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Review paper

Importance of Using Basic Statistics and Statistical Methods in Health Science: A Review.

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Abstract: Health science refers to a group of disciplines related to the delivery of health care in humans through the application of science, statistics and mathematics. The overall goal of health science is the improvement of human health through scientific research. Statistical methods are used throughout a study that includes drawing meaningful interpretation, collecting data, planning, designing and finding the results. There are many statistical methods are used at various stages of a research. The purpose of this article was to review fundamental statistical tools to aware people and readers about the importance of statistics and statistical methods which used in health science. A well-designed study possesses fewer biases, valid and reliable results, which intern gives precise, Statistics are used in daily real life, social sciences and business. To illustrate numerical example can be considered.

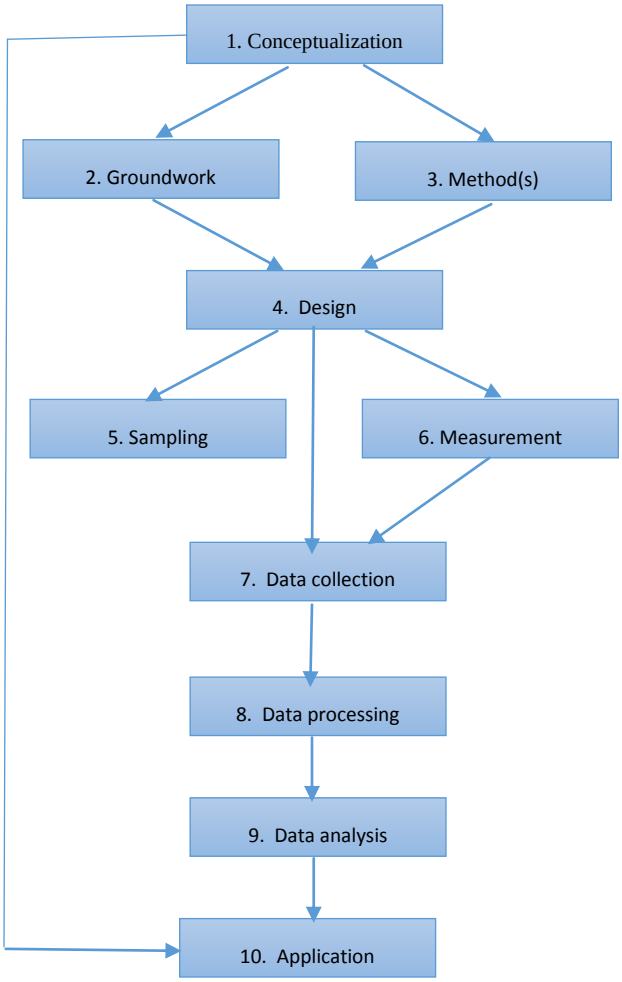
Keywords: Statistics, Measure of central tendency, Health science research, Interpretation and humans.

1. Introduction

Statistics is a branch of science concerned with the collection, organization, summarization, and analysis of data and collecting the information about the whole body of data when only one part of the data is observed. Statistics has a role in a study starting from designing, collecting data, planning, analyzing the data until drawing meaningful understanding from it. Many scientific health researchers may arise around the inquiry "why statistical methods are so important in research?" The respond is "good statistics lead to good research and good research is ethical". The course of investigative situation is unclear. For example, complicated multivariate method are can't be considered as difficult to apply from computations point of view. Now a days, statistics is an essential tool in each and every field of health science research, whether it is Medicine, Ayurveda, Pharmacy, Dental or other allied health sciences. Statistics helps clinically giving in exact vital information from the empirical data that eventually lead to improved patient care. Statistical concepts are required to be measured all through a study, from preparation to the final treatment stage. This article provides a brief overview of statistical methods used at various stages of a health science study with the main importance on inference of minimum sample size for various types of objectives. **[1]**

Most health care practitioners do not carry out medical research. However, if they pride themselves on being up to date then they will definitely be consumers of medical research. It is current on them to be able to distinguish good studies from bad; to be able to verify the conclusions of a study are valid and to understand the limitations of such studies. Evidence-based medicine (EBM) or more comprehensively evidence-based health care (EHBC) requires that healthcare practitioners consider critically all evidence about whether a treatment works. As Mach in and Campbell (2005) points out, this requires the systematic assembly of all available evidence followed by a critical appraisal of this evidence. A specific case may be a paper portraying the aftereffects of a clinical preliminary of another medication. A doctor may read this answer to endeavor to choose whether to utilize the medication on his or her own patients. Since physicians are responsible for the care of their patients, it is their own responsibility to ensure the validity of the report, and its possible generalization to particular patients. More often, in the trustworthy medicinal press, the peruse is to some degree shielded from horribly deceptive papers by a survey procedure including both masters' clinical and factual arbitrators. In any case, frequently there is no such security in the general press or in a significant part of the special writing supported without anyone else invested individuals. Even in the medical literature, misleading results can get through the

refereeing net and no journal offers a guarantee as to the validity of its papers.



