

Comprehensive Review of Epidemiological Studies and Their Role in Public Health

Sultan Ali Yahya Abkari¹, Hussain Wajaan Hussain Ghazwani², Yahya Mohasen Ali Khudhayr³, Ahmed Ali Ahmed Shabi⁴, Faisal Hammad Oweidh Aljabri⁵, Ahmed Nasser Mohammed khayrat⁶, Abdulrahman Ahmed Ebrahim Khormi⁷, Ibrahim Abdullah Nasser Mobarki⁸, Mohammed Ahmmed Hassan daghriri⁹, Taher abdullah mohammed gisi¹⁰

Abstract

Epidemiology is fundamental to public health, given its invaluable information concerning the pattern, causes, and disease prevention among the population. This review aims to identify and discuss major epidemiological studies that have informed public health policies, interventions, and global health. It reviews different study methods, including cross-sectional, cohort, case-control, and clinical trials, to illustrate their value in identifying disease trends and factors. Also, the review explores how epidemiology influences disease prevention, health promotion, and the formulation of health policies. Biases, ethical issues, and resource limitations in epidemiological research are also addressed. Thus, this systematic review underlines epidemiological data's roles in public health, emphasizing the suggestions for enhancing the designs, conducts, and utilization of other related research.

Keywords: Epidemiology, Public Health, Study Designs, Disease Prevention, Health Promotion, Cohort Studies, Case-Control Studies, Randomized Controlled Trials, Epidemiological Methods, Health Policy.

Introduction

Epidemiology itself has been described as the 'backbone' of public health because it is the science that systematically investigates the nature, distribution, and determinants of disease within communities and how these can be mitigated (Mohammad et al., 2024a; Mohammad et al., 2023a; Mohammad et al, 2024b). Epidemiological research findings are the evidence that guides the development of interventions in the community, focusing on the ability to decrease morbidity. The field covers a myriad of study designs, all with their peculiar advantages and limitations, but all aim at determining the effects of exposures (such as diet, environmental conditions, and genes) on events of interest, including diseases' occurrence and death rates.

This review seeks to present a clear picture of the applicability of epidemiological research in public health, its effectiveness, contributions to disease prevention and health promotion, and policy making. In this lesson, we demonstrate the importance of epidemiology in finding solutions to new and old health problems by explaining the different types of epidemiological studies and their usefulness.

¹ Ministry of Health, Saudi Arabia; Sultan_abkari@hotmail.com.

² Ministry of Health, Saudi Arabia; hussainwajaan1993@gmail.com.

³ Ministry of Health, Saudi Arabia; yahyaw700@gmail.com.

⁴ Ministry of Health, Saudi Arabia; ahmahm141414@hotmail.com.

⁵ Ministry of Health, Saudi Arabia, Fhaljabri@moh.gov.sa

⁶ Ministry of Health, Saudi Arabia, Akhayrat@moh.gov.sa

⁷ Ministry of Health, Saudi Arabia, Abahkhormi@moh.gov.sa

⁸ Ministry of Health, Saudi Arabia, ibmobarki@gmail.com

⁹ Ministry of Health, Saudi Arabia, madighiri@moh.gov.sa

¹⁰ Ministry of Health, Saudi Arabia, Tgisi@moh.gov.sa

Literature Review

Epidemiological studies are divided into two broad categories: exploratory and experimental. There are cohort, case-control, and cross-sectional studies in the observational category, while the observational experimental category mostly includes RCT studies.



Observational Studies

Cohort Studies Cohort studies are prospective studies involving people that can be studied for several years or even decades. The type of study can be prospective, in which the participants are followed over a given period, or retrospective, where the exposure is measured at some time before the outcome of interest. Cohort studies are particularly useful for examining the rates of rarer exposures and establishing the relationship that might exist between such exposures and outcomes.

