

# Historical Developments in Public Health

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## LEARNING OBJECTIVES

- To better understand the historical context of public health
- To gain perspective on the role of public health in society
- To grasp the key milestones in the evolution of public health practice and policy
- To understand recent reform and its implications for the future of public health

## Chapter Overview

Public health administration and practice comprises organized efforts to improve the health of populations. Public health prevention strategies target populations rather than individuals. Throughout history, public health efforts have largely focused on the control of communicable diseases, reducing environmental hazards, sanitation, and providing safe drinking water. Because social, environmental, and biological factors interact to determine health, public health practice must utilize a broad set of skills and interventions. During the twentieth century, the historic emphasis of public health on protecting populations from infectious disease and environmental threats expanded to include the prevention and reduction of chronic disease through behavioral and lifestyle interventions. New challenges will emerge as we move forward in the twenty-first century, and new strategies

and initiatives will be required. The role of public health will undoubtedly be central to the well-being of the nation and the world. Before the advancements of recent centuries, early medical providers, even without modern, professional, and more detailed scientific knowledge, studied health experiences to develop steps toward improved health and for prevention—they engaged in public health measures before the label “public health” was adopted.

## Early History of Public Health

The fleet in view, Apollo twanged his deadly bow,  
And hissing fly the feathered fates below.  
On mules and dogs the infection first began;

And last, the vengeful arrows fixed  
in man.

—The Iliad

Little is known about the health of the hunting and gathering people of prehistoric times. Paleopathology has shown that disease not only existed in antiquity, but that it has always occurred in humans in the same basic forms, such as infection, inflammation, disturbance of development and metabolism, and tumors.<sup>1</sup> When humans began to aggregate into larger, more permanent settlements with the introduction of agricultural techniques and the domestication of animals, they fundamentally altered the way they lived. With the adoption of an agrarian society, humans began to live in closer contact in communities supported by the production of food. These new types of human settlements reconstructed the ecosystems over which they presided, ushering a fundamental shift in how humans interacted with each other and their environments. These new, denser living arrangements afforded innumerable microorganisms a new ecological niche to exploit, paving the way for pestilence, epidemics, and disease.<sup>2-4</sup> For example, human settlements offered greater opportunity for constant contact with intestinal parasites carried through human feces, whereas constantly mobile bands of hunters and gatherers were less likely to acquire such infections.<sup>2</sup> Permanent and semipermanent settlements, the domestication of plants and animals, and the urbanization of human society forever altered the disease environment of the human species.<sup>2,3,5</sup> From the most ancient times of recorded history, all human societies have been affected by the contingencies of illness and health.<sup>1,2,6</sup>

Although little is known about the disease regimes of prehistoric societies, it is generally assumed that the early settlements of Mesopotamia, the Indus valley, and the Peruvian coastal region were plagued by tropical diseases such as malaria and schistosomiasis.<sup>2,3</sup> Ancient medical systems relied predominantly on mystical and religious explanations for disease and often stressed the importance of evading illness through ritual and practical methods of prevention grounded in spiritual and temporal purity through various codes of

behavior and dietary protocols.<sup>1,2,7</sup> Chinese physicians under the Chou Dynasty (1122–250 BCE) advocated for the preservation of health through a mixture of dietary restrictions, temperance, and physical and spiritual exercises.<sup>2</sup> Similarly, in ancient Egypt the consensus was that illness and disease were a result of an imbalance between temporal and spiritual existence. The ancient Egyptians used techniques such as prayers, magic, ritual, and pharmacopoeia to restore health.<sup>2,8</sup> Regulations governing food preparation, hygiene, and sexual relations were largely ritualistic and widely practiced throughout ancient Egyptian society.<sup>2,9</sup> Furthermore, archaeological excavations in Egypt have provided evidence that several ancient cities from around the fourteenth century BCE were planned and had relatively sophisticated stone masonry drainage systems.<sup>1</sup> In ancient India, planned cities, in which bathrooms and drains in buildings were commonplace, were also constructed around 4,000 years ago in the Indus valley. These cities also routinely enjoyed broad, paved streets and covered sewers.<sup>1</sup> In Mesopotamia, many societies, including the Babylonians, Assyrians, and Hebrews, embraced regulatory hygiene customs in the form of established codes. Although the aims of these codes were to encourage spiritual purity, the hygiene regulations brought improved sanitation, which prevented disease.<sup>9</sup> Furthermore, Hebrew rabbi-physicians formulated elaborate rules for disease prevention based on the belief that some diseases were communicable through foods, bodily discharge, clothing, water, and air.<sup>2</sup> The Hebrews and Babylonians also believed that plagues spread through contaminated water and connected epidemics with certain animals such as rats, flies, and gnats.<sup>2,10</sup> Both of these groups isolated individuals during epidemics and fumigated and disinfected their houses and belongings. The Hebrew and Babylonian codes also demanded that no well was to be dug near a cemetery or waste dump, water was to be boiled before drinking, and food had to be clean, fresh, and thoroughly cooked.<sup>2</sup> The association between ritualistic cleanliness and health was not limited to the “old world”; the Incas instituted an annual health ceremony, which included

the cleaning of all homes.<sup>11</sup> These examples provide evidence of early understanding of the importance of protecting the public from disease.

