

Importance and the Usage of Statistics

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Abstract

There are different sayings about the origin of Statistics. One of them is that Statistics originated from the method used by philosopher Aristotle to study the population, resource and wealth of states over two thousand years ago in ancient Greece. Hence, the word “Statistics” still retains the root “State”. Statistics had no major breakthrough for quite a long time after the ancient Greece, until the scientific revolution in Europe in the 17th and 18th centuries. During this period, mathematical methods integrated with Statistics gradually, and people started deploying the concept of probability into social statistics. Such as mortality rate, birth rate, crime rate and etc. This formed the early basis of Modern Statistics. After hundreds of years of development, more emerging research theories were introduced and developed in the subject of Statistics. Statistics now apply in all the sectors through the era of agricultural economy, industrial economy, to today’s knowledge-based economy and Statistics is now applied into all sectors. This article discuss how the Statistics is important in various fields in various ways.

Key Words: *Statistics, Data, Usage, Statistical*

Introduction

“Statistics” means numerical information expressed in quantitative terms. (Jothikumar, 2005, 5) This information may relate to objects, subjects, activities, phenomena, or regions of space. As a matter of fact, data have no limits as to their reference, coverage, and scope. At micro level, individual firms, however small or large, produce extensive statistics on their operations. The annual reports of companies contain variety of data on sales, production, expenditure, inventories, capital employed, and other activities. These data are often field data, collected by employing scientific survey techniques. Unless regularly

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updated, such data are the product of a one-time effort and have limited use beyond the situation that may have called for their collection. A student knows statistics more intimately as a subject of study such as economics, mathematics, chemistry, physics, and others. It is a discipline, which scientifically deals with data, and is often described as the science of data. In dealing with statistics as data, statistics has developed appropriate methods of collecting, presenting, summarizing, and analyzing data, and thus consists of a body of these methods. In the beginning, it may be noted that the word 'statistics' is used rather curiously in two senses plural and singular. In the plural sense, it refers to a set of figures or data. In the singular sense, statistics refers to the whole body of tools that are used to collect data, organize and interpret them and, finally, to draw conclusions from them. (Madrigal, 2012) It should be noted that both the aspects of statistics are important if the quantitative data are to serve their purpose. If statistics, as a subject, is inadequate and consists of poor methodology, we could not know the right procedure to extract from the data the information they contain. Similarly, if our data are defective or that they are inadequate or inaccurate, we could not reach the right conclusions even though our subject is well developed. (Jothikumar, 2005, 2) different definitions of statistics can be viewed as follows',

- Statistics is the science of counting, Statistics may rightly be called the science of averages, and statistics is the science of measurement of social organism (Bowley, 1992).
- Statistics is the science of estimates and probabilities. Further, W.I. King has defined Statistics in a wider context, the science of Statistics is the method of judging collective, natural or social phenomena from the results obtained by the analysis or enumeration or collection of estimates (Boddington, 1990).

From the above definitions, highlight the major characteristics of statistics as follows:

- Statistics are the aggregates of facts. It means a single figure is not statistics. For example, national income of a country for a single year is not statistics but the same for two or more years is statistics.
- Statistics are affected by a number of factors. For example, sale of a product depends on a number of factors such as its price, quality, competition, the income of the consumers, and so on.

- Statistics must be reasonably accurate. Wrong figures, if analyzed, will lead to erroneous conclusions. Hence, it is necessary that conclusions must be based on accurate figures.
- Collected in a systematic manner for a pre-determined purpose
- Lastly, Statistics should be placed in relation to each other. If one collects data unrelated to each other, then such data will be confusing and will not lead to any logical conclusions. Data should be comparable over time and over space.

In today's world we are facing with the situations where statistics can be applied. Statistics can be used to determine the potential outcome of thousands of things where the human mind alone wouldn't be able to (Bowley, 1992). Statistics benefits for all of us to predict the future based on primary or secondary data. Being able to predict the future not only changes our lifestyle but also helps us be more efficient and effective.

Objectives

The objective of this study is to examine the importance of statistics and usage of statistical tools in different disciplines

Methodology

This study is based on secondary data. The study involves SWOT analysis to reach the above objective.

Statistical usage in quantitative and qualitative research

Quantitative research

Quantitative studies provide data that can be expressed in numbers, thus, their name. Because the data is in a numeric form, we can apply statistical tests in making statements about the data. These include descriptive statistics like the mean, median, and standard deviation, but can also include inferential statistics like t-tests, ANOVAs, or multiple regression correlations (MRC). Statistical analysis lets us derive important facts from research data, including preference trends, differences between groups, and demographics.