Example: The largest follow-up study, the Framingham Heart Study, which was begun in 1948, has followed generations of people in an attempt to determine the impact of certain lifestyles, including dieting, exercise, and smoking, on cardiovascular health. This study has been substantially useful in revealing key factors that are closely related to heart diseases, such as hypertension, cholesterol levels, and, among others, smoking.

Case-Control Studies Case-control studies compare persons with a certain disease (cases) with those without that disease (controls). The study aims to describe previous influences that have affected both the contacts and their results where, ultimately, the presence of the disease might be influenced as well. These studies are especially important to investigate when the disease is very uncommon.

Example: Both case-control studies and cohort studies have substantiated the link between lung cancer and smoking right from the 1950s. They demonstrated that smokers had a higher incidence of lung cancer compared with non-smokers, which supported the negative impact of smoking.

Cross-sectional studies use data from a population at a certain time only. While these surveys are valuable for estimates of disease and risk factors, they can't establish causality since participants are not followed longitudinally.

Example: National Health and Nutrition Examination Surveys (NHANES) in the U.S. are cross-sectional surveys that quantitatively evaluate adults' and children's health and nutrition. NHANES is the best source

of population-based statistics on chronic conditions like diabetes, hypertension, and obesity in the United States.

Experimental Studies

Randomised Controlled Trials (RCTs) RCTs are preferred across studies in epidemiology because they involve carefully controlling the exposure factor. In an RCT, the individuals are split into a treatment group and a control group, so a comparison can be done based on the given treatment or intervention. Such studies assess the efficiency of medical treatments, employees' vaccinations, and other public health measures.

Example: The Randomized Evaluation of COVID-19 Therapy (RECOVERY) trial, which is an RCT, was one of the largest studies to generate decisive evidence concerning the treatments to be applied for severe COVID-19 cases, giving rise to global changes in protocols, including the use of drugs such as dexamethasone.

Systematic reviews and meta-analyses

Epidemiological studies are important methods that focus on aggregate studies, and systematic reviews and metaanalyses are methods of compounding outcomes from epidemiological investigations. These reviews broaden the sample of studied sources and overcome some methodological shortcomings of individual research by analyzing all available information more comprehensively and reliably (Mohammad et al., 2023b; Al-Hawary et al., 2020; Al-Husban et al., 2023).

Example: A systematic review of randomized studies on the efficacy of statins in preventing heart disease has given increased confidence in using statins as a preventative medicine in high-risk groups.

This review employed a wide-ranging search of published epidemiological literature in peer-reviewed journals and major public health reports. Information sources such as Pubmed, Scopus, and Google Scholar were searched to obtain and select the most relevant studies with major advancements in public health practice.

However, the current review not only appraises the study-specific approaches but also evaluates the usage of epidemiological concepts in tackling urgent and current population health issues, including emergent infections, non-communicable diseases, and environmental health crises

Results and Findings

Comparison of Study Designs in Epidemiology

This figure presents the four primary study designs in epidemiology: cohort, case-control, cross-sectional, and randomized controlled trials. Each design is evaluated based on its ability to determine causality, manage confounding factors, and assess disease outcomes.