## Hellenistic Health

Between the seventh and fifth centuries BCE new philosophies that separated the temporal and divine causes of disease began to emerge in ancient Greece. However, these philosophies were the exception and their influence was minuscule; much of the ancient Greek understanding of health was still dominated by mysticism until the emergence of Hippocrates and the **Hippocratic tradition**. Hippocrates was an honored and celebrated physician who probably lived sometime between 460 and 360 BCE. He was one of the authors and namesake of the Hippocratic Corpus, from which the Hippocratic Oath pledged by physicians today was derived. The Corpus is a compilation of works by many authors that presented a radical departure from the religious and mystical traditions of healing. The Corpus and more generally the Hippocratic tradition concentrated on the patient rather than the disease and emphasized prevention.<sup>2</sup> The Hippocratic tradition represented medicine as a professional vocation that used and adapted healing methods and regimes that were based on empirical observation.<sup>2,12</sup> Hippocratic physiology recognized the body as consisting of four fluids or **humours**: blood, black bile, yellow bile, and phlegm. Health was achieved when all four were in perfect balance or equilibrium. The humours reflected the essential elements of the physical universe: fire, earth, air, and water.

Hippocratic tradition recognized that health was affected by seasons and the quality of the environment. *On Airs, Waters, and Places*, a central Hippocratic text, analyzed the environmental determinants of health and divided diseases into ones that were **endemic**, always present, and ones that were **epidemic**, occurring occasionally.<sup>1,2</sup> These terms and concepts are still used today. *On Airs, Waters, and Places* was not limited to a theoretical treatise, but rather served as a practical guide used in Hellenistic colonial expansion. The text recommended that before a place was colonized and prior to any construction, a physician

should conduct a detailed investigation of the environment's integrity. Building settlements on or near marshes and swamps was discouraged, whereas it was recommended to erect houses on dry, elevated areas warmed by the sun.<sup>1</sup> Another practical application of *On Airs, Waters, and Places* was to assist physicians in setting up practices in unfamiliar towns or areas.

Greek medicine never exclusively relied on curative methods, but rather embraced a tradition of combining therapeutic treatments with prevention measures. Because disease was believed to reflect an imbalance in the humours, preventing the disturbance of equilibrium was thought to be essential. To preserve equilibrium, physicians proposed an ideal model of life that required that nutrition, excretion, exercise, and rest remain in perfect balance. However, very few people in ancient Greece could afford to live such a life, and this recommended regimen was limited to the upper classes whose lives consisted of leisure. In ancient Greece, the upper classes were supported by a slave economy; thus, for most Greeks the recommended equilibrium was virtually unattainable.<sup>1</sup> The theoretical idea of equilibrium proposed by the ancient Greeks has had a profound impact on the perceptions of health and healing throughout the ages. Today it remains at the conceptual core of homeostasis, the foundation of modern allopathic medicine.

## Latin Engineering and Administration

Hellenistic expansion through the conquests of Alexander the Great spread Hippocratic traditions throughout parts of Europe, the Middle East, and North Africa. However, nothing had as profound an impact on the spread of Hippocratic traditions and the abandonment of religious and mystical healing techniques as the emergence of the Roman Empire. Rome conquered the Mediterranean world and embraced the legacy of Greek culture. Although the Romans adopted the philosophies proposed by Hippocratic traditions, they added to them components that were distinctly Roman. The Roman clinician was, in most respects, an

imitation of the Greek physician, embracing the Hippocratic traditions. Roman elites frequently hired Greek physicians as their personal healers. In fact, the famed Roman physician Galen (129–200 CE) was ethnically Greek. Where the Romans differed from the Greeks was in their abilities in engineering and administration, as builders of complex sewage systems and baths, and as providers of water supplies and other health facilities.<sup>1</sup> Through the construction of complex engineering projects and the establishment of sophisticated administration systems, the Romans forever changed how the world addressed health.

Sanitation reform in Rome was catalyzed by the growth of the bureaucratic imperial state and the development of sophisticated civil engineering to provide rapid communication across the empire.<sup>2</sup> By the second century BCE, an elaborate system of aqueducts was bringing fresh water into the city of Rome; eventually most cities throughout the empire would have systems in place that were on par with those of Rome. Many cities also had sophisticated baths, public fountains, piped water, drainage systems, underground sewage systems, and public pay lavatories located in the busier sections of town.<sup>1,2,13</sup> The public routinely retrieved water from communal water sources, whereas aristocrats and the ruling elite typically had their own private water supplies.<sup>1</sup> The administration of public health services was a responsibility of the imperial state. In Rome, government supervision and regulations extended to public baths, water supplies, street cleaning, and the sale of spoiled food.<sup>14</sup> The state also commissioned and oversaw innumerable building projects that contributed to health and sanitation. By the early second century, physicians were given immunity from taxation by most civil authorities.<sup>2</sup> Furthermore, physicians were employed by many municipalities to provide medical services for the poor; however, these services were limited and inadequate for addressing the needs of the expansive poor populations.<sup>1,2,15</sup> Infirmaries were established in the first century CE throughout the empire to service sick slaves; occasionally these facilities were utilized by free citizens, although this was rare. In addition, military hospitals were established at large fortresses to service the expansive military.<sup>16</sup> While hospitals

were provided for soldiers and slaves, the dual engines of the imperial economy, such provisions for the poor members of Roman society were virtually nonexistent.<sup>1,2</sup> Although the Roman state provided a salubrious metropolitan environment for its aristocracy and ruling elite, most citizens lived in overcrowded, squalid conditions in burgeoning cities.<sup>14</sup>

In addition to their revolutionary sanitation reforms, the Romans recognized the connection between swamps and marshes and disease, especially malaria. In the first century BCE, the Roman scholar and writer Marcus Terentius Varro advised against establishing farms near swamps and marshes because “there are bred certain minute creatures which cannot be seen by the eyes, which float in the air and enter the body through the mouth and nose and there cause serious disease.”<sup>1, p.19</sup> Despite all of the public engineering projects and sanitation regulations and reforms, Rome was burdened by the many endemic and epidemic diseases similarly experienced by other peoples of the Mediterranean basin.

