

## CHAPTER 1

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# DEFINING PUBLIC HEALTH: HISTORICAL AND CONTEMPORARY DEVELOPMENTS

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Lloyd F. Novick  
Cynthia B. Morrow

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### Chapter Overview

Public health practice comprises organized efforts to improve the health of communities. Public health prevention strategies are targeted to populations rather than to individuals. Throughout history, public health effort has been directed to the control of transmissible diseases, reduction of environmental hazards, and provision of safe drinking water. Because social, environmental, and biologic factors interact to determine health, public health practice must utilize a broad set of skills and interventions. During the 20th century, the historic emphasis on protecting communities from infectious disease and environmental threats expanded to counter risks from behaviors and lifestyles that led to chronic disease. Population-based prevention resulted in major gains in life expectancy during the 1900s. In the beginning of this century, public health expanded even further as numerous events necessitated a shift in public health priorities.

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### Defining Public Health

Public health consists of organized efforts to improve the health of communities. The operative components of this definition are that public health efforts are *organized* and *directed to communities* rather than to individuals. Public health practice does not rely on a specific body of knowledge and expertise but rather relies on a combination of science and social approaches. The definition of public health reflects its central goal—the reduction of disease and the improvement of health in a community.

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In 1920, C.E.A. Winslow provided the following definition of public health practice:

Public health is the science and art of preventing disease, prolonging life, and promoting physical health and efficiency through organized community efforts for the sanitation of the environment, the control of community infections, the education of the individual in principles of personal hygiene, the organization of medical and nursing services for the early diagnosis and preventive treatment of disease, and the development of social machinery which will ensure to every individual in the community a standard of living adequate for the maintenance of health.<sup>1(p34)</sup>

Almost 70 years later, in 1988, the Institute of Medicine (IOM) published its classic report, *The Future of Public Health*, similarly defining public health as an “organized community effort to address the public interest in health by applying scientific and technical knowledge to prevent disease and promote health.”<sup>2(p7)</sup> The mission of public health, then, is to ensure conditions that promote the health of the community.

Population-based strategies for improving community health include efforts to control epidemics, ensure safe water and food, reduce vaccine-preventable diseases, improve maternal and child health, and conduct surveillance of health problems (Exhibit 1-1). In addition to long-standing efforts to protect communities from contagious and environmental health threats, the public health arena is expanding to counter new and contemporary risks: obesity, adolescent pregnancy, injury, violence, substance abuse, sexually transmitted diseases (STD), human immunodeficiency virus (HIV) infection, natural disasters, and bioterrorism. To be successful, however, any approach to improve a community’s health must involve both population-based and clinical preventive activities, as presented in Figure 1-1.

Public health differs from clinical medicine by emphasizing prevention and keying interventions to multiple social and environmental determinants of disease; clinical medicine focuses on the treatment of the individual. However, interaction between public health and medicine is necessary be-

### Exhibit 1-1 Public Health Activities

- Prevents epidemics
- Protects the environment, workplaces, housing, food, and water
- Monitors health status of population
- Mobilizes community action
- Responds to disasters
- Assures quality, accessibility, and accountability of medical care
- Reaches out to link high-risk and hard-to-reach people to needed services
- Researches to develop new insights and innovative solutions
- Leads the development of sound health policy and planning

Source: Reprinted from *For a Healthy Nation: Returns on Investments in Public Health*, Executive Summary, 1994, U.S. Department of Health and Human Services, Public Health Services.

