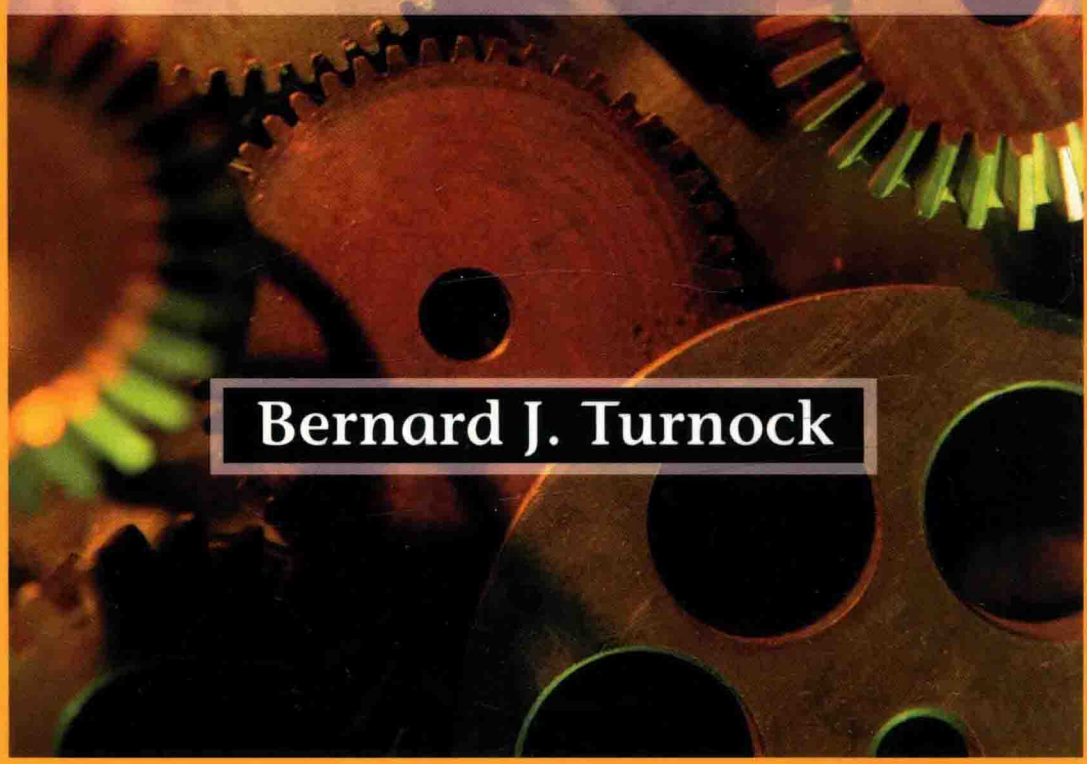
SECOND EDITION

PUBLIC HEALTH

What It Is and How It Works



Bernard J. Turnock

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Public Health
What It Is and How It Works
Second Edition

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To my beautiful and loving wife, Colleen

and

our five wonderful children:

Patrick, Brian, Kevin, Neil, and T.J.

Preface

The year 2000 and the century that will follow provide a unique opportunity to reflect on where we have been and what we have accomplished as a nation and as a society. For public health, it is truly an opportunity to examine what we might call, for lack of a better phrase, our Century of Progress. And what a spectacular century it has been!

My grandparents were children at the turn of the last century. At that time, they lived in a young and rapidly developing nation whose 75 million people held not unreasonable hopes of a long and healthy life. However, they also faced an alarmingly large number of health hazards and risks that, when taken together, offered them the prospect of an average life expectancy of only about 47 years. Smallpox, tuberculosis, pneumonia, diphtheria, and a variety of diarrheal diseases were frequent, although unwelcome, visitors. It was not uncommon for families to bury several of their children before reaching adulthood.