## The Middle Ages

In the Middle Ages (500–1500 CE), continual epidemics of infectious diseases spurred collective activities by communities to promote the public’s health, presaging the later formation of boards of health and public health departments in the 1800s. The Middle Ages were marked by two major epidemics of bubonic plague, the Plague of Justinian (543 CE) and the Black Death (1348 CE), with smaller outbreaks of various diseases in the intervening period including leprosy, smallpox, tuberculosis (TB), and measles.<sup>17</sup>

The decline of the Roman Empire was most pervasive in the city of Rome and the empire’s western provinces. The emperor Constantine accelerated this decline when he relocated the administrative capital of Rome to Byzantium, current-day Istanbul. The Western Roman Empire eventually dissolved, unofficially ushering in the Middle Ages. However, the Eastern Roman Empire, often referred to as the Byzantine Empire, thrived for several hundred more years. During the Middle Ages, the Eastern Roman Empire, Persia, and

Arab city-states became economically interrelated, fostering the exchange of knowledge and ideas, including health and healing methods. One of the most notable figures of this blending of eastern and western traditions was the renowned Persian physician, Avicenna. Avicenna, who was as much a philosopher as a medical theorist, synthesized the medical doctrines of Hippocrates and Galen with the biology presented by Aristotle in a five-volume work called the *Canon*.<sup>2</sup> The *Canon* became a definitive work of innumerable medical laws and an authoritative text in medical education and practice throughout much of the world, including European medical universities, until the end of the seventeenth century.<sup>2,18,19</sup> Avicenna illustrated this conceptual synthesis with clinical histories and their therapeutic indications, serving as a predecessor to contemporary medical texts.<sup>2</sup>

The disintegration of the western Roman Empire led to the decentralization of government and administration across Europe. The sophisticated cities built by the Romans were largely abandoned, and their maintenance and upkeep went unattended. This decentralization of civic power, coupled with mass emigration from the dilapidated cities, dissolved the administrative health reforms established by the empire. The absence of centralized governance gave rise to the expansive power of the Christian Church. The Church became the presiding authority over Europe during this period and thus inherited the responsibilities required by such a position, including public health administration. The Church, unlike the Roman Empire, had no established bureaucracy in place to administrate complex public health measures. This led to a reliance on municipal initiatives that were endorsed by the Church. With the emergence of the Church over the Roman State, cultural preoccupations with health in this period began to focus less upon the comfort of aristocrats and ruling elites and more upon the dangerous effects that disease had on the general population.<sup>1,2</sup> The needs and health of the poor became objects of Christian welfare provisions. The Church also presided over medical education during this time period. All university-trained physicians were required to be clerics; when the Council of Tours declared

in 1163 that “the church does not shed blood,” surgery was subsequently relegated to a manual craft practiced by barbers and other craftsmen, not physicians.<sup>2,20,21</sup>

Changing patterns in agricultural production during this period led to a substantial increase in the population. Furthermore, there was increased trade with the densely urbanized societies of the Middle East. These two developments contributed to the urbanization of Europe, and people began to aggregate in and around old Roman cities and newly established settlements. These new cities relied on encircling fortifications for security, and consequently, suffered from overcrowding in the confined spaces.<sup>2</sup> As social, economic, and demographic factors began to change, there were new opportunities for pestilence and disease to exploit, and approaches to disease prevention faced new challenges.

During this period, leprosy remained a persistent problem. Epidemics of leprosy, and later plague and syphilis, threatened to destabilize medieval society as prevalence grew and population density increased in urban environments. Attempts to control leprosy came in the form of isolation and excommunication from society. The social consequences of contracting leprosy could be as devastating as the disease itself. The Church ordered that municipalities were to isolate lepers from greater society. Outcast from society, lepers were considered socially and legally dead long before physical death occurred.<sup>2</sup> This was ritualized in a ceremony where lepers would stand in open graves while a priest throwing handfuls of earth over them proclaimed that they were “dead unto the world but alive unto Christ.”<sup>2</sup> After lepers were declared legally dead, their property was inherited by relatives, and they were forced to wear a cloak, carry a bell, and keep their distance from the community on penalty of death; however, a healthy wife could not divorce an infected husband.<sup>2,22</sup> Excommunication from society was not necessarily grounded in fears of contagion, but rather on the belief that leprosy was a punishment for lechery and other sins.<sup>2,23,24</sup> Regardless, this practice was a precursor to the current-day preventive measure of isolating individuals who have acquired a lethal infectious disease.

The Black Death, a bubonic plague epidemic that peaked in 1348, had devastating consequences on medieval Europe. At the time, it was unknown that bubonic plague was transmitted to humans via the fleas infesting rodents; consequently, it was regarded as a communicable disease. One countermeasure employed to combat the pestilence was the isolation of individuals who were ill. In addition, victims of the disease had to be reported to authorities, an antecedent of the basic public health functions of disease reporting and surveillance. Quarantine measures were instituted to prevent entry of the plague from outside regions. Quarantine consists of the systematic isolation of travelers and ships for a period of 40 days—hence the name quarantine. The period of 40 days was believed sufficient to allow any potential acute infections to run their course.<sup>12</sup> Italian administrative measures to prevent the import of disease became the model eventually adopted by the rest of Europe.<sup>15</sup> In 1348, Venice, a chief port of entry for commerce from Asia, was the first city to institute quarantine, requiring the inspection and segregation of ships and individuals suspected of carrying disease. This was expanded in 1423, when a pest house or lazaretto was erected in Venice as a place to hold detained individuals suspected of harboring infection.<sup>25</sup> These early efforts remain relevant today as they are precursors to the contemporary public health practices of **isolation** and **quarantine**.