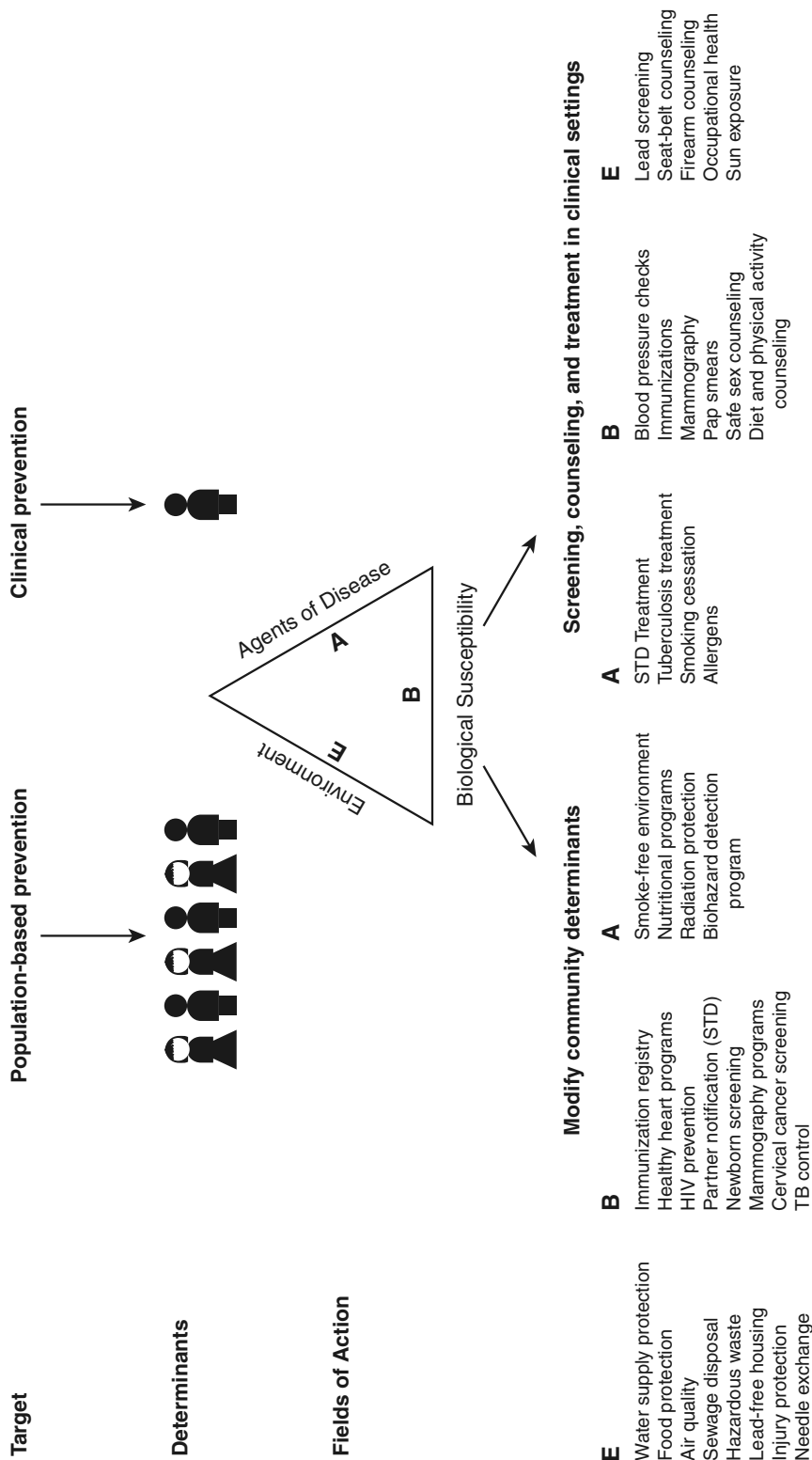


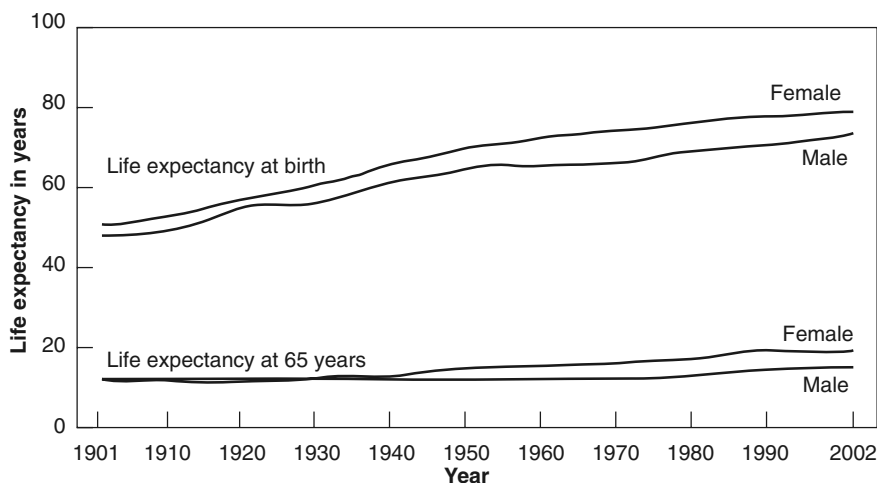
FIGURE 1-1 Public Health Approaches to Improving Health  
Source: Copyright © 2000 L.F. Novick

cause individual health and community health are elements of a continuum. Tuberculosis (TB), HIV infection, STD, lead toxicity, vaccine-preventable disease, and even heart disease and asthma are among the many health problems that are ideally managed in both population and clinical settings.