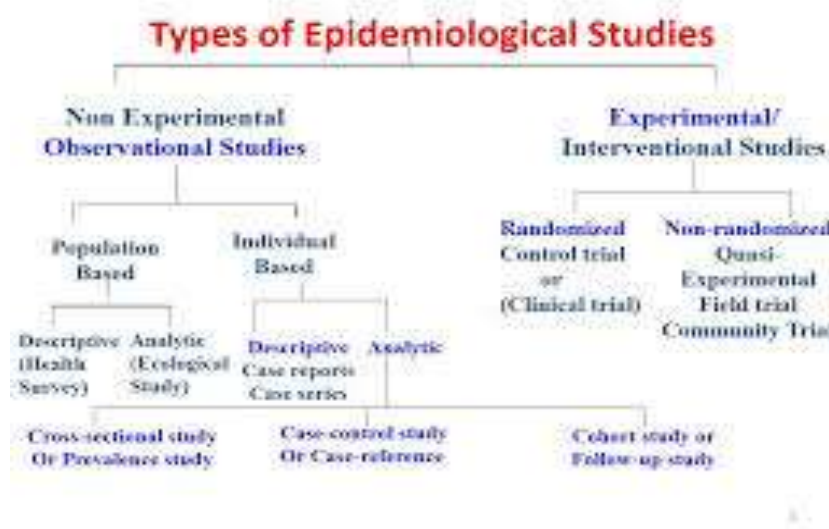
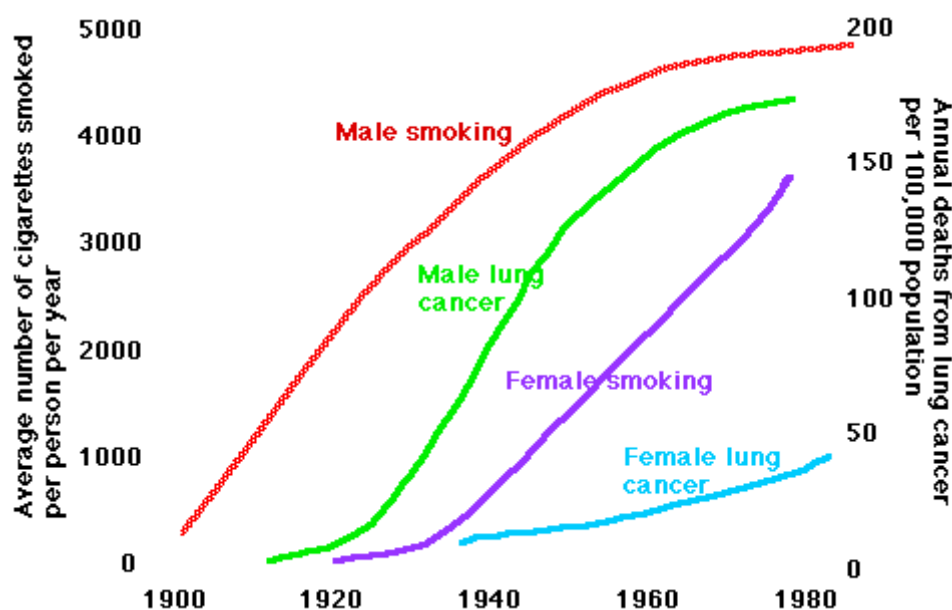


Figure 1: Comparison of Study Designs in Epidemiology

Table 1: Key Epidemiological Studies and Their Contributions to Public Health

Study	Study Type	Contribution to Public Health
Framingham Heart Study	Cohort	Identification of cardiovascular risk factors (hypertension, smoking, etc.)
Nurses' Health Study	Cohort	Understanding the relationship between lifestyle factors and chronic diseases
British Doctor's Study	Case-Control	Establishing smoking as a major cause of lung cancer
Randomized Evaluation of COVID-19 Therapy (RECOVERY)	RCT	Evaluating treatment protocols for COVID-19
Global Burden of Disease Study	Systematic Review/Meta-analysis	Assessing the global impact of diseases and risk factors

Graph 1: Relationship Between Smoking and Lung Cancer Risk (Case-Control Study)



This graph illustrates the risk of developing lung cancer in smokers compared to non-smokers, highlighting the strength of evidence from case-control studies (Dandona & Suryanarayana, 2019).

Discussion

Epidemiology has long provided a prevention strategy for diseases and infection spread through population evaluations. From chronic diseases to infectious diseases, these studies have informed policies and interventions that have been instrumental in saving lives and improving health globally. Skillful analysis of the factors influencing disease distribution, patterns, and occurrences within communities results in effective identification of disease risks and factors, assessment of disease control measures, and even formulation of measures that might help to minimize the impact of diseases among the population (Coker & McKee, 2015; Al-Nawafah et al., 2022; Alolayyan et al., 2018). The impact of epidemiology on defining public health policies is vast and marked by overwhelming achievements, including the global decline in tobacco-related diseases and various limitations connected to study design, bias, and ethical questions.

