

Biostatics has made major contributions to our understanding of countless public health issues, such as AIDS, Cancer and Chronic diseases.

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Abstract

The study aims to increase understanding of Biostatistics knowledge within the public health sector to control chronic diseases such as AIDS and cancer. The importance of Biostatistics within the study is indicated. The statistics tools are applied in public health to use the existing data to identify the factors involved in health issues and predict their outcomes based on experiments and observations. The contribution of Biostatistics in epidemiological studies was found significantly important. The study utilised a thematic analysis methodology to understand Biostatistics role and contributions in the public health field. The incorporation of thematic analysis involving the past 10 years' articles helped highlight various perspectives associated with the importance of biostatics and an indication of risk factors associated with the spread of chronic diseases. Moreover, the study's findings showed the significant importance of Biostatistics in public health as it increases information with statistics evaluating disease prevalence, incidence, and modes of transmission in the general population. It is concluded through the study that incorporating Biostatistics educational programs or sessions along with appropriate training on the use of Biostatistics methods can help increase opportunities for the control of chronic disease spread.

Keywords: *Biostatistics , public health, chronic diseases, AIDS, Cancer*

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I. Introduction

Biostatistics is the branch of biology in which applied statistics are used in medical and public health sciences (Sullivan, 2017). The data and information from Biostatistics are applied in epidemiology which is the study of the cause, spread, and elimination of diseases at a particular time and location (Ahlbom, 2017). In this way, biostatics in public health provides information regarding the general public health status, occurrence of diseases, and mortality rates in the general public (Suárez et al. 2016). The prevention and control of diseases related decisions are majorly influenced by the applications of Biostatistics and epidemiology studies in public health while covering the diseases found in local and global populations (Cataldo et al., 2019).

Martínez et al. (2019) found that the statistical methods used in Biostatistics are used to describe and investigate the outcomes of several health issues, predict the future of epidemics and pandemics and affect the decisions of public health managers. In addition, biostatisticians collaborate with scientists and other health professionals and provide the designs for scientific studies to predict the outcomes of public health issues (Ahlbom, 2017). Biostatistics has also played an essential role in understanding important public health issues, including chronic diseases, cancer, AIDS, environmental health, and human growth and development (Abdulla et al., 2021). Therefore, the statistics tools are applied in public health to use the existing data to identify the factors involved in health issues and predict their outcomes based on experiments and observations.

Ahlbom (2017) found that Biostatistics also contribute to understanding important public health issues by providing statistical tools for clinical and observational trials, genomics, human genetics, and spatial studies. This study provided the importance of biostatics in understanding public health issues, mainly AIDS, cancer, and chronic diseases. This study was conducted to identify the contributions of Biostatistics in describing, analysing, and understanding the public health issues like AIDS, cancer, and other chronic diseases. The main objectives were to identify the contributions of Biostatistics in public health and to analyse the role biostatics play in improving the understanding of AIDS, cancer, and other important chronic diseases. Another objective of this study was to provide the individuals interested in public health with the importance and application of biostatics in public health. The role of biostatics in managing public health issues and its importance among the public health sciences was also identified in this study.

II. Methodology

This study was conducted using a secondary qualitative research design, in which previously existing studies were used to develop the findings of this study. Relevant articles were searched using scientific databases like Google Scholar, PubMed, NCBI, Med-Line, Science-direct, and Sci-hub. The articles were searched using key terms related to this study's research topics, aims, and objectives. The studies discussing the role of Biostatistics in public health issues were included to develop the findings of this study. The articles were also searched using Boolean operators to find relevant studies to fulfil the aims of this study. Articles from the previous 10 years were included in this study from authentic sources and published in English. The studies included for the review of this research were also from freely available sources to avoid the additional cost of purchasing the articles. The searched articles mainly comprised the studies based on the role of biostatistics in public health, the importance of Biostatistics in providing the understanding of public health issues of AIDS, Cancer, and chronic diseases, and the major contribution of biostatistics in providing information on AIDS, Cancer and chronic diseases in public health. The searched articles were analysed using thematic analysis, and the findings were formed based on the pieces of evidence provided in the selected studies.