Multivariate statistics like the MRC or stepwise correlation regression break the data down even further and determine what factors—such as variances in

preferences—we can attribute to differences between specific groups such as age groups. Quantitative studies often employ automated means of collecting data such as surveys, but we can also use other static methods—for example, examining preferences through two-alternative, forced-choice studies or examining error rates and time on task using competitive benchmarks.

The advantage of legitimate quantitative data, that is data which is collected rigorously, using the appropriate methods and analyzed critically, is in its reliability. However, the shortcoming of quantitative data is that it fails to provide an in depth description of the experience of the disaster upon the affected population (Acaps, 2012). Knowing how many people are affected and their locations does not provide sufficient information to guide agencies and sectors on what they should plan for in terms of response. Knowing why there is a problem and how people are affected will combine with the numbers and locations to provide insight on how best to tailor the humanitarian response.

The main strengths of quantitative data collection are that it provides:

- Numeric estimates
- Opportunity for relatively uncomplicated data analysis
- Data which are verifiable
- Data which are comparable between different communities within different locations
- Data which do not require analytical judgment beyond consideration of how
- Information will be presented in the dissemination process.

Weaknesses inherent in quantitative data include:

- Gaps in information - issues which are not included in the questionnaire, or secondary.
- Data checklist, will not be included in the analysis.
- A labor intensive data collection process.
- Limited participation by affected persons in the content of the questions or direction of the information collection process.

Qualitative research

Data from qualitative studies describes the qualities or characteristics of something. You cannot easily reduce these descriptions to numbers—as you can the findings from quantitative research; though you can achieve this through an encoding process. Qualitative research studies can provide you with details about human behavior, emotion, and personality characteristics that quantitative studies cannot match. Qualitative data includes information about user behaviors, needs, desires, routines, use cases, and a variety of other information that is essential in designing a product that will actually fit into a user's life.

While quantitative research requires the standardization of data collection to allow statistical comparison, qualitative research requires flexibility, allowing you to respond to user data as it emerges during a session. Thus, qualitative research usually takes the form of either some form of naturalistic observation such as ethnography or structured interviews. In this case, a researcher must observe and document behaviors, opinions, patterns, needs, pain points, and other types of information without yet fully understanding what data will be meaningful (Madrigal & McClain, 2012).

The main strengths of qualitative data collection are that it provides:

- Rich and detailed information about affected populations
- Perspectives of specific social and cultural contexts (i.e. the human voice of the disaster)
- Inclusion of a diverse and representative cross section of affected persons
- In depth analysis of the impact of an emergency
- A data collection process which requires limited numbers of respondents
- A data collection process which can be carried out with limited resources.

Weaknesses inherent in qualitative data are that it:

- Results in data which is not objectively verifiable.
- Requires a labor intensive analysis process (categorization, recoding, etc.)
- Needs skilled interviewers to successfully carry out the primary data collection activities.

Theoretical Usage

Under the theoretical usage, consider the subjects such as economics, accounting, psychology and engineering. This section, discusses how statistics apply when we studying such subjects.

Usage of Statistics in Economics

Statistics is a methodology necessary in the field of statistics and are used to collect, analyze and evaluate data. Economics depends heavily on the use of statistics. Economics is defined as the study of how people behave with regard to the production and consumption of goods. As a social science, economics attempts to describe trends in consumer markets, such as wealth acquisition and transfer. There are two forms of economics:

- Macroeconomics: analysis of large-scale economic activity, such as within a country or international market.
- Microeconomics: analysis of small-scale economic activity, such as between individuals and corporations.

There are various themes studied within both forms of economics, including costs, production, consumption, and the rationales behind individual, corporate, national and international trade. In order to develop hypotheses around the various topic areas, economists make use of statistics and are able to compare information. Economic statistics involve quantitative data that describe either past or present trends (eMathZone, 2012). The data may be presented in various ways:

- Time-related: to show trends and changes that occurred across a specific period of time, for example, unemployment rates or housing costs during a 10-year period
- Cross-section: to show trends and changes within a specific period of time, for example, job statistics for current year college graduates.

Economic statistical data sets include information about measurement, sample sizes, collection procedures and analysis processes. The data are often published for public use, such as through the United States Census or for private use, such as intra-company data used for decision-making.