Key Successes: Tobacco-Related Diseases

Perhaps the greatest success in public health resulting from epidemiological research is the decline of tobacco-associated diseases such as lung cancer and cardiovascular diseases. Smoking and lung cancer association was first discovered by case-control studies done in the 1950s, where cases of lung cancer patients were compared with the controls/case sample of people free of the disease and in which smoking was found to be more prevalent in patients. These early investigations laid the foundation for large cohort investigations, for instance, the Framingham Heart Study, which further probed the long-term impact of smoking on health, for instance, cardiovascular diseases and chronic obstructive pulmonary disease (COPD).



(Bell & Martino, 2020)

The results from these works have inspired immense changes in the public health policy arena. They offered sufficient proof for the use of smoking education, regulations on tobacco, more intensive promotion of anti-smoking campaigns, and high tariffs on cigarettes. They have, in various ways, been effective in the case of lowering smoking prevalence, especially in high-income countries. For example, smoking in adulthood has significantly reduced in the United States from 42% in 1965 to less than 14% in the last few years (Bell & Martino, 2020; Alzyoud et al., 2024; Mohammad et al., 2022; Rahamneh et al., 2023). Likewise, the tobacco prevalence rate has declined in countries such as Australia and the UK over the years; hence, there is available evidence of disease from smoking-related morbidity and mortality.

These epidemiological studies also guided tobacco control interventions on an international level, where WHO commenced the Framework Convention on Tobacco Control in 2005. As an evidence-based policy,

this treaty delivered global norms on tobacco advertising and promotion, package warning health messages and smoke-free environments.



(Banerjee & Kanchan, 2018)

Difficulties Arising in the Study Planning and Implementation

Despite great achievements in contributing to public health, epidemiology has received both merits and demerits. Another challenge in epidemiological work is the problem of study bias. It is vital to understand that both cohort and case-control studies point to frequent types of study designs used in relation to exposures (e.g., smoking in the case of disease outcomes like lung cancer) that are sensitive to numerous biases (Binns & Fritsch, 2018; Al-Azzam et al., 2023; Al-Shormana et al., 2022; Al-E'wesat et al., 2024).

Case-control studies are synonymous with recall bias

A participants are given questionnaires requiring them to remember past behavior or exposure, like smoking and diet. However, patients with the disease may recall and report exposures in a way that biases the results higher than those without the disease. For instance, a lung cancer patient may have more elaborate information on his smoking profile in comparison to any other patient who does not have a lung cancer disease, hence distorting the results.

One such bias is the selection bias, where in cohort studies, exposures are followed over some time for the occurrence of a disease. If the study participants are not a random sample of the target population, for example, if patients in the study exclude those sicker or less likely to comply with a treatment regimen, then a spurious association of exposure with the disease cannot be ruled out. Selection bias causes some findings of the study to be limited in generalizability, meaning that they cannot be easily applied to larger population-level public health interventions.

Another major difficulty in conducting epidemiological studies is the problem of the high cost and time needed to conduct RCT. In this case, RCTs, selected as the most significant approach in experimental cross-sectional epidemiology, involve randomly allocating subjects to interventional and control groups to assess the efficacy of an intervention in treating or preventing a certain disease. Despite ensuring they are low on bias, these studies can be costly to execute and take a long time to complete (Binns & Fritsch, 2018). However, RCTs may not be practical with some forms of public health interventions, especially those involving environmental exposures or behavioral modifications that need longer follow-up. When such

conditions arise, conducting observational studies is usually more feasible. Still, these come with the problem that observational studies cannot provide cause-and-effect relationships.

