ESSENTIAL PUBLIC HEALTH

HEALTH FOUNDATIONS

Public Health 101 THIRD EDITION

Improving Community Health

Richard Riegelman and Brenda Kirkwood

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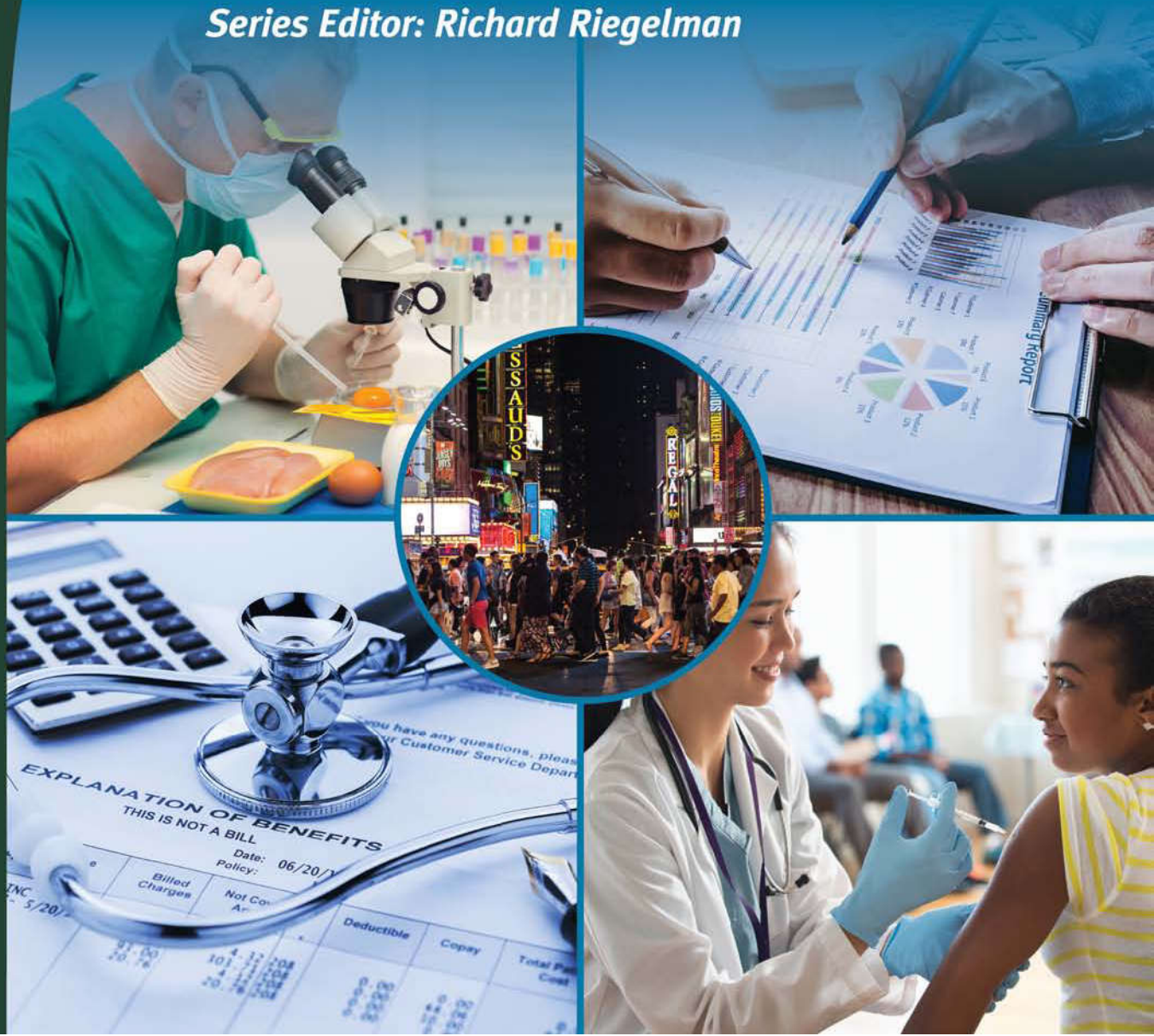