Ample evidence for the importance of influencing population-based determinants of health is shown by the increase in life expectancy from 45 to 75 years for individuals living in industrialized countries during the 1900s (Figure 1-2). The majority of this gain, 25 of the 30 years, can be attributed to public health measures such as better nutrition, sanitation, and safer housing.<sup>3</sup> Medical care focusing on individual patients, though important, only contributed five years of the gain in life expectancy.

Furthermore, the relevance of public health and clinical collaboration is underscored by estimates that 50% of premature deaths are preventable and influenced by personal behaviors—the abuse of tobacco and other substances, poor diet, and sedentary lifestyles.<sup>4,5</sup> Changes in health status can best be achieved through partnership between clinical efforts focusing on individual patients and community-wide public health interventions addressing environmental and social determinants that place individuals at greater risk of disease.

Both science and social factors form the basis for public health intervention. Successfully eradicating a vaccine-preventable disease from a community requires more than development of an effective vaccine. Acceptance and widespread use of the vaccine in the community is dependent on a successful public health initiative providing public information and facilitating delivery. Too often, scientific advances are not fully translated into community health improvement. For example, in the United States, perinatal transmission of HIV has plummeted in the past 10 years because of aggressive approaches for testing and treatment of HIV during pregnancy and delivery; yet congenital syphilis, while decreasing, has not achieved the same level of success despite the fact that scientific means (penicillin) to eradicate it entirely have been known for many more years. A comprehensive public health ap-



**FIGURE 1-2 Life Expectancy in the United States over the 20th Century**

Source: Centers for Disease Control and Prevention, National Center for Health Statistics, *Health, United States, 2005*, Figure 26.

proach, combining science with practical approaches to address cultural and socioeconomic factors important to the improvement of birth outcomes for at-risk women, is essential to eliminate these preventable diseases.

Another example of the important interplay of clinical and public health interventions is that of an outbreak of tuberculosis in a homeless shelter for men in a community in upstate New York in the 1990s. Clinical interventions, including administration of anti-TB medications and sophisticated diagnostic methods, were combined with a broad public health approach to minimize the impact of the outbreak. Outreach efforts and incentives for directly observed therapy were tailored to the social factors associated with this group of men. Risk factors for poor health outcomes included concomitant infection with HIV, alcohol and substance abuse, homelessness, and inadequate ventilation of the shelter. All were determinants of this outbreak. Unfortunately, despite vigorous attempts to engage the individuals diagnosed with active tuberculosis, noncompliance remained a significant challenge, ultimately leading the local public health agency to obtain court orders mandating the hospitalization of several of the men. In addition to ensuring treatment of those known to have active tuberculosis, significant efforts were made to identify, and treat when indicated, hundreds of individuals who were exposed to tuberculosis in this outbreak. This case illustrates a basic tenet of public health: protecting the health of the community, even when these efforts conflict with the individuals' autonomy, involves more than the sum of the treating the infected individuals.

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### **Early Collective Action to Improve Health in Great Britain and the United States**

The evolving definition of public health activity is forged by hazards requiring collective action. Throughout history, attention has been directed to controlling transmissible diseases, improving the environment, and providing safe drinking water. Toilets drained by covered sewers have been found in excavations of civilizations dating to 4000 years ago in the Indus Valley. In 2000 BCE cities, including Troy, had highly developed water supply systems.<sup>6</sup> At the time of Joshua when Israelites settled in the Holy Land, there were rules governing the water supply that dictated that there could not be a cemetery, animal slaughterhouse, tannery, or furnace within 50 cubits (approximately 25 meters) of a village water supply.<sup>7</sup> In the Western Hemisphere, impressive ruins of sewers and baths document the achievements of the Incas in public health engineering.<sup>6</sup>

The Greeks believed that ill health developed from an imbalance between man and his environment, not unlike contemporary public health theories of multifactorial disease causation, in which environment plays a prominent role. In his book, *On Airs, Waters and Places*, Hippocrates summarizes factors important to disease, including climate, soil, water, mode of life, and nutrition.<sup>8</sup> Furthermore, Hippocrates provided guidance to the location of Greek colonies as they expanded eastward to Italy and Sicily. Houses were to be located on elevated and sunny areas, avoiding marshes and swamps with their vector-borne illnesses.<sup>6</sup> The Romans also made the connection between swamps and disease (specifically, malaria), and determined salubrity was an