“Statistics are *everything* to economists”. Without statistics, the economic field wouldn't even exist (Hamada, 2012, 28).

An example of this would be an economist trying to analyze the performance of a car manufacturer over the period of a year. Figures use to show the car manufacturer's sales, profits, costs, and other important economic information would be relayed through the use of statistics.

Statistical analysis is a quantitative tool widely used within the economics field and is applied in a variety of ways such as determining the validity of economic theories through the analysis of empirical real-world data, clarifying cause-effect relationships between variables for the purpose of assisting in the formation of effective public policy, predicting the future behavior of relevant economic conditions for the purpose of reducing uncertainty in making business or public policy decisions, or fine-tuning mathematical models by incorporating actual data. Econometrics is the name of the field within economics which applies statistical analysis to economic problems.

Econometric analysis can be used to determine the precise effect of a tax on cigarettes on cigarette consumption (that is to determine the price elasticity of demand for cigarettes) or to understand whether or not a reduction in class size has a positive effect on the performance of primary school students. Various types of regression analysis, from basic linear regression models studying the relationship between one independent variable and one dependent variable, to multiple linear regression models, to non-linear regression and more are used in the economics field. Econometric analysis is commonly used in areas outside the field of economics, such as sociology and political science.

Usage of Statistics in Accounting

Accountants in various fields, including auditors, forensic accountants, controllers and risk accountants, use statistics to accomplish their professional duties. Accountants who conduct audits use samples that are statistically representative of a data base because it is almost impossible to collect all the data needed in a short period of time. Auditors typically use this method when conducting a reliability assessment to determine the accuracy of the data being audited.

Forensic accountants depend on statistical methods to analyze financial instruments that may be used to perpetrate financial fraud. By understanding statistical principles, forensic accountants correctly estimate whether the valuation of the risk associated with financial instruments was appropriate (Hamada, 2012, 261).

Controllers are typically in charge of all the financial operations of a company. Some of their main responsibilities are to perform cost analyses, provide financial forecasts and compile budget reports. Controllers apply their knowledge of statistics to develop the appropriate forecasts and analyses that promote the success of the company.

Risk management accountants use the statistical principles of distribution and correlation to account for risks when setting a valuation. Risk accountants also apply statistics principles to limit the range of valuation errors and to specify a premium that is appropriate for the risk associated with a particular forecast.

Usage of Statistics in auditors

Accounts that perform audits benefit greatly from understanding and using statistical analysis. For example, when conducting a reliability assessment, one of the accountant's first tasks is to gather evidence. Auditors know that the easiest way to do this is by looking at a portion of the whole, rather than gathering every bit of data available. (Hamada, 2012, 265) Statistically representative samples are preferred in this area as they help auditors work more efficiently and objectively.

Usage of Statistics in forecasters

Accountants use statistics to forecast consumption, earnings, cash flow and book value. Simply put as accounting for the future, forecasting involves an amount of guesswork about the future and when people guess, they frequently make errors. Having a thorough understanding of the distribution and metrics for evaluating that error, the accountants are better able to make predictions more efficiently about the future (Hamada, 2012, 264).

Usage of Statistics in accounting

The detectives of the accounting world, forensic accountants use accounting and legal principles to ferret out financial fraud and deceit. With today's incredibly complicated financial instruments like credit default swaps and collateral debt obligations, forensic accountants need to understand how statistical principles were used to value and anticipate risk in those securitization products.

Usage of Statistics in mortgage underwriter

With foreclosures at near record levels, anticipating and predicting the risks associated with any given loan has never been more important. Mortgage underwriters assess that risk, and, therefore, need to have a thorough understanding of statistics in order to set a premium price that is reasonable for the borrower and profitable for the lender.

Usage of Statistics in medicine

For decades, biostatistics has played an integral role in modern medicine in everything from analyzing data to determining if a treatment will work to developing clinical trials. The School of Global Public Health defines biostatistics as "the science of obtaining, analyzing and interpreting data in order to understand and improve human health" (Goodman, 1999). Virtually any medical research study uses biostatistics from beginning to end. "Statisticians help medical researchers design studies, decide what data to collect, analyze data from medical experiments, help interpret the results of the analyses, and collaborate in writing articles to describe the results of medical research." To make it even plainer: biostatistics helps researchers make sense of all the data collected to decide whether a treatment is working or to find factors that contribute to diseases.

As such, it is important that statistics are used in medicine in order to justify the development and subsequent use of a particular drug or treatment; as well as identifying in the first place whether it is having the desired effect at all.