By the time my parents were children in the 1920s and 1930s, a variety of economic and social and scientific advances offered more than one additional decade of average life expectancy, despite even the massive social and economic disruption of the Great Depression. Still, tuberculosis, scarlet fever, whooping cough, measles, and other diseases were common. Fewer childhood deaths occurred, but many families still experienced one or more deaths among their children.

By the time those of us in the Baby Boom Generation appeared after World War II, my four siblings and I enjoyed the prospects of living to and even beyond the Golden Years and age 65. When I was a child, polio was one of the few remaining childhood infectious disease threats. Some of my most vivid childhood memories were the mass immunization programs that took place in my home town. Childhood deaths were an uncommon experience and often more likely due to causes other than infectious diseases.

As the twenty-first century dawns on more than 270 million Americans, my children and yours now look forward to an average life expectancy of about 80 years. Also, today there are no less than 22 different conditions for which immunizations are available—11 of which are recommended for use in all children—to prevent virtually all of the conditions that threatened their parents, grandparents, and great grandparents over the twentieth century. Today, children are even being immunized against cancer through the hepatitis B immunization

preparations! Overall, childhood deaths have declined more than 95 percent from what they had been a century earlier! Think of that; it means that 19 of the 20 deaths that used to occur to children in this country no longer take place!

To many of us, a century seems like a long time. However, in the grand scheme of things, it is not, and it seems even shorter when we consider how our lifetimes are so interconnected. Just look at the connections linking each of us with our grandparents and our children and even our children's children, each of whom held quite different expectations for their lives and health. These links and connections play critical roles when it comes to understanding the value and the benefits of the work of public health. At the turn of the next century, an estimated 570 million Americans will be enjoying the fruits of public health's labors over the preceding centuries. The vast majority of the people who will benefit from what public health does are yet to be born!

As someone who has spent 15 years in public health practice and another decade in teaching and researching the field, I have been concerned about why those who work in the field and those who benefit from its work do not better understand something so important and useful. Throughout my career as a public health physician, I have developed a profound respect for the field, the work, and the workers. However, I must admit that even while serving as director of a large state health department, I lacked a full understanding and appreciation of this unique enterprise.

What has become clear to me is that the story of public health is not simple to tell. There is no one official at the helm, guiding it through the turbulence that is constantly encountered. There is no clear view of its intended destination and of what work needs to be done by whom to get there. We cannot turn to our family physicians, elected officials, or even to distinguished public health officials, such as our Surgeon General, for vision and direction. Surely, these people play important roles, but public health is so broadly involved with the biologic, environmental, social, cultural, behavioral, and service utilization factors associated with health that no one is accountable for addressing everything. Still, we all share in the successes and failures of our collective decisions and actions, making us all accountable to each other for the results of our efforts. My hope is that this book will present a broad view of the public health system and deter current and future public health workers from narrowly defining public health in terms of only what they do. At its core, this book seeks to describe public health simply and clearly in terms of what it is, what it does, how it works, and why it is important to all of us.

Although there is no dearth of fine books in this field, there is most certainly a shortage of understanding, appreciation, and support for public health and its various manifestations. Many of the current texts on public health attempt to be comprehensive in covering the field without the benefit of a conceptual framework understandable to insiders and outsiders alike. The dynamism and complexity of the field suggest that public health texts are likely to become even larger and more comprehensive as the field advances. In contrast, this book aims to present the essentials of public health, with an emphasis on comprehensibility, rather than comprehensiveness. It presents fundamental concepts but links those concepts to practice in the real world.

These are essential topics for public health students early in their academic careers, and they are increasingly important for students in the social and political sciences and other health professions, as well. However, this book is intended as much for public health practitioners as it is for students. It represents the belief that public health cannot be adequately taught through a text, that it needs to be learned through exploration and practice of its concepts and methods. In that light, this book should be viewed as a framework for learning and understanding public health, rather than the definitive catalog of its principles and practices. Its real value will be its ability to encourage thinking "outside the book."