## Industrialization and the Influence of Great Britain

Public health activities in Great Britain were greatly influenced by the growing urbanization and industrialization of the 1800s. Conditions in England and the responsive social reforms and public health policies had a profound influence on how the United States addressed similar problems. London more than tripled in size from approximately 200,000 inhabitants in 1600 to 675,000 in 1700. During the 1700s, London grew only by approximately one-third and still had fewer than 1 million residents, but between 1800 and 1840, London doubled in size to nearly 2 million residents.<sup>26</sup> Malnutrition, overcrowding, filth, and poor working conditions contributed to severe

disease outbreaks.<sup>27</sup> Similarly, in New York City, the rise of typhus as a significant cause of death was attributed in part to the large increase in the number of immigrants in the 1840s and 1850s. In New York, the rise of tenement housing transformed typhus into an endemic slum disorder, but because it affected the poorest groups of society, it aroused little public concern.<sup>28</sup>

In 1842, Edwin Chadwick published the *General Report on the Sanitary Condition of the Laboring Population of Great Britain*.<sup>17</sup> This and follow-up reports became essential public health documents, stimulating sanitary awareness and social reforms.<sup>17,27,29,30</sup> Chadwick described the prevalence of disease among the laborer populations, showing that the poor exhibited a preponderance of disease and disability compared to more affluent populations,<sup>29</sup> an observation that remains true throughout the world today. Chadwick's report concluded that unsanitary environments caused the poor health of working people. At the time, disease was often attributed to miasma and foul odors,<sup>29</sup> and epidemics such as typhus, typhoid, and cholera were attributed to filth, stagnant pools of water, rotting animals and vegetables, and garbage.<sup>26</sup>

As chief administrator of the Poor Law Commission, Chadwick was responsible for providing relief to impoverished populations in England and Wales. He championed sanitary reform, which became the basis for public health activities in Great Britain and the United States alike. Chadwick was also the chief architect of the 1848 Public Health Act, which created a general board of health empowered to establish local boards of health and appoint an officer of health.<sup>17,31</sup> The latter was required to be a medically qualified practitioner and inspector of sanitary conditions. The board of health incurred opposition from those with property interests who, for economic reasons, were against proposals for the improvement of drainage and water systems. In 1854, only 5 years after its commencement, Parliament refused to renew the Public Health Act, thereby dissolving England's first national board of health.<sup>17</sup>

Although ultimately repealed, the 1848 Public Health Act was instrumental in improving public health and remains relevant to current

population-based preventive efforts.<sup>31</sup> Based on available morbidity and mortality data, the Act identified major public health issues of the time and assigned responsibility to national and local boards, including inspectors and officers of health.<sup>31</sup> The identified issues included poverty, housing, water, sewerage, the environment, safety, and food. Public health in England and Wales was thus organized with the primary purpose of improving the sanitary conditions of towns. The drafters of the Public Health Act, concerned with population health, assigned the responsibility of public health to national and local governments.<sup>31</sup> The sanitation reforms in Great Britain had a profound influence on the development of public health administration in America as the two nations confronted similar problems throughout the nineteenth century.

## The Emergence and Impact of Bacteriology

During the latter part of the 1800s and the early 1900s, scientific advances, particularly in microbiology, ushered in a new era for the fields of public health and medicine.<sup>27</sup> Sometimes referred to as the bacteriological phase of the public health movement, this era was led by the discoveries of Louis Pasteur and Robert Koch and the subsequent germ theory of disease. Pasteur discovered aerobic and anaerobic organisms and began to consider the possibility of a causal relationship between germs and disease. Koch, a country physician, discovered the bacillus responsible for anthrax and was able to demonstrate that the disease was transmissible in mice. He later discovered other disease-causing bacteria, including those that caused TB and cholera. This new germ theory afforded new opportunities for infectious disease control, including improved diagnosis, understanding of carrier states, and insight into the importance of vectors with respect to the transmission of disease. Furthermore, in New York City in the 1920s, the development of antitoxin and immunizations against diphtheria were harbingers of the abilities of organized public health programs to prevent a wide range of communicable diseases.<sup>17</sup>

The bacteriological discoveries of Pasteur and Koch became a marker between the “old” and the

“new” public health.<sup>32</sup> The association between bacteria and disease causation drew attention away from the sanitary problems of water supply, street cleaning, housing, and living conditions of the poor.<sup>32–34</sup> Disease-oriented approaches to public health were adopted by health officers and local health agencies.<sup>34</sup> Polluted water was demonstrated to be responsible for the transmission of typhoid fever, and methods were developed to measure bacteria in air, water, and milk.<sup>2</sup> Although disease-oriented approaches became the standard during this period, public health professionals continued to emphasize social reform with the realization that diseases, even those caused by germs, could not be separated from living and working conditions.<sup>10</sup>

## Public Health in the United States

The specters cholera, yellow fever, and smallpox recoil in fear as their way through the port of New York is blocked by a barrier labeled “Quarantine” and by an angel holding a sword and a shield on which is written “Cleanliness.”

