

## OVERVIEW ON MEDICAL STATISTICS

### 1. Some introduction:

- I'm interested in research...
- I'm forced to do research...
- Whatever the reason may be...

### 2. What should I do?

- How should I start???

### 3. Let's make it easily understandable

- Research methods/ approaches – leading the way/ direction
- Statistical applications – tools/ vehicles

### 4. What do I know? Be honest!!

- Do I know about research methods?
  - If know back to basic... go back and read research methods/ approaches
- Do I know about statistical and software application?
- Do I know how to interpret?
  - OK... I understand methods and approaches
- So... how to proceed?
- Please try to learn medical statistics
- OK... I agree to learn medical statistics
- Tell me how should I go for it (the easiest way)
- Don't make it complicated (statistician make statistics more difficult)
- Tell me only statistics for non-statisticians

## 5. Application of statistics in medical research

- Why use statistics?
  - Art statistics differences in medical context due to real effects or random variation or both
- Modern viewpoint of statistics
  - Aid for making scientific decision in the face of uncertainty
  - A valuable tool in decision making whenever one is uncertain about the state of nature
- Statistics in medicine
  - Increasingly prevalent in medical practice
    - Hospital utility statistics, auditing, vaccination uptake, incidence/prevalence of AIDS and so on...
- Statistics is about common sense and good design
- Statistics is only the guide to make decisions
- Judgment should be made based on both biological and statistical plausibility
- Concept and applications of statistics in medical sciences
  - Let us discuss briefly
  - People say “stat is boring”
  - Let us make it interesting

## 6. Classification of statistics

- It consist of two parts
  - Descriptive statistics
    - Concerned with collection, organization, enumeration of the frequency of characteristics, summarization and presentation of data.
  - Inferential statistics
    - Statistical inference
    - Analytical in nature

- Consists of a collection of principles or theorems
- Allows researcher to generalize characteristics of a “population” from the observed characteristics of a “sample”
- Statistical jargons
  - Population parameter
    - A fixed numerical value which describes a particular characteristic of a population
    - E.g. 1 – the mean value in the population of a particular characteristic of interest (mean systolic blood pressure of Australia adults)
    - E.g. 2 – the proportion of individuals in the population with a particular characteristics of interest (the proportion of low birth weight babies born in Indonesia)
  - Sample statistics
    - Varies in value from sample to sample
    - Other terms – statistics, summary statistics, point estimate, effect size, point estimate of the effect size
  - The relationship between sample statistics and population parameters is the basis of statistical inference.

## 7. Statistical inference

- 2 broad categories
  - Hypothesis formulation and testing
  - Estimation
    - Point estimation
    - Interval estimation  
(Confidence interval)

## 8. Concepts of populations, samples and statistical inference

- Statistical analysis of medical studies is based on the key idea that we make observations on sample of subjects and then draw inferences about the populations of all such subjects from which the sample is drawn.
- If the study sample is not representative of the population we may well be misled and statistical procedures cannot help
- But even a well designed study can give only an idea of the answer sought because of random variation in the sample
- Thus result from a single sample is subject to statistical uncertainty, which is strongly related to the size of the sample.  
(Gardner MJ and Altman DG, 1988)