exposed to the factor*** must also be studied in the same way, this is called the control group.

This control group must be as similar as possible to the test group except in respect of the factor under investigation.

Group of interest
(e.g. cancer patients)



Take histories



Compare
histories

Draw
conclusions

Comparison group
(e.g. non-patients)



Take histories



Blind Study:

It is a study in which the investigator does not know whether a subject is a member of a test or a control group.

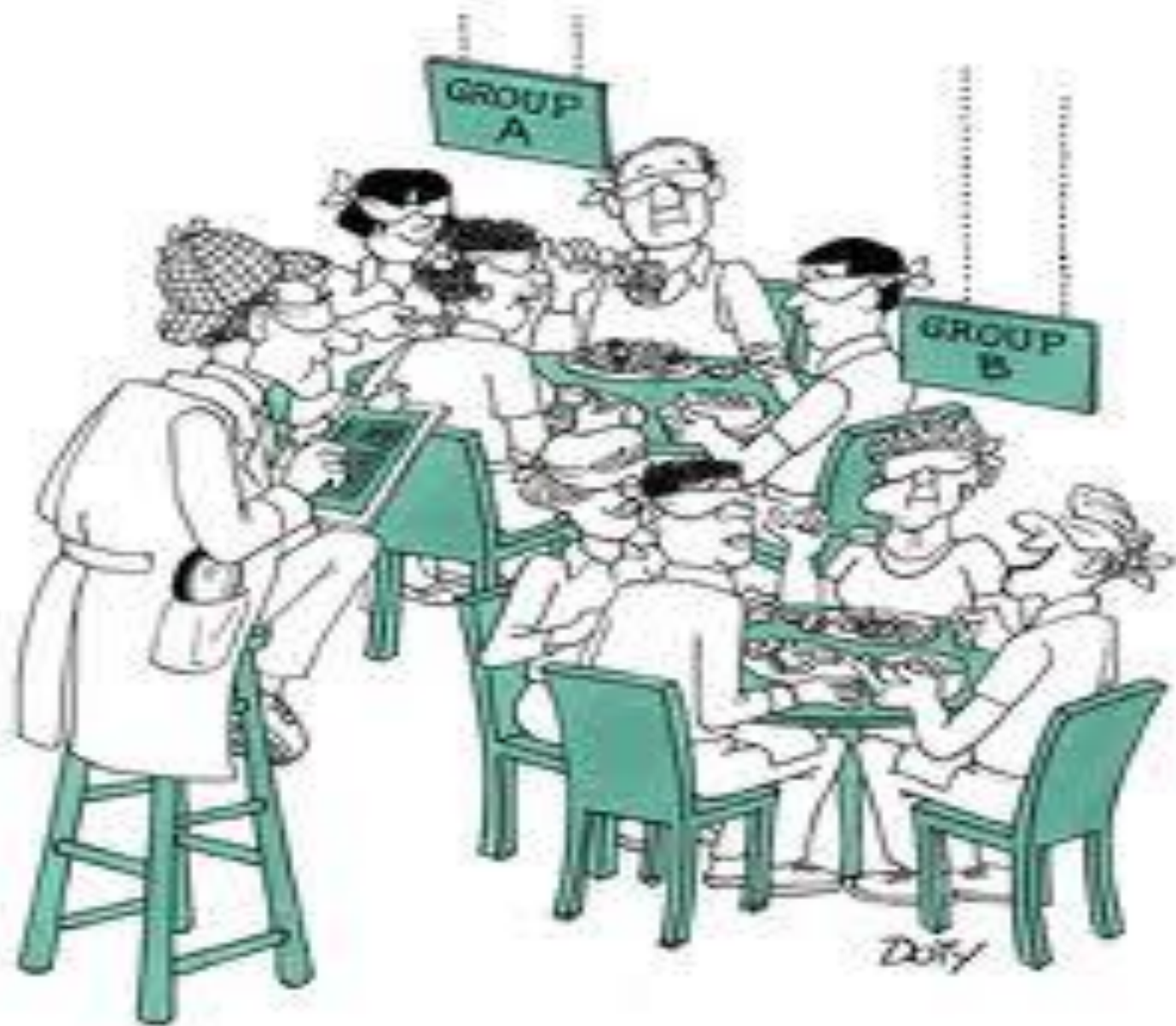
If the subject does not also know whether he is using a test product or a placebo (an ineffective material having the same appearance as the material under testing), the study is termed a *double blind*.