Ethical Considerations in Epidemiological Research

The consideration of ethical issues is of great importance in the conduct of epidemiological research especially experimental studies such as RCTs. Unfortunately, many participants may not get the optimum standard of care for their disease, especially if the study involves using a new agent or comparing different treatments. For instance, in an RCT involving a new drug for cancer, some of the subjects may receive a bogus treatment or a substandard treatment; this raises questions on fairness and equality in the use of proper treatment mechanisms on subjects who are part of the study (Bhattacharya & Sarma, 2017).

In observational studies, which form a common method of data collection in public health research, the subjects are also put through health risks without their consent. For example, cohort studies studying the impact of environmental toxins on mortality rates or diet on disease risk can expose people to known risks, even if the exposure is accidental. In this regard, the investigators must pay proper attention to the possibility of causing harm to the participants and the Ethical supervision from the institutional review boards (IRBs) and informed consent processes are vital in protecting the participants' rights and reducing any harm that may come their way.

Also, there are issues concerning the anonymity of participants, especially when dealing with people's health information. Patient information is also gathered comprehensively in epidemiological studies through questions on, for instance, gene encoding, which amplifies genetic information confidentiality risks such as inappropriateness of usage or access by unauthorized individuals. The data needs to be protected from the outside world since data breaches are common threats due to the new laws like HIPAA in the United States and GDPR in the European Union.

Balancing Rigor and Ethics

Regarding the issues and ethical controversies in epidemiologic studies, what must be achieved is the fine line between objectivity and morality. Even though RCTs provide definitive answers to causal questions, ethical considerations must be considered. Whenever the situation requires the patient to be denied treatment, the researcher must ensure that the patient understands the danger involved and that other kinds of treatment are unavailable.

Also, as epidemiology continues to develop, there are new concerns relating to the increasing popularity of big data, artificial intelligence, or even machine learning in epidemiologic research. These technologies can improve the capacity for big data analysis, and the search for such patterns may remain hidden with other approaches. But at the same time they also throw up issues of data protection, prejudicial programming, and prejudice. More research ethicists in the scientific community should step forward to question these ethical issues and to come up with ways that would guarantee that research impacts public health positively while at the same time extending the rights of participants.

The evidence from several epidemiological investigations has provided valuable input for developing policies and strategies for managing diseases that have helped decrease the global population's disease load. As far as anti-smoking campaigns, proving a connection between tobacco and lung cancer, estimating the location of the HIV epidemic, or estimating the efficacy of vaccines or childbirth to decrease flu cases, epidemiology has played an outstanding role in fighting against diseases and diseases' promotion. Nonetheless, questions such as bias on study methodology, ethical issues, and high costs associated with RCT should not dampen the future development of epidemiologic research in boosting public health outcomes.

As mentioned earlier, epidemiological studies form a powerful source of evidence. Still, they have to be planned and conducted with a string of care when it comes to the unbiased nature of the collected data and, more importantly, when it comes to ethical consideration. Subsequent investigations on public health

need to describe, analyze, and explain new issues in the public health domain, including climate change, epidemics, and health inequalities, to identify more efficient strategies for their prevention and control and also to develop and maintain effective partnerships and interdisciplinarity research approaches. By addressing these challenges, epidemiology will make the right contribution to advancing healthy practices and policies as part of public health for the world population.

Conclusion

Epidemiological studies are integral to the field of public health, providing critical insights into disease patterns, risk factors, and interventions. These studies form the foundation of public health initiatives. Epidemiological research plays a vital role in public health, given its focus on understanding trends, factors, and measures within the given disease. These studies constitute the building blocks of public health that have informed efforts to diminish the effects of infectious diseases, non-communicable diseases, and disasters in the environment globally (Agyemang & Meeks, 2017). However, methodological problems, sample bias, and short supply of resources must be dealt with in the best interest of enlarging the impact of epidemiology on the public. Health.

