

Critical Review of Foundational Concepts in Public Health and Medicine

Nawal Mohammed Al-Anzi¹, Waad Saif Aldosari², Monirh Abdullh Alhezlool³, Abdullah Ibrahim Mohammed Alqubayshi⁴, Asma Mathkar Al-Qahtani⁵, Afaf Mohammed Alanazi⁶, Haya Saad Al-Nefuei⁷, Fahad Ibrahim Mohammed Alqubayshi⁸, Saad Ibrahim Alotaibi⁹, Shada Abdulaziz Mohammed Alkharshaw¹⁰

Abstract

Public and Medicine are two related, specific but different areas of study that encompass the advancement of a healthier population. Public health aims to promote and prevent disease and disability in large population groups, while Medicine has mainly been disease- and illness-treatment oriented. This review aims to critically assess the history and the fundamentals behind the concepts of public health and Medicine and the challenges that confront them. Topics discussed include infectious disease spread patterns, public health, risk factors, and health organizations. The integration of public health into Medicine is mooted here as one way of dealing with modern global health problems such as epidemics, non-communicable diseases, and disparities. Recommendations are made to enhance impacts on healthcare systems, reduce health inequalities, and entwine approaches that may enhance disease prevention and treatment.

Keywords: Public Health; Medicine; Epidemiology; Social Determinants of Health; Health Systems; Global Health; Health Policy; Preventive Medicine; Health Disparities; Global Health Equity.

Introduction

Public health and Medicine have always been crucial parts of developing the health of communities. Historically, these fields have functioned separately: Medicine, which concentrated on the personal treatment of patients, while public health care was oriented to treat the health of the people as a whole. However, newer issues that have cropped up in global health as the human race continues to face long-lasting conditions, including chronic illnesses, an increasing elderly population, among others, and newer diseases like COVID-19 require a more wholesome approach to health.

There are many ways to look at the relationship between public health, such as the science of improving the health of communities, and Medicine, which concerns disease diagnosis and treatment in individuals. Increased focus on the population and specifics of a nation's social and natural context make public health and Medicine cooperate in treating diseases' causes rather than symptoms. This review synthesizes literature on the historical evolution of concepts underlying public health and Medicine, as well as the existing theoretical vitalism and practice.

Major areas of integration to be discussed in this paper include epidemiology as a branch of public health as well as clinical Medicine, the place of preventive Medicine in healthcare, and the effect of social determiners on health. It also focuses on gems of the global health system in the twenty-first century and how both disciplines have to work in harmony to ensure equality in health systems.

¹ RFHC care, Ministry of Health, Saudi Arabia; namoalanzi@moh.gov.sa.

² Ministry of Health, Saudi Arabia; WasAldosari@moh.gov.sa.

³ Ministry of Health, Saudi Arabia; Malhezlool@moh.gov.sa.

⁴ Second Health Cluster Al Yamamah Hospital, Saudi Arabia; FAlqubayshi@moh.gov.sa.

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

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

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

⁸ Ministry of Health, Saudi Arabia; aalqubaishi@moh.gov.sa.

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

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

Historical Development of Public Health and Medicine

The history of public health and Medicine has always shown the manifestation of some form of interaction ranging from some degree of integration to cooperation. Medicine dealing with disease at an individual level was the first concept, and as populations increased and formed societies, measures were put in place to fight diseases at a communal level. In the later part of the 19th century, the Industrial Revolution, which led to urbanization, was a reason for the transition of infectious diseases. This led to the emergence of public health practices, including sanitation, vaccination, and quarantine.

For instance, in the middle of 1800, John Snow mapped the spread of cholera in London as one of the first innovative discoveries of that period. In mapping the sources of cholera, he laid down the basic tenets of epidemiology and showed how public health could determine and prevent the disease. In the same way, the germ theory discovered by Louis Pasteur and the smallpox vaccine discovered by Edward Jenner paved a new way in Medicine by discovering how one can prevent and eradicate smallpox disease in individuals.