Public Health 101

Improving Community Health

THIRD EDITION

Richard Riegelman, MD, MPH, PhD

Professor and Founding Dean

Milken Institute School of Public Health

The George Washington University

Washington, DC

Brenda Kirkwood, MPH, DrPH

Clinical Associate Professor

School of Public Health

University at Albany, State University of New York

Albany, NY

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Jones & Bartlett Learning
5 Wall Street
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978-443-5000
info@jblearning.com
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To Nancy Alfred Persily, whose enthusiasm for teaching public health to undergraduates inspired Public Health 101: Improving Community Health

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Acknowledgments

Public Health 101: Improving Community Health, 3rd Edition is the culmination of two decades of effort aimed at introducing public health to undergraduates. The effort originated with the teaching of an introductory course in public health in 1998 at the then newly created George Washington University School of Public Health and Health Services. The new course, organized by associate dean Nancy Alfred Persily, inspired efforts to teach and to learn from a new generation. The approach was designed as part of a liberal arts education, stimulating the movement that came to be called the Educated Citizen and Public Health.

Efforts to think through the content of an introductory course in public health have involved a large number of people throughout the United States. Public health, arts and sciences, and clinical educators all participated in the 2006 Consensus Conference on Public Health Education, which put forward the framework for Public Health 101 upon which this book is based. Among those who led and continue to lead this effort is Susan Albertine, whose insights into the relationship between public health and liberal education have formed the basis for much of the Educated Citizen and Public Health movement.

I have taught Public Health 101 since 2002, which has provided me with an opportunity to teach and to learn from well over 500 undergraduate students at The George Washington University. Their feedback and input has been central to writing and rewriting this book. I would also like to thank Alan Greenberg and Heather Young, the chair and vice chair of the Department of Epidemiology and Biostatistics at The George Washington University Milken Institute School of Public Health, for their support of my efforts to expand the audience for undergraduate public health.

I am pleased that Brenda Kirkwood has joined me as a co-author. I first had the opportunity to work with Brenda while she was a DrPH student at The George Washington University. Dr. Kirkwood has made extraordinary contributions to Public Health 101. Her insights and careful reviews and dedication to getting the details right have been key to the quality of this edition. Brenda is truly exceptional and a pleasure to work with, as will be confirmed by all who work with her.

Mike Brown, Director of Product Management of the Public Health and Health Administration line of products for Jones & Bartlett Learning, has made special contributions to this book and the *Essential Public Health* series as a whole. His vision has helped craft the series, and his publishing expertise made it happen. The production, marketing, and editorial staff of Jones & Bartlett Learning deserve special recognition. Their commitment to this book and the entire *Essential Public Health* series has gone well beyond the expectations of their jobs.

Last, but by no means least, is my wife, Linda Riegelman, who encouraged this book and the *Essential Public Health* series from the beginning. She saw the need to reach out to students and make real the roles that public health plays in their everyday lives.

Confronting the challenge of putting together *Public Health 101* has been one of the great joys of my professional life. I hope it will bring both joy and challenge to you as you enter into the important and engaging world of public health.

Richard Riegelman, MD, MPH, PhD

Preface: What Is *Public Health 101: Improving Community Health* All About?

Public health is more than a profession; it is a way of thinking. *Public Health 101: Improving Community Health* introduces you to the profession and also the way of thinking that we will call population health. Population health is an important way of looking at the world, whether you are going into public health as a profession, a clinically oriented health profession, business, law, international affairs, or a range of other professions.

Population health is also a key way of thinking, which prepares you for the challenges of citizenship in a democracy. Many of the issues that come before us as a society stem from or benefit from a population health perspective. Whether we are dealing with AIDS, the impact of aging, climate change, or the costs of health care, the population perspective can help us frame the issues and analyze the options to intervene. Population health requires an evidence-based approach to collecting and using the facts to develop and implement approaches to improve community health.

In addition, the population perspective leads us to look broadly at the way issues intertwine and interact with each other. We call this systems thinking. In population health, systems thinking is taking center stage as we increasingly struggle with complex problems that require us to look beyond the traditional boundaries of health and disease and the traditional lines between the roles of the health professions.