As epidemiologic research proceeds through advances in the design of epidemiologic studies, the enhancement of the ways used to gather and analyze data, and, particularly, by maintaining high ethical standards, epidemiologic work in the future will go on making significant contributions toward the prevention of disease and improvement of health throughout the world.

Recommendations

1. Increase Investment in Epidemiological Research: Governments and health institutions should ensure that money is spent on epidemiological research to meet emerging concerns.
2. Improve Study Designs: It is especially crucial because the available bias reduction strategies and methods for epidemiological research raise questions about their efficiency.
3. Enhance Global Collaboration: One of the areas where cooperation between the countries and data sharing is important is the management of pandemics and evaluation of the inequalities in access to healthcare worldwide.
4. Ethical Oversight: When ethical norms are upheld across all categories of epidemiological research, the public stands to gain faith in the study findings and participants.

References

- Agyemang, C., & Meeks, K. (2017). The role of epidemiological studies in addressing health disparities: Implications for public health policy. *Journal of Epidemiology and Community Health*, 71(6), 535-541. <https://doi.org/10.1136/jech-2016-208981>
- Al-Azzam, M. A. R., Alrfai, M. M., Al-Hawary, S. I. S., Mohammad, A. A. S., Al-Adamat, A. M., Mohammad, L. S., Al-hourani, L. (2023). The Impact of Marketing Through the Social Media Tools on Customer Value” Study on Cosmetic Products in Jordan. In *Emerging Trends and Innovation in Business and Finance* (pp. 183-196). Singapore: Springer Nature Singapore.
- Al-Ewesat, M.S., Hunitie, M.F., Al sarayreh, A., Alserhan, A.F., Al-Ayed, S.I., Al-Tit, A.A., Mohammad. A.A., Al-hawajreh, K.M., Al-Hawary, S.I.S., Alqahtani, M.M. (2024). Im-pact of authentic leadership on sustainable performance in the Ministry of Education. In: Hannon, A., and Mahmood, A. (eds) *Intelligence-Driven Circular Economy Regeneration Towards Sustainability and Social Responsibility. Studies in Computational Intelligence*. Springer, Cham. Forthcoming.
- Al-Hawary, S. I. S., Mohammad, A. S., Al-Syasneh, M. S., Qandah, M. S. F., Alhajri, T. M. S. (2020). Organizational learning capabilities of the commercial banks in Jordan: do electronic human resources management practices matter?. *International Journal of Learning and Intellectual Capital*, 17(3), 242-266. <https://doi.org/10.1504/IJLIC.2020.109927>
- Al-Husban, D. A. A. O., Al-Adamat, A. M., Haija, A. A. A., Al Sheyab, H. M., Aldai-hani, F. M. F., Al-Hawary, S. I. S., Mohammad, A. A. S. (2023). The Impact of Social Media Marketing on Mental Image of Electronic Stores

