Statistics: An Indispensable Tool in the Field of Research

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Abstract: *This paper highlighted statistics as an essential tool in research making, be it in education, health, engineering, agriculture, industry, science and technology for the betterment of the society. It revealed that statistics helps us to analyze data, to identify and probe trends and relations, to develop generalization, to revise and improve our theories. The paper recommended, among others, that academic institutions should ensure that research teachers are well grounded in the field of statistics.*

Keywords: Statistics, Indispensable, Research, Tool, Relevance.

I. INTRODUCTION

Statistical concepts and method are not only useful but indeed often indispensable in understanding the world around us. They provide ways of gaining new insights into the behaviour of many phenomena that one will encounter in one's chosen field of specialization (Devore, 2004).The discipline of statistics teaches us how to make intelligent judgments and informed decisions in the presence of uncertainty and variation. Changing conditions in many fields of endeavour demand continual inquiry to establish new facts and to ensure that already established facts continue to stand the test of time.

Statistics is an important discipline. Wherever one belongs to in the society, one makes use of the knowledge of statistics in one form or the other. Researches are been carried out on daily basis in the world and statistics provides the methodologies used in planning, execution, analyzing and interpretation of results (Dike, 2009). A researcher relies on data analysis for the advancement of knowledge; even the most objective and carefully collected data does not and cannot speak for itself. The researcher must be able to use statistics effectively to organize, evaluate and analyze data. Without a good understanding of the principles of statistical analysis, the researcher will be unable to make sense of the data. According to Healey (2005), without the appropriate application of statistical techniques, the data will remain mute and useless.

1.1 Statistics Defined

Everyday usage of the term "Statistics" can be viewed in a broad sense to represent any of the following concepts as observed by Ugwu (2003)

- A science discipline concerned with the collection, analysis and interpretation of numerical data relevant to a specific inquiry.
- A collection or compilation of numerical data in any specified department of inquiry; such as "birth and death statistics", "unemployment statistics".
- A set of numerical summaries or estimates (such as averages, totals, proportions,ratios, etc.).

Precisely, statistics is a science that offers a variety of analytical procedures in making decisions in the presence of uncertainties. It can also be seen as a branch of science concerned with the design of experiments or sampling procedures, the analysis of data, and the procedures for making inferences about a population of measurements from information contained in a sample (Mendenhall & Reinmuth, 1978).

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Statistics plays a vital role in every field of human activity. It holds a central position in almost every field like Education, Quality Control in industries, Administration, Forecasting, Agriculture, Marketing research, Economics, Natural Sciences, etc.

All problems involving the use of statistical methods may be categorized as belonging either to the field of descriptive statistics or inferential statistics.

Descriptive Statistics: According to Salkind (2003), the first step in the analysis of data is to describe them. Describing data usually means computing a set of descriptive statistics. This is concerned with the collection, compilation and summarization of data so as to portray the important properties of the data set. Therefore, if we are concerned only with the data on hand and no attempt is made to generalize to a larger set of data, then we are in the field of descriptive statistics.

Techniques/tools used in descriptive statistics are tables for condensation of data, graph and charts for presentation of data, averages (mean, mode, median), measures of variability (range, variance standard deviation, etc.), rates, ratios etc.

Inferential Statistics: Any treatment of data leading to predictions or inferences concerning a larger group of data is known as inferential statistics. The generalization of inferential statistics is subject to uncertainties since we are dealing with only partial information obtained from a subset of data of interest (Walpol, 1968).Inferential statistics deals with estimations of population parameters, test of hypotheses, analysis of variability, model fitting, etc. Inferential Statistics is of two categories: Parametric statistics and Non-parametric statistics. Some of the techniques/tools used in inferential statistics are t-test, multiple regression, analysis of variance (ANOVA), Z-test, correlation, analysis of covariance (ANCOVA), Chi-square, multivariate analysis, factor analysis, etc.

1.2 Research Defined

Right from the time immemorial, individuals, organizations and societies at large are faced with a lot of problems and challenges, and the need to solved them. The curiosity and hunger to solve these problems and challenges led to the field of research. Research is a scientific approach employed to find the solution to problems. It can be seen as a systematic activity directed at the discovery of new scientific information or the solution of a specific practical problem. Any process of gathering information systematically and carefully to answer questions or test theories may be called a research. According to Akuezuilo (1993), research is the systematic and objective recording and analysis of controlled observations that may lead to the development of generalizations, principles, or theories, resulting in prediction and possibly ultimate control of events. It is a process through which new knowledge is discovered (Salkind, 2003). Research can also be defined as planned and systematic investigation of the facts about a situation.

Research encompasses all inquiries into events, phenomena, and objects for the purpose of clarifications. It should not in anyway be restricted to the field of science, arts or humanities but open to inquiries into the unknown, the speculated or the argued, for the purpose of clarifications not minding the subject areas (Ozofor, 2012).

Essence of research: No aspect of human life be it education, economy, science, agriculture, etc can grow or progress without research and application of the product of research.

According to Ozofor (2012), the essence of research among others include;
- It contributes towards the extension of the frontiers and practices
- It is used for long term planning and development
- It is used to improve on techniques as well as to provide evidence either on its own or as a verification of what others have done before.