Until recently, public health was considered a discipline taught only at the graduate level. Today, undergraduate public health is booming at 4-year colleges and is beginning to take hold at community colleges as well. Its roots in general and liberal education go back to the 1980s, when David Fraser, the president of Swarthmore and an epidemiologist who led the investigation of Legionnaires' disease, wrote a now classic article called "Epidemiology as a Liberal Art."[1]

In 2003, the National Academy of Medicine, formerly called the Institute of Medicine, recommended that "all undergraduates should have access to education in public health."[2] That recommendation encouraged the development of the Educated Citizen and Public Health initiative, a collaboration of undergraduate educators and public health educators to define and stimulate public health curricula for all undergraduates. *Public Health 101* was written to implement the recommendations that came out of this initiative and continues to form the basis for undergraduate education in public health.

The third edition of *Public Health 101* has a new subtitle, *Improving Community Health. Improving Community Health* is designed to highlight the importance of community-wide collaboration to promote and protect health as well as to prevent disease and disability. The third edition more fully addresses the work of a wide range of health professionals whose roles are an indispensable part of improving community health.

This third edition of *Public Health 101* has been thoroughly updated and expanded. Each chapter includes new material designed to expand your understanding of public health. From e-cigarettes to the opioid epidemic, from aging as a public health issue to the One Health movement, *Public Health 101* aims to make public health relevant to today's students and today's world. Each of the five sections includes new case studies challenging you to apply what you have learned.

Public Health 101: Improving Community Health will not try to overload your mind with facts. It is about providing you with frameworks for thinking,

and applying these frameworks to real situations and thought-provoking scenarios. Each chapter begins and ends with vignettes designed to show you the types of situations you will confront in public health. After each section, there are case studies that relate to one or more chapters in the section. They provide realistic, engaging exercises and open-ended questions to help you think through the application of the key concepts presented in each section.

Hopefully, you will come away from reading *Public Health 101* with an appreciation of how the health of the public is influenced by and can be improved by efforts directed at the population level, as well as at the individual level. Let us begin in Chapter 1 by exploring the ways that public health affects everyone's daily life.

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About the Authors

Richard Riegelman, MD, MPH, PhD, is professor of epidemiology–biostatistics, medicine, and health policy, and founding dean of The George Washington University Milken Institute School of Public Health. His education includes an MD from the University of Wisconsin, plus an MPH and PhD in epidemiology from The Johns Hopkins University. Dr. Riegelman practiced primary care internal medicine for over 20 years.

Dr. Riegelman has over 75 publications, including 6 books for students and practitioners of medicine and public health. He is editor of the Jones & Bartlett Learning *Essential Public Health* series. The series provides books and ancillary materials for the full spectrum of curricula for undergraduate public health education.

Dr. Riegelman has spearheaded efforts to fulfill the National Academy of Medicine's recommendation that "all undergraduates should have access to education in public health." He continues to work with public health and undergraduate education associations to integrate public health into the mainstream of undergraduate education at 2-year as well as 4-year colleges and universities. Richard Riegelman teaches undergraduate and graduate public health courses, which include Public Health 101 and Epidemiology 101.

Brenda Kirkwood, MPH, DrPH, works in academic administration and is clinical associate professor at the School of Public Health, University at Albany, State University of New York. Dr. Kirkwood has experience in higher education spanning public and private institutions on the associate, baccalaureate, and graduate levels, including development and teaching of undergraduate and graduate public health courses, development and management of public health academic programs, student advisement and mentorship, and contributing to public health education research. Prior to her career in higher education, Dr. Kirkwood held positions within the New York State Department of Health. She received a BS from Ithaca College, MPH from the University at Albany, State University of New York, and DrPH from The George Washington University.

Dr. Kirkwood has been actively involved in national efforts to expand public health education and strengthen the public health workforce. Her numerous publications and presentations have focused on the roles of, and opportunities for, public health education in 2-year and 4-year colleges and universities as well as at the graduate level.

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SECTION I

Principles of Population Health

Section I of *Public Health 101: Improving Community Health* introduces you to the ways that public health affects your every waking moment, from the food you eat, to the water you drink, to the car you drive. Even sleep matters. In public health, we use bed nets to prevent malaria, we use beds that prevent back pain, and put infants to sleep on their backs to prevent sudden infant death syndrome (SIDS).