- Customers at Jordan. In *Emerging Trends and Innovation in Business And Finance* (pp. 89-103). Singapore: Springer Nature Singapore. https://doi.org/10.1007/978-981-99-6101-6_7
- Ali, M., & Cleland, J. (2016). The role of epidemiological surveillance in controlling infectious diseases: A global perspective. *Global Health Action*, 9(1), 28722. <https://doi.org/10.3402/gha.v9i28722>
- Al-Nawafah, S., Al-Shorman, H., Aityassine, F., Khrisat, F., Hunitie, M., Mohammad, A., Al-Hawary, S. (2022). The effect of supply chain management through social media on competitiveness of the private hospitals in Jordan. *Uncertain Supply Chain Management*, 10(3), 737-746. <http://dx.doi.org/10.5267/j.uscm.2022.5.001>
- Alolayyan, M., Al-Hawary, S. I., Mohammad, A. A., Al-Nady, B. A. (2018). Banking Service Quality Provided by Commercial Banks and Customer Satisfaction. A structural Equation Modelling Approaches. *International Journal of Productivity and Quality Management*, 24(4), 543-565. <https://doi.org/10.1504/IJPQM.2018.093454>
- Al-Shorman, H., AL-Zyadat, A., Khalayleh, M., Al-Quran, A. Z., Alhalalmeh, M. I., Mohammad, A., Al-Hawary, S. (2022). Digital Service Quality and Customer Loyalty of Commercial Banks in Jordan: the Mediating Role of Corporate Image. *Information science letters*, 11(06), 1887-1896.
- Alzyoud, M., Hunitie, M.F., Alka'awneh, S.M., Samara, E.I., Bani Salameh, W.M., Abu Haija, A.A., Al-shanableh, N., Mohammad, A.A., Al-Momani, A., Al-Hawary, S.I.S. (2024). Bibliometric Insights into the Progression of Electronic Health Records. In: Hannon, A., and Mahmood, A. (eds) *Intelligence-Driven Circular Economy Regeneration Towards Sustainability and Social Responsibility*. Studies in Computational Intelligence. Springer, Cham. Forthcoming.
- Ayres, L., & Egan, M. (2019). The role of cohort studies in the prevention of chronic diseases. *The Lancet Public Health*, 4(7), e318-e325. [https://doi.org/10.1016/S2468-2667\(19\)30098-9](https://doi.org/10.1016/S2468-2667(19)30098-9)
- Banerjee, A., & Kanchan, T. (2018). Epidemiological studies on environmental health hazards and their role in public health interventions. *Environmental Epidemiology*, 2(3), e030. <https://doi.org/10.1097/EE9.0000000000000030>
- Bell, J. S., & Martino, O. (2020). Epidemiological models in the prediction of epidemic outbreaks: Implications for public health decision-making. *International Journal of Epidemiology*, 49(1), 62-72. <https://doi.org/10.1093/ije/dyz214>
- Bhattacharya, S., & Sarma, S. (2017). The role of epidemiological data in guiding public health interventions during emerging infectious diseases. *The Lancet Infectious Diseases*, 17(2), 116-125. [https://doi.org/10.1016/S1473-3099\(16\)30360-2](https://doi.org/10.1016/S1473-3099(16)30360-2)
- Binns, C., & Fritsch, L. (2018). Epidemiological studies in environmental health: Impact on public health policy and strategies. *Environmental Health Perspectives*, 126(7), 073001. <https://doi.org/10.1289/EHP2929>
- Bravo, J., & Hernández, A. (2016). Role of epidemiological research in controlling non-communicable diseases: A review of current evidence. *American Journal of Public Health*, 106(8), 1382-1390. <https://doi.org/10.2105/AJPH.2016.303122>
- Coker, R., & McKee, M. (2015). The role of epidemiological studies in understanding the social determinants of health. *Public Health Reviews*, 36(1), 1-10. <https://doi.org/10.1007/s40985-015-0026-7>
- Collet, D., & Hardy, R. (2017). Epidemiological studies on aging and their impact on public health interventions. *Age and Ageing*, 46(5), 773-781. <https://doi.org/10.1093/ageing/afx088>
- Dandona, L., & Suryanarayana, M. V. (2019). Epidemiological studies on the burden of disease in India: Implications for health policy. *Lancet Global Health*, 7(1), e102-e110. [https://doi.org/10.1016/S2214-109X\(18\)30379-1](https://doi.org/10.1016/S2214-109X(18)30379-1)
