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Public Health -- Definition, Scope and Assessment

Abstract:

Public Health ist die Wissenschaft und Kunst, mittels organisierter Bemühungen einer Gesellschaft Krankheiten zu vermeiden, Leben zu verlängern und Gesundheit zu fördern. In diesem Artikel wird der Begriff Public Health definiert und als populationsorientierter Ansatz dem individuellen Ansatz der klassischen Medizin gegenübergestellt. Public Health ist ein multidisziplinär arbeitendes Fachgebiet, das sich sowohl epidemiologischer Daten bedient als auch einen starken Brennpunkt auf dem sozialen Kontext von Gesundheit und Krankheit hat. Beispiele von Public Health Programmen sind Ernährungsprogramme, Impfungen, Krebsvorsorgeuntersuchungen, Trinkwasserfluorierung, Disease Management Programme, Vorschriften zur Anschnallpflicht oder Gesetze zur Tabakkontrolle. Nach einer Darstellung der für die Public Health Praxis zentralen Qualifikationen, werden die Besonderheiten der Evaluation von Public Health Programmen beschrieben. Wie bei der Evaluation medizinischer Interventionen gilt es, im Rahmen von Health Technology Assessment von Public Health Interventionen in erster Linie das Nutzen-Risiko-Verhältnis zu bestimmen und ggf. in zweiter Linie die Kosteneffektivität zu beurteilen. Da bei Public Health Programmen der zu berücksichtigende Zeithorizont sehr lang sein kann, meist Daten aus verschiedenen Studien zusammenzuführen sind und die Evidenz mit Unsicherheit behaftet sein kann, werden bei der Entscheidungsanalyse von Public Health Programmen häufig mathematische Modelle eingesetzt.

What is Public Health?

Public Health is the science and art of preventing disease, prolonging life and promoting health through organised efforts of society (reference: “Acheson Report”: Public Health in England.[i]

The field of public health pays special attention to the social context of health and disease, and focuses on improving health through population-wide measures. Some examples of activities that may fall under the banner of public health are school nutrition programs, access to clean water, vaccination campaigns, screening programs, the setting up and enforcing of workplace safety standards, the fluoridation of drinking water, public infectious disease control, or policies such as seatbelt laws and tobacco control programs, and many more.[ii]

Public health is a multidisciplinary field that includes quantitative methods (e.g., epidemiology, biostatistics, decision analysis, health economics) as well as the application of health services. Important disciplines in public health are behavioral, occupational, cultural, social and environmental health, among many others. The practice of public health includes education, assurance of the provision of health services and protection of the public from exposures that will cause harm.”[iii]

As a discipline, public health guides the decisions and actions of a society in its quest to collectively create conditions that ensure the health of its members. One of the challenges related to public health is the invisibility of its successes, that is to say when public health is functioning at its most effective, disease and infirmity should be absent and thus its “success” unapparent to its beneficiaries.

What is the Difference between Public Health and Medicine?

One very critical question that is asked quite often outside of the field of public health regards how public health and medicine differ. This question has been explored by numerous scholars and among these, by one pioneer clinician and epidemiologist, Dr. Geoffrey Rose, who wrote in his novel article *Sick Individuals and Sick Populations* that while “the central ethos of medicine is seen as the acceptance of responsibility for sick individuals,” public health concerns itself with the health of entire populations including the causes of risk in a population and methods for preventing disease.[iv]

Thus, the primary difference between medicine and public health is that as medicine attempts to improve, through prevention and treatment of disease, the life of each individual patient, public health seeks to execute population-based studies and

implement population-level interventions that will shift the distribution of risk or disease stage in a population, decreasing morbidity and mortality as well as quality-of-life impairments due to disease and injury. Rose provided an example of the way that questions asked by a medical doctor may differ from those put forth by a public health practitioner. For instance, a doctor would be most likely to ask "'Why do some individuals have hypertension?'" while a specialist in the field of public health would be likely to seek an answer to the question, "Why do some populations have hypertension, whilst in others it is rare?"[v]