In Section I, we will examine a range of approaches to public health that have been used over the centuries. Then we will focus on a 21st century approach known as **population health**. Population health considers the full range of options for intervention to address health problems, from community control of communicable disease and environmental health, to healthcare delivery systems, to public policies such as taxation and laws designed to reduce cigarette smoking. Population health takes a life cycle approach, considering how risks to health affect the population throughout the life span. We will also look at how populations are changing and aging by examining three important transitions that affect population health today and will continue to do so for years to come.

In this section, we will also examine an evidence-based approach to population health that focuses on defining the problem, establishing the etiology, making evidence-based recommendations, implementing these recommendations in practice, and evaluating the impacts of interventions. The population health and evidence-based approaches introduced in Section I provide an underpinning for all that follows.

At the end of Section I (and at the end of every section), there are cases with discussion questions that draw on chapters from the section. Each case is designed as a realistic description of the types of problems we face as we seek to improve community health.

So with no further ado, let us take a look at how public health can and does affect all of our daily lives.

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CHAPTER 1

Public Health: The Population Health Approach

LEARNING OBJECTIVES

By the end of this chapter, the student will be able to:

- identify multiple ways that public health affects daily life.
- define eras of public health from ancient times to the present.
- define the meaning of "population health."
- illustrate the uses of health care, traditional public health, and social interventions in population health.
- identify a range of determinants of disease.
- identify ways that populations change over time and how this affects health.

I woke up this morning, got out of bed, and went to the bathroom. There I used the toilet, washed my hands, brushed and flossed my teeth, drank a glass of water, and took my blood pressure medicine, cholesterol medication, and an aspirin. Then I did my exercises and took a shower.

On the way to the kitchen, I didn't even notice the smoke detector I passed or the old ashtrays in the closet. I took a low-fat yogurt out of the refrigerator and prepared hot cereal in the microwave oven for my breakfast.

Then I walked out my door into the crisp, clean air and got in my car. I put on my seat belt, saw the light go on for the airbag, and safely drove to work. I got to my office, where I paid little attention to the new defibrillator at the entrance, the "no smoking" signs, or the absence of asbestos. I arrived safely in my well-ventilated office and got ready to teach Public Health 101.

It wasn't a very eventful morning, but then it's all in a morning's work when it comes to public health.

This rather mundane morning is made possible by a long list of achievements that reflect the often-ignored history of public health.[1] We take for granted the fact that water chlorination, hand washing, and indoor plumbing largely eliminated the transmission of common bacterial diseases, which for centuries killed the young and not so young. Do not overlook the impact of prevention on our teeth and gums. Teeth brushing, flossing, and fluoridation of water have made a dramatic impact on the dental health of children and adults.

The more recent advances in the prevention of heart disease have been a major public health achievement. Preventive successes include the reduction of blood pressure and cholesterol, cigarette smoking prevention and cessation efforts, the use of low-dose aspirin, an understanding of the role of exercise, and the widespread availability of defibrillators. These can be credited with at least half of the dramatic reductions in heart disease that have reduced the death rate from coronary artery disease by approximately 50% in the United States and most other developed countries in the last half century.

The refrigerator was one of the most important advances in food safety, which illustrates the impact of social change and innovation not necessarily intended to improve health. Food and product safety are public health achievements that require continued attention. It was public pressure for food safety that in large part brought about the creation of the U.S. Food and Drug Administration. The work of this public health agency continues to affect all of our lives from the safety of the foods we eat to the drugs and cosmetics we use.

Radiation safety, like radiation itself, usually goes unnoticed, from the regulation of microwave ovens to the reduction of radon in buildings. We rarely notice when disease does not occur.

Highway safety illustrates the wide scope of activities required to protect the public's health. From seat belts, child restraints, and airbags to safer cars, highways, designated driver programs, and enforcement of drunk driving laws, public health efforts require collaboration with professionals not usually thought of as having a health focus. New technologies produce new challenges as our constant communications lead to inattention to the road. However, technology also offers new opportunities which help compensate for some of our "blind spots."

The physical environment also has been made safer by the efforts of public health. Improvement in the quality of the air we breathe both outdoors and indoors has been an ongoing accomplishment of what we will call "population health." Our lives are safer today because of interventions ranging from installation of smoke detectors to removal of asbestos from buildings.