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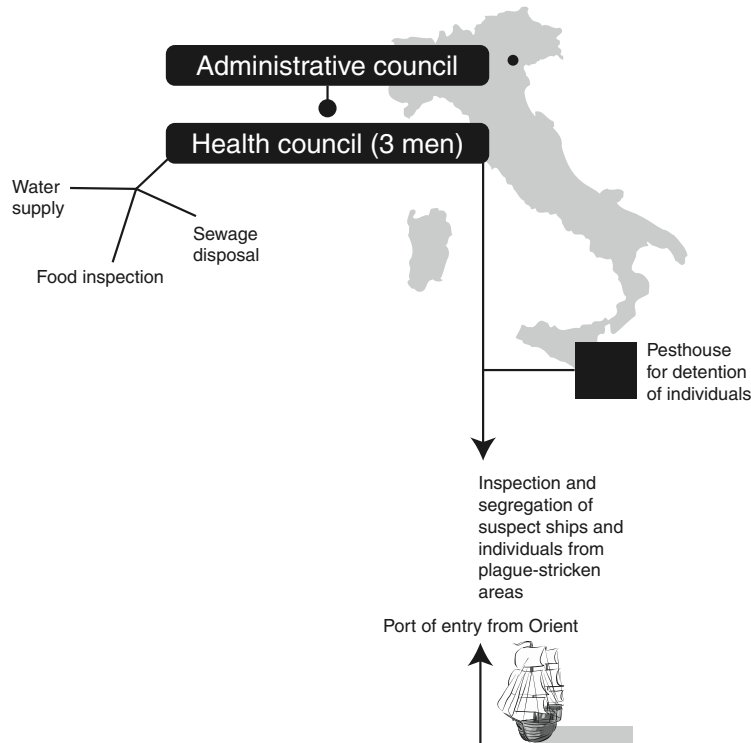
important component of the selection of places for habitation. Ancient terms describing disease are still in use, including *endemic* (background or usual occurrence) and *epidemic* (excessive occurrence).

In the Middle Ages (AD 500–1500), 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) and the Black Death (1348)—with smaller outbreaks of various diseases in the intervening period, including leprosy, smallpox, tuberculosis, and measles.<sup>6</sup> During this period, lepers were considered public menaces and were expelled from the community. This is a stark example of deprivation of individual civil rights in a quest to protect the health of the public. Similarly, the Black Death was regarded as a communicable disease, and the countermeasure employed was isolation of the ill individual. In addition, victims of the disease had to be reported to the authorities, a forerunner of the basic public health functions of disease reporting and surveillance. Quarantine measures were instituted to stop the entry of plague from outside regions. In 1348, Venice, a chief port of entry for commerce from the Orient, 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 pesthouse or *lazaretto* was erected in Venice as a place to hold detained individuals suspected of harboring infection (*lazaretto* is derived from the name of the Biblical character Lazarus, who was a leper). These detention areas were used for isolation in many types of pestilence.<sup>9</sup> This precedent of isolation and quarantine remains relevant and controversial in contemporary public health practice.

Medieval cities were run by councils who were charged with routine community administration as well as the supervision of disease prevention, sanitation, and protection of community health. Measures were instituted to control the transmission of infections, including food inspections, regulation of waste disposal isolation, disinfection, as well as isolation and quarantine.<sup>6</sup> In another example of early collective public health action, Venice, like other cities at that time, set up a council of men to supervise the health of the city—a forerunner of boards of health that were implemented centuries later.<sup>6</sup> These interactions are diagrammed in Figure 1-3. The collective actions to protect public health that were implemented in the Middle Ages exhibit patterns that are very much in existence in our current public health programs: a population-based focus for interventions, involvement of government, prominence of environmental interventions, and potential for infringement of individual rights to protect the public.