At the heart of the use of statistics in medicine is the seemingly insurmountable problem that everybody is different, not only in the psychological sense, but a physiological sense too. While human beings may share similar organs, tissues and chemical compounds; how they are bonded, how we are composed and the effects different drugs have on the individual can be radically different from one person to the next.

Therefore, to measure the effectiveness of any form of medication, it is important to run trials where a wide variety of subjects are administered the drug. Firstly, this helps gage the effectiveness of the medicine when compared to, for example, a placebo. Subsequent statistical analysis can also give medical professionals and pharmaceutical companies the information they need to judge

whether the medicine is an effective treatment for the majority of patients; and whether it is a cost-effective solution to a particular ailment.

How does statistics important in health care field?

Quantitative research guides health care decision makers with statistics--numerical data collected from measurements or observation that describe the characteristics of specific population samples. Descriptive statistics summarize - the utility, efficacy and costs of medical goods and services. Increasingly, health care organizations employ statistical analysis to measure their performance outcomes. Hospitals and other large provider service organizations implement data-driven, continuous quality improvement programs to maximize efficiency. Government health and human service agencies gauge the overall health and well-being of populations with statistical information (Casto, 2011).

- **Health Care Utilization**

Researchers employ scientific methods to gather data on human population samples. The health care industry benefits from knowing consumer market characteristics such as age, sex, race, income and disabilities. These "demographic" statistics can predict the types of services that people are using and the level of care that is affordable to them. Health administrators reference statistics on service utilization to apply for grant funding and to justify budget expenditures to their governing boards.

- **Resource Allocation**

Health care economists Rexford Santerre and Stephen Neun emphasize the importance of statistics in the allocation of scarce medical resources. Statistical information is invaluable in determining what combination of goods and services to produce, which resources to allocate in producing them and to which populations to offer them. Health care statistics are critical to allocate and production efficiency. Inevitably, allocation decisions involve trade-offs the costs of lost or missed opportunities in choosing one economic decision over another. Reliable statistical information minimizes the risks of health care trade-offs.

- **Quality Improvement**

Health care providers strive to produce effective goods and services efficiently. Statistics are important to health care companies in measuring performance success or failure. By establishing benchmarks, or standards of service

excellence, quality improvement managers can measure future outcomes. Analysts map the overall growth and viability of a health care company using statistical data gathered over time.

- **Product Development**

Innovative medicine begins and, sometimes, ends with statistical analysis. Data are collected and carefully reported in clinical trials of new technologies and treatments to weigh products' benefits against their risks. Market research studies steer developers toward highly competitive product lines. Statistics indirectly influence product pricing by describing consumer demand in measurable units.

Applied Usage

Under the applied usage, consider the fields such as business, managers for decision making and tourism. In this, discuss how statistics apply to day to day professional activities.

Usage of Statistics in business

Statistics are an important tool for running a business. Managers are required to make decisions based on data collected over time. This data is worthless unless it is analyzed and interpreted; statistics allows business managers to analyze the data and arrive at meaningful conclusions.

Statistical analysis allows businesses to deal with the uncertainties of the business. It allows managers to make sound judgments, knowing their decisions are based on data and not on assumptions. Statistics helps businesses to plan better and make predictions about the road ahead. Marketing is an important part of any business and statistics helps to market products and services effectively. Statistics also allow a business to keep an eye on the competition.

Statistics plays a significant part in successful business decisions. Any successful entrepreneur has to be especially sharp and correct when making business decisions. The entrepreneur should have a feeling for the market demand for the company's products and should therefore be able to identify what to produce products or services that will sell. The volume of sales may also be accurately estimated. Statistics will help entrepreneurs to align production according to the market demand. Utilizing business statistics the quality of the

products may also be verified in a more scientific manner to save on measuring cost.

It should be clear that any business manager or entrepreneur could utilize statistical information to make high quality business decisions. These decisions could be about the location of business, the marketing of the products or services, the application of scarce financial resources or the determination of sales bonuses (Abraham, 2007, 3).

Statistics are essential in business because it measures profitability; without profit a business is almost pointless. Being able to compare income and outgoings is the most basic form of accounting in business and provides evidence of profitability.