However, the challenges continue. Globalization increases the potential for the spread of existing and emerging diseases and raises concerns about the safety of the products we use. Climate change and ongoing environmental deterioration continue to produce new territory for "old" diseases, such as malaria, dengue fever, and, more recently, Zika. Overuse of technologies, such as antibiotics, has encouraged the emergence of resistant bacteria. Overprescription of opioids has led to an epidemic of fatal overdoses among the young and not so young.

The 1900s saw an increase in life expectancy of almost 30 years in most developed countries, much of it due to the successes of public health initiatives.[2] We cannot assume that these trends will continue indefinitely. The epidemic of obesity already threatens to slow down or reverse the progress we have been making. The challenges of 21st century public health include the protection of health and continued improvement in quality of life, not just the quantity of years individuals are living.

To understand the role of public health in these achievements and other, ongoing challenges, let us start at the beginning and ask: What do we mean by "public health"?

What Do We Mean by "Public Health"?

Ask your parents what "public health" means, and they might say, "Health care for the poor." They are right that public health has always been about providing services for **vulnerable populations** or those at higher than average risk of disease and/or bad outcomes of disease, either directly or through the healthcare system. Public health approaches to vulnerable populations range from reducing exposure to lead paint in deteriorating buildings, to food supplementation, to preventing birth defects and goiters. Addressing the needs of vulnerable populations has always been a cornerstone of public health. As we will see, however, the definition of "vulnerable populations" continues to change, as do the challenges of addressing their needs.

Ask your grandparents what "public health" means, and they might say, "Washing your hands." Well, they are right too—public health has always been about determining risks to health and providing successful interventions that are applicable to everyone. But hand washing is only the tip of the iceberg. The types of interventions that apply to everyone and benefit everyone span an enormous range: from food and drug safety to controlling air pollution, from measures to prevent the spread of tuberculosis to vaccinating against childhood diseases, from prevention and response to disasters to detection of contaminants in our water.

The concerns of society as a whole are always in the forefront of public health though traditionally the focus of public health has been on prevention among mothers and children and the working aged population. These concerns keep changing and the methods for addressing them keep expanding. New technologies and global, local, and national interventions are becoming a necessary part of public health. To understand what public health has been and what it is becoming, let us look at some definitions of "public health." The following are two definitions of "public health"—one from the early 1900s and one from more recent years.

> Public health is "the science and art of preventing disease, prolonging life and promoting health through organized community effort."[3]
>
> The substance of public health is the "organized community efforts aimed at the prevention of disease and the promotion of health."[4]

These definitions show how little the concept of public health changed throughout the 1900s; however, the concept of public health in the 21st century is beginning to undergo important changes in a number of ways, including:

- The goal of prolonging life is being complemented by an emphasis on the quality of life. Protection of health when it already exists is becoming a focus along with promoting health when it is at risk.
- Use of new technologies, such as the Internet, is redefining "community," as well as offering us new ways to communicate.
- The enormous expansion in the options for intervention, as well as the increasing awareness of potential harms and costs of intervention programs, requires a new science of "evidence-based" public health.
- Public health and clinical care, as well as public and private partnerships, are coming together in new ways to produce collaborative efforts rarely seen in the 1900s.
- Complex public health problems need to be viewed as part of larger health and social systems, which require efforts to simultaneously examine multiple problems and multiple solutions rather than one problem or one solution at a time.
- Public health increasingly needs to pay attention to the full range of health issues, not just prevention among mothers and children and the working aged population but prevention of disability among our growing elderly populations. A full life cycle approach is now needed to improve community health.

A new 21st century definition of public health is needed. One such definition might read as follows:

> The totality of all evidence-based public and private efforts throughout the life cycle that preserve and promote health and prevent disease, disability, and death.

This broad definition recognizes public health as the umbrella for a range of approaches that need to be viewed as a part of a big picture or population perspective. Specifically, this definition enlarges the traditional scope of public health to include an examination of the full range of environmental, social, and economic determinants of health—not just those traditionally addressed by public health and clinical health care. An examination of the full range of interventions to address health issues, including the structure and function of healthcare delivery systems, plus the role of public policies that affect health even when health is not their intended effect. This is being called a "health in all policies" approach.