—Description of “At the Gates,”  
an etching printed by Harper and  
Brothers, New York, September 5, 1885

## The American Colonies and the Early United States

The early American colonists struggled with hunger and malnutrition, their respective diseases, and infectious diseases such as smallpox, cholera, measles, diphtheria, and typhoid fever.<sup>35</sup> Malaria was endemic in parts of the colonies and smallpox was epidemic throughout the 1600s, yellow fever in the 1700s, and cholera in the 1800s.<sup>29</sup> The major public health measure employed by the colonies was the control of communicable diseases through legal efforts regarding quarantine and sanitation. The early colonies consisted of a series of seaports connected by ships. In 1699, William Penn, concerned about yellow fever in

the colony he had established, passed the Act to Prevent Sickly Vessels from Coming into This Government.<sup>29</sup> The Massachusetts Quarantine Act of July 1701 required parties bringing infectious diseases within the colony to pay all associated costs and damages and compelled confinement of individuals who were infected with pestilential illnesses. Quarantine laws were enacted in all major cities and towns along the eastern seaboard. Other laws that protected the health of the community included sanitary laws, which regulated such matters as privies and disposal of wastes and of animals.

In addition to the passage of these laws, another notable public health intervention of the colonial period was smallpox inoculation. Reverend Cotton Mather, known for his involvement in the Salem Witch trials, provided an account of the smallpox epidemic of 1689–1690 in New England: “In about a twelvemonth, one-thousand of our neighbors have been carried to their long home.”<sup>29, p.22</sup> The total population of Boston at that time was only 6,000. In 1721, during a smallpox epidemic in Boston, Mather suggested inoculation with small doses of smallpox to initiate immunity to the disease. As with many public health interventions, initially there was considerable resistance to the voluntary addition of a disease to healthy individuals, particularly among physicians; however, inoculation efforts eventually prevailed. Years later, when smallpox again struck Massachusetts, the death rate was 1.8% among individuals who had been inoculated, compared to 14% among those who were not.<sup>29</sup>

Yellow fever, an acute mosquito-borne viral infectious disease of short duration and varying severity, was the scourge of the 1700s.<sup>26</sup> In 1702, following importation of the disease from the Virgin Islands, New York City was particularly affected by the yellow fever epidemic, although numerous other cities, including Philadelphia, Norfolk, Charleston, New Orleans, and Boston, also fell victim to the disease. When a ship was quarantined in a harbor because it was a suspected carrier of yellow fever, it was required to fly a yellow flag upon its mast—hence the name of the disease. Cities experienced yellow fever epidemics throughout the century with some

cities experiencing multiple epidemics.<sup>36</sup> For instance, in Philadelphia nearly 50,000 people were reported to have contracted yellow fever in 1793, resulting in 4,044 deaths, only to be devastated by the disease again 5 years later, when another 3,506 deaths were attributed to the disease.<sup>33</sup> In the northern colonies the disease was noted to occur only in summer, after ships arrived from ports affected by yellow fever, whereas when the fall frost arrived the epidemics ended. This underscored the importance of the environment in epidemic diseases and improved understanding of the opportunity and necessity for public health measures.

## Public Health in the Nineteenth Century

In the 1800s, New York City was ravaged by several epidemics, including cholera, smallpox, typhus, dysentery, and diphtheria.<sup>33</sup> In addition to epidemics, the health of the public was threatened by the constant presence of TB, the leading cause of death in the United States at that time. In 1890, nearly one out of every four dwellings in New York City experienced a TB-related death. The toll was much higher in poorer neighborhoods, leaving those communities devastated by the disease.<sup>33</sup>

As in Britain, public health activities in the United States were greatly influenced by the growing urbanization and industrialization of the 1800s. Early health reformers in the United States, including Lemuel Shattuck of Boston, identified environmental improvement to prevent epidemic disease as a moral mission.<sup>37</sup> Shattuck was the foremost American advocate for community action in the area of environmental health. In the report “Census of Boston,” Shattuck reported on high mortality rates, including maternal and infant mortality rates, and the prevalence of communicable diseases.<sup>38</sup> He described these findings as directly related to living conditions and low income. In 1850, Shattuck published *General Plan for the Promotion of Public and Personal Health*, describing health and social conditions in Massachusetts and extolling the sanitary movements taking place in Britain and Europe.<sup>38</sup>

Sewage, refuse, and waste disposal and drainage were identified as priority public health measures; of these, sewage disposal was considered the most important.<sup>39</sup>

C. E. A. Winslow characterized **sanitation**, ensuring healthful environmental conditions, as the first stage in public health. He stated:

To a large section of the public, I fear that the health authorities are still best known as the people to whom one complains of unpleasant accumulations of rubbish in the backyard of a neighbor, accumulations which possess such offensive characteristics which somehow can only originate in a neighbor's yard and never in one's own.<sup>40, p.5</sup>

Early public health interventions in the United States, like those enacted in Europe and Great Britain, often required government authority to address environmental factors thought to be compromising the health of communities. Local public health agencies in the United States developed from the local boards of health dating to the 1700s.<sup>33</sup> Various claims have been made asserting community formation of the first board of health in the United States, with Baltimore, Charleston, New York City, and Philadelphia all contending for the honor. New York City, for example, established a board of health in 1796, which consisted of three commissioners and a health officer. The term *health officer* designated the responsibilities of a quarantine officer. From 1832, repeated cholera epidemics stimulated the creation of boards of health in the eastern United States, and port cities instituted a 40-day quarantine of ships entering harbors.<sup>34</sup> In his 1850 report, Shattuck emphasized the importance of government involvement in public health when he recommended the establishment of a state health department and local boards of health in each town.<sup>38</sup>

The challenges of massive populations concentrated in cities were magnified by the burdens of organizing large armies in the Civil War, 1861–1865. Diseases such as dysentery were endemic among soldiers on both sides. The Union and the Confederacy responded to

improve preventive health measures. They built hospitals in the field and in established locales; the largest was the Confederate Chimborazo Hospital in Richmond. The South, however, suffered from chronic shortages of food, which contributed to the ill health of the troops. Greater resources in the North and the pressures of urgency contributed to innovations such as the development of Borden's condensed milk, which could be transported easily without spoilage and supplied basic nutrition. In addition, the Union armies were supported by the Sanitary Commission, the forerunner of the American Red Cross, which developed practices for disease prevention and mitigation that both helped the war effort and would serve as models for post-war urban sanitation.