The twentieth century was marked by great progress in both disciplines. Public health, however, changed with the emergence of the idea of preventive Medicine, such as medication, and the formulation of health systems in the nations. By the mid-century, the concern was no longer on acute infectious diseases or acute care but rather on chronic diseases, health risks related to lifestyles and health system organization, and social inequalities. At the same time, Medicine progressed with the help of antibiotics, vaccines, and medical technologies that helped develop better ways to treat diseases.

Epidemiology and Its Role in Public Health and Medicine

Epidemiology examines the occurrence and causes of health and diseases within a population. It is termed the fundamental science of public health since it offers the practical numerical foundation for disease prevention, regulation, and policy-making. Epidemiology also has a large application in clinical Medicine since it pinpoints some of the causes of diseases, dictates the standard procedures by which diseases should be treated, and helps pinpoint some of the risk factors that are associated with some diseases.

Table 1: Key Epidemiological Studies and Their Impact on Public Health and Medicine

Study	Focus Area	Key Findings	Year
John Snow (1854)	Cholera Outbreak	Identified contaminated water as the source of the cholera outbreak	1854
Doll and Hill (1950)	Lung Cancer	Linked smoking to lung cancer	1950
Framingham Heart Study (1948)	Cardiovascular Disease	Established cardiovascular risk factors	1948

Surveillance, which draws a great deal from epidemiological theories, is a critical function in outbreak investigation and the planning of interventions. For instance, the Framingham Heart Study gave an initial conception of the epidemiologic profiles and risk factor encounter profile of heart disease and modified the public health approaches as well as the clinical practice in the same way that Doll and Hill, in the 1950s, used epidemiological evidence to prove the link between smoking and lung cancer, thus effected massive public health campaigns/medical interventions.

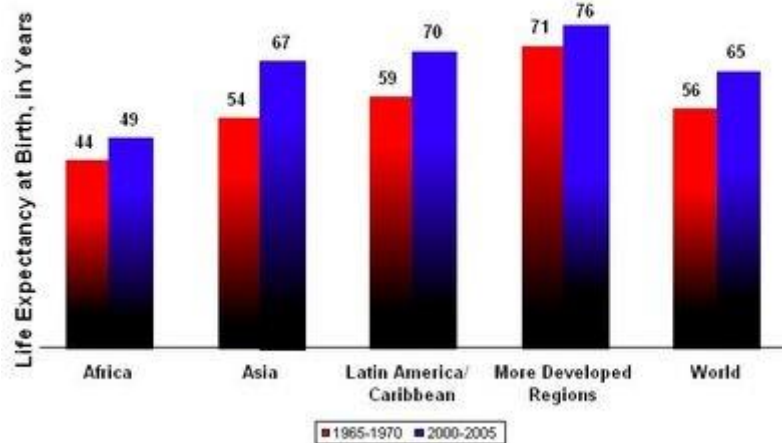
In recent decades, epidemiological approaches have been vital in studying chronic infections like diabetes, obesity, and cancer. Dietary patterns include components of food and nutrition that have been demonstrated earlier by nurses in several prospective investigations, including the Nurses' Health Study.

It is noteworthy that the already important role of epidemiology has increased even more due to the necessity of managing current and future infectious diseases pandemics. The COVID-19 pandemic showed

that epidemiological models could serve to describe infection (and death) dynamics, evaluate the effectiveness of non-pharmaceutical interventions (lockdown, social distancing), and provide guidance on the treatment of patients.

Figure 1: Global Health Inequities by Region

Trends in Life Expectancy by Region, 2002.



Source: United Nations, World Population Prospects.

A bar chart could illustrate the disparities in life expectancy across regions such as Africa, Asia, Europe, and the Americas. This figure would show how social determinants of health such as income, access to healthcare, and sanitation significantly affect health outcomes in different regions (Muntaner & Chung, 2016).