This is to avoid unconscious *bias* in diagnosis.





Fig. 3 A double-blind placebo-controlled clinical trial for CAM therapies.



"Anyone for a game of Blind Man's Bluff after dinner?"

III. Selection of the sample:

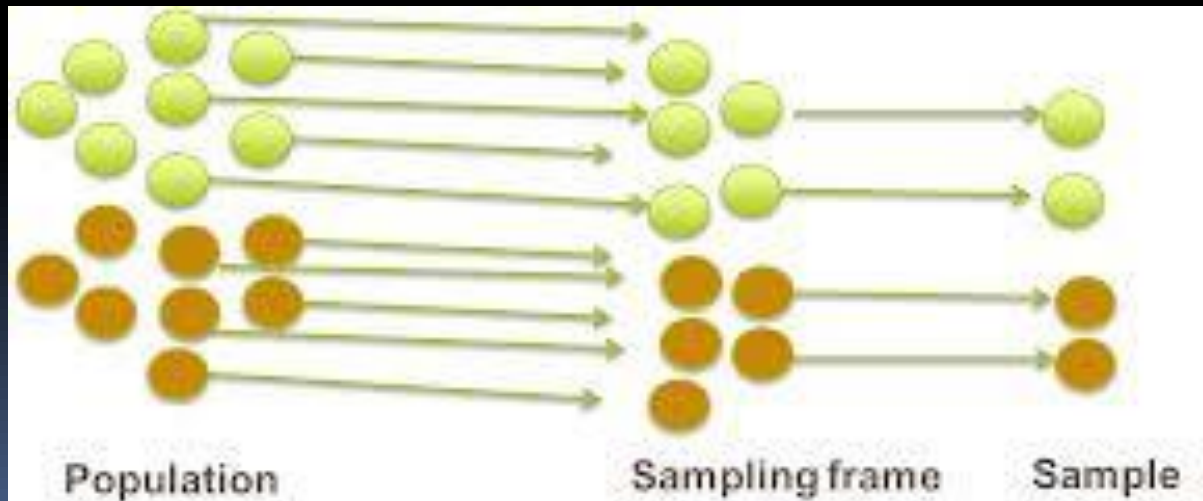
it is usually impossible to examine every individual in the population or universe under investigation as **resources** in terms of *money*, *time* and *man power* are not available.

For this reason, a small number of individuals or a sample must be chosen from the population.

Types of sample

a. Selected sample:

Is one in which a criterion is set for the inclusion of each individual in the study, and each individual satisfies this criterion will be included in this sample.



b. Random sample:

This technique will provide more valid data from a population.

For the sample to be truly random, each individual must have an equal chance being included in the sample. One of the easiest way of doing this is to use **number tables**.

A computer-generated table of random numbers is compiled with each number representing a single student. Thirty numbers are then chosen again at random from the possible 250 numbers. This process is known as random selection.

Population: 43 239 210 67 190 222 22 154 58 245 114 138 169 85 109 145
151 89 2 19 61 168 74 237 128 240 205 232 208 93 199 42 135 157 247 112
29 152 198 208 6 200 213 238 123 220 64 132 55 94 141 170 87 88 217 113
75 57 39 25 18 28 184 63 207 227 62 179 131 177 224 31 159 161 168 79
133 107 66 49 91 56 102 189 162 73 229 171 155 216 197 191 172 89 166
111 99 248 250 146 65 27 219 50 96 192 35 47 221 103 37 40 243 14 1 17
48 3 101 122 62 7 121 204 75 212 30 137 164 241 20 188 68 198 235 36 52
201 118 25 16 148 51 108 90 119 216 163 174 8 13 110 214 181 233 95 167
238 10 54 150 162 149 33 21 117 98 228 32 246 23 9 165 203 24 44 118
127 12 153 176 70 228 160 11 138 115 84 147 178 45 242 97 124 193 183
211 165 105 139 218 34 81 186 225 38 223 15 92 244 142 195 80 140 77 45
128 83 144 100 180 173 187 5 194 234 134 175 129 59 4 249 155 209 78
125 41 230 72 231 202 85 71 105 120 143 63 130 60 104