In order to give credence to the above, Ozo, Odo, Ani and Ugwu (2007) highlighted the benefits of research as follows:
- Research helps in advancement of knowledge
- Provision of training and objectivity in problem solving
- It provides information for planning and development
- It provides valid information to support theories
- Research leads to improvement of professional practices

1.3 Relevance of Statistical Tools in Research Process

The techniques of statistics and their applications are involved, in one form or another, in almost all advancements in modern science, and in many other phases of human activity (Harnett &Murphy, 1975). Hence, the objective of statistics is to make inference about unknown population parameters based on information contained in a sample.

Statistics enables one not only to predict and test hypotheses but to determine the accuracy of one's decisions. Statistics, as a set of techniques used to organize and manipulate data for the purpose of answering and testing theories, suggests that statistics is one of the most important means by which research and theory interact (Healey, 2005). Only by the application of statistical techniques can mere data help us shape and refine out theories and understand the world better. It will supply us with many ideas about "what to do with the data". Therefore, without statistics, quantitative research is impossible (Healey, 2005).

Fig.1 The role of statistics in research process.
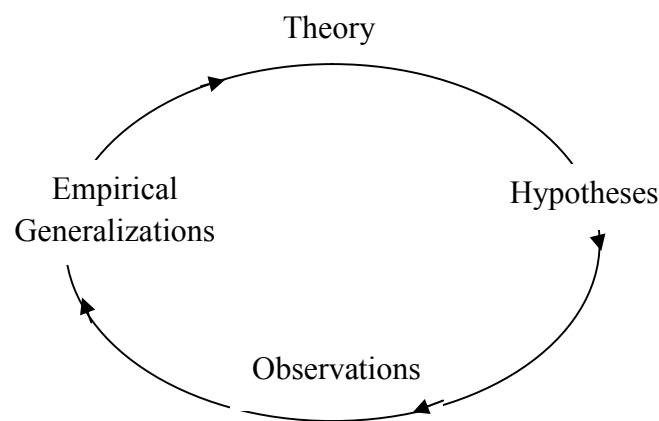
One of the major problems in most scientific researches is the analysis of data to ascertain the new knowledge gained and to evaluate its strengths and weaknesses. The theory and methods of statistics have been primarily developed to meet these exigencies of scientific research. Statistics provides the researcher with proper ways and means of experimentation and sample selection, so that the sample will be representative enough to form a reliable basis for drawing conclusions about the population of interest.

With the help of statistical tools like regression analysis and correlation, we have been able to investigate relationships between two or more variables, predict one variable from other variable(s), and controlled events.Statistical methods and analyses are often used to disseminate research findings and to support hypotheses and give credibility to research methods and conclusions. They help us to understand and describe phenomena in our world and help us draw reliable conclusions about those phenomena.

The principles and methods of statistics allow clinical researchers to draw reasonable and accurate inferences from collected information and to make sound decisions in the presence of uncertainties. Knowledge of statistical concepts can avert numerous error and biases in medical research.

The effect of statistics in research has been felt in no small measure in the area of engineering and industrial management. This has helped in bringing solutions to the problems of production, effective use of materials and labour, development of new products. Many decisions on matters related to quality are called for in manufacturing. With the help of statistical techniques like statistical quality control, has brought certain desirable results than cannot be achieved well in any other way(Grant &Leavenworth, 1996).

The ability to master statistical tools and techniques by a researcher is of great importance for the development of research, accurate data analysis and interpretation of results. It is perhaps clear from the above remarks that statistics is at the centre of all researches, mainly, as stipulated by Ugwu (2003):

- It provides the researcher with the proper ways and means of experimentation and sample selection
- It guides the researcher towards methods of estimation, that provides at the lowest possible cost
- Most appeals and assertions made in real life must be grounded in data based (statistical) evidence.

- In many practical situations, statistical inferences provide basis for decisions and actions directed towards solving specific problems.

Agu (2014) posited that statistics is sacrosanct to research because:

- It provides the necessary exact description.
- It forces researchers by its methods to follow defined procedures in their work and thinking.
- Its method provides a means of summarizing results of research in meaningful and convenient form.
- It enables researchers to make predictions based on the data available at hand.
- It provides easy means of analyzing cause(s) of complex events.

Researchers are expected to study their research situation properly and select the most appropriate tool to use for data analysis if the findings of the research are to be dependable. No quantitative research can reach its climax without the application of statistics. Hence, the beauty of every quantitative research is the appropriate statistical analysis of data collected from the field.

II. CONCLUSION

In research, we draw inferences from the few to the many in our works. The integration of statistics into our methods enables us to use empirical evidence in the formulation of our theories. Statistics is different among academic disciplines in the sense that statistical thought is needed at every phase of almost all research investigations including planning the research, selecting the sample, managing the data, and interpreting the results.

III. RECOMMENDATIONS

Having given a rational exposition to the study, it is recommended that:

- Nigerians should quest for the knowledge of statistics by according priority to the teaching and learning of the course in tertiary institutions for enhancing the conduct of modest research studies and evaluation of programmes and policies for development,
- Students should be made to see statistics as the course whose knowledge is applicable during and after schooling and to relate statistics they learnt to the realities of life.
- Academic institutions should ensure that research teachers/lecturers should be well grounded in statistics.

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