- Set-up and monitoring

Before setting up a business, it is essential to have evidence that it will be viable. Finding a market for your business, the costs involved and the income it will raise, will determine the viability of the business. By looking over statistics you are likely to uncover hidden costs that can have an impact on the business. When in business, it is inevitable that costs will vary, an obvious one being the costs of fuel. By keeping tabs on costs you can vary your own prices to ensure continued profitability.(Abraham, 2007, 4) If you are exporting then the exchange rates are essential statistics, without making any changes at your end there could easily be a 10% swing in either direction in exchange rates; which will have an important impact on your profitability.

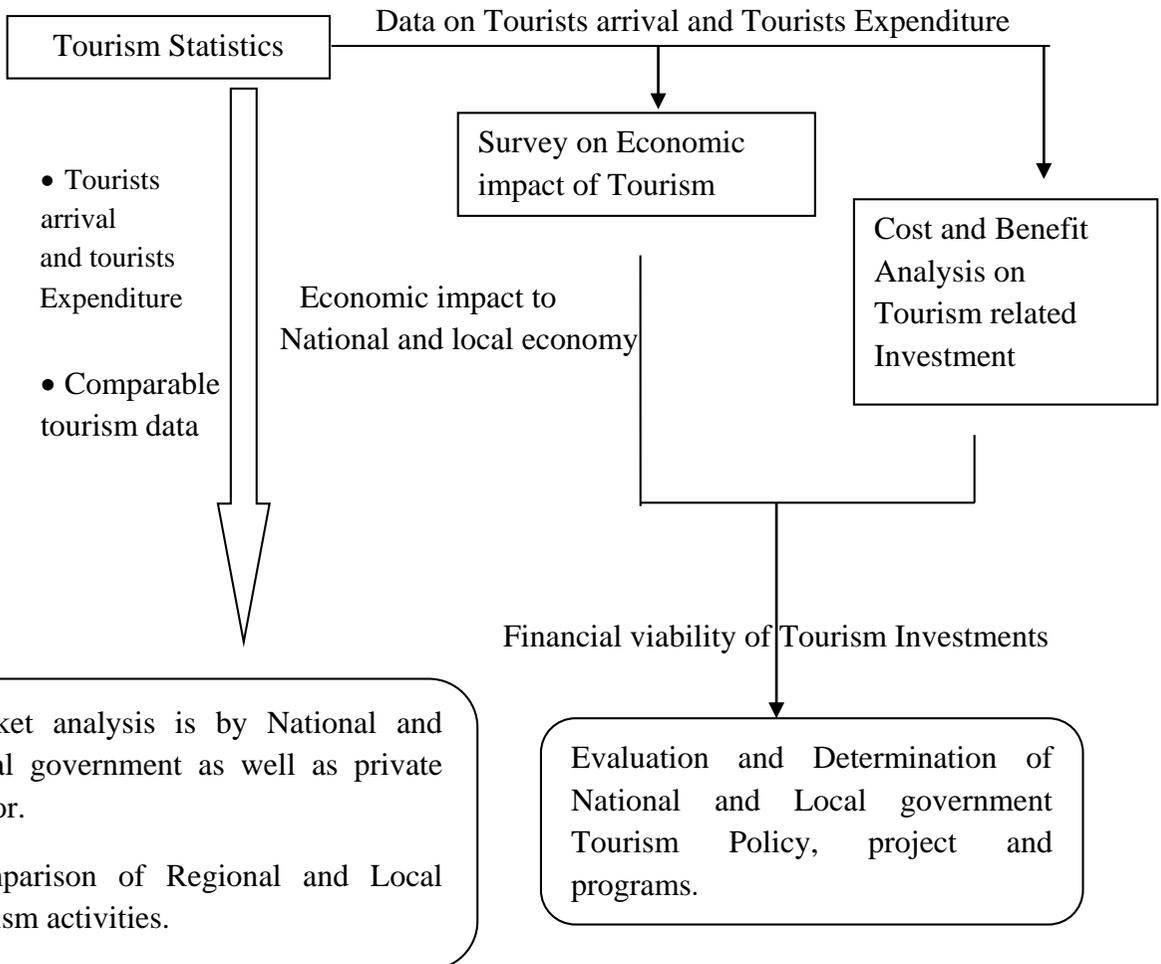
- Auditing

Maintaining a regular audit system ensures that your statistics and accounts are being properly checked out. All component parts of a business are liable to change; having a system that is adaptable and flexible to these variations ensures that your business is best placed to react to fluctuations whilst remaining profitable.

- Trends

A less obvious use of statistics in business is to pick up on trends. If one particular line in your business is likely to see an increase in demand then it is best to concentrate your resources into that area.

