



FUNDAMENTALS OF PUBLIC HEALTH

The Complementarity of Public Health and Medicine — Achieving “the Highest Attainable Standard of Health”

David J. Hunter, M.B., B.S., Sc.D.

Mr. F., a 70-year-old retired landscaper, presents to the emergency department reporting 3 hours of left-sided chest pain. He takes an ACE inhibitor for hypertension and aceta-

minophen daily for knee and hip pain, his LDL cholesterol is in the normal range, and he’s a former smoker who quit when he was 50. An electrocardiogram shows evidence of an ST-segment elevation myocardial infarction, so he is taken to the angiography unit, where a stent is placed in his left anterior descending artery, relieving his symptoms. Subsequent troponin levels are mildly elevated. He is discharged to a community cardiac rehabilitation program on a statin, a beta-blocker, the ACE inhibitor, and ticagrelor.

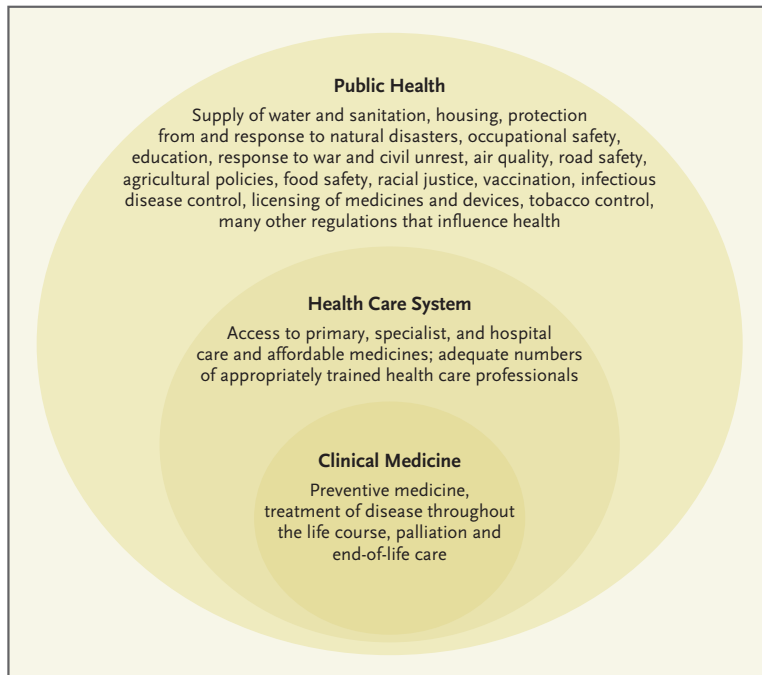
When Mr. F. was born in 1950, life expectancy for male Americans was 67 years, so he has already outlived his life expectancy at birth. Over the course of the

20th century, life expectancy increased by about 30 years in the United States and nearly 40 years globally, albeit with large disparities among U.S. states and among countries. Of the 30 additional years in the United States, 25 have been attributed to public health interventions.¹

In the 1950s, for example, the risk of heart attack was twice as high among middle-aged men as it is today, but public health campaigns may have inspired Mr. F. to quit smoking, substantially reducing his age-specific risk of cardiovascular disease. Changes in dietary advice and regulations such as limiting trans fats in the food supply may also have prevented hyperlipidemia and reduced

Mr. F.’s risk of more severe or earlier-onset myocardial infarction. Changes in environmental conditions, such as reductions in certain components of air pollution, have reduced heart attack risk in the population. And Mr. F. may have gotten to the hospital quickly thanks to greater public awareness of heart attack symptoms and signs, as well as reduced concern about the expense of medical care since the establishment of Medicare.

Of course, advances in clinical care also contributed to Mr. F.’s recovery. The medical management of chest pain has changed radically since the 1950s. Imaging, rapid diagnosis, and interventions have revolutionized treatment, leading to reductions in infarct size and shorter hospital stays. Mr. F.’s hypertension was treated, reducing his risk of stroke and heart attack. Randomized trials showing increased heart



Relationship between Public Health and Clinical Medicine.

Public health actions influence the environment in which the health care system is embedded and clinical medicine is practiced.

attack risk with the coxibs leading to their withdrawal from the market meant that he instead took acetaminophen for his joint pain. Randomized trials have shown the value of beta-blockers and statins in secondary prevention. A team-based approach leading to early discharge and referral to cardiac rehabilitation reduces risk for both nosocomial infections and rapid readmission.