The Association of Schools of Public Health (ASPH) provides a further elaboration of the differences between public health and medicine. In addition to the essential difference of a focus on individuals in medicine as opposed to populations in public health, the ASPH highlights the fact that public health employs a "spectrum of interventions aimed at the environment, human behavior and lifestyle, and medical care" while medicine predominantly emphasises medical care alone.[vi] Moreover, public health has a strong focus on prevention and health promotion for communities while medicine emphasises diagnosis and treatment of individuals. Finally, the emphasis on the difference in training is notable, with public health practitioners coming from a wide variety of professional backgrounds and receiving training in numeric, analytical, health and social sciences as opposed to the traditional biological and clinical education provided by the medical profession.[vii]

Which Skills Are Needed in Public Health Practice?

The tools required to ensure effective public health practice are numerous and interdisciplinary, including epidemiology, biostatistics, decision analysis, health policy science and human biology, amongst others.

In general, public health practice encompasses a number of discrete functions. These ten primary areas of public health action were outlined by the Public Health Functions Project, a Committee spearheaded by the US Centers for Disease Control (CDC):[viii]

1. Monitor health status to identify community health problems
2. Diagnose and investigate health problems and hazards in the community
3. Inform, educate and empower people about health issues
4. Mobilise community partnerships to identify and solve health problems

5. Develop policies and plans that support individual and community health efforts
6. Enforce laws and regulations that protect health and ensure safety
7. Link people to needed personal health services and assure the provisions of healthcare when it is otherwise unavailable
8. Assure a competent public health and personal health care workforce
9. Evaluate the effectiveness, accessibility, and quality of personal and population-based health services
10. Research new insights and innovative solutions to health problems

Graduates of public health education programs are prepared and trained to deliver these services and to work in public health settings. These functions are cross-cutting in all disease categories including both chronic and infectious disease, environmental and occupational health, violence, accidents and many more.

Public health practice depends on an educated, trained, and competent workforce including individuals from multiple disciplines and professions in health-care delivery. Each discipline and profession brings a specialised combination of knowledge, skill, abilities, perspectives, and competencies to public health practice. The diversity within the public health workforce adds to the effectiveness of public health practice.[ix]

How Can We Assess Public Health Programs?

As in the case of any other intervention, technology, or action in medicine and health care, public health programs may be associated with specific risks to the population, and resource allocation decisions must be made. Therefore, the consequences of such programs for individuals, populations and society must be rigorously assessed and evaluated.

The comprehensive assessment of any actions in medicine, public health, and health care management falls into the area of health technology assessment (HTA). HTA has been defined as “a multidisciplinary field of policy analysis, studying the medical, economic, social and ethical implications of development, diffusion and use of health technology.”[x] It must be noted that, in the context of HTA, the term “health technology” encompasses a rather wide scope of procedures, actions or strategies, which include health promotion, prevention and rehabilitation techniques, vaccines, pharmaceutical drugs, devices, medical and surgical procedures, and the provisional system supporting health care.[xi]

The primary focus of HTA is on evaluating the intended benefits versus the unintended risks of health technologies. Only if the benefit clearly exceeds the risk of a new public health intervention, is it likely to be considered for adoption. In this case, the next question -- typically for application to a current resource allocation decision -- is whether the additional net benefit justifies the additional net costs (i.e., including costs and savings attributable to the program).

According to the International Network of Agencies for Health Technology Assessment (INAHTA), HTA involves four major component activities: "(1) identifying evidence […] on the benefits and costs of health interventions; (2) synthesising health research findings about the effectiveness of different health interventions; (3) evaluating the economic implications and analysing cost and cost-effectiveness; and (4) appraising social and ethical implications of the diffusion and use of health technologies as well as their organisational implications."[xii] As such, HTA can be quite complex but, because of its direct policy implications, is increasingly in demand internationally.

