# Enhancing scientific research among medical faculty

**This is a series of topics intended to improve the knowledge of scholars in medicine about basics of medical statistics as they are relevant to basic research. At each issue of the journal an area of medical statistics is covered.**

## 1. Statistics in Medical Research: an introduction to selected definitions

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Statistics is a science that most people dislike because it is taught by a statistician who assumes that everyone is adept at mathematics. However, today's medical researchers will not, for the most part of it, and most of them became consumers of research and will need to understand the inferential statistical principles behind the reports and articles. Therefore, it is important for everyone to know some information about statistics and how to deal with data.

Statistics started around 1749. At the beginning the meaning was restricted to information about states, later on extended to include collection of all types of information. Now a days a number of statistical concepts have had an important impact on a wide range of sciences including the design of experiments and approaches of statistical inference.

Modern applications of statistics to medicine are highly developed. A look at almost any medical journal reveals that a substantial proportion of medical research papers employ statistical techniques.

Statistics plays an important role in all areas of science. Statistics and models and methods allow us to take a samples of data from our area of focus and answer questions about the population of subjects or events that we are interested in studying. Statistical methods and analyses are often used to communicate research finding and to support hypotheses and give credibility to research methodology and

conclusions. It is important for researchers and consumers of research to understand statistics so that they can be informed, evaluate and make appropriate decisions.

Statistics can be defined as the science of collecting, summarizing, presenting and analyzing data, and using them to test hypotheses. The field of statistics can be divided into:

1. **Mathematical statistics,** in which they study and develop statistical methods and theory.
2. **Applied statistics,** in which the application of statistical methods to solve real problems involving randomly generated data and the development of new statistical methodology motivated by real problems.

Biostatistics is one branch of statistics which deals with collection, compilation,analysis and interpretation of data in the field of health or health related events.

**Types of data:**

Statistical data can be defined as any observations that are collected, recorded or observed.

The choice of an appropriate statistical technique depends on the type of data in question. Data will always form one of four scales of measurement: nominal, ordinal, interval and ratio.

**Nominal scale:** is assigned to limited numbers of qualitative categories and their information. An individual is put in only one category, for examplesgender, blood group, and religious affiliation. Nominal data that fall in to only two groups are called dichotomous data, such as male/female. There is no implication of order or ratio.

**Ordinal scale:** Ordinal scale data is assigned to one of limited number of categories that are ranked in a grade order and the differences among categories are not necessary to be equal, for example apopulation may be ranked according to socio-economic status into low, middle and high.

**Interval scale:**Interval scale data is usually measure quantities. It is like ordinal data in that they can be placed in a meaningful order and presence of intervals between items, with no true zero point (i.e. does not begin from zero due to presence of minus numbers) for exampletemperature per degree cintegrates, $0^{o}C$ does not indicate a complete absence of heat.

**Ratio:** A ratio scale is the most precise level of measurement. It has the same properties as an interval scale, however it has an absolute true zero. Most biomedical variables form a ratio scale such as weight in grams, time in seconds, and blood pressure in millimeters of mercury.

The only ratio scale of temperature is the Kelvin scale, in which zero degrees indicates an absolute absence of heat.

Data may also be classified into qualitative or quantitative (discrete or continuous).

**Qualitative data:**This type of data can't be measured in usual sense but can be described in respect of qualitative characters such as gender, marital status, level of education, vaccination status, …….etc. here does not get any number to start with.

**Quantitative data:** This type of data is quantifiable, either measurable or countable such as height per centimeters, weight per kilograms, number of patients attended out patients department, …..etc. and this type of data can be classified into two types:

**Discrete variable:** When a variable only assumes some isolated values in term of integers that means it is characterized by presence of gaps or interruptions in between the values, for examples number of children in a family, number of bed rooms in a house, number of patients with coronary heart disease, ….etc.

**Continuous variable:** When a variable can assume any value within its range of variation, that means itrepresents variables that don't have gaps or interruption, it can take on any value for examples weight in kilograms, height in centimeter, blood pressure in millimeter mercury, ……etc.

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