Random Numbers Generated from <http://www.random.org>

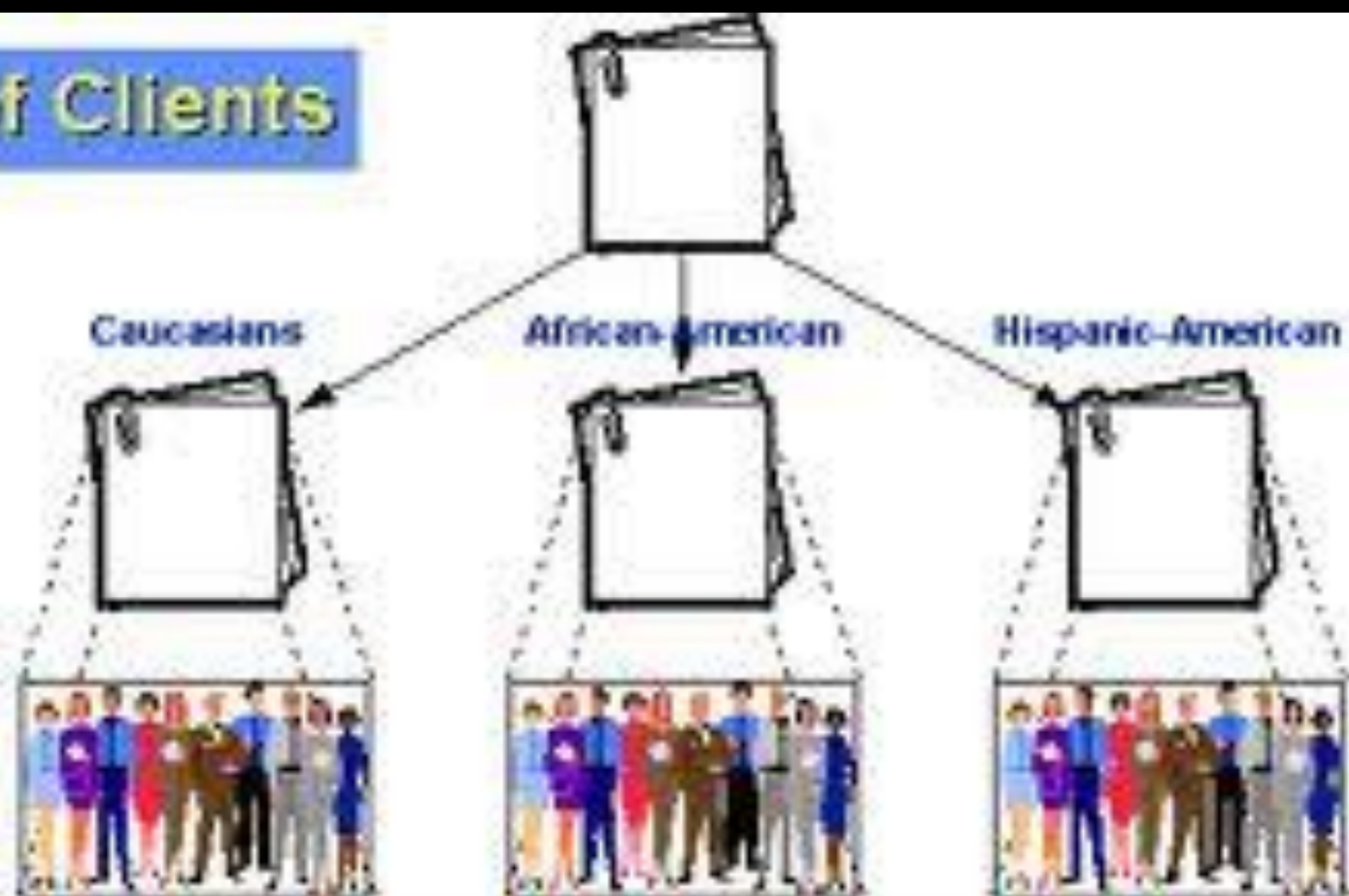
C. Stratified random sample:

If the condition under investigation known to be related to *various factors* such as age, sex, or area of residence.

the population is first divided into these groups (*strata*) and a random sample taken within each group (*stratum*).