To the health professional engaged in the daily grind of clinical work, the transformation of the human condition enabled by these advances can feel remote and abstract. Furthermore, the approaches and achievements of public health and clinical medicine are often unhelpfully framed as dichotomies — “prevention versus cure” or “individual versus population health.” But increasingly, public health professionals understand that the two fields are complementary, if only be-

cause we or our loved ones have all been patients hanging on the words of a physician after the presentation of a disease that was not prevented. Similarly, seeking a fuller picture of how to improve our patients’ health, physicians increasingly recognize the historical, environmental, social, racial, and political forces that shape people’s propensity to disease and the success or failure of clinical interventions.

Public health often plays a behind-the-scenes role, yet it is the envelope in which health systems reside (see diagram). Most of the gains in U.S. life expectancy in the first half of the 20th century have been attributed to provision of clean water, sanitation, rural electrification, communications, better housing, and public health programs.² In countries that have been unable to provide these improvements, life expectancies are still low, and as others

have pointed out, simply drinking water is a high-risk behavior. The elimination in the United States of infectious diseases such as tuberculosis, typhoid fever, and cholera was substantially under way well before antibiotics or vaccines were available. As we have rediscovered with Covid-19, competent public health administration and vaccines, along with the capacity to administer them, are critical to infectious disease control.³

The rise in noncommunicable diseases has been driven by longer life expectancy and behavioral and environmental changes, but it has been ameliorated by public health campaigns against tobacco and by occupational and environmental health regulations and guidelines designed to reduce exposure to known health hazards. We often become aware of these regulations only when they are not enforced, with results such as legionnaires’ disease and lead toxicity in Flint, Michigan; the opioid crisis that has reduced life expectancy for some populations in the United States; and the failure in many countries of the public health response to the Covid-19 pandemic. The driving force behind the discovery of environmental influences on disease is epidemiology, the basic science of public health that focuses on the causes of differences in disease rates within and among populations. Responses to these discoveries are the domains of many disciplines, including the behavioral sciences, economics, health policy, law, and politics.

We all, of course, get sick and need access to the health care system. As Martin Luther King, Jr., said in 1966, “Of all the forms of inequality, injustice in health is the most shocking and

the most inhuman because it often results in physical death.” In the United States, the development of Medicare and Medicaid, and more recently the Affordable Care Act, has greatly improved access to payment for health care, yet substantial inequities remain. In addition, our health workforce is often inadequate: whether health professionals are working in a largely public or private system, few countries manage to train enough health care workers, retain them in their system, and ensure that they are appropriately distributed to meet the needs of patients in rural or poorer areas.

When a patient does see a health care professional — whether a community health worker, a nurse practitioner, a primary care physician, or a specialist physician — the layers described above theoretically melt away, and the professional applies their skills to serve the patient’s needs, by means of acute intervention, preventive care, or management of chronic conditions. Yet success depends not only on the professional’s skills and the content of the clinical encounter, but also on the public health activities described above — campaigns to raise awareness, regulations to provide healthier and uncontaminated foods, adequate access to the means to change behaviors, and affordable access to medicines. And much of our advice fails at one of these hurdles if patients cannot afford to take the advice.

Once a disease has been diagnosed and a treatment plan instituted, inequities in access may cause patients to delay or forgo treatment. In the United States, survival rates for many cancers, myocardial infarction, and strokes are lower among Black Americans

and people with low socioeconomic status. Frustration and burnout can build in health professionals who live and work in a society where the odds are stacked against their patients because they live in unhealthy environments and must be repeatedly readmitted with the same problems. At a minimum, an understanding of the social determinants of disease can help clinicians empathize with patients who appear to be ignoring their advice.

As respected members of society, physicians can also play a role in researching and highlighting the root causes of inequities in outcomes and help close the gap between the population-based public health approach and the individual orientation of clinical encounters. The increasing deployment of interprofessional teams may also provide physicians with colleagues such as community health workers, home health aides, and social workers who can assist with a more holistic approach to care.

As an epidemiologist who has long researched the causes of disease in populations, I am always tempted to dwell on the gains in life expectancy that are attributable mostly to public health interventions. As Mr. F.’s story demonstrates, determination of cause and effect for such interventions relies on evidence from populations, not individual patients. Although it’s often said that this difference in focus distinguishes public health from clinical medicine, most clinical guidelines rely on evidence from large studies; even the interventional cardiologist cannot know whether Mr. F.’s coronary angioplasty reduced the size of his ischemic episode, but only that in a large series of similar patients, the procedure

has that effect on average. In addition, medical treatments such as blood-pressure control rely both on office visits and prescriptions and on public health interventions to reduce sodium intake and encourage more active lifestyles.