If your children ask you what public health is, you might respond: "It is about the big picture issues that affect our own health and the health of our community every day of our lives. It is about protecting health in the face of disasters, preventing disease from addictions such as cigarettes and opioids, controlling infections such as the human immunodeficiency virus (HIV) and Zika, and developing systems to ensure the safety of the food we eat and the water we drink."

A variety of terms have been used to describe this big picture perspective that takes into account the full range of factors that affect health and considers their interactions.[5] We will use the term population health. Before exploring what we mean by the **population health approach**, let us examine how the approaches to public health have changed over time.[a]

How Has the Approach of Public Health Changed Over Time?

Health Protection (Antiquity—1830s)

Organized community efforts to promote health and prevent disease go back to ancient times.[6,7] The earliest human civilizations integrated concepts of prevention into their culture, their religion, and their laws. Prohibitions against specific foods—including pork, beef, and seafood—plus customs for food preparation, including officially designated methods of killing cattle and methods of cooking, were part of the earliest practices of ancient societies. Prohibitions against alcohol or its limited use for religious ceremony have long been part of societies' efforts to control behavior, as well as prevent disease. Prohibition of cannibalism, the most universal of food taboos, has strong grounding in the protection of health.[b]

The earliest civilizations have viewed sexual practices as having health consequences. Male circumcision, premarital abstinence, and marital fidelity have all been shown to have impacts on health.

Quarantine or isolation of individuals with disease or those exposed to disease has likewise been practiced for thousands of years. The intuitive notion that isolating individuals with disease could protect individuals and societies led to some of the earliest organized efforts to prevent the spread of disease. At times they were successful but without a solid scientific basis. Efforts to separate individuals and communities from epidemics sometimes led to misguided efforts, such as the unsuccessful attempts to control the black plague by barring outsiders from walled towns while not recognizing that it was the rats and fleas that transmitted the disease.

During the 1700s and the first half of the 1800s, individuals occasionally produced important insights into the prevention of disease. In the 1740s, British naval commander James Lind demonstrated that lemons and other citrus fruit could prevent and treat scurvy, a then-common disease among sailors, whose daily nourishment was devoid of citrus fruit, the best source of vitamin C.

In the last years of the 1700s, English physician Edward Jenner recognized that cowpox, a common mild ailment among those who milked cows, protected those who developed it against life-threatening smallpox. He developed what came to be called a vaccine—derived from the Latin *vacca*, meaning "cow." He placed fluid from cowpox sores under the skin of recipients, including his son, and exposed them to smallpox. Despite the success of these smallpox prevention efforts, widespread use of vaccinations was slow to develop, partially because at that time there was not an adequate scientific basis to explain the reason for its success.

a Turnock[2] has described several meanings of "public health." These include the system and social enterprise, the profession, the methods, the government services, and the health of the public. The population health approach used in this text may be thought of as subsuming all of these different perspectives on public health.

b In recent years, this prohibition has been indirectly violated by feeding beef products containing bones and brain matter to other cattle. The development of "mad cow" disease and its transmission to humans has been traced to this practice, which can be viewed as analogous to human cannibalism.

Hygiene Movement (1840–1870s)

All of these approaches to disease prevention were known before organized public health existed. Public health awareness began to emerge in Europe and the United States in the mid-1800s. The U.S. public health movement has its origins in Europe, where concepts of disease as the consequence of social conditions took root in the 1830s and 1840s. This movement, which put forth the idea that disease emerges from social conditions of inequality, produced the concept of **social justice**. Many attribute public health's focus on vulnerable populations to this tradition.

While early organized public health efforts paid special attention to vulnerable members of society, they also focused on the hazards that affected everyone, such as contamination of the environment. This focus on sanitation and public health was often called the hygiene movement, which began even before the development of the germ theory of disease. Despite the absence of an adequate scientific foundation, the hygiene movement made major strides in controlling communicable diseases, such as tuberculosis, cholera, and waterborne diseases, largely through alteration of the physical environment.

The fundamental concepts of epidemiology also developed during this era. In the 1850s, John Snow, often called the father of epidemiology, helped establish the importance of careful data collection and documentation of rates of disease before and after an intervention in order to evaluate effectiveness. He is known for his efforts to close down the Broad Street pump, which supplied water contaminated by cholera to a district of London. His actions quickly helped terminate that epidemic of cholera. John Snow's approach has become a symbol of the earliest formal epidemiological thinking.

