

## **The Significance of Statistics in Evidence-Based Decision Making**

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### **Abstract**

Statistics is an essential part of every research that collects data, organizes, and interprets it into a meaningful sense. This review article helps to understand how statistics help us in every research and in our daily lives. The data was collected from books, research articles, and online libraries like PubMed and Google Scholar etc. This study shows that statistics is used in every research, from planning and data collection to analysis and conclusion. In the health system, it helps to measure the treatment effect and to control the diseases. In business and the economy, it helps to forecast the trends and make decisions. In agriculture and social sciences, statistical tools help to improve the productivity, quality of the crops, and help to understand human behavior.

In conclusion, statistics transformed the raw data into meaningful information. They help professionals and researchers to make better and evidence-based decisions and create a reliable and meaningful conclusion.

**Key Words:** Statistics, Research, Data Analysis, Decision-Making, Quantitative Research

### **Introduction**

Statistics is a branch of mathematics that focuses on organizing, summarizing, and interpreting data. Statistics is a fundamental technique for both scholars and researchers to examine data [1-2]. Statistical tools allow the researcher to make a generalized image from a scattered population, events, and objects, which are based on the sample data sets that they collect to address a specific research question [3]. The worth of statistics cannot be omitted as they provide us, and the researcher, with valid results and conclusions from the data set. It enables us to demonstrate that the results are not due to chance but have the proposed relationship with the datasets [4]. Every day, research is conducted worldwide, requiring statistical tools to plan, conduct, analyze, and interpret the results [5]. Researchers depend on the data sets and their analysis to explore the knowledge, as the data set by itself does not make any sense. To make the data sensible, the researcher must use some statistical tools to make the data meaningful [6-7].

Statistics is a scientific tool that helps us in making decisions when there is uncertainty. It includes designing experiments, surveys, analyzing the data, and drawing conclusions from population-based samples of the datasets [8]. Statistics is considered to be the fundamental instrument in every area of research, like education, industries, administrations, forecasting, agriculture, marketing, economics, health, and natural sciences [9].

Generally, statistics is divided into two main broad areas: descriptive statistics and inferential statistics. According to Salkind, descriptive statistics help us to describe the data in the form of collecting, organizing the common features of descriptive statistics, like mean, median, mode, tables, charts, and graphs. Other features of the descriptive statistics include: range, variance, and standard deviation [10].

In contrast, inferential statistics, as stated by Walpol, help us to predict a conclusion about a larger group (population) which is based on a smaller sample size [11]. Inferential statistics help us in estimating the population values, testing hypotheses, and finding relationships within the variables with the help of correlation, chi-square association, T test, Z test, ANOVA, regression, and factor analysis. This review article aims to understand the importance of statistics in every research by explaining its key types, tools, and role in data analysis and decision-making.

### **Literature Review**

Statistics play a significant role in every field of research. It collects data, information that it summarizes and interpret to conclude.

The theoretical foundation of statistics is mainly based on the mathematical framework and probability theory that allow us to extract a meaningful concept from the uncertainty and variability. At its core, the different methods used in statistics to make an induction inference about population-based sample data allow the professional and researcher to conclude a meaningful confidence level. The

descriptive statistics describe the statistical measurements and tools to summarize and interpret the data set. In contrast, the inferential statistic is used to test a hypothesis and draw a conclusion about a larger population based on a smaller sample size. This is the primary distinction in statistics that makes a fundamental base for most of the statistical work in daily life [10-11].

The scope of health and medicine is also incomplete without the use of statistics. According to the WHO, to improve the public health status, it is important to use the tools of statistics for collecting data and interpreting. Before the operation of a new medicine on a commercial basis, the statistician must use some of the statistical tools to measure its efficacy and the level of safety for the public. In the field of epidemiology, especially in the control of outbreaks of certain diseases and for the protection of the community, different measurements of statistics were used by the biostatistician. Like in the outbreak of COVID-19, the biostatistics used different scales of statistics to monitor and identify the spread of the outbreak, its risk factors for death, and to measure how the vaccine is working [12-13].

The business of an individual or the economy of a country depends on statistics to make smart decisions. The companies use statistics to look at the demand and trends of a market, that what the customer likes and thinks about the market and trends. With the help of this, the business owner and the market made a better product and planned an effective strategy. In manufacturing, statistic is used to maintain product quality, while in forecasting help to predict sales and manage inventory efficiency. Economists also study and control the factors like supply, inflation rate, trade, and employment that affect a certain region using the tools of statistics. Bankers and financial experts also used statistical models to overcome lending risks, track market changes, and even predict possible economic crises [14-17].