Usage of Statistics in tourism



The needs for Tourism Statistics

- Designing marketing strategies.
- Strengthening inter-institutional relations.
- Evaluating the efficiency and effectiveness of management decisions.

- Measuring tourism throughout the national economy
- Assessment tools whether tourism policies or activities are effective, sustainable and progressing.
- Monitoring instruments to track changes over time in a constant and consistent manner.
- Help clarify goals
- Foster accountability and raise awareness for action.

As above explanations it proves statistics use in vast area. Although statistics is very important it also has some weaknesses and threats. So it's important to do a SWOT analysis, to understand the overall picture of statistics (joseph, 2014).

Strengths

- Statistic is a universal accepted analytical method.
- It can be used in qualitative and quantitative analysis and also in inductive and deductive research analysis.
- Statistics has the capable of categorizing the data into different fields, timelines, purposes etc.
- Statistics simplifies the marks of data: - It organizes and presents figure in such a way that they start communicating meaning. At a glance representation, pictorial, diagrammatic or graphical presentation of data reduces complexity, increases attractiveness and facilitates comparison. It also helps understanding irrelativeness.
- Statistics presents facts in definite form: - The data collected is presented in numeral forms so that it has preciseness while convening meaning. A statement made like cold is increasing is not a statistics, but when it is said that the temperature has increased by 20 C than previous day it is statistics, because it precisely shows that cold has increased.
- Statistics facilities comparison: The maximum use of statistic is for comparisons and finding out cause an effect relationship if at all they exist. The comparisons help finding causes for change and also helps in finding what

changes can occur in future. The greenhouse effect, depletion of ozone layer, global warming are examples where precisely statistics has predicted the changes and has also suggested that what could be the pressed benefits by the remedies those are found out.

- **Forecasting:** It is the important function of statistics which is best on relationships and which tried to predict future events. The most powerful tool for businesses and economics.
- **Statistics helps formulate and test hypothesis:** It not only helps formulating and testing hypothesis, but also infer from the same. It helps making rational decisions. It understands measures and describes the effects of action and reactions. It tries to correlate pieces of isolated events or information to make meaning full picture.

Weaknesses

- Insufficient cooperation from providers – delays in data capture.
- Inadequate statistical literacy in community.
- Always depend on the data – if one data is missing or wrong whole analysis result can be failed.
- Cannot measure the qualitative data 100% successfully - The researcher's presence during data gathering, which is often unavoidable in qualitative research, can affect the subjects' responses.
- Cannot provide 100% accurate results
- If one data is missing or wrong, the whole analysis results can be failed.

Opportunities

- Statistics, computational methods and simulation growing in demand.
- Developments in IT literacy – there are specific software for data analyzing, such as SPSS, SAS, R etc.
- New possibilities to cooperation with computer science and other neighboring fields.
- Relate and useful for most of the fields, such as social science, humanities, business, engineering, medicine, marketing etc.
- Increased the demand for statistics

- Promote the research and development.
- Due to the improvement of the statistical analyzing methods research and development (RND) have promoted overall the world.

Threats

- Lack of independency. –statistic is always connecting with another subject as statistics is specifically capable of data gathering and analyzing.
- Difficulties on collecting data. - The out sides/cooperate sector do not have enough knowledge it's difficult to gather data successfully.
- Gathering accurate data, some research data cannot gather successfully such as human feelings, about a murder or a theorist etc.
- Computer security.

Conclusion

In this article we consider about how statistics important to our life. As mentioned earlier, statistics need us to apply to our daily works and it helps companies to carry their work without difficulties. And also some of fields are depend on statistics. Statistics is study of the systematic collection, organization, and interpretation of data. This includes the planning of data collection in terms of the design of surveys and experiments. Is therefore safe to say that Statistics, as a discipline, is the development and application of methods to collect, analyze and interpret data for future planning and problem solving.

The common goal of a statistical research project is to investigate causality, that is the is the relationship between an event (the cause) and a second event (the effect) where the second event is understood as a consequence of the first and in particular to draw a conclusion on the effect of changes in the values of predictors or independent variable on dependent variables or response. Modern statistical methods involve the design and analysis of experiments and surveys, the quantification of biological, social and scientific phenomenon and the application of statistical principles to understand more about the world around us. Since data are used in most areas of human endeavor, the theory and methods of modern statistics have been applied to a wide variety of fields. Finally, we can say studying statistics is really very important to all of us because it can apply at any time to our day to day activities.

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