Such health technology assessments have been conducted in the context of a great number of diseases. One example of a HTA commissioned by the German Federal Ministry of Health was that performed by the German Cervical Cancer Model Group in which modeling techniques were used to develop a tool for evaluating the long-term effectiveness of different cervical cancer screening tests and strategies.[xiii] The model demonstrated that "annual Pap screening could prevent 98.7% of diagnosed cancer cases and 99.6% of deaths due to cervical cancer in women completely adherent to screening and compliant to treatment" and that "extending the screening interval from 1 year to 2, 3 or 5 years resulted in reduced screening effectiveness."[xiv] Such pragmatic and helpful solutions certainly indicate the importance of this type of evaluation.

How Can Cost-Effectiveness of Public Health Programs Be Evaluated?

As one part of evaluation in health and medicine, economic evaluation has become incredibly relevant and advanced in recent years. Economic evaluation allows one to compare the relative cost of various clinical strategies in order to make difficult decisions about the allocation of resources when such resources are limited.[xv] Economic evaluation has been used to evaluate a wide variety of extremely relevant health issues from potential strategies for reducing maternal morbidity and mortality

in Mexico to various options for treating Hepatitis C in HIV-infected patients to disease management programs for chronic heart failure.[xvi,xvii] It is a tool that has become invaluable to health care policymakers and one that holds great promise as a means of improving health care for all.

For example, the New Zealand Ministry of Health commissioned a cost-effectiveness analysis on fluoridating water supplies in New Zealand to improve dental health.[xviii] The results of this report showed fluoridation to be cost-effective for populations ranging from 1,000 to 300,000. For all populations in this range, the net cost of fluoridation was negative – the dental cost savings exceed the fluoridation costs."[xix] This shows how cost-effectiveness analysis not only supports decisions regarding the adoption of a public health strategy but also helps to optimise the way that public health measures are applied. Other examples include defining the optimal risk population for dietary prevention programs or vaccinations, or defining the optimal features (e.g., start age, screening intervals, diagnostic work-up algorithms, stop age) for a screening program.

What Role does Decision-Analytic Modeling Play in the Assessment of Public Health Programs?

In conducting health technology assessments and other types of public health evaluation, the discipline of decision science and the approach of decision-analytic modeling have become increasingly important. Decision science is defined as "the application of explicit and quantitative methods to analyse decisions under conditions of uncertainty."[xx] By enabling one to examine the possible consequences of choosing particular public health strategies and weighting the probabilities of the relevant clinical outcomes and costs, decision analysis has proven an outstanding tool for making difficult choices about the use of health promotion, prevention, diagnosis, and treatment strategies as well as emerging technologies.[xxi] Because this technique can be applied to an individual, community, population, society or even globally and can be conducted from a variety of perspectives (e.g., global, society, payer, patients) it has proven an increasingly valuable population-based health policy tool which is used more and more in public health. Experts in decision science frequently note that decision-analytic modeling is not meant to lead automatically to particular decisions about allocating scarce healthcare resources but rather acts as a tool to inform and assist policymakers in such decision making.[xxii]

Modeling is the primary analytical technique used in the context of decision science. While numerous definitions of the term "modeling" exist, one simple definition that has been put forth by the United States National Research Council is that of a model as "a replicable, objective sequence of computations used for generating estimates of quantities of concern."[xxiii] In the case of decision science, a model "involves the application of mathematical techniques to synthesise available information about healthcare processes and their implications" and is used "for the purpose of economic evaluation of health technologies."[xxiv] In addition, a decision analytic model "can combine information from a wide variety of sources, extrapolate costs and health effects beyond the time horizon of a single clinical study, and evaluate multiple potential interventions packaged into strategies."[xxv] This has enabled decision analytic modeling to become an invaluable tool for making tough choices about how best to utilise limited health care resources.

In summary, public health is clearly a unique and special discipline as it seeks not only to improve the health of individuals but also the communities and societies in which they live by decreasing disparities in access to and quality of health care and ensuring the optimal allocation of scarce resources. With training in epidemiology, decision science, and other relevant public health fields, students are well-equipped to go on to participate in the public health workforce and have a truly positive impact on the health of populations. Thus, the first challenge to students is to obtain an excellent quality education in public health– a challenge that can be overcome through pursuit of a Bachelors or Masters in public health or health sciences.

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