The first four chapters cover topics of interest to general audiences. Basic concepts underlying public health are presented in Chapter 1; included are definitions, historical highlights, and unique features of public health. This and subsequent chapters focus largely on public health in the United States, although information on public health globally and comparisons among nations appear in Chapters 2 and 3. Health and illness and the various factors that influence health and quality of life are discussed in Chapter 2. This chapter also presents data and information on health status and risk factors in the United States and introduces a method for analyzing health problems to identify their precursors. The third chapter addresses the overall health system and its intervention strategies, with a special emphasis on trends and developments that are important to public health. Interfaces between public health and a rapidly changing health system are highlighted. Chapter 4 examines the organization of public health responsibilities in the United States by reviewing its legal basis and the current structure of public health agencies at the federal, state, and local levels. Together, these four chapters serve as a primer on what public health is and how it relates to health interests in modern America.

The final four chapters flesh out the skeleton of public health introduced in the first half of the book. They examine how public health does what it does, addressing issues of the inner workings of public health that are critical for the more serious students of the field. Chapter 5 reviews the core functions of public health and both how and how well these are currently being addressed. This chapter identifies key processes or practices that operationalize public health's core functions and tools that have been developed to improve public health practice. Chapter 6 builds on the governmental structure of American public health (from Chapter 4) and examines other inputs of the public health system, including human, informational, and fiscal resources. Outputs of the public health system, in the form of programs and services, are the subject of Chapter 7. Evidence-based public health practice is examined in terms of its population-based community prevention services and clinical preventive services, and an approach to program planning and evaluation for public health interventions is presented. The final chapter looks to the future of public health at the turn of the century, building on the lessons learned from the preceding century. Emerging problems, opportunities afforded by the expansion of collaborations and partnerships, more effectively organized community efforts, and obstacles impeding public health responses are also examined in the concluding chapter.

Each chapter includes a variety of figures, tables, and exhibits to illustrate the concepts and provide useful resources for public health practitioners. A glossary of public health terminology is provided for the benefit of those unfamiliar with some of the commonly used terms, as well as to convey the intended meaning for terms that may have several different connotations in practice. At the end of each chapter are discussion questions and exercises, many of which involve Internet-based resources, that complement the topics presented and provide a framework for thought and discussion. These allow the text to be used more flexibly in public health courses at various levels, using different formats for learners at different levels of their training and careers.

Together, the chapters represent a systems approach to public health, grounded in a conceptual model that characterizes public health by its mission, functions, capacity, processes, and outcomes. This model is the unifying construct for this text. It provides a framework for examining and questioning the wisdom of our current investment strategy that directs 100 times more resources toward medical services than it spends for population-based prevention strategies—even though treatment strategies contributed only 5 of the 30 years of increased life expectancy at birth that have been achieved in the United States since 1900.

Whatever wisdom might be found in this book has filtered through to me as a result of my mentors, colleagues, co-workers, and friends. For those about to toil in this vineyard of challenge and opportunity, this is meant to be a primer on public health in the United States. It is a book that seeks to reduce the vast scope, endless complexities, and ever-expanding agenda to a format simple enough to be understood by first-year students and state health commissioners alike.

Internet-based resources for courses based on this text are available at: http://www.aspenpublishers.com/books/turnock/

Acknowledgments

Many persons have shaped the concepts and insights provided in this text. This book evolved from an introductory course on public health concepts and practice that I have been teaching at the University of Illinois at Chicago School of Public Health since 1991. During that time, more than 1,500 current and aspiring public health professionals have influenced the material included in this book. Their enthusiasm and expectations have challenged me to find ways to make this subject interesting and valuable to learners at all levels of their careers.