III. Findings

Role of Biostatistics in public health

Several studies have found the importance of Biostatistics in public health. As found by (Sullivan, 2017), biostatistics plays an important role in providing researchers, epidemiologists, and the general public with an understanding of major health issues like AIDS, cancer, and other chronic diseases. Yu et al. (2020) also identified that biostatistics provide certain tools and frameworks for epidemiologists to identify the causes, spread, and control of the diseases that are of major public health concern. In addition, Fortuna et al. (2018) provided that Biostatistics, along with epidemiology, provides information for the decision-making in public health to take measures for the prevention and control of diseases, including both infectious and non-infectious diseases found in the local and general population. The statistical tools used in biostatistics provide public health professionals with the information to explain and predict the outcomes of different diseases and provide the future directions of epidemics and pandemics (Kandula et al., 2018).

As found by Goldstein, LeVasseur, and McClure (2020), Biostatistics help epidemiologists identify the methods and ways to be adapted to use available resources for the prevention, treatment, and mitigation of diseases in a population. In the research of AIDS, the biostatisticians provide their critical expertise to carry out infectious diseases research and provide information regarding the existing rate of occurrence and the factors involved in the rise of this disease among the general population (Brickley and Lindan, 2018). The study conducted by (Sedrak et al. 2020) also found that the epidemiology of cancer in the general population is studied in detail using biostatistics which provides information regarding the existing cases of cancer in the general population, the factors including diet, living habits, and economic and social factors and the effective measures that health professionals can take to curb the increase in cancer cases around the world. The study by Yu et al. (2020) also identified chronic diseases like respiratory illnesses, diabetes, chronic kidney disease, and obesity and provided that the statistical tool help in the identification of existing cases and the section of the population prone to these diseases. Biostatistics is crucial in providing valuable information regarding AIDS, cancer, and chronic diseases and helping the public health departments to prevent and overcome these diseases.

Importance of Biostatistics in public health

The importance of Biostatistics is also identified in several studies where the importance of statistical methods in understanding important public health issues like AIDS, cancer, and other chronic diseases. As found in the study by Milic et al. (2018), biostatistics in public health is important as it provides the researchers with important data to develop inferences for disease outcomes. The biostatisticians assist the health research teams in developing the study methods and data analysis for public health concerns (Goldstein et al., 2020). Masuadi et al. (2021) showed that the experts in Biostatistics are qualified in statistical programs and techniques, including R, SAS, STATA, SPSS, and Excel, which help design clinical researchers and analyse the impact of public health programs. Sedrak et al. (2020) also identified the importance of Biostatistics in providing treatment efficacy and helping develop appropriate and evidence-based health care treatments.

The importance of Biostatistics in public health was also identified in the study by O'Brien et al. (2020), where they provided that the methods in Biostatistics provide clinical trials to analyse the treatment outcomes for patients and can positively affect patient care in diseases like AIDS, cancer and chronic disease. Another study by Milic et al. (2018) identified the importance of biostatistics in epidemiology as it provides the basis for prevention and care and forms the foundation for public health policies. It provides the link between the causes and factors influencing the spread of disease. The study by Yu et al. (2020) also provided the importance of biostatistics in identifying the factors involved in increasing cases of chronic diseases and provided the preventive measure that the general public can take to overcome the mortalities and morbidities of this

disease. They also provided that the biostatistics of the factors and causes for AIDS and cancer cases also helped identify the population at risk and the measures that can be taken to prevent these diseases.

Major contributions of Biostatistics in public health

The major contribution of Biostatistics was also found in several recent studies. As found in the study by Villeneuve, Paradis, and Muhajarine (2020), biostatistics contributed to the AIDS epidemic by providing the determination of infected cases, approximating the incubation period of HIV, providing the causes of AIDS, monitoring the spread of this disease and predicting the future outcomes in the epidemic of AIDS. This study also provided that Biostatistics has enabled the researchers to get accurate surveillance of AIDS and monitor possible future epidemics of this disease. Biostatistics and epidemiology contribute extensively to collaborated research against HIV-related diseases providing the information related to these diseases (Alimohamadi et al., 2021). The study by Mazumdar et al. (2018) identified the contribution of biostatistics in dealing with public health issues mainly related to cancer. They identified the data collection and assessment using Biostatistics to help find the prevalence of cancer among the general population and conduct prevention studies to identify the risk factors associated with cancer.