### Collective Activities to Protect Health in the United States

The early American colonists struggled with hunger and malnutrition, scurvy, and infectious diseases such as smallpox, cholera, measles, diphtheria, and typhoid fever.<sup>10</sup> Smallpox was the epidemic disease of the colonies in the 1600s; yellow fever became prominent in the 1700s; and the dread disease of the 1800s was cholera.<sup>9</sup> The major public health function of the colonies was the control of communicable diseases as demonstrated by the enactment of laws



**FIGURE 1-3 Medieval Model for Public Health Practice: Venice, 1300–1500**

Source: Copyright © 2000 L.F. Novick

regarding quarantine and sanitation. The colonies consisted principally of a series of seaports connected by ships. In 1699, William Penn, concerned about yellow fever in the colony he had established, passed an “Act to Prevent Sickly Vessels from Coming into This Government.”<sup>9</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 towns along the eastern seaboard. Other laws that protected the health of the community included sanitary laws regulating such matters as privies, disposal of wastes, and disposition 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>9(p22)</sup> The total population of Boston at that time was only 6000. In a smallpox epidemic of Boston in 1721, Mather suggested smallpox inoculation. As with many public health interventions, initially there was considerable controversy concerning smallpox inoculation, but he was able to convince Dr. Zabdiel Boylston to try the technique. Years later, when smallpox again struck Massachusetts, the death rate was 1.8% in those who were vaccinated, compared to 14% in individuals who were not.<sup>9</sup>

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Yellow fever, an acute mosquito-borne viral infectious disease of short duration and varying severity, was the scourge of the 1700s.<sup>11</sup> In 1702, following importation of the disease from St. Thomas, Virgin Islands, New York City bore the brunt of a yellow fever epidemic, although numerous other cities, including Philadelphia, Norfolk, Charleston, New Orleans, and Boston, also fell victim to the disease. Yellow fever epidemics were experienced in cities throughout the century with some cities being hit more than once.<sup>12</sup> A stark example of this is Philadelphia in which nearly 50,000 people were reported to have contracted yellow fever (with 4044 reported deaths) in 1793 only to be devastated by the disease again five years later, when another 3506 deaths were attributed to it.<sup>13</sup> Interestingly, in the northern part of America, the disease was noted to occur only in summer, after ships arrived from ports affected by yellow fever. When the October frost arrived, the epidemics ended. This underscored the importance of the environment in epidemic disease and improved understanding of the opportunity and necessity for public health measures.

### Social and Environmental Factors and Organized Public Health Action

To 19th-century New Yorkers, the word *epidemic* was all too clearly understood and experienced in the form of cholera, smallpox, yellow fever, and typhoid (Table 1-1).<sup>13</sup> In addition to these epidemics, the health of the community was threatened by the constant presence of tuberculosis, 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 these communities devastated by the disease.<sup>13</sup>

The nature of these contagions or threats to health defines the public health approach to disease as they cannot be countered successfully by addressing only ill individuals. Epidemics transmitted through food and water are best addressed by removing the environmental causes as well as treating the victims. During that time of frequent epidemics, the importance of understanding disease from both a clinical and public health perspective was necessary. In his book, *Hives of Sickness*, David Rosner observes that in the 1800s “while physi-

**TABLE 1-1 The Great Epidemics of New York City During the 19th Century**

Year	Disease	Total Deaths	Deaths per 100,000
1832	Cholera	3513	1561
1849	Cholera	5071	1014
1851	Dysentery	1173	221
1854	Cholera	2509	395
1866	Cholera	1137	113
1872	Smallpox	1666	118
1881	Diphtheria	4894	266
1887	Diphtheria	4509	226

Source: Bulletin New York City Department of Health, p. 6, March 1953.



cians saw sick patients and sought to identify the cause of disease and treat its symptoms, public health workers addressed the problem of environmental control, developing a perspective that emphasized personal and public hygiene.”<sup>13</sup>

Public health activities in both Great Britain and the United States were greatly influenced by growing urbanization and industrialization of the 1800s. London more than tripled in size from approximately 200,000 inhabitants in 1600 to 674,000 in 1700. During the 1700s, London grew only by approximately one third and still had less than one million residents, but between 1800 and 1840, London doubled in size to nearly two million residents.<sup>14</sup> Malnutrition, crowding, filth, and poor working conditions contributed to severe disease outbreaks.<sup>15</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. The rise of tenements changed typhus into an endemic slum disorder, but because it affected the poorest group of individuals, it was said to have aroused little public concern.<sup>16</sup>

In 1842, Edwin Chadwick published the *General Report on the Sanitary Condition of the Laboring Population of Great Britain*.<sup>6</sup> This and follow-up reports became classic public health documents, stimulating sanitary awakening and social reforms.<sup>6,7,9,15</sup> Chadwick described the prevalence of disease among the laboring people, showing that the poor exhibited a preponderance of disease and disability compared to more affluent individuals,<sup>9</sup> an observation that remains true throughout the world today. The conclusion of Chadwick’s report was that the unsanitary environment caused the poor health of working people. Disease was attributed to miasma and bad odors.<sup>9</sup> Epidemic diseases such as typhus, typhoid, and cholera were attributed to filth, stagnant pools of water, rotting animals and vegetables, and garbage.<sup>14</sup>

