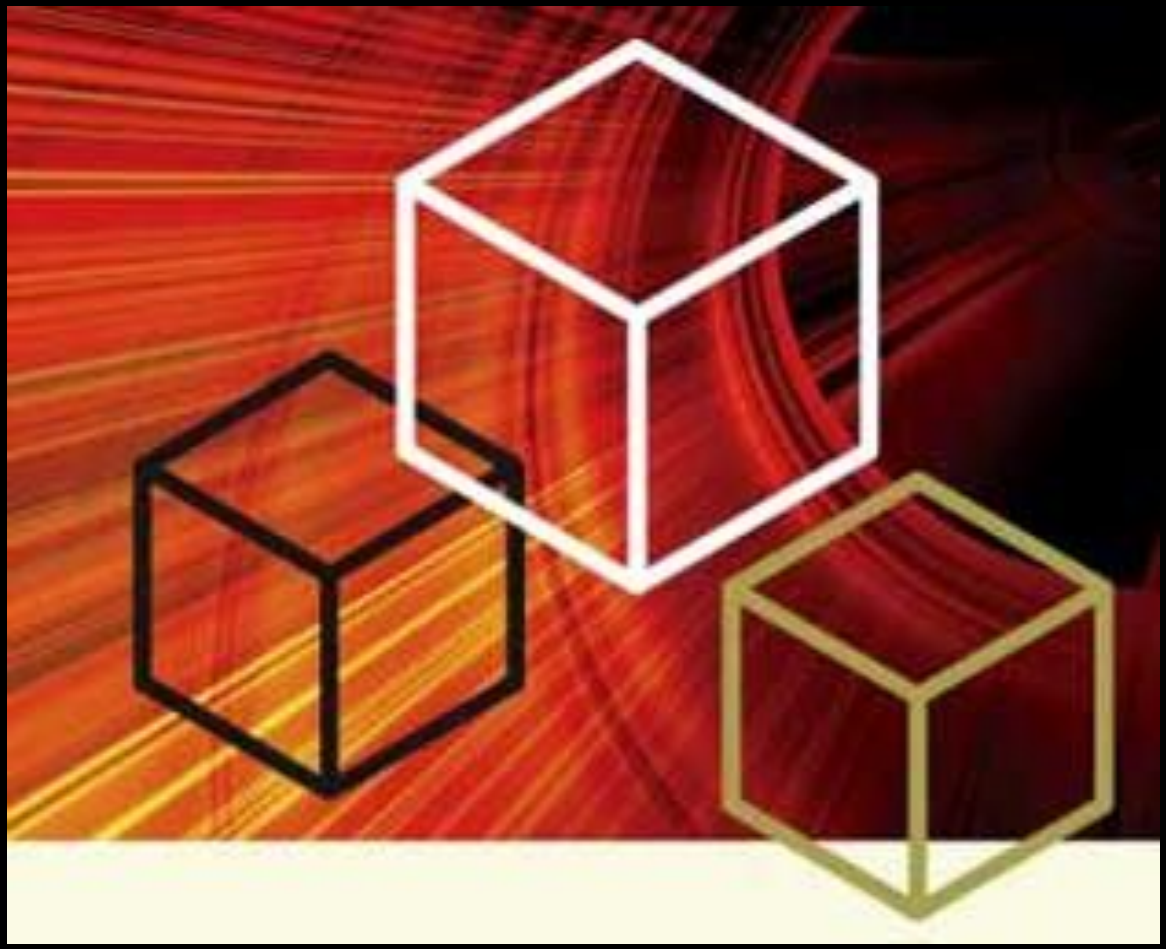
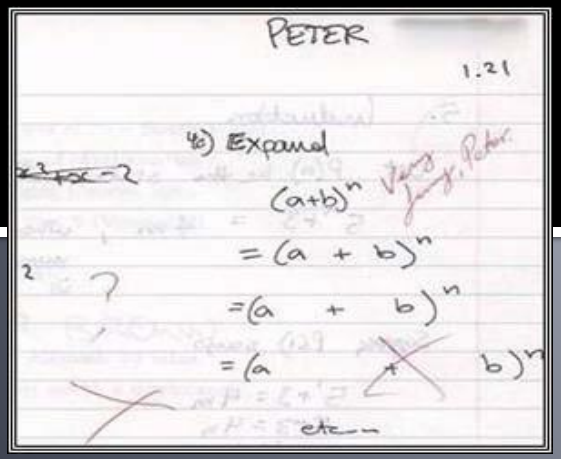
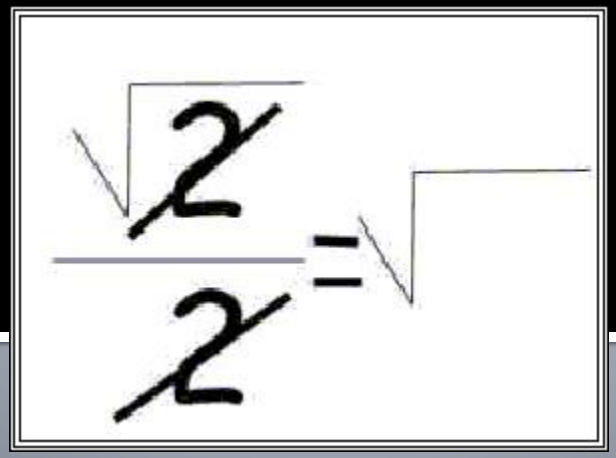


Introduction to Medical Statistics





After explaining to a student through various lessons and examples that:

$$\lim_{x \to 8} \frac{1}{x-8} = \infty$$

I tried to check if she really understood that, so I gave her a different example. This was the result:

$$\lim_{x \to 5} \frac{1}{x-5} = \text{ɯ}$$

Objectives

By the end of lecture, student will have an idea about;

- ***Definition of statistics***
- ***Definition of biostatistics***
- ***Meaning of Data, Variable, Types of variables***
- ***Sources of data***
- ***Objectives of Biostatistics***
- ***Definition of sample and population***
- ***Uses of biostatistics***

Statistics in Medical Training

"Statistics is above all the subject most disliked by (medical) students."