Ignaz Semmelweis, an Austrian physician, used much the same approach in the mid-1800s to control puerperal fever—or fever of childbirth—then a major cause of maternal mortality. Noting that physicians frequently went from the autopsy room to the delivery room without washing their hands, he instituted a handwashing procedure and was able to document a dramatic reduction in the frequency of puerperal fever. Unfortunately, he was unable to convince many of his contemporaries to accept this intervention without a clear mechanism of action. Until the acceptance of the germ theory of disease, puerperal fever continued to be the major cause of maternal deaths in Europe and North America.

The mid-1800s in England also saw the development of birth and death records, or vital statistics, which formed the basis of population-wide assessment of health status. From the beginning of this type of data collection, there was controversy over how to define the cause of death. Two key figures in the early history of organized public health took opposing positions that reflect this continuing controversy. Edwin Chadwick argued that specific pathological conditions or diseases should be the basis for the cause of death. William Farr argued that underlying factors, including what we would today call social determinants of health, should be seen as the actual causes of death.

Contagion Control (1880–1940s)

The methods of public health were already being established before the development of the germ theory of disease by Louis Pasteur and his European colleagues in the second half of the 1800s. The revolutions in biology that they ignited ushered in a new era in public health. U.S. physicians and public health leaders often went to Europe to study new techniques and approaches and brought them back to the United States to use at home.

After the Civil War, U.S. public health began to produce its own advances and organizations. In 1872, the American Public Health Association (APHA) was formed. According to its own historical account, the APHA's "founders recognized that two of the association's most important functions were advocacy for adoption by the government of the most current scientific advances relevant to public health, and public education on how to improve community health."[8]

The biological revolution of the late 1800s and early 1900s that resulted from the germ theory of disease laid the groundwork for the modern era of public health. An understanding of the contributions of bacteria and other organisms to disease produced novel diagnostic testing capabilities. For example, scientists could now identify tuberculosis cases through skin testing, bacterial culture, and the newly discovered chest X-ray. Concepts of vaccination advanced with the development of new vaccines against toxins produced by tetanus- and diphtheria-causing bacteria. Without antibiotics or other effective cures, much of public health in this era relied on prevention, isolation of those with disease, and case-finding methods to prevent further exposure.

In the early years of the 1900s, epidemiology methods continued to contribute to the understanding of disease. The investigations of pellagra by Goldberger and the United States Public Health Service overthrew the assumption of the day that pellagra was an infectious disease and established that it was a nutritional deficiency that could be prevented or easily cured with vitamin B-6 (niacin) or a balanced

diet. Understanding the role of nutrition was central to public health's emerging focus on prenatal care and childhood growth and development. Incorporating key scientific advances, these efforts matured in the 1920s and 1930s and introduced a growing alphabet of vitamins and nutrients to the U.S. vocabulary.

Filling Holes in the Medical Care System (1950s–mid-1980s)

A new era of effective medical intervention against active disease began in force after World War II. The discovery of penicillin and its often miraculous early successes convinced scientists, public health practitioners, and the general public that a new era in medicine and public health had arrived.

During this era, public health's focus was on filling the holes in the healthcare system. In this period, the role of public health was often seen as assisting clinicians to effectively deliver clinical services to those without the benefits of private medical care and helping to integrate preventive efforts into the practice of medicine. Thus, the great public health success of organized campaigns for the eradication of polio was mistakenly seen solely as a victory for medicine. Likewise, the successful passage of Medicaid and Medicare, outgrowths of public health's commitment to social justice, was simply viewed as efforts to expand the private practice of medicine.

This period, however, did lay the foundations for the emergence of a new era in public health. Epidemiological methods designed for the study of noncommunicable diseases demonstrated the major role that cigarette smoking plays in lung cancer and a variety of other diseases. The emergence of the randomized controlled trial and the regulation of drugs, vaccines, and other interventions by the Food and Drug Administration developed the foundations for what we now call evidence-based public health and evidence-based medicine.