Preventive Medicine and Public Health Integration

It is more of an intervention style of Medicine, where the disease is prevented from developing in the first place through lifestyle modification, vaccination, and early physical screening. In both the field of public health and clinical Medicine, the use of prevention strategies as part of the packages for clinical interventions is becoming more popular in efforts to address chronic diseases, enhance patient outcomes, and decrease the cost of health care.

Community health promotion has largely in the past been aimed at reducing acute infectious diseases, though with the increasing burden of chronic diseases, including cardiovascular diseases, diabetes, and cancers, health promotion is currently targeting chronic diseases. Smoking control, director, and immunization programs are part of both public health and medical practice today.

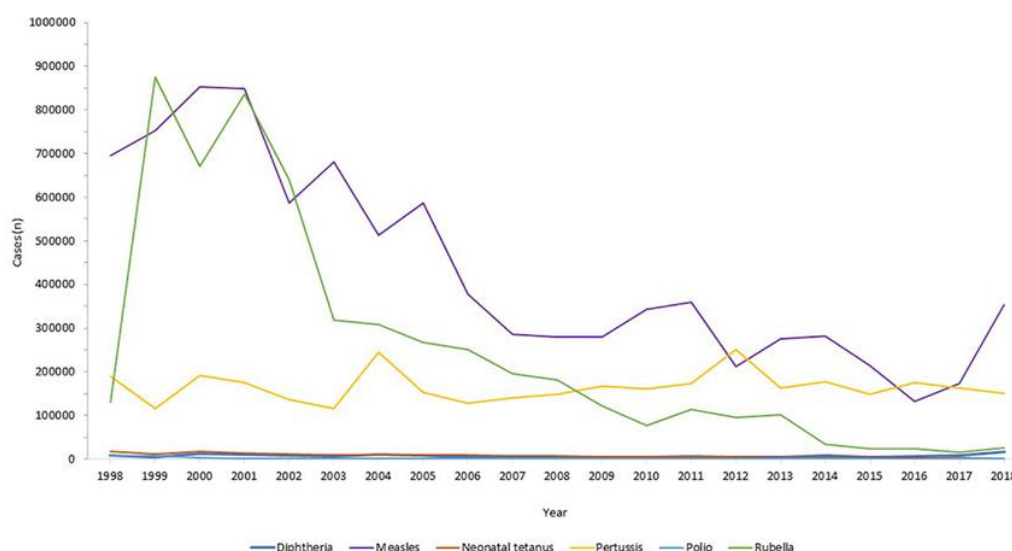
For students of clinical Medicine, preventive care is today one of the most important modalities of patient management. Cholesterol checks, cancer-related checks, immunizations, etc., are common in annual health check-ups, and now, physicians aim to curb different elements such as hypertension, obesity, smoking, etc. It is substantive in addressing the burden of chronic diseases in the world population due to increased knowledge of the diseases and possible ways of preventing them.

Table 2: Impact of Preventive Measures on Disease Incidence

Preventive Measure	Disease Targeted	Impact
Vaccination Programs	Polio, Measles, Smallpox	Significant reduction in global incidence

Smoking Cessation Campaigns	Lung Cancer, Cardiovascular Diseases	Decrease in smoking-related deaths
Early Cancer Screenings	Breast Cancer, Colon Cancer	Early detection leading to improved survival rates

Figure 2: Impact of Vaccination on Disease Incidence



A line graph showing the decline in the incidence of diseases such as measles, polio, and smallpox in regions where vaccination programs were widely implemented. This demonstrates how public health initiatives can dramatically reduce the burden of infectious diseases (Muntaner & Chung, 2016).