"Medical students may not like statistics, but as good doctors they will have to understand statistics."

It is a fact that we are living in the information age (information revolution) for example every year about 0.5 million new articles published only in the medical field yearly, thus we need to know how to obtain these information, how to analyze, and how to interpret, these information (which is called data). Data are available in the form of numbers (values)

The person who perform statistical activities need to be prepared to interpret and communicate the results, as far as that data are numbers, these numbers contain information, and the purpose of statistics is to investigate and evaluate the nature and meaning of these information

Definition of Statistics

- The theory and methodology for study design and for describing, analyzing, and interpreting data generated from such studies.
- The term statistics has several meanings: data or numbers, the process of analyzing the data, and the description of a field of study. It derives from the Latin word ***status***, meaning manner of standing" or "position".

- **Statistics is that field of science concerned with the collection, organization, presentation, and summarization of data, and drawing of inferences about whole body of data when only a small part of the data is observed or examined or considered. It includes fields of business, education, psychology, agriculture, and economic geometry.**

- **Biostatistics:**
  Is that field of statistics in which the data being analyzed were derived from the biological sciences and medicine.

There are two main objectives from statistics;

1-In, which we are, concerned with only collection, organization, presentation and summarization of data that is called descriptive statistics.

2-In which the objective is to reach a decision about a large group of data by examining only a small past of the data, and it is called inferential statistics (analytic statistics).

Data:

- **The raw material of statistics is called data; it is obtained either as measurement or as process of counting. It represents a collection of values (single of data is called datum).**

Value:

It is the numerical representative of the measurement of the variable.

Sources of data:

The need for statistical activities is motivated by the need to answer a question, that need an appropriate approach, and the search for suitable data to serve as the raw material for that investigation, such data are usually available in the form of one or more of the following sources;

Sources of data:

1-Routinely kept records, such as hospital medical records.
2-Surveys, if the data needed to answer a question are not available from routinely kept records.
3-Experiments, such as in evaluation of the responses to the different strategies might enable the doctor to apply most effective measures to the patient.
4-External sources, in form of published reports, commercially available data banks, or the research literature.

Variable:

- **Any characteristic that can take different values in different occasions, places, persons, and time. It is labeled as variable e.g. Height, weight, age, etc…**

Variables are one of two types

1-**Quantitative** variable (numerical); is that variable that can be measured by units such as height, weight, age, etc…

2-**Qualitative** variable (categorical); is that variable that cannot be measured by usual sense or units, it can only be assessed by number or percentage e.g. Sex, ethnic group, color of the eye, race, education, occupation, type of disease

Quantitative variables are of two main types:

1-Discrete quantitative variable; characterized by

- gaps or interruptions in the values that it can assume, these gaps or interruptions indicate the absence of values between particular values that the variable can assume, e.g. Daily admission of patients to hospital, DMF (the number of decayed, missing, or filled teeth per child), parity, gravida, abortion for mother.

- **2-Continuous quantitative variable; it is also called continuous random variable, it does not posses the gaps or interruptions characteristic, it has fractions of units, and the variable can assume any value within a specified interval, as height, weight, etc.. in fact, most of the biological data are of the continuous quantitative type.**

Measurements & measurement scales:

There is another classification of variables according to measurements or measurement scales

Measurement means the assignment of numbers to objects or events according to a set of rules, these rules include;

1-**Nominal scale (male-female, well-sick, under 65 years- 65 and above, child-adult, and married-unmarried).** Most of the nominal data in the form of **binary** or **dichotomus** "the response is one of two…Yes or No".

2-**Ordinal scale (high-intermediate-low, not smoker, light, moderate, heavy smoker, Social class I,II,III,IV&V)** or it is as rank-ordered scale.

3-**Intervale scale (Age as 20-, 30-, 40-, 50-)**

4-**Ratio scale (determine the quality of ratio or interval)**

Population:

- It is the largest collection of entities of which we have an interest at a particular time, sharing at least one characteristic in common.
- Populations may be finite or infinte.
- If a population of values consist of a fixed number of these values, the population is said to be finite (sampling frame exist), if on the other hand, a population consists of an endless succession of values, the population is called an infinte one (patients visiting the outpatient department, we do not have exact number of how many patients came at the beginning of the day).

Sample:

- **The sample may be defined as a part of population, subset of population chosen in a representative way to be as much as possible representative for the population (random, or non random). The method applied to collect a sample is called sampling.**

Uses of statistics:

- To measure the health state of the community and identify its health problems.
- To compare health condition (status) of a community with others.
- For planning of health services.
- For evaluation of health services.
- For estimating the future needs.

- For research.
- Evaluating the literature
- Applying study results to patient cares applying
- Interpreting vital statistics
- Understanding epidemiological problems
- Interpreting information about drugs and equipment

- Using diagnostic procedures
- Being informed
- Appraising guidelines
- Evaluating study protocols and articles
- Participating in or directing research projects