This contribution was found to help employ the successful resources to overcome the factors and prevent cancer from promoting health. Hazra and Gogtay (2017) identified using biostatistics in public health issues. They identified its contributions to the control and prevention of chronic diseases like diabetes, cardiovascular disease, chronic pulmonary and kidney disease, etc. They also provided that the successful application of Biostatistics in health care provides continuous evolution and developments in public health outcomes. The major contribution of biostatistics was also found by Villeneuve, Paradis, and Muhajarine (2020). They provided that Biostatistics enables epidemiologists and other public health researchers to identify the trends of diseases and provide better treatment plans to overcome these diseases. These contributions provided an understanding of important public health issues like AIDS, cancer, and chronic disease to public health professionals and the general population.

IV. Discussion

Biostatistics play a crucial role in the area of public health discipline with regards to the analytics, descriptive and logical domains as it includes analytical techniques and methods for analysing public health research investigations which help determine the mortality and morbidity rate of diseases or infections in the interested population (Shortreed et al., 2019). The role of biostatisticians is focused on applying mathematical and statistical methods for collecting information and forecasting. Through analysis, it is found that role of biostatisticians helps in comprehending useful information into suitable and precise decision-making regarding the changing health trends (Ahlbom, 2017).

It is found that the importance of Biostatistics in the public health sector is dynamic as it encourages the determination of emerging health-related problems along with their associated risk factors with statistics. In addition, it is also found that bio-statistical analysis can be based upon focused groups or on clinical trials to evaluate the pattern of spread of disease along with an examination of disease development, progress, and transmission mechanism (Mooney and Pejaver, 2018). The analysis showed that Biostatistics help predict the rate of mortality within the targeted population which can facilitate understanding of prevalence among with progression in diseases such as AIDS, cancer, and other chronic diseases could be examined statistically through biostatistics tools and methods. The determination of the pattern of disease spread can thus be controlled by designing appropriate programs and initiatives focusing on minimising the spread of disease in the environment (Cataldo et al., 2019).

Moreover, Biostatistics helps identify public health challenges encountered to prevent disease spread. Furthermore, it is found that an increase in understanding of Biostatistics methods increases opportunities for the formation of appropriate designing of strategies and policies for the prevention of chronic health disease distribution. It is also encouraged through literature that incorporating biostatistical analysis of health problems influences epidemiological studies, which involve identifying the cause of disease spread along with identifying a pattern of disease in the environment. The importance of studying Biostatistics in public health promotes the prevention form health-associated risk factors and problems. The main focus of the study indicated improving a healthy lifestyle through minimising disease progression with the help of an in-depth understanding of public health issues with biostatistics (Wang, 2018).

The contributions of Biostatistics within developed and underdeveloped countries are immense and vary from region to region. It is reported that different biostatistics courses are introduced, such as epidemiology and preventive medicine focusing on chronic disease spread and control strategies (Daniel and Cross, 2018). Therefore, evidence suggested an emphasis on the importance of Biostatistics within the public health sector to improve living quality. It is found through evidence that currently, rapid changes within the pattern of disease progression are found to contribute to the reoccurrence of diseases with severity. Within the public health sector, an immense amount of investments is continuously made to mitigate the health-associated data for accurate interpretation with statistics (Milic et al., 2018).

For conclusive and accurate decision-making, it is necessary to apply biostatistics analysis within the public health sector. In relation to the monitoring of AIDS, biostatistics methods provide different surveillance methods to predict future trends. Similarly, several epidemiological studies were conducted to identify cancer prevalence, indicating the biostatistical analysis, thus increasing knowledge and in-depth understanding of the disease. Estimating infected population cases in a particular region can be done through Biostatistics (Heath et al., 2016). Furthermore, Biostatistics also increases understanding of determining the relationship between different variables contributing to disease progression. It is found that major health problems such as AIDS and cancer with limited curability opportunities are studied efficiently through biostatistics (Grobbee and Hoes, 2014).

The less availability of data for the curability or treatment approaches relating to chronic disease can be studied and tested through biostatistics tools and methods. The study emphasises significantly increasing research relating to biostatistics research within the public health sector as it was found beneficial in determining the alternative ways for disease control along with developing strategic programs or policies for disease control. Moreover, the study also encourages the study of different economic, social, and environmental factors contributing to the disease occurrence and distribution. Therefore, biostatistics provides valuable knowledge and understanding on preventing diseases such as AIDS, cancer, or other chronic diseases to improve health outcomes (Luque and Negro, 2020).