For the development of polices and for the distribution of the resources fairly, the government and the administration use statistical models. According to the United Nations Statistics Division that statistics is the official key part of every democratic society. The help of the Census data of the country helps the government to distribute voting districts and funds to the different areas. It also helps to identify the needs of the community, like as choosing the best place to build a hospital that is more accessible and approachable to the community [17-18].

Statistics also played an important role in our daily lives, not only in professional fields. For example, to check the weather forecasts for planning our day, we use a complex statistical model to study the weather forecasts. Statistics also help us in managing our personal finances by looking at the average monthly income and expenses.

In the time of the global village, statistics are used in every field, in every research. Taking the example of the digital world, the social media platforms and influencers use statistics to increase their followers and to improve their performance. Marketer also uses statistics for their ads to try to reach the right audience while making ads effectively. Similarly in the sport, statistics have changed the team management, like in the famous “Moneyball” story of the Oakland Athletics used player data to develop a strong team on a low budget.

Statistics made the people smarter; they rely on evidence-based decisions instead of institutional reliance. In today's world full data, they use a clear way to check information and make guided decisions. Learning statistics allows us to build critical, analytical, and logical thinking skills, which lead us to question assumptions, break down problems, and help us understand the difference between correlation and causation [17-19].

### **Study design**

The study design for this study is a narrative review, which is based on secondary data sources.

### **Data Collection and Sources**

Data was collected from the secondary source, published articles, and books using databases like PubMed, Google Scholar, and different online libraries to address the research question "why do we need statistics in every research?".

### **Results and Discussion**

From the literature search, we found that statistics is not only a supplementary tool used for research, but it is also the foundation of every research. It supports the research from the origin to the end. The indispensable nature of the statistics makes the research transform the raw data into real with meaningful concepts and provide evidence-based conclusions. The main role of statistics can be divided into two broad areas [19].

The use of statistics is not limited to a routine basis, but it provides a requirement for reliable and meaningful scientific work. Many of the statistical models, like regression analysis, rely on assumptions about the data to check for linearity, dependence, and normality of the data. Most of the researchers and professionals use statistical tools for the analysis to highlight the variation [20]. If our data has a group or strata, we use a standard statistical tool for the analysis and interpretation, like White, A. et al also support our findings [21]. In health care, for the diagnosis of any disease or to check the efficacy of a new drug, we use standard statistical diagnostic tests. Smith, J, et al, also used regression models for the effectiveness of any treatment and guided the targeted intervention for the community based on variables like demographics and comorbidities [22].

The economy of a country mainly depends upon statistics; all of the administrative decisions of a country are based on statistics, using valid statistical tools. Let's suppose any department of the government or the government itself wants to revise the pay scale of their employees in view cost of living conditions; the statistical methods determine the rise in cost of living. Wooldridge et al, in their research work, also employed modeling economic relationships and forecasting market trends and various factors, policy changes, on economic indicators such as employment rates, inflation, and GDP growth [23].

The agriculture of the country is considered to be the backbone of the country. Farmers and agricultural scientists use statistics to observe the quantity and quality of

the crops, and to make future decisions in agriculture and farming. The application of statistical methods and principles is crucial for the effectiveness of the growth and problem-solving arising from different branches of agricultural activities.

Some of the statistical methods were also used for the genetic problems occurring in plant breeding, crop production, fertilizers, and the conditions [24].

Statistical methods are also used to help us in the evaluation of the relationship between behavior with its demographics in the field of social sciences. Creswell et al. also explain the role of statistical method (regression Analysis) in their paper. They quantify the strength and nature of the relationship between factors like education, income, and social status interactions. They also rule out that linear regression is the main techniques that help in the best relationship between education on income level [25].

### **Conclusion**

Statistics make up the backbone of all scientific research. It transforms the raw data into a knowledgeable and meaningful data, that help us in decision and policy making. This review article is not only support that statistic is the supportive tool but also the essential techniques used throughout the research process, from the data collection to the data analysis and its interpretation.

These findings show that statistics is the fundamental and crucial tool in all disciplines from epidemic control, treatment of diseases, economy of the country, market business, and to shape the fiscal policies of a country. Furthermore, statistics was also used to ensure the reliability, accuracy and objectivity of research finding.

In conclusion, statistics is a crucial technique used to every field of life and for the daily decision making. Statistics bridge the theory with the practical outcomes, by ensuring that the result is valid and data-driven, and reflective of reality. Therefore, statistics is crucial for the researcher and professional to understand its techniques to produce impactful, credible and meaningful work.

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