Many parts of this book rely heavily on the work of public health practitioners and public health practice organizations. The Public Health Practice Program Office (PHPPO) at the Centers for Disease Control and Prevention deserves special acknowledgment for their contributions, especially those of Ed Baker (Director of PHPPO), Bud Nicola, and Paul Halverson. The contributions and collaborations of Bill Dyal, formerly with PHPPO, are readily apparent throughout this text. Other valuable contributions came from public health colleagues, including John Lumpkin, Chris Atchison, Laura Landrum, Judith Munson, and Patrick Lenihan. In several chapters, I have drawn on the work of two public health agencies at which I have worked during my career, the Illinois Department of Public Health and the Chicago Department of Public Health. The influence of four outstanding public health figures who have served as mentors and role models—Jean Pakter, Quentin Young, George Pickett, and C. Arden Miller—is also apparent in this book.

Lloyd Novick provided early encouragement and support for this undertaking, as well as useful suggestions on the scope and focus of this text. Kalen Conerly and Nora McElfish at Aspen Publishers have consistently provided valuable suggestions and guidance. Michele Issel, Bree Andrews, and Mike Mendoza provided critical review and constructive suggestions. Arden Handler has long been my colleague and collaborator on many public health capacity–building projects. I am grateful for the many and varied contributions from all of these sources.

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Chapter 1

What Is Public Health?

The passing of one century and the beginning of another afford a rare opportunity to look back at where public health has been and forward to the challenges that lie ahead. Imagine a world 100 years from now where life expectancy is 30 years more and infant mortality rates are 95 percent lower than they are today. The average life span would be more than 107 years, and fewer than one of every 2,000 infants would die before their first birthdays. These seem like unrealistic expectations and unlikely achievements; yet, they are no greater than the gains realized between 1900 and 1999 in the United States.

At the turn of the last century, in 1900, few envisioned the century of progress in public health that lie ahead. Yet, by 1925, public health leaders such as C.E.A. Winslow reported a 47 percent increase in the life expectancy (from 36 years to 53 years) for residents of New York City between the years 1880 and 1920.[1] Accomplishments such as these caused Winslow to wonder what was possible through widespread application of scientific knowledge. With the even more spectacular achievements over the rest of the twentieth century, we all should wonder what is possible in the century that lies ahead.

The year 2000 will be remembered for many things, but it is unlikely that many people will remember it as a spectacular year for public health in the United States. No major discoveries, innovations, or triumphs set the year 2000 apart from other years in recent memory. Yet, on closer examination, maybe there were! Like the story of the wise man who invented the game of chess for his king and asked for payment by having the king place one grain of wheat on the first square of the chessboard, two on the second, four on the third, eight on the fourth, and so on, the small victories of public health over the past century have resulted in cumulative gains so vast in scope that they are hard to comprehend.

In the year 2000, there were nearly 900,000 fewer cases of measles reported than in 1941, 200,000 fewer cases of diphtheria than in 1921, more than 250,000 fewer cases of whooping cough than in 1934, and 21,000 fewer cases of polio than in 1951.[2] The dawn of the new century witnessed 45 million fewer smokers than would have been expected, given trends in tobacco use through 1965. More than 2 million Americans were alive that otherwise would

have died from heart disease and stroke, and nearly 100,000 Americans were alive as a result of automobile seat belt use. Protection of the United States blood supply had prevented more than 1.5 million hepatitis B and hepatitis C infections and more than 50,000 human immunodeficiency virus (HIV) infections, as well as more than $3.5 billion in medical costs associated with these three diseases.[3] In the late 1990s, average blood lead levels in children were less than one-third of what they had been in 1976. This catalog of accomplishments could be expanded many times over. Figure 1–1 summarizes this progress, as reflected in two of the most widely followed measures of a population's health status—life expectancy and infant mortality.

