

# Importance of Statistics in Medicine

**ABSTRACT:** "Mathematics is the fundamental basis of medical decision making". Medicine and Epidemiology are becoming increasingly quantitative. Knowledge of statistics is required in medicine to design studies that will satisfactorily answer the medical questions and also to understand medical literature.



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STATISTICS is the science whereby inferences are made about specific random phenomena on the basis of relatively limited sample material. Statistics include a set of methods which allows the analysis of information contained in various "numeric" data. As a clinician, everyday of our working lives is spent evaluating the probability of a diagnosis, estimating the risks of treatment benefit, calculating the risk of harm, and predicting the prognosis for our patients. For many of us, statistics was either not taught or presented from a mathematical perspective obscuring the link to medicine. As a result, many excellent clinicians do not recognize the importance of statistics in clinical practice and remain unable to effectively evaluate medical literature.

Unlike many statistics courses, "Practical statistics for clinicians and researchers" focuses on statistical concepts in clinical practice and interpretation rather than mathematics or equations, aiming to get participants proficient in setting up, analysing, interpreting and presenting data to a standard for submission to a medical journal or for scientific presentations. This process naturally imparts skills required for understanding Evidence Based Medicine and critical appraisal of medical literature. Statistics helps in analysis of a given set of empirical data or real world observations. Statistical analysis involves the process of collecting and analyzing data and then summarizing the data into a numerical form.

The statistical citation of results has become one of the most common, striking phenomena of mod-

ern medical literature. No matter what topic is under investigation, and no matter how the data have been collected, the results are constantly presented in statistical 'wrappings.' Hence, to evaluate the results scientifically, medical men need to look beneath the wrapping to determine the scientific quality of the contents with the knowledge of statistics.

Statistics is central to most medical research. Statistics in medicine help in many ways. There are several aims to medical research, all of which involve a significant amount of statistics:

- Monitoring and surveillance of health and disease.
- Establishing causes of disease or factors associated with death or disease.
- Detecting disease.
- Preventing death or disease.
- Evaluating treatments for disease.
- Helps to validate a theory.
- Helps in judging the curative power and the popularity of a drug conducted through surveys and random studies.

The study of statistics helps us in recognizing the value of deviations from the expected norms in the general population when titrating and prescribing medicines, when making generalized statements about therapy outcomes, medication side effects, when describing commonly recognized symptomatology of diseases, and the extrapolated predicted outcomes of contagions and/or medications.

Statistics plays an important role in making the public aware about certain facts. Statistics plays a central role in determining the validity of certain assertions made such as "Electromagnetic fields are dangerous" or "Smoking causes lung cancer". Methods developed by statisticians are used to plan population surveys and to optimally design experiments aimed at collecting data that allows valid conclusions to be drawn, and thus help in either confirming or refuting the assertions. Biostatisticians develop the analytical tools necessary to derive the most appropriate conclusions based on the collected data.

Eg "Smoking cigarettes causes lung cancer". This is presently a somewhat uninteresting fact because it is well known now, yet 60 years ago relatively few people were aware of this. It has been possible to introduce the consequence of smoking to the society only through the aid of research methods and statistical techniques. Through Research and statistical evidences, the validity of the statement that smoking causes lung cancer is asserted. Numerous other diseases are shown to be caused by smoking. As a result several people have started to give up smoking, hence there has been a dramatic reduction in deaths in many countries. Hence by making people aware of facts through statistical evidences, allows mortality and morbidity to be reduced.

Without proper statistical analysis, effective treatments may not be offered, while ineffective ones could be. Eg the effect of the flu vaccine does seem to be clear. Statistical analysis is required to prove the effect.

#### ROLE OF BIOSTATISTICS IN PUBLIC HEALTH

**BIOSTATISTICS** is the branch of applied statistics that applies statistical methods to medical and biological problems. Biostatisticians are to develop the necessary mathematical tools to measure the problems, to ascertain associations of risk factors with disease, and to create models to predict the effects of policy changes. Finally, biostatisticians are directly involved in the evaluation of the effects

#### BIOSTATISTICS PLAYS A KEY ROLE IN

(1) Assessing to identify problems related to the

health of populations and determining their extent.

- (2) Prioritizing the identified problems, determining possible interventions and/or preventive measures, setting regulations in an effort to achieve change.
- (3) Assuring that necessary services are provided to reach the desired goal.

#### NEED OF STATISTICS

Since it is not possible to study an *entire population* to compare the effects of one treatment to another, most clinical studies are conducted on small *sample groups* chosen to represent the population of interest (Eg Adults with diabetes). The assumption is made that if the sample group truly represents the population, then the results of a study of the sample group should reflect the results as if the entire population was studied.