Following the work of the Sanitary Commission, the Citizens Association of New York issued its report *The Sanitary Condition of the City* in 1865, pressuring New York (both the city and state) to organize a board of health the following year.<sup>33</sup> The report documented the intimate relationship between social and economic forces contributing to ill health. A newly organized New York City Department of Public Health followed, focusing on cleaning the streets, regulating sewage and waste disposal, and mandating tenement reforms.<sup>33</sup> It soon became a model that many other cities emulated.

Subsequent development of local health departments was sporadic until around 1910, when severe epidemics of typhoid fever occurred in a number of cities. In response, the federal government recommended the establishment of full-time local health departments throughout the United States. In the meantime, the New York City Health Department continued to address environmental concerns during the 1900s. In a 1912 annual report, the health department described the removal of 20,000 dead horses, mules, donkeys, and cattle from the streets of New York, in addition to nearly half a million smaller animals such as pigs, hogs, calves, and sheep. In total, the disposal of more than 5 million pounds of spoiled poultry, fish, pork, and beef was accomplished. The report also noted that there were records of 343,000 complaints from

the public with respect to poor ventilation, waste disposal, and unlicensed manure dumps.<sup>33</sup>

The development and spread of state health departments were similar to that of local health departments. The first state board of health was established by the Louisiana State Legislature in 1855 in response to yellow fever, but this proved not to be a functional organization. The first successful board of health was established in Massachusetts in 1869 following Shattuck's earlier recommendation.<sup>29,38</sup> Other states quickly followed: California (1870), Minnesota (1872), Virginia (1872), Michigan (1873), Maryland (1874), and Alabama (1875). By 1900, all but eight states had boards of health. With the formation of the New Mexico board of health in 1919, all states had boards of health.<sup>29</sup>

## Public Health in the Twentieth Century

In the early 1900s, the public health workforce had gained skills in understanding the impact of the environment on the community's health and was beginning to understand the relationship between bacteria and infectious diseases. An example of a city-wide public health effort pertaining to the control of influenza can be seen in **Exhibit 2.1**. Over the next several decades, public health realized tremendous gains, with interventions such as improved sanitation, water purity, nutrition, control of infectious disease, and immunization.<sup>41</sup> This translated into major gains in health. Life expectancy increased by more than 30 years, and the quality of life remarkably improved. Much of the increase was experienced in the first 25 years of the century. For example, the death rate from all causes in New York City was 31 per 1,000 in 1825; this rate had dramatically fallen to 12 per 1,000 a century later in 1925. Similarly, in 1880, the average life expectancy in New York City and Brooklyn was 36 years; by 1920, life expectancy had increased to 53 years, an increase of 47% in a 40-year period.<sup>35</sup> As exclaimed by Winslow and others, public health activities were responsible for reducing environmental and infectious disease threats, and such "achievements were

**Exhibit 2.1** Early Influenza Warning

**INFLUENZA**  
 FREQUENTLY COMPLICATED WITH  
**PNEUMONIA**  
 IS PREVALENT AT THIS TIME THROUGHOUT AMERICA.  
 THIS THEATRE IS CO-OPERATING WITH THE DEPARTMENT OF HEALTH.  
**YOU MUST DO THE SAME**  
 IF YOU HAVE A COLD AND ARE COUGHING AND  
 SNEEZING. DO NOT ENTER THIS THEATRE  
**GO HOME AND GO TO BED UNTIL YOU ARE WELL**  
 Coughing, Sneezing or Spitting Will Not Be  
 Permitted In The Theatre. In case you  
 must cough or sneeze, do so in your own hand-  
 kerchief, and if the coughing or sneezing  
 persists leave the theatre at once.  
 This Theatre has agreed to co-operate with  
 the Department Of Health in disseminating  
 the truth about Influenza, and thus serve  
 a great educational purpose.  
**HELP US TO KEEP CHICAGO THE**  
**HEALTHIEST CITY IN THE WORLD**  
**JOHN DILL ROBERTSON**  
 COMMISSIONER OF HEALTH

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almost wholly based on the organized application of the sciences of sanitary engineering and bacteriology."<sup>42, p.1079</sup>

Attempts to replicate the successes achieved with infectious and environmentally related diseases have been extended to the contemporary health challenges of obesity, diabetes, injury prevention, violence, substance abuse, human immunodeficiency virus (HIV) infection, tobacco-related diseases, and other noncommunicable diseases. As early as 1926, Winslow argued for this extension in a speech delivered before the American Public Health Association in Buffalo, New York:

We may . . . say that the health officer should concern himself only with communicable disease. Or we may say that the field of the health department includes