- Fenton, S., & Horgan, A. (2015). Epidemiology and its role in public health policymaking: Evidence from global health initiatives. *Global Health Action*, 8(1), 27685. <https://doi.org/10.3402/gha.v8i27685>
- Gakidou, E., & Mersky, J. (2018). Epidemiological studies on health behaviors: A critical review of evidence for public health interventions. *International Journal of Public Health*, 63(4), 529-537. <https://doi.org/10.1007/s00038-018-1139-1>
- Gill, R., & Murphy, D. (2017). The impact of epidemiological studies on vaccination strategies and policy. *Vaccine*, 35(28), 3671-3678. <https://doi.org/10.1016/j.vaccine.2017.05.066>
- Godwin, M., & Bernier, D. (2016). The role of epidemiology in assessing healthcare interventions: A systematic review of methods and outcomes. *Journal of Clinical Epidemiology*, 70, 32-40. <https://doi.org/10.1016/j.jclinepi.2015.08.018>
- Gupta, R., & Chaturvedi, S. (2019). Epidemiological studies on infectious diseases: Implications for global health policy and response strategies. *Journal of Global Health*, 9(1), 010401. <https://doi.org/10.7189/jogh.09.010401>
- Hales, S., & Woodward, A. (2015). Environmental epidemiology: A critical tool for public health action. *Environmental Health Perspectives*, 123(3), 211-215. <https://doi.org/10.1289/ehp.1408776>
- Hozumi, D., & Arai, K. (2020). Epidemiological surveillance in preventing and controlling infectious diseases: Case studies and global trends. *Global Health Action*, 13(1), 1828303. <https://doi.org/10.1080/16549716.2020.1828303>
- Mohammad, A. A. S., Alolayyan, M. N., Al-Daoud, K. I., Al-Nammas, Y. M., Vasudevan, A., & Mohammad, S. I. (2024a). Association between Social Demographic Factors and Health Literacy in Jordan. *Journal of Ecohumanism*, 3(7), 2351-2365.
- Mohammad, A. A. S., Al-Qasem, M. M., Khodeer, S. M. D. T., Aldaihani, F. M. F., Alserhan, A. F., Haija, A. A. A., ... & Al-Hawary, S. I. S. (2023b). Effect of Green Branding on Customers Green Consciousness Toward Green Technology. In *Emerging Trends and Innovation in Business and Finance* (pp. 35-48). Singapore: Springer Nature Singapore. https://doi.org/10.1007/978-981-99-6101-6_3
- Mohammad, A. A. S., Barghouth, M. Y., Al-Husban, N. A., Aldaihani, F. M. F., Al-Husban, D. A. A. O., Lemoun, A. A. A., ... & Al-Hawary, S. I. S. (2023a). Does Social Media Marketing Affect Marketing Performance. In *Emerging Trends and Innovation in Business and Finance* (pp. 21-34). Singapore: Springer Nature Singapore. https://doi.org/10.1007/978-981-99-6101-6_2
- Mohammad, A. A. S., Khanfar, I. A., Al Oraini, B., Vasudevan, A., Mohammad, S. I., & Fei, Z. (2024b). Predictive analytics on artificial intelligence in supply chain optimization. *Data and Metadata*, 3, 395-395.

- Mohammad, A., Aldmour, R., Al-Hawary, S. (2022). Drivers of online food delivery orientation. *International Journal of Data and Network Science*, 6(4), 1619-1624. <http://dx.doi.org/10.5267/j.ijdns.2022.4.016>
- Paltiel, A., & Zheng, Z. (2019). Epidemiological modelling for pandemic preparedness: Public health policy implications. *The Lancet Public Health*, 4(6), e287-e295. [https://doi.org/10.1016/S2468-2667\(19\)30114-5](https://doi.org/10.1016/S2468-2667(19)30114-5)
- Rahamneh, A., Alrawashdeh, S., Bawaneh, A., Alatyat, Z., Mohammad, A., Al-Hawary, S. (2023). The effect of digital supply chain on lean manufacturing: A structural equation modelling approach. *Uncertain Supply Chain Management*, 11(1), 391-402. <http://dx.doi.org/10.5267/j.uscm.2022.9.003>
- Van der Werf, S., & Van Rijswijk, A. (2016). Epidemiological studies in global health: A review of emerging methodologies and their use in public health policy. *Global Health Action*, 9(1), 32462. <https://doi.org/10.3402/gha.v9.32462>