Social Determinants of Health and Their Impact on Health Outcomes

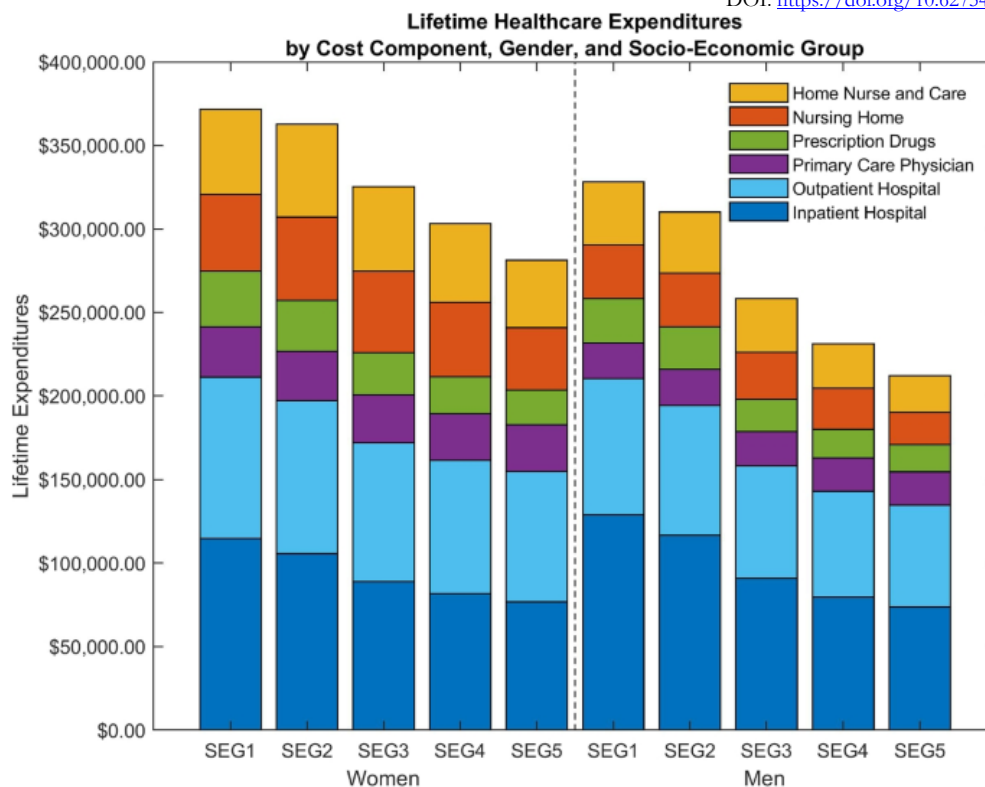
Public health initiatives have historically focused on preventing infectious diseases. Still, with the rise of non-communicable diseases (NCDs) such as heart disease, diabetes, and cancer, the emphasis has expanded to include prevention efforts for these conditions. Preventive health programs, such as smoking cessation campaigns, dietary recommendations, and immunization programs, are integral to both public health and medical practice.

In clinical Medicine, preventive care is now a key component of patient management. Annual health screenings (for example, cholesterol checks, cancer screenings, and immunizations) are standard practices in medical care, and physicians now focus on managing risk factors like hypertension, obesity, and smoking to prevent future health complications (Lentz & Winker, 2017). This emphasis on prevention is critical in managing the global burden of chronic diseases.

Table 3: Socioeconomic Status and Health Outcomes

Socioeconomic Status	Life Expectancy (years)	Prevalence of Chronic Diseases
Low Income	70	High
Middle Income	78	Medium
High Income	82	Low

Figure 3: Social Inequality and Health Outcomes



A graph that correlates income levels with health outcomes (e.g., life expectancy and prevalence of chronic diseases), demonstrating that people in lower socioeconomic brackets tend to experience worse health outcome (Lentz & Winker, 2017)