The data generated from a study are generally described mathematically in 3 ways

- (1) **SUMMARY OF THE INDIVIDUAL RESULTS:** Mean, median and mode of the data is evaluated.
- (2) **VARIABILITY AMONG THE INDIVIDUAL RESULTS OR HOW DIFFERENT ONE IS FROM THE OTHERS:** Degree of variability is to be determined. (Some measures of variability are range, standard deviation, and standard error).
- (3) **SIGNIFICANCE:** To determine if there is a true difference between the two treatment groups. (The statistic generally used to determine significance is the "P value").

Statistics is used to support assertions about health and what people can do to improve their health. The press frequently quotes scientific articles assessing the roles of diet, exercise, the environment, and access to medical care in maintaining and improving health. Because the effects are often small, and vary greatly from person to person, an understanding of statistics and how it allows researchers to draw conclusions from data is essential for every person interested in public health. Hence, statistics plays a vital role in the field of medicine.



DATE	EVENT	VENUE
8-9 Nov 2008	National Conference of Homoeopathy CEC meeting at Chandigarh, National body of IIHP <b>WEBSITE:</b> www.iihppunjab.org, www.iihp.co.in <b>CONTACT: Dr Ranbir Singh Josan, Josan Holistic Hospital, Mehta Road, Fatehpur Rajputan, District: Amritsar-Pin 143113.</b> <b>Email:</b> rjosan@msn.com <b>Ph: 91-183-2757234, 2757334(c) 2758134(R) Mob.91-9915193234</b>	Amritsar, Punjab
7th September, 2008	<b>EVENT:</b> "8 th Late J.N.Kanjilal Memorial Seminar on Diabetes Mellitus 2008" <b>ITENARY :</b> Understanding Diabetes the Homoeopathic way; Heart, Diabetes and Homoeopathy; Role of Mind in Diabetes Mellitus; Management of Type II Diabetes and its complications, You present your cases; Audience Asks!; Diabetic Quiz. <b>SPEAKERS-</b> Dr Kasim & team <b>HOST:</b> The National Academy of Homoeopathy <b>FEES:</b> Rs 200/- Students and 300/- Doctors <b>Contact:</b> Dr Aadil, Dr Sanjay, Dr Neeta, Dr Sanjay C, Dr Priti. <b>PHONES:</b> (0712) 2766286, 2532008, 9822240648, 9827156836, 993546232.	Shaad Hospital Complex & Research Centre Near Itwari Railway Station, Nagpur - 2
20th and 21st September, 2008	<b>THEMES:</b> • MOTHER and CHILD: • Homoeopathic Rx of arthritis, other joint problems • Study of materia medica through repertory. <b>FEES:</b> Non-Mem: Rs 1000/- Annual Mem: Rs. 850/ Life Mem: Rs. 750/. Internee, PG Stu: Rs. 500/ <b>Contact:</b> Dr R N Wahi. Tel 9810293865	PHD House, 2, Institutional Area, August Kranti Marg, (Opp. Siri Fort Auditorium), Haus Khas, New Delhi-110016.
9 Sep -2 Oct 08 9.30 - 18.00  4 <sup>th</sup> Oct 08 & 5 <sup>th</sup> Oct 2008	<b>INTERNATIONAL WORKSHOP: PROF KULKARNI &amp; PROF F SCHROYENS</b> <b>FEES:</b> Contact organizers <b>UNIC METHOD OF DR FREDERIK SCHROYENS' Case Taking:</b> <b>DR AJIT KULKARNI TOPIC: Mother and Child:</b> Hom Approach To Infants, Managing Fever Cases. "The Trio: <i>Pulsatilla - Silicea - Fluoric-Acid</i> To contact authors <a href="http://www.ajitkulkarni.com / seminars.aspx">http://www.ajitkulkarni.com / seminars.aspx</a> <a href="http://www.archibel.com / frederikschroyens.html">http://www.archibel.com / frederikschroyens.html</a> <b>Contact:</b> CHE "EDICTA", Bulgaria, Sofia, 1505, Aleko Konstantianov Str 10, <b>Email:</b> edicta@abv.bg, Phone: +359 888 90 48 36	Seminar Hall, University of Forestry; Student town of Sofia, 1700  <b>ACCOMMODATION:</b> Hotel of National Sports Academy. The price for double room with bath and TV set is 9 euro. Attached restaurant, a km from the seminar hall.