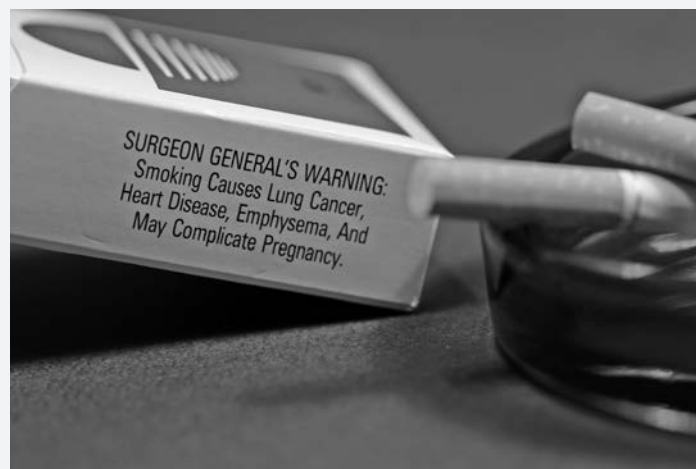
all the health problems of the infant and the child plus the communicable diseases of the adult. This is a second clear and defensible position and one that approximates current-day practice. Or we may take a still wider view and envisage the whole field of the prevention of disease and the promotion of physical and mental health and efficiency.<sup>42, p.1080</sup>

As public health enabled more prevention of communicable diseases, and with scientific medical treatment of these and other ailments enabling Americans to live longer lives, public health measures turned increasingly toward improving chronic conditions and reducing injuries. For example, as scientific research identified links between cigarette smoking and diseases of the heart and lungs, public education measures turned toward discouraging the habit of smoking and reducing its association with sophistication and fashion. Similar public health measures targeted motor vehicle-associated fatalities and workplace hazards.<sup>43</sup> In 1966, the United States enacted legislation to require warning labels on cigarette packages. This effort to address one of the world's greatest public health problems

was further advanced by U.S. Surgeon General C. Everett Koop, who advocated for a smoke-free America by the year 2000 and began the practice of rotating messages on warning labels, as shown in **Exhibit 2.2**.

During the 1940s, the United States undertook a large-scale coordinated effort, through partnership between the federal government and 13 southeastern states, to eliminate endemic malaria from the United States. This involved the spraying of over 4.5 million homes with DDT, draining and controlling swamps and marshes, and the rapid diagnosis and treatment of malaria with chloroquine. To coordinate this effort, the federal government established the Office of National Defense Malaria Control Activities in Atlanta, Georgia, in 1942. The agency's name was changed 4 years later to the Communicable Disease Center, referred to as CDC. Atlanta was chosen instead of Washington, D.C., for this new federal agency because malaria was endemic in the southeastern United States. In addition to the government's **elimination** efforts, residential sales of modern electric air-conditioning units dramatically increased in the late 1940s and early 1950s, especially in the southeast. By 1951, malaria was officially considered eliminated from

### Exhibit 2.2 Surgeon General's Warning



CDC/Debra Cartagena.

the United States. After the elimination of malaria, the Communicable Disease Center expanded its mission and eventually became the Centers for Disease Control and Prevention in 1992, maintaining its CDC acronym.

The first polio vaccine was developed by Jonas Salk and came into use in 1955. The oral polio vaccine was later developed by Albert Sabin and came into commercial use in 1961. In the early 1950s, before polio vaccines were available, polio outbreaks caused more than 15,000 cases of paralysis each year in the United States. The number of new polio cases was sharply reduced thanks to widespread polio vaccination, and since 1979, no cases of polio have originated in the United States. Currently, Afghanistan, Pakistan, and Nigeria are the only countries to have reported cases of polio.<sup>44</sup>

As in the United States, many other countries, particularly in Western Europe, experienced similar gains in health outcomes during the latter half of the twentieth century. In fact, one of

public health's greatest accomplishments was the **eradication** of smallpox. Smallpox is estimated to have killed more people throughout history than all of the wars combined. Although practices of smallpox inoculation have been performed since ancient time in various parts of the world, the development of the first successful vaccine for smallpox is credited to Edward Jenner in 1796. Through a global smallpox vaccination effort during the latter half of the twentieth century led by the World Health Organization (WHO), the world saw its last known naturally occurring case in 1977, and the disease was officially declared eradicated in 1979. To date, smallpox is the only human virus to have been eradicated.

The 10 great public health achievements in the United States in the 1900s include advances in both communicable and chronic disease prevention, as listed in **Exhibit 2.3**.

Although the gains in public health in the 1900s were quite substantial, largely as a result

### Exhibit 2.3 Ten Great Public Health Achievements

1. Vaccines: Few treatments were effective in the prevention of infectious diseases in 1900. Now, smallpox, measles, diphtheria, pertussis, rabies, typhoid, cholera, and the plague are preventable through widespread use of vaccines.
2. Recognition of tobacco use as a health hazard: Since the 1964 Surgeon General's report on risks associated with smoking, smoking among adults has decreased, saving lives.
3. Motor vehicle safety: Improved engineering of vehicles and roads plus the use of seat belts, children's car seats, airbags, and helmets have reduced the number of deaths, as has decreased drinking and driving.
4. Safer workplaces: A 40% decrease in fatal occupational injuries (since 1980) has resulted from efforts to control work-related disease such as pneumoconiosis (black lung) and silicosis, which are associated with coal mining, and to improve safety in manufacturing, construction, transportation, and mining.
5. Control of infectious diseases: Efforts to protect the water supply and keep it clean with improved sanitation methods have greatly improved health, particularly curbing the spread of cholera and typhoid. The discovery of antimicrobial therapy has helped to control TB and sexually transmitted disease (STDs).
6. Fewer deaths from heart disease and stroke: Smoking cessation, blood pressure control, early detection, and better treatments have resulted in a 51% decrease in death rates for coronary heart disease since 1972.
7. Safer and healthier foods: Major nutritional deficiency diseases such as rickets, goiter, and pellagra have been virtually eliminated in the United States through greater recognition of essential nutrients, increases in nutritional content, food fortification, and decreases in microbial contamination.
8. Healthier mothers and babies: Better hygiene, nutrition, access to health care, antibiotics, and technological advances have helped to reduce infant mortality by 90% and maternal mortality by 99%.
9. Family planning and contraceptive services: These services have altered the social and economic roles of women. Access to counseling and screening has resulted in