For example, dental caries is an age-specific disease and so any population on which a survey should be stratified by age.

List of Clients



Strata

Random Subsamples of n/N

d. Cluster sample:

In some cases, it is more convenient for administration and for economic reasons to sample from clusters rather than from individuals.

In cluster sampling, a simple random sample is selected from groups or cluster of individuals. The clusters may be schools, villages .. etc.

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IV. Conducting the Examinations:

For the scientific study of any dental disease and conditions, three aspects are of great importance:

1- The examination methods & diagnostic aids.

2- Diagnostic criteria.

3- The indices used for measuring and reporting.

Basic requirements for the mouth examination are:

a *chair*,

a source of *illumination*

and some method of *teeth cleaning* to remove loose debris.

Types of examination

Type 1: (intensive examination)

Probe, mirror, adequate light

Full mouth radiograph

Study cast

Pulp tester

Laboratory investigation

Type 2: (limited examination)

Probe, mirror, adequate light

Bite wing radiograph

**Type 3: (dental inspection) epidemiological
study**

Probe, mirror, adequate light

Type 4: (screening examination)

Tonge depressor and available light

An index :

It is a numerical value describing the relative status of a population on a graduated scale with definite upper and lower limits designed to facilitate comparison with other population classified by the same criteria and method.

An index describes the prevalence of a disease in a population and also describes the severity or intensity of the condition.

Requirements of an Ideal Index:

1- Clarity: The criteria of scoring should be clear and easy to understand and apply in practice.

2- Objectivity: Each index should have a specific and clear-cut objectives.

3- Simplicity: Each index should be easy to apply even in field studies.

4- Reliability: should be reliable so that when a condition in the same subject is measured repeatedly, it should give the same results. There should be no intraexaminer or interexaminer variation.

5- Sensitivity: should be able to detect a reasonably small difference in what is being assessed.

6- Acceptability: The index should be acceptable to the subject (not cause pain or discomfort).

7- Amenability to statistical evaluation.

8- Economical: not need high cost to apply.

9- Not time consuming.

Limitation of an index system

- 1- An index properly used records objective calibration of a particular factor of a disease process but does not give the operator a comprehensive picture of the disease condition.
- 2- An index cannot be used for a pin-point diagnosis or therapy for the patients.
- 3- An error of judgment in calibration can occur.
- 4- An index gives indication on the spot static data but does not give a biological picture or indication of dynamic process.

Classification of indices

1-Classification according to nature of disease as:

a) Reversible index: is an index in which scores attributed to the condition can be reversed back to normal, as there is no permanent damage. E.g. indices used to assess gingival inflammation;

b) Irreversible index: is an index in which the condition cannot reverse back to normal as the damage is a permanent damage. E.g. index used to dental caries.

2- Classification according to the causative factors responsible for the disease e.g. calculus index, plaque index.

In such indices the scores are given according to the amount or extent of these factors present on teeth.

3- Classification according to the condition for which they are used, e.g. index to assess gingival inflammation, or index used to assess periodontal condition.

4- Classification according to the method or material used for assessment:

a) Simple: can be easily applied to the field studies and which does not require any costly equipment, material or method.

E.g. Gingival index.

b) Complex: which requires costly equipment or method.

E.g. Russell's periodontal index.

Uses Of Dental Indices:

- 1. To study the oral health status of population.**
- 2. To study incidence and prevalence of oral diseases.**
- 3. To study etiological factors responsible for oral diseases.**
- 4. For collection of data in epidemiological studies.**
- 5. For research work.**