STATISTICAL FALLACIES IN MEDICAL AND SOCIAL SCIENCES

Dr Lakshman Rao (MDP 1999) shared with us a research note with a view of it as a vital aspect to improve the quality of research and administration in multiple areas of Public concerns. He can also be reached on hklrao@gmail.com for academic debate and discussions.

There have been adverse comments on the Quality of Research and executive decisions in several Socio-Economic Political Fields due to inadequate attention to details of data collections, along with Analytics and Quantitative techniques. Research findings can result in theories only after rigorous Statistical validation, as otherwise, it will remain as opinions based on random experiences and case studies. Must we not periodically question our methods of Data Analysis and Interpretation with a view to update.

Quality of Research and the authenticity to generalize for practical applications largely depend on the quality and quantity of data used, with adoption of appropriate Statistical methods in data analysis and interpretations. Statistical methods, when applied appropriately will measure the variations, extent of variation, causes, correlation and the risks based on probability, also the levels of significance attached to help decisions.

- In the current context of easy accessibility of massive data (online and offline) and computing facilities, Researchers and Executives must develop-practice analytical skills to utilize the database fully. There are many decision making areas where data and information have no scope.
- Wrong use and interpretations of percentages, ratios, correlations, regressions, Chi- square tests, inadequate and non-probability samples have been rampant in Social and Medical research studies, along with executive decisions which require immediate correction. The Research Methodology seminars and workshops have not been taking adequate care on this vital aspect of Research which has led to a decline in quality. Most of the researchers in Medical and Social Sciences fields are not adequately conversant with Statistical Methods and Quantitative techniques needed.

As a Researcher and guide for over three decades, I have been noticing that the database and data analysis methods are far from satisfactory, particularly Statistical methods adopted by researchers in Medicine, Psychology & Social Sciences. Statistical Fallacies in clinical research are rampant. Researchers adopt the easy and convenient measuring tools such as Percentages, Ratios, Tables and Graphics which can be faulty and lead to misleading conclusions, be it GDP growth rate for the efficacy of medicines and treatment methods in health care systems. The traditional methods adopted by Researchers with inadequate fundamentals of statistical methods have been damaging and resulting in poor quality of research. It is time that we awaken to this fallacy of adopting inappropriate techniques in data analysis on a continuing basis at Universities and research organizations. Rather than getting to the depths of statistical methods, researchers choose the easy option of seeking the help of statisticians at the tail end of research for data analysis and interpretations. We need to debate on this fundamental issue and reverse the trend of easy-going in regards to the adoption of statistical methods in research.

The grey areas in the statistical analysis in Social Economic Sciences include: inappropriate methods of formulating hypothesis and adopting appropriate rigorous testing tools, following appropriate and adequate sampling methods. Unless the data collected through well designed data collection instruments satisfy adequacy and representativeness, any further analysis of data would be futile. Today we are blessed with technology for obtaining massive online data with little cost and effort and therefore need not get stuck with small samples and using non-parametric tests on the assumption of non-normality of data and leading to less than robust conclusions. While adopting percentages are rough and tough methods of analysing data, it hides several inner meanings of data since mere averages and percentages do not bring out the variability/deviations among data points. These types of presentations are easy but could be misleading. Invalidation, estimation and measuring the statistical

significance in hypothesis testing or Chi-square tests are adopted in most cases instead of T-tests, Z-tests, F-tests, and Anova.

- While parametric tests and non-parametric tests use data selectively and can result in higher errors, researchers in medical psychology, other social sciences, politics, and legal areas must note the limitations of adopting percentages, graphs, or ratios.
- Let's fully utilize the data analysis techniques and computer facilities, moving away from traditional methods of small sample.
- When big data analytics are easily available for researchers and working executives.
- Let's stop using too much of percentages, graphics to validate and justify the hypothesis, further making quick estimates and judgment. Instead, use statistical methods from beginning till the end to bring quality in research and decisions in critical multiple areas in the current digital environmental and data-friendly scenario without any short cuts
- There is now ample scope and opportunity to adopt statistical methods without being a statistician