V. Conclusion

The importance of Biostatistics in health sciences and public health is of paramount importance. Biostatistics in public health also helps in understating the public health status, the prevalence of diseases, morbidity and mortality rates, and causes and factors associated with the disease. This study was also done to determine the contributions of Biostatistics in public health and the importance of their role in providing an understanding of AIDS, cancer, and chronic diseases in public health concerns. This study was conducted by reviewing existing literature and relevant studies to determine the effective roles played by Biostatistics in understanding public health issues, mainly AIDS cancer and chronic disease. Thematic analysis was done to analyse the findings of the selected studies and the role, importance, and major contributions of Biostatistics in public health issues found in this study.

The findings in the thematic analysis of this study provide the valuable contributions of Biostatistics in improving public health outcomes. Findings in this study provided the role of Biostatistics in public health in providing the prevalence, occurrence, and incidence of AIDS, cancer, and chronic diseases in the general population. Its importance was identified when the statistical tools were used to predict disease outcomes, analyse its causative factors and provide the direction of epidemics and pandemics. Major contributions of Biostatistics were also found in preventing and controlling important public health diseases like AIDS, cancer, and chronic disease. The findings of this study are valuable in providing the importance of Biostatistics in improving the understanding of public health issues of AIDS, cancer, and chronic diseases. Therefore, the study emphasises including Biostatistics tools and methods within research to control disease spread and occurrence. In addition, it is also encouraged through study findings to create awareness and integrate Biostatistics courses within educational programs to improve the evaluation methods in the public health sector.

References

- [1]. Abdulla, F., Nain, Z., Karimuzzaman, M., Hossain, M.M. and Rahman, A., 2021. A non-linear biostatistical graphical modeling of preventive actions and healthcare factors in controlling COVID-19 pandemic. *International journal of environmental research and public health*, 18(9), p.4491.
- [2]. Ahlbom, A., 2017. *Biostatistics for epidemiologists*. CRC Press.
- [3]. Alimohamadi, Y., Sepandi, M., Teymouri, T. and Hosamirudisari, H., 2021. *Journal of Biostatistics and Epidemiology*.
- [4]. Brickley, D.B. and Lindan, C.P., 2018. AIDS prevention research: training and mentoring the next generation of investigators from low-and middle-income countries. *AIDS and Behavior*, 22(1), pp.1-3.
- [5]. Cataldo, R., Arancibia, M., Stojanova, J. and Papuzinski, C., 2019. General concepts in biostatistics and clinical epidemiology: Observational studies with cross-sectional and ecological designs. *Medway*, 19(8), p.e7698.
- [6]. Cataldo, R., Arancibia, M., Stojanova, J. and Papuzinski, C., 2019. General concepts in biostatistics and clinical epidemiology: Observational studies with cross-sectional and ecological designs. *Medwave*, 19(08).
- [7]. Daniel, W.W. and Cross, C.L., 2018. *Biostatistics : a foundation for analysis in the health sciences*. Wiley.
- [8]. Fortuna, D., Hooper, D.C., Roberts, A.L., Harshyne, L.A., Nagurney, M. and Curtis, M.T., 2018. Potential role of CSF cytokine profiles in discriminating infectious from non-infectious CNS disorders. *PLoS One*, 13(10), p.e0205501.
- [9]. Goldstein, N.D., LeVasseur, M.T. and McClure, L.A., 2020. On the convergence of epidemiology, biostatistics , and data science. *Harvard Data Sci Rev*.
- [10]. Grobbee, D.E. and Hoes, A.W., 2014. *Clinical epidemiology: principles, methods, and applications for clinical research*. Jones & Bartlett Publishers.
- [11]. Hazra, A. and Gogtay, N., 2017. Biostatistics series module 8: Assessing risk. *Indian Journal of Dermatology*, 62(2), p.123.
- [12]. Heath, A., Manolopoulou, I. and Baio, G., 2016. Estimating the expected value of partial perfect information in health economic evaluations using integrated nested Laplace approximation. *Statistics in medicine*, 35(23), pp.4264-4280.
- [13]. Kandula, S., Yamana, T., Pei, S., Yang, W., Morita, H. and Shaman, J., 2018. Evaluation of mechanistic and statistical methods in forecasting influenza-like illness. *Journal of The Royal Society Interface*, 15(144), p.20180174.
- [14]. Luque-Fernández, M.Á. and Negro Calduch, E., 2020. Education in public health, epidemiology and biostatistics in Spain from a global and comparative perspective. *Gaceta Sanitaria*, 33, pp.502-503.