fewer infant, child, and maternal deaths. Contraceptives have provided protection from HIV and other STDs.

10. Fluoridation of drinking water: Nearly 150 million people have access to treated

water, a safe and effective way to prevent tooth decay. Fluoridation has helped reduce tooth decay in children by 40–70% and tooth loss in adults by 40–60%.

Adapted from Centers for Disease Control and Prevention. Ten great public health achievements, United States, 1900–1999. *MMWR*. 1999;48(12):1–3.

of the reduction of infectious diseases due to increasingly effective antibiotics, vaccinations, and improved sanitary and living conditions, the 1980s saw the emergence of one of the most significant threats to public health in the last 40 years. In 1981, acquired immunodeficiency syndrome, or AIDS, was identified in the United States. By 1983, HIV was identified as the agent that caused the disease. Due to its long incubation period, an individual with HIV was able to spread the disease unknowingly to many people, resulting in a worldwide **pandemic**. Today, arguably every country on Earth is affected by HIV/AIDS. Since the beginning of the epidemic, more than 70 million people have been infected with the HIV virus and about 35 million people have died of AIDS. In 2017, 37 million people were living with HIV, many of whom were in sub-Saharan Africa.<sup>45</sup>

## Public Health in the Twenty-First Century

The public may not recognize many of the gains of the twentieth century, particularly in developed countries, because we have become accustomed to the accrual of long-standing benefits from communal efforts to protect against hazards to health. Quentin Young, former president of the American Public Health Association (APHA), remarked: “Turning on any kitchen faucet for a glass of drinking water without hesitation or peril is a silent homage to public health success, which would not have been possible at the start of the twentieth century.”<sup>46, p.1</sup> However, many of the public health challenges we face in the twenty-first century have become increasingly complex and globalized. The marked reduction of infectious disease and improvements in infant mortality and birth outcomes in many parts of

the world have exposed great inequality, both internationally and within countries. Poverty remains the single biggest threat to health worldwide. Additionally, equally complex problems, such as climate change and conflict, threaten the livelihood of millions of people. Although the United Nations (UN) has been largely successful in preventing large-scale wars since World War II, regional conflicts and violence persist, with a devastating toll. By the end of 2016, 65.6 million individuals were forcibly displaced worldwide as a result of persecution, conflict, violence, or human rights violations.<sup>47</sup>

The globalization of many public health problems in the twenty-first century has led to increased efforts to achieve collaborative solutions and greater emphasis on global health. For instance, in an effort to improve health outcomes worldwide, in 2000 all 191 UN member states agreed to achieve the Millennium Development Goals (MDGs) by 2015. The MDGs included eight goals addressing conditions affecting health, ranging from eradicating extreme poverty and hunger to environmental sustainability. Although success varied among the different goals, MDG 6: Combat HIV, Malaria, and Other Disease is generally considered the most successful. This largely has to do with well-funded efforts to combat HIV/AIDS. In response to the HIV/AIDS pandemic, in 2003, the United States initiated the U.S. President's Emergency Plan for AIDS Relief (PEPFAR). Since its inception, PEPFAR has contributed billions of dollars to global HIV efforts, particularly in sub-Saharan Africa. In addition to government efforts, initiatives through private entities such as the Bill and Melinda Gates Foundation have funded large-scale efforts to reduce HIV, malaria, and TB. Capitalizing on the gains made through the MDGs, the UN has since initiated the Sustainable

Development Goals (SDGs) in an effort to further address many of the goals not fully realized by the end of the MDGs in 2015.

Ironically, the very accomplishments in population-based prevention have resulted in decreased recognition of the many public health activities in our communities. When these protective activities work well, illnesses from water, food, and environmental toxins rarely occur. In the absence of clearly visible problems, the public remains largely unaware the methods of assurance, and, historically, collective support for public health resources and programs has been nominal. Unfortunately, this can lead to decreased funding for programs that address “problems that no longer exist.” Without the protections put in place by public efforts, these problems will inevitable resurface, resulting in unnecessary preventable illness and human suffering.

Despite these daunting challenges, there are many reasons to be optimistic about the future of public health in the twenty-first century. All of the work of generations of public health leaders has led to a much better understanding of the determinants of health and new opportunities for impact—for example, a potentially important role for public health in the field of genomics, exciting new information technology advances that may dramatically change public health surveillance and evaluation, new openings provided by social media to effect behavioral change, and a greater appreciation for the importance of evidence-based public health practice. These are just some of the factors that show promise for public health to achieve tremendous gains and continue to improve lives.

## Discussion Questions

1. What is the value to you as a student of public health to know its history?
2. Please identify an event from history, not mentioned in this chapter, and discuss how it could be related to public health.
3. Why do you think the study of epidemics and pandemics might be helpful to us today? Give examples of lessons from the past.

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## Additional Resources

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