These results did not occur by themselves. They came about through decisions and actions that represent the efforts of public health practice. It is the story of public health practice and its immense value and importance in our lives that is the focus of this text. With this impressive litany of accomplishments, it would seem that public health's story would be easily told. For several reasons, however, it is not. As a result, public health remains poorly understood by its prime beneficiary—the public—as well as many of its dedicated practitioners. Although public health's results, as measured in terms of improved health status, diseases prevented, scarce resources saved, and improved quality of life, are more apparent today then they have ever been, many people fail to link

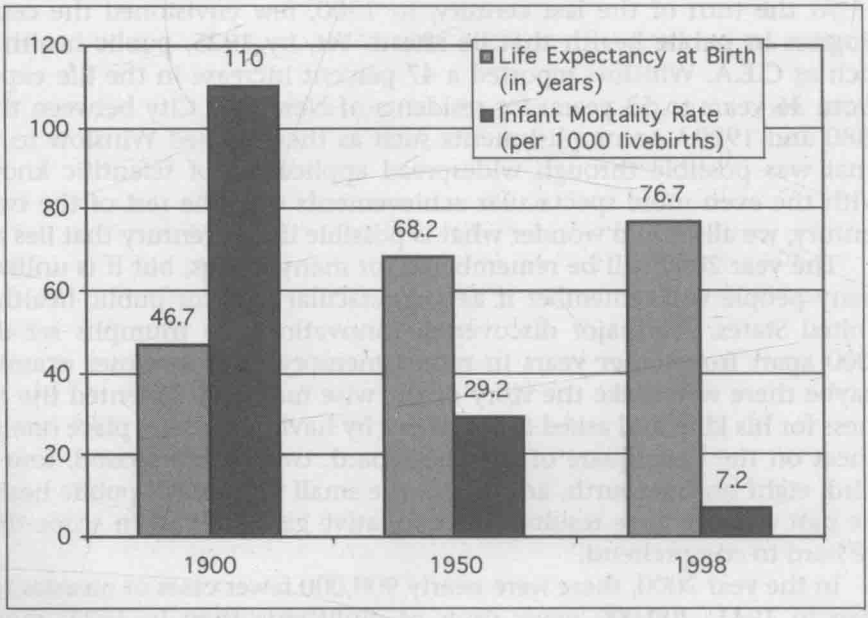

Figure 1–1 Life Expectancy at Birth and Infant Mortality Rates, United States, 1900, 1950, and 1998. *Source:* Adapted from *Health United States 1999*, National Center for Health Statistics, Public Health Service, 1999.

public health with its results. This suggests that the public health community must more effectively communicate what public health is and what it does, so that its results can be readily traced to their source.

This chapter is an introduction to public health that links basic concepts to practice. It considers three questions:

- What is public health?
- Where did it come from?
- Is it important in modern America?

To address these questions, the chapter begins with a sketch of the historical development of public health activities in the United States. It then examines several definitions and characterizations of what public health is and explores some of its unique features. Finally, it offers insights into the value of public health in biologic, economic, and human terms.

Taken together, the topics in this chapter provide a foundation for understanding what public health is and why it is important. A conceptual framework that approaches public health from a systems perspective is introduced to identify the dimensions of the public health system and facilitate an understanding of the various images of public health that coexist in modern America. We will see that, as in the story of the blind men examining the elephant, the American public has mistaken separate components of public health for the entire system. Later chapters will more thoroughly examine and discuss the various components and dimensions of the public health system.

A BRIEF HISTORY OF PUBLIC HEALTH IN THE UNITED STATES

Early Influences on American Public Health

Although the complete history of public health is a fascinating saga in its own right, this section will present only selected highlights. Suffice it to say that when ancient cultures perceived illness as the manifestation of supernatural forces, they also felt that little in the way of either personal or collective action was possible. For many centuries, disease was synonymous with epidemic. Diseases, including horrific epidemics of infectious diseases such as the Black Death (plague), leprosy, and cholera, were phenomena to be accepted. It was not until the so-called Age of Reason and the Enlightenment that scholarly inquiry began to challenge the "givens" or acceptable realities of society. Eventually, the expansion of the science and knowledge base would reap substantial rewards.