Flow chart-1

Statistical methods are an important role play in the scientific research process, but apply the wrong application of statistics or misuse of statistics and their severity discussed so many times. In this paper, we discuss the importance of study design of the study, application of the suitable statistical test and proper interpretation of p-value. The frequency of the adequate use of statistical tests can be seen in a number of medical fields, such as oncology, radiology, surgery, and anesthesiology. Consequences can be serious if the scientific content analysis is inadequate, such as false results with unwarranted assumptions and conclusions lacking biological support. The overall aims of this module are to enable students to:

- Understand the statistical issues in the planning and analysis of research
- Understand the basic statistical aspects of published research
- Apply statistical analysis to cohort studies, case-control studies, and randomized controlled trials.

2. Basic concepts of descriptive statistics

Descriptive statistics is a main important part of statistics that help readers and researchers understand the information of collected data through its organization. Descriptive statistics are widely used to describe date using numbers or statistical measures that may best represent all data collected during a research.

3. Measures of central tendency

Measures of central tendency or measures of location give an idea about the concentration of the values (observations) in the central part of the distribution. A measure of central tendency is a statistical average or a single value which represents the entire distribution. The following are some important measures of central tendency.

- Mean
- Median
- Mode

Mean: Arithmetic mean of a set of observations is the sum of all observations divided by the number of observations. It is denoted by $\bar{x}$.

$$\bar{x} = \frac{1}{N} \sum_{i=1}^{n} f_i \, x_i$$

Median: Median of a distribution is the value of the variable which divides it into two equal parts, i.e., median is the middle value of the distribution. Median is also called as a 'positional average'

$$\text{Median} = l + \left(\frac{\frac{N}{2} - c}{f}\right) \times h$$

Where l = lower limit of median class
f = Frequency of median class
h = Magnitude of the median class
c = Cumulative frequency for the distributions with open-end classes.

Mode: Mode is defined as the value which occurs most frequently in a set of observations.

$$\text{Mode} = l + \left(\frac{f_{1-f_0}}{2f_{1-f_{0-f_2}}}\right) \times h$$

Where l = lower limit of model class
h = width of the model class interval
f_1 = frequency of model class
f_0 = frequency of preceding the model class.
f_2 = frequency of succeeding the model class.

4. Numerical example

Problem

Day(x)	3	4	5
No. of patients(f)	10	12	6

Find the mean, median and mode.

Solution

x_i	f_i	$x_i f_i$	Cumulative frequency
1	5	5	5
2	8	16	13

3	10	30	23
4	12	48	35
5	6	30	41
	N = 41	$\sum_{i=1}^{n} f_{ix_i}$ = 129	

Mean

N = $\sum_{i=1}^{n} f_i$ = 41

$\bar{x} = \frac{1}{N} \sum_{i=1}^{n} f_i x_i = \frac{129}{41}$ = 3.15

Median

N = $\sum_{i=1}^{n} f_i$ = 41, $\frac{N}{2}$ = 20.5

Cumulative frequency just greater than $\frac{N}{2}$ is 23 and the value of x corresponding to 23 is 3.

∴ Median = 3.

Mode

The maximum number of patients (f) is 12.

The value of x corresponding to maximum number of patients (f) is 4.Hence mode is 4.

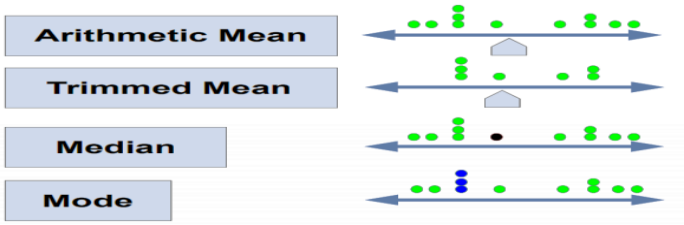


Table – 1: Summary of the most commonly used descriptive statistics in health publications. ***[2]***

Descriptive statistics			
Shape and normality	**Central tendency**	**Dispersion or variation**	**Percentile and quartile**
Symmetry	Mode	Range	Percentile
Kurtosis	Median	Variance	Inter quartile range
	Mean	Standard deviation	

5. Conclusion

This paper has discussed the importance of using basic statistics and statistical methods in health science. In present days statistics has become a major component of medical research. All medical sciences and health sciences are using the statistical methods. The measure of central tendency is very important in all types of research studies. Understanding the correct use of basic statistics leads to lesser errors in coverage the results of studies performed and in the interpretation of their conclusions. The aim of this article is to discuss some of the important points of the use of statistics in health (medical) research.

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