- [15]. Martínez, D., Papuzinski, C., Stojanova, J. and Arancibia, M., 2019. General concepts in biostatistics and clinical epidemiology: observational studies with case-control design. *Medwave*, 19(10), p.e7716.
- [16]. Massage, E., Mohamud, M., Almutairi, M., Alsunaidi, A., Alswayed, A.K. and Aldhafeeri, O.F., 2021. Trends in the usage of statistical software and their associated study designs in health sciences research: a bibliometric analysis. *Cureus*, 13(1).
- [17]. Mazumdar, M., Moshier, E.L., Özbek, U. and Parsons, R., 2018. Ten essential practices for developing or reforming a biostatistics core for a NCI designated cancer center. *JNCI cancer spectrum*, 2(1), p.pky010.
- [18]. Milic, N., Masic, S., Bjegovic-Mikanovic, V., Trajkovic, G., Marinkovic, J., Milin-Lazovic, J., Bukumiric, Z., Savic, M., Cirkovic, A., Gajic, M. and Stanisavljevic, D., 2018. Blended learning is an effective strategy for acquiring competence in public health biostatistics. *International journal of public health*, 63(3), pp.421-428.
- [19]. Milic, N., Masic, S., Bjegovic-Mikanovic, V., Trajkovic, G., Marinkovic, J., Milin-Lazovic, J., Bukumiric, Z., Savic, M., Cirkovic, A., Gajic, M. and Stanisavljevic, D., 2018. Blended learning is an effective strategy for acquiring competence in public health biostatistics. *International journal of public health*, 63(3), pp.421-428.
- [20]. Mooney, S.J. and Pejaver, V., 2018. Big data in public health: terminology, machine learning, and privacy. *Annual review of public health*, 39, p.95.
- [21]. O'Brien, K.K., Brown, D.A., Corbett, C., Flanagan, N., Solomon, P., Vera, J.H., Aubry, R. and Harding, R., 2020. AIDSImpact special issue—broadening the lens: recommendations from rehabilitation in chronic disease to advance healthy ageing with HIV. *AIDS care*, 32(sup2), pp.65-73.
- [22]. Sedrak, M.S., Li, D., Walter, L.C., Mustian, K., High, K.P., Canin, B., Mohile, S.G., Dale, W. and Sun, C.L., 2020. Cores for geriatric oncology infrastructure in the Cancer and Aging Research Group: Biostatistics, epidemiology, and research design (the analytics core). *Journal of geriatric oncology*, 11(2), pp.355-358.
- [23]. Shortreed, S.M., Cook, A.J., Coley, R.Y., Bobb, J.F. and Nelson, J.C., 2019. Challenges and opportunities for using big health care data to advance medical science and public health. *American journal of epidemiology*, 188(5), pp.851-861.
- [24]. Suárez, E.L., Pérez, C.M., Noguera, G.M. and Moreno-Gorrín, C., 2016. *Biostatistics in Public Health Using STATA*. CRC Press.
- [25]. Sullivan, L.M., 2017. *Essentials of biostatistics in public health*. Jones & Bartlett Learning.
- [26]. Villeneuve, P.J., Paradis, G. and Muhajarine, N., 2020. Always better together: the Canadian Journal of Public Health and the Canadian Society for Epidemiology and Biostatistics. *Canadian Journal of Public Health*, 111(3), pp.305-307.
- [27]. Wang, M.Q., Yan, A.F. and Katz, R.V., 2018. Researcher requests for inappropriate analysis and reporting: a US survey of consulting biostatisticians. *Annals of internal medicine*, 169(8), pp.554-558.
- [28]. Yu, C., Choi, D., Bruno, B.A., Thorpe, K.E., Straus, S.E., Cantarutti, P., Chu, K., Frydrych, P., Hoang-Kim, A., Ivers, N. and Kaplan, D., 2020. Impact of MyDiabetesPlan, a web-based patient decision aid on decisional conflict, diabetes distress, quality of life, and chronic illness care in patients with diabetes: cluster randomisedrandomised controlled trial. *Journal of medical Internet research*, 22(9), p.e16984.