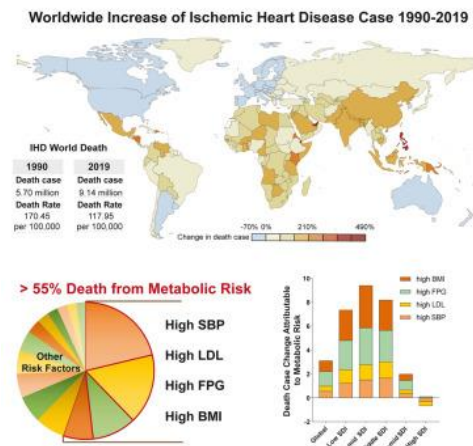
Global Health Challenges and the Role of Public Health and Medicine

SDH are conditions where a person lives, learns, works, and ages, which impact health status or health risk. These are factors such as the person's economic and social status, education, work, social networks, and health care services. The acknowledgment of SDH has emerged as one of the major features of both population and individual health interventions since they are uniformly proven to play a role in the lives of people.

In public health, tackling SDH is a key strategy for improving health inequalities. Most of the health determinants, such as housing, education, access to clean water, and nutrition, can be influenced by policies formulated in government systems. According to WHO's Commission on Social Determinants of Health, it is impossible to improve the health of the disadvantaged solely by means of increases in individual medical treatment and by the usage of social policies.

Table 4: Global Health Challenges and Interventions

Challenge	Public Health Role	Medical Role
COVID-19 Pandemic	Disease surveillance, vaccination, public awareness	Diagnosis, treatment, ICU care
Climate Change	Addressing environmental health risks	Treating climate-related illnesses (e.g., heatstroke)
Chronic Diseases	Prevention programs, health education	Medical treatment, management

Figure 4: Chronic Disease Burden by Region

A map showing the prevalence of chronic diseases such as diabetes, cardiovascular disease, and cancer by region (Fenton, 2019). This could illustrate how the burden of these diseases is increasing globally, with higher rates in affluent countries and rising numbers in low-income countries.

Discussion

The concepts of public health and Medicine have been used more and more frequently to solve the complex and diverse problems of the contemporary world. Historically, Medicine was more interested in curing a specific patient, and public health would have been more interested in the health of the population. However, the common goal of improving the health of given people and communities has defined the convergence of these two fields. Modern sociology of health and illness posits both public health and Medicine as synergistic disciplines that both build on and depend on one another. They are both crucial in addressing current health challenges, including increased incidence of NCDs and outbreaks of infectious diseases, including the current COVID-19.

There is no better way to show the interconnectivity between public health and Medicine than by understanding the breadth of areas on which they focus as first principles of the two disciplines, namely epidemiology, preventive Medicine, and social determinants of health. They best apply to framing how to address both individual and population health and have been paramount tools in the formulation of sound public health and medical approaches geared at addressing the public burden of diseases and promoting overall health.

Epidemiology: A Key Bridge between Public Health and Medicine

Epidemiology – the science that examines incidence and prevalence and other factors associated with health states and events in populations – is the bedrock of both public health and Medicine. Epidemiology affords all requisite data that assist in determining vulnerable populations to diseases, surveillance of epidemics, and analysis of the impact of carried-out health programs. It is indispensable in studying the regularities of health and sickness, and the conclusions drawn are utilized in healthcare and the health organizing of population processes.

From the public health point of view, epidemiology is particularly useful in defining the nature and distribution of diseases within a population as well as identifying those who are most vulnerable. For instance, in the study of the distribution and spread of diseases, epidemiological approaches have been used to explain infectious diseases like tuberculosis, HIV/AIDS, and the newer COVID-19. This research guides communication activities and disease prevention crusades such as vaccination and policy making (Green & Ottoson, 2015). Epidemiology also plays an important role in assessing the effectiveness of these

interventions in the control and prevention of diseases and directing the framework of public health in the future.