With the advent of industrialism and imperialism, the stage was set for epidemic diseases to increase their terrible toll. As populations shifted to urban centers for the purpose of commerce and industry, public health conditions worsened. The mixing of dense populations living in unsanitary conditions and working long hours in unsafe and exploitative industries with wave after wave of cholera, smallpox, typhoid, tuberculosis, yellow fever, and other diseases was a formula for disaster. Such disaster struck again and again across the globe, but most seriously and most often at the industrialized seaport cities

that provided the portal of entry for diseases transported as stowaways alongside commercial cargoes. The experience, and subsequent susceptibility, of different cultures to these diseases partly explains how relatively small bands of Europeans were able to overcome and subjugate vast Native American cultures. Seeing the Europeans unaffected by scourges such as smallpox served to reinforce beliefs that these light-skinned visitors were supernatural figures, unaffected by natural forces.[4]

The British colonies in North America and the fledgling United States certainly bore their share of the burden. American diaries of the seventeenth and eighteenth centuries chronicle one infectious disease onslaught after another. These epidemics left their mark on families, communities, and even history. For example, the national capital had to be moved out of Philadelphia, due to a devastating yellow fever epidemic in 1793. This epidemic prompted the city to develop its first board of health in that same year.

The formulation of local boards of distinguished citizens, the first boards of health, was one of the earliest responses to epidemics. This response was revealing, in that it represented an attempt to confront disease collectively. Because science had not yet determined that specific microorganisms were the causes of epidemics, avoidance was the primary tactic used. Avoidance meant evacuating the general location of the epidemic until it subsided or isolating diseased individuals or those recently exposed to diseases on the basis of a mix of fear, tradition, and scientific speculation. Several developments, however, were swinging the pendulum ever closer to more effective counteractions.

The work of public health pioneers such as Edward Jenner, John Snow, and Edwin Chadwick illustrates the value of public health, even when its methods are applied amidst scientific uncertainty. Well before Koch's postulates established scientific methods for linking bacteria with specific diseases and before Pasteur's experiments helped to establish the germ theory, both Jenner and Snow used deductive logic and common sense to do battle with smallpox and cholera, respectively. In 1796, Jenner successfully used vaccination for a disease that ran rampant through communities across the globe. This was the initial shot in a long and arduous campaign that, by the year 1977, had totally eradicated smallpox from all of its human hiding places in every country in the world.

Through a series of studies of cholera outbreaks in London between 1848 and 1854, Snow's accomplishments even further advanced the art and science of public health. In 1854, Snow traced an outbreak of cholera to the water of a well drawn from the pump at Broad Street and helped to prevent hundreds, perhaps thousands, of cholera cases. Earlier in 1854, he had demonstrated that another large outbreak could be traced to one particular water company that drew its water from the Thames River, downstream from London, and that another company that drew its water upstream from London was not linked with cholera cases. In both efforts, Snow's ability to collect and analyze data allowed him to determine causation, which, in turn, allowed him to implement corrective actions that prevented additional cases. All of this occurred without benefit of the knowledge that there was an odd-shaped little bacterium that was carried in water and spread from person to person by hand-to-mouth contact!

England's General Board of Health conducted its own investigations of these outbreaks and concluded that air, rather than contaminated water, was

the cause.[5] Its approach, however, was one of collecting a huge amount of information and accepting only that which supported its view of disease causation. Snow, on the other hand, systematically tested his hypothesis by exploring evidence that ran contrary to his initial expectations.

Chadwick was a more official leader of what has become known as the *sanitary movement* of the latter half of the nineteenth century. In a variety of official capacities, he played a major part in structuring government's role and responsibilities for protecting the public's health. Due to the growing concern over the social and sanitary conditions in England, a National Vaccination Board was established in 1837. Shortly thereafter, Chadwick's *Report on an Inquiry into the Sanitary Conditions of the Laboring Population of Great Britain* articulated a framework for broad public actions that served as a blueprint for the growing sanitary movement. One result was the establishment in 1848 of a General Board of Health. Interestingly, Chadwick's interest in public health had its roots in Jeremy Bentham's utilitarian movement. For Chadwick, disease was viewed as causing poverty, and poverty was responsible for the great social ills of the time, including societal disorder and high taxation to provide for the general welfare.[6] Public health efforts were necessary to reduce poverty and its wider social effects. This view recognizes a link between poverty and health that differs somewhat from current views. Today, it is more common to consider poor health as a result of poverty, rather than as its cause.

