Community Dentistry
Biostatistics

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Epidemiology and biostatistics are sister sciences. The former collects facts relating to groups of population in places, times and situations, while the latter converts ail facts into figures and at the end translates them into facts, interpreting the significance of their results. Facts are qualitative in nature and do not admit several kinds of statistical treatment and hence have to be converted into figures for statistical analysis.

Types of data

Depending on the nature of the variable, data is classified into two categories:

1) Qualitative data: when the data is collected on the basis of attributes or qualities like gender, malocclusion, cavity types etc., it is called qualitative data.

2) Quantitative data: when the data is collected through measurement using calipers, like arch length, arch width, fluoride concentration in water supply etc., it is called quantitative data.

Methods of data collection:

(a) Direct personal interview

In this method, there is a face-to-face contact with the persons from whom the information is to be obtained. This method enabled to measure subjective phenomena such as the oral health status, the opinions, beliefs and attitudes and some behavioral characteristics. The advantage of this method is that all information can be collected accurately and any ambiguity can be clarified.

(b) Oral health examination

When information is needed on the oral diseases, this method provides more valid information than health interviews. It is conducted by dentists, technicians, and the investigators.

(c) Questionnaire

In this method, a list of the questions relating to the survey - known as questionnaire-is prepared. This method is easy to adopt when a wide geographic area is to be covered. It is relatively cheap and fast. The questions should be short, easy to understand. There should be nO ambiguity while answering thequestions. As far as possible, the questions should be close-ended i.e., objective- multiple choice questions.

Sample

The word sample means the group of individuals who are actually available for the investigation. The actual sample selection can be accomplished in two basic ways:

(1) Purposive selection

Is easy to carry out and does not need the preparation of sampling frame. For instance, in a study on oral cancer in man, 30 representative patients may be picked, examined and assessed for this disease.

(2) Random selection

A sample in which each individual in the population has an equal chance of appearing. is a random sample. Random, here, dose not mean haphazard, but it indicates the chance of the population-unit being selected in the sample. So, it is also called probability sampling.

The advantages of sampling over the census enumeration are:

Census	Sampling
1.Information is collected from all the individuals in the population.	1.Information is collected from the units in the sample.
2. Cost of organization and execution will be more.	2. Cost is less since sample is smaller than the population.
3.Requires more time and personnel for collection and analysis.	3.Requires lesser time and personnel for collection and analysis.
4. Lesser accuracy and completeness.	4. More accuracy and completeness.

Sampling designs:

Different sampling designs are available depending on the type and nature of the population and the objectives of the investigation. Some designs commonly used are:

a) Simple random sampling
b) Systematic randomsampling
c) Stratified random sampling
d) Cluster sampling
e) Multiphase sampling
f) Pathfinder surveys .

a) **Simple random sampling:**

This is a sampling technique in which each and every unit in the population has an equal chance of being included in the sample. In this method, the selection of the unit is determined by chance only. To ensure randomness a very popular method is used. To draw a sample of 10 from a population of 100:

1. First give serial numbers to all the units in the population.
2. The population units are numbered on separate slips of paper of identical size and shape.
3. These slips are then shuffled
4.A blindfold selection of the number of slips is made to constitute the desired sample size.
This method assures randomness and eliminates personal bias.

b) Systematic random sampling:

A systematic sample is formed by selecting one unit at random and then selecting additional units at evenly spaced interval till the sample size has been formed

For example. suppose there are 215 patients in a clinic and it is decided to select a sample of size 20. From the numbers 1 to 10, suppose the number 2 is selected at random .the next will be, for example, 10 which is the interval,

so the serial numbers of the sample units will be 2, 12, 22, 32, and 42, and so on till 20 numbers. This method can be adopted as long as there is no periodicity of occurrence of any particular event in the population.

c) Stratified random sampling:

The population to be sampled is subdivided into groups known as strata. Then a simple random sample is then chosen from each stratum.

For example, if it is decided to know the prevalence of caries in different age groups, then the age groups form the strata and a random sample is to be chosen from each stratum.

d) Cluster sampling:

This method is used when the population forms natural groups or clusters, such as, villages, children of school- etc. Here, first- a sample of the clusters is selected and then all the units in each of the selected clusters are surveyed.

e) Multiphase sampling:

In this method, a part of the information is collected from the whole sample and a part from the sub-sample. For example, in a school Health survey all the children in the school may be examined. From these, only the ones with tooth fracture may be selected in the second phase. A section needing treatment may be selected in the third phase. Number in the sub-samples in the 3rd and 4th phase (need recall) becomes smaller and smaller.

f} Pathfinder surveys:

Sometimes, there is a need to sample a specific proportion of the population, say 1% in order to estimate disease prevalence accurately.

Sampling methodology to be defined called "pathfinder" methodology. The method used is a stratified cluster sampling technique, which includes the most important population subgroups likely to have differing disease levels and to cover a standard number of subjects in specific index age group m any one location.

Sam ple size

The sample size has to be decided before selection of the sample. Bigger the sample, higher will be the precision of the estimates of the sample. In fact, it may do the opposite, if the quality of the measurement or data collection is adversely affected by the large size of the study. It is better to ensure that the sample is representative, rather than being very large.

Errors in sampling

There are two types of errors that arise in sampling investigation:

1- The sampling errors which occur due to the sampling process, including: (i)   Faulty sampling design.
          (ii) Small size of the sample.

2- The non-sampling errors arise due to:
    a) Coverage error– due to
              1- Non-response of the informant.
              2- Non-cooperation of the informant.
    b) Observational error+ due to
              1- Interviewers bias
              2- Imperfect experimental technique
              3- Interaction of both.

    c) Processing error – due to errors in statistical analysis.