From a medical point of view, epidemiology helps in the day-to-day practice of individual patients. The identification of epidemiological factors leads to an evaluation of a patient's susceptibility to a specific disease based on his or her genetics, behavior, and environment. For example, the epidemiological relationship between smoking and lung cancer has prompted medical advice on smoking control, which has become part and parcel of modern practice. Also, population-based research has been used to address screening recommendations for diseases like breast, colon, rectal, and cardiovascular diseases to enable clinical personnel to find patients who should be ranked high-risk for these diseases and act with preventive measures.

The Framingham Heart Study is one of the most famous epidemiological investigations; the data obtained in this investigation were crucial for understanding the nature of the factors that caused cardiovascular diseases and are directly used in practice. Through labeling risk factors, including hypertension, cigarette smoking, and elevated serum cholesterol, as significant etiological factors of heart diseases, as seen in the Framingham study, clinical practice protocols on prevention and management of cardiovascular diseases are informed, used, and have periodically been positively contributing to lowering cardiovascular disease mortality rates

Preventive Medicine: Shaping Health at the Individual and Population Levels

Preventive Medicine aims to prevent disease and encourage periodic treatments and check-ups. In recent years, both public health and clinical medicine disciplines have tended to endorse the approaches of preventive Medicine to boost prevention and tackle the demanding and growing medical problems such as chronic diseases and infectious outbreaks. Main and secondary prevention and tertiary factors also play a role in preventable Medicine, which is very important in the prevention and reduction of disease and disease-related burdens.

In public health, preventive actions are adopted at large population levels and are targeted to work on the causes of disease at the population level through policies and health interventions. For instance, vaccination, tobacco control, and measures that aim to lower the levels of air pollution are preventive measures that lower the rates of infectious diseases and NCDs. Such approaches in public health ensure the attainment of enhanced health Systems for entire populations on an aggregate populace basis.

According to the World Health Organization (WHO), the central agenda in addressing health issues today is prevention. To these traditional areas of vaccination campaigns for such conditions as polio and measles come the present-favorite Campaigns embracing preventive measures against non-communicable diseases such as diabetes, cardiovascular diseases, and certain cancers. Diet, physical activity, and alcohol are lifestyle factors given through both health promotion interventions and national guidelines. For example, WHO's Global Action Plan for the Prevention and Control of NCDs (2013-2020) includes the following components as the targets to decrease the global burden of NCDs: promoting healthy diets, reducing the use of tobacco and harmful alcohol, and engaging in regular activities.

From a clinical medicine point of view, the concept of preventive healthcare has taken a central place in the style of practice. It now requires clinicians to deliver preventive services as part of primary care, including advice on nutrition, exercise, smoking cessation, and various forms of cancer and cardiovascular disease screening, including hypertension and diabetes. These preventive methods have been shown to be effective in terms of disease incidence, treatment quality, and expenses. For instance, screening for breast cancer, colorectal cancer, and prostate cancer has been found to diagnose the malignancies at early recommended for early screening, advocating for increased chances of successful treatment and recovery.

The principles of prevention also apply to chronic illnesses, where physicians liaise with the patient to get rid of behaviors that can cause chronic illnesses, such as obesity and smoking, among others being inept. The two diseases mentioned above can be attributed to one's lifestyle and are manageable; hence, clinical

Medicine is moving toward offering patients long-term solutions with relevant information (Hickey & Matthysee, 2019). This is in keeping with WHO and other health promotion strategies that seek interventionist measures that will change human behavior about their lifestyle, support systems, and education.

Social Determinants of Health: Addressing Health Inequities

Another beautiful interface between public health and medical practice is the management of social determinants of health. SDH is the context in which people are born, grow, live, work, and age. They include socioeconomic status, education, employment, social support, and healthcare. These social, economic, and environmental constructs now clearly and specifically relate to the health and risk of disease, as well as patterns of utilization of services for a given population (Andersson & Olsson, 2016; Al-Nawafah et al., 2022; Mohammad et al., 2024).