Chadwick was also a key participant in the partly scientific, partly political debate that took place in British government as to whether deaths should be attributed to clinical conditions or to their underlying factors, such as hunger and poverty. It was Chadwick's view that pathologic, as opposed to less proximal social and behavioral, factors should be the basis for classifying deaths.[6] Chadwick's arguments prevailed, although aspects of this debate continue to the present day. William Farr, sometimes called the *father of modern vital statistics,* championed the opposing view.

In the latter half of the nineteenth century, as sanitation and environmental engineering methods evolved, more effective interventions became available against epidemic diseases. Further, the scientific advances of this period paved the way for modern disease control efforts targeting specific microorganisms.

Growth of Local and State Public Health Activities in the United States

In the United States, Lemuel Shattuck's *Report of the Sanitary Commission of Massachusetts* in 1850 outlined existing and future public health needs for that state and became America's blueprint for development of a public health system. Shattuck called for the establishment of state and local health departments to organize public efforts aimed at sanitary inspections, communicable disease control, food sanitation, vital statistics, and services for infants and children. Although Shattuck's report closely paralleled Chadwick's efforts in Great Britain, acceptance of his recommendations did not occur for several decades. Eventually, in the latter part of the century, his farsighted and far-reaching recommendations came to be widely implemented. With greater understanding of the value of environmental controls for water and sewage and of the role of spe-

cific control measures for specific diseases (including quarantine, isolation, and vaccination), the creation of local health agencies to carry out these activities supplemented—and, in some cases, supplanted—local boards of health.

These local health departments developed rapidly in the seaport and other industrial urban centers, beginning with a health department in Baltimore in 1798, because these were the settings where the problems were reaching unacceptable levels. An illustration of such local public health efforts is presented in Appendix 1–A, which traces public health activities in Chicago from 1835 through 1999. The history summarized in this appendix parallels that of other American cities through the nineteenth and twentieth centuries.

Because infectious and environmental hazards are no respecters of local jurisdictional boundaries, states began to develop their own boards and agencies after 1870. These agencies often had very broad powers to protect the health and lives of state residents, although the clear intent at the time was that these powers be used to battle epidemics of infectious diseases. In later chapters, we will revisit these powers and duties, because they serve as both a stimulus and a limitation for what can be done to address many contemporary public health issues and problems.

Federal Public Health Activities in the United States

This sketch of the development of public health in the United States would be incomplete without a brief introduction to the roles and powers of the federal government. Federal health powers, at least as enumerated in the U.S. Constitution, are minimal. It is surprising to some to learn that the word *health* does not even appear in the Constitution. As a result of not being a power granted to the federal government (such as defense, foreign diplomacy, international and interstate commerce, or printing money), health became a power to be exercised by states or reserved to the people themselves.

Two sections of the Constitution have been interpreted over time to allow for federal roles in health, in concert with the concept of the so-called implied powers necessary to carry out explicit powers. These are the ability to tax in order to provide for the "general welfare" (a phrase appearing in both the preamble and body of the Constitution) and the specific power to regulate commerce, both international and interstate. These opportunities allowed the federal government to establish a beachhead in health, initially through the Marine Hospital Service (eventually to become the Public Health Service). After the ratification of the Sixteenth Amendment in 1916, authorizing a national income tax, the federal government acquired the ability to raise vast sums of money, which could then be directed toward promoting the general welfare. The specific means to this end were a variety of grants-in-aid to state and local governments. Beginning in the 1960s, federal grant-in-aid programs designed to fill gaps in the medical care system nudged state and local governments further and further into the business of medical service provision. Federal grant programs for other social, substance abuse, mental health, and community prevention services soon followed. The expansion of federal involvement into these areas, however, was not accomplished by these means alone.