This complementarity highlights the vanishing distinction between the aims of public health and those of preventive medicine. Preventive medicine can be practiced with individual patients in a consulting room or through organized activities such as vaccine outreach, community blood-pressure screening, or health education. Future “big data” analyses may both provide insights into population health as well as permitting more personalized medical care. In the 1980s, the British epidemiologist Geoffrey Rose observed that small changes in the distribution of a risk factor such as hypertension or high cholesterol across the population may prevent more cases of heart disease than larger changes among only high-risk people. Attending to those small but widespread changes is often represented as a “population-wide” approach, as contrasted with the “clinical” approach of treating only people at high risk.⁴ But Rose’s insight has been incorporated into preventive medicine: target blood-pressure and LDL-cholesterol measurements have been lowered across the board, and medical interventions are not limited to patients with “pathologically” high values.


Ultimately, achieving “the highest attainable standard of health” — a right enshrined in the World Health Organization’s constitution — depends not on either public health or clinical medicine alone, but on “where the twain

Variable	Public Health	Clinical Medicine
Unit of measurement and focus	Population (global, national, regional small area)	Individual patient or series of patients
Disciplines	Epidemiology, economics, behavioral sciences, environmental health, microbiology, etc.	Medicine, nursing, and allied health; primary care and specialties
Training	Schools of public health, government, business, etc.	Schools of medicine, nursing, pharmacy, allied health
Team approach	Multidisciplinary	Interprofessional
Intervenes on	Upstream risk factors	Established or incipient disease
Best practices defined by	Scientific evidence encoded in regulations and guidelines	Evidence-based algorithms and clinical acumen
Financed by	Governments (national, regional, local); nonprofit and charity organizations	Governments, insurance, out-of-pocket
Orientation	Preventive	Preventive, disease management, or both
Outcomes	Reductions in exposures, disease incidence, or mortality	Successful disease management

Some Differences in Emphasis between Public Health and Clinical Medicine.

Note that, with regard to “public health” in the third row (Training), some schools and academic departments are now named schools or departments of population health, to distinguish them from departments of public health that are nested in local, regional, or national governments. The label “population health” is sometimes also used to indicate the incorporation of social determinants of disease, to contrast with classic epidemiology, which is said to focus more on risk factors and biomedicine.

shall meet” (see table).⁵ A better understanding of the manifold influences on patients’ health and the range of actions that alter their health trajectories can only help anyone who aspires to improve health — whether for whole populations or for the next patient in the waiting room.

 An audio interview with Dr. Hunter is available at NEJM.org

The series editors are Barry Bloom, Ph.D., Debra Malina, Ph.D., Stephen Morrissey, Ph.D., and Geneva Pittman, M.A.

Disclosure forms provided by the author are available at NEJM.org.

From the Nuffield Department of Population Health, University of Oxford, Oxford, UK; and the Harvard T.H. Chan School of Public Health, Boston.

1. Bunker JP, Frazier HS, Mosteller F. Improving health: measuring effects of medical care. *Milbank Q* 1994;72:225-58.

2. Centers for Disease Control and Prevention. Ten great public health achievements — United States, 1900-1999. *MMWR Morb Mortal Wkly Rep* 1999;48:241-3.

3. Bloom BR. The future of public health. *Nature* 1999;402:6761 Suppl:C63-C64.

4. Rose G. Strategy of prevention: lessons from cardiovascular disease. *Br Med J (Clin Res Ed)* 1981;282:1847-51.

5. Fineberg HV. Public health and medicine: where the twain shall meet. *Am J Prev Med* 2011;41:4 Suppl 3:S149-S151.

DOI: 10.1056/NEJMp2102550

Copyright © 2021 Massachusetts Medical Society.

Contact Tracing for Covid-19 — A Digital Inoculation against Future Pandemics

James O’Connell, M.B., B.Ch., B.A.O., and Derek T. O’Keeffe, M.B., B.Ch., M.D., Ph.D.

Outbreaks of coronavirus disease 2019 (Covid-19) emerged in the United States and in European countries in February 2020. Urgent action was called for, since experts estimated that 30 to 70% of people in these Western countries could become infected — a frightening projection at a time when the Covid-19 mortality

rate was estimated to be substantially higher than we now know it to be. In March 2020, Michael Ryan, executive director of the Health Emergencies Program of the World Health Organization (WHO), implored countries to act, noting that when it comes to epidemic response, “speed trumps perfection” but “the greatest error

is not to move.” At the time, the only tools for containing Covid-19 were social distancing, testing, case isolation, and contact tracing.

Contact tracing is a crucial public health practice that has been a part of epidemic responses for centuries. From the bubonic plague, to smallpox and tuberculosis, to HIV, the fate of public