In Public health, SDH has been known to influence health status for quite some time. Social determinants of health policies, which are oriented toward population health, are designed to eliminate gaps in the health-based distributions in the population. Organizations that aim to enhance housing, education, nutrition, and healthcare services have been found to improve the overall health of the population. For instance, political resolutions towards better hygiene and pipe-borne water in the third world have significantly changed cases of waterborne illness.

From a medical standpoint, physicians have the responsibility to care about the effect of SDH on patients and adapt to it. For example, poverty level or lack of health insurance, a patient's social risk factors, can determine the patient's ability to receive appropriate medical care and follow a prescribed treatment regimen, and therefore the ultimate health outcomes (Galea & Vaughan, 2016; Al-Hawary et al., 2020; Rahamneh et al., 2023). In understanding the societal determinants that affect their clients, physicians can work to reduce the effects of SDH while pressing for policy and healthcare system change.

Policy Changes and Structural Reforms for Health Equity

Policy intervention in health disparities is certainly one of the most important areas for improvement in public health and Medicine. Payment reform alone is not enough; addressing patient needs involves getting to the root of their poor health: poverty, education, housing, et cetera. Education and healthcare and social justice broad goals such as equal access to a healthy lifestyle, proper education, and quality health care reduce the achievement gap and improve human quality.

For instance, Centers for Medicare and Medicaid Services or policies spearheaded through Obama care affecting the minority have been seen to, in fact, lessen gaps in special populations' health profiles. Education programs that advocate for healthy lifestyles and encourage an option for preventive treatment will help enhance the health of several social groups and decrease the rate of untimely diseases (Diderichsen & Andersen, 2017; Ghaith et al., 2023; Alolayyan et al., 2018). Further forward, the development of health equity frameworks that aim at closing gaps between patient groups and ensuring that every patient has equal access to what he/she needs can also minimize the disparity among the patient groups.

Public health and Medicine are two important disciplines that remain intertwined in addressing the numerous and complicated health issues of the whole person in contemporary society. Although prenatal and neonatal care were traditionally practiced as two distinct specialties, the understanding that individual and population health intersect has begun to bring these two fields closer together. As is evident when these two disciplines focus on epidemiology, preventive Medicine, and social determinants of health, they have dominant roles in enhancing health and reducing disease prevalence and health inequality. Today, there is constant growth of chronic diseases, the spread of infectious diseases, and health inequalities; it is clear that cooperative work between public health and Medicine will be vital for the development of effective, efficient, and fair systems of health (Alvaro & Sallis, 2015; Alzyoud et al., 2024; Alolayyan et al., 2024). The approaches that will take center stage in improving the indices of global health will include tackling the

social determinants of health, prevention, and promotion strategies, as well as the call for policy reformation in the organization of healthcare systems

Conclusions

Therefore, there is a need to embed these foundational curricular themes to combat global health issues. The fields have changed from individual treatment to prevention, promotion of health, and parity to social factors. In continuing global developments of health issues, more interconnection between the field of public health and Medicine will be helpful in constructing fair and sustainable health system solutions.

Recommendations

- **Strengthen Interdisciplinary Collaboration:** Walk together with Public Health and clinician medicine to develop integrated approaches toward health interventions.
- **Focus on Prevention:** An increase in the number of significantly allocated resources to preventive measures such as immunization, health promotion, and early detection.
- **Address Social Determinants:** For the prevention of the gap between the health of the poor and the rest of the population to close further, policy changes that enhance education, housing, and nutritional intake are useful (Alvaro & Sallis, 2015; Mohammad et al., 2022; Al-Husban et al., 2023).
- **Utilize Technology:** Embrace the use of digital tools in health care and telemedicine to enhance the reach and quality of health care, especially for those in rural areas.
- **Global Health Policies:** Cooperation and policies must be increased all over the world in order to fight health hazards, including pandemics and antibiotic resistance.

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