Health Promotion/Disease Prevention (Mid-1980s–2000)

The 1980s and much of the 1990s were characterized by a focus on individual responsibility for health and interventions at the individual level. Often referred to as health promotion and disease prevention, these interventions targeted individuals to effect behavioral change and combat the risk factors for diseases. As an example, to help prevent coronary artery disease, efforts were made to help individuals address high blood pressure and cholesterol, cigarette smoking, and obesity. Behavioral change strategies were also used to help prevent the spread of the newly emerging HIV/AIDS epidemic. Efforts aimed at individual prevention and early detection as part of medical practice began to bear some fruit with the widespread introduction of mammography for detection of breast cancer and the worldwide use of Pap smears for the detection of cervical cancer. Newborn screening for genetic disease became a widespread and often legally mandated program, combining individual and community components.

Major public health advances during this era resulted from the environmental movement, which brought public awareness of the health dangers of lead in gasoline and paint. The environmental movement also focused on reducing cancer by controlling radiation exposure from a range of sources, including sunlight and radon, both naturally occurring radiation sources. In a triumph of global cooperation, governments worked together to address the newly discovered hole in the ozone layer. In the United States, reductions in air pollution levels and smoking rates during this era had an impact on the frequency of chronic lung disease, asthma, and most likely coronary artery disease.

Population Health (2000s)

The heavy reliance on individual interventions that characterized much of the last half of the 1900s changed rapidly in the beginning of the 21st century. The current era in public health that is often called "population health" has begun to transform professional and public thought about health and the relationship between traditional public health and the healthcare system. From the potential for bioterrorism, to the high costs of health care, to the control of pandemic influenza, AIDS, and Ebola, the need for community-wide or population-wide public health efforts has become increasingly evident. This new era is characterized by a global perspective and the need to address international health issues. The concept of One Health, which focuses on the connections between human health, animal health, and ecosystem health, is providing a framework for understanding the global health impacts that affect all of us. One Health includes a focus on the potential impacts of climate change, emerging and reemerging infectious diseases, and the consequences of trade in potentially contaminated or dangerous products, ranging from food to toys.

TABLE 1.1 outlines these eras of public health, identifies their key defining elements, and highlights important events that symbolize each era.[9]

TABLE 1.1 Eras of Public Health

Eras of public health	Focus of attention/ paradigm	Action framework	Notable events and movements in public health and epidemiology
Health protection (Antiquity–1830s)	Authority-based control of individual and community behaviors	Religious and cultural practices and prohibited behaviors	Quarantine for epidemics; sexual prohibitions to reduce disease transmission; dietary restrictions to reduce food-borne disease
Hygiene movement (1840–1870s)	Sanitary conditions as basis for improved health	Environmental action on a community-wide basis distinct from health care	Snow on cholera; Semmelweis and puerperal fever; collection of vital statistics as empirical foundation for public health and epidemiology
Contagion control (1880–1940s)	Germ theory: demonstration of infectious origins of disease	Communicable disease control through environmental control, vaccination, sanatoriums, and outbreak investigation in general population	Linkage of epidemiology, bacteriology, and immunology to form tuberculosis (TB) sanatoriums; outbreak investigation, e.g., Goldberger and pellagra
Filling holes in the medical care system (1950s–mid-1980s)	Integration of control of communicable diseases, modification of risk factors, and care of high-risk populations as part of medical care	Public system for control of specific communicable diseases and care for vulnerable populations distinct from general healthcare system, beginning of integrated healthcare systems with integration of preventive services into general healthcare system	Antibiotics; randomized controlled trials; concept of risk factors; surgeon general reports on cigarette smoking; Framingham study on cardiovascular risks; health maintenance organizations and community health centers with integration of preventive services into general healthcare system
Health promotion/ Disease prevention (Mid-1980s–2000)	Focus on individual behavior and disease detection in vulnerable and general populations	Clinical and population-oriented prevention with focus on individual control of decision-making and multiple interventions	AIDS epidemic and need for multiple interventions to reduce risk; reductions in coronary heart disease through multiple interventions
Population health (2000s)	Coordination of public health and healthcare delivery based upon shared evidence-based systems thinking	Evidence-based recommendations and information management, focus on harms and costs as well as benefits of interventions, globalization	Evidence-based medicine and public health; information technology; antibiotic resistance; global collaboration, e.g., one health; tobacco control; climate change, and a full life cycle approach to improving community health

Data from Awofeso N. What's New About the "New Public Health"? *American Journal of Public Health*. 2004;94(5):705–709.