As chief administrator of the Poor Law Commission, Chadwick was responsible for relief to the impoverished in England and Wales. He became the champion of sanitary reform, which became the basis for public health activities in both Great Britain and the United States. The “sanitary idea” was public health through public works—prevention of infectious disease through the provision of clean, pure water and sewers for waste disposal. Of note, this theory of public health antedated the germ theory, which did not become dominant until the end of the 1800s.<sup>17</sup>

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>6,18</sup> The latter was required to be a medically qualified medical practitioner and inspector of nuisances and sanitary conditions. The board of health incurred the opposition of those with property interests who, for economic reasons, were against proposals for improvement of drainage and water supplies. In 1854, after only five years of operation, Parliament refused to renew the Public Health Act, thereby dissolving England’s first national board of health.<sup>6</sup>

Although repealed, the 1848 Public Health Act was instrumental in improving public health and remains relevant to current population-based preventive efforts.<sup>18</sup> The act, based on available morbidity and mortality data, identified all major public health issues of the time and assigned responsibility to national and local boards including inspectors and officers of health.<sup>18</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 sanitary conditions of the towns. Clearly the drafters of the act were concerned with population health and assigned that responsibility to national and local government.<sup>18</sup>

During this same time period, John Snow, a physician who had provided anesthesia at Queen Victoria's childbirth, investigated London cholera epidemics in 1849 and 1854.<sup>6</sup> He demonstrated through epidemiologic analysis that cholera was transmitted through water contaminated with sewage.<sup>9</sup> Although this theory of waterborne cholera was not fully accepted, the London Board of Health did attempt to avoid disease by obtaining nonpolluted water.<sup>9</sup>

The events in Great Britain shaped the development of public health practice in America as the same concepts of public health were followed in the United States.<sup>9</sup> Early health reformers in the United States, including Henry Griscom of New York and Lemuel Shattuck of Boston, identified environmental improvement to prevent epidemic disease as a moral mission.<sup>19</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, with prevalent communicable diseases and TB.<sup>6</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 movement abroad."<sup>20</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>21</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>1(p5)</sup>

Early public health interventions in the United States, like those seen in Europe, 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 local boards of health dating to the 1700s.<sup>22</sup> Various claims have been made asserting community formation of the first board of health in the United States with Baltimore, Charleston, Petersburg, 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>23</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>20</sup> In 1865, the Association of New York issued a report, *Sanitation of the City*, pressuring New York (both city and state) to organize a Metropolitan Board of Health the following year.<sup>13</sup> The report documented the intimate relationship between social and economic forces creating ill health. A newly or-

ganized New York City Department of Public Health followed, focusing on cleaning the streets, regulating sewage and waste disposal, and mandating tenement reforms.<sup>13</sup> It soon became a model for others to emulate.

Subsequent development of local health departments was sporadic until around 1910, when severe epidemics of typhoid fever occurred at a number of locations, including Yakima, Washington, leading to a recommendation from the federal government that full-time local health departments be formed. 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 in addition to nearly half a million smaller animals such as pigs, hogs, calves, and sheep. All told, the disposal of more than five 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 and waste disposal and unlicensed manure dumps.<sup>13</sup>

The development and spread of state health departments was 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 board of health is thus stated to have been legislated in Massachusetts in 1869 following Shattuck's earlier recommendation.<sup>9,20</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 New Mexico forming this organization in 1919, all states had boards.<sup>9</sup>

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## The New Public Health Impact of Bacteriology

During the latter part of the 1800s and the early 1900s, scientific advances, particularly in microbiology, ushered in a new dimension for the field of public health.<sup>15</sup> This second or bacteriologic phase of the public health movement was led by the discoveries of Louis Pasteur and Robert Koch and the subsequent "germ theory" of disease. In his studies, 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 tuberculosis and cholera. This new germ theory opened the door for new opportunities to control infectious diseases, including improved diagnosis, understanding of carrier states, and insight into the importance of vectors with respect to 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>6</sup> The drastic changes in the distribution of mortality that followed is illustrated in Table 1-2.

The bacteriologic discoveries of Pasteur and Koch became a marker between the "old" and the "new" public health.<sup>24</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

**TABLE 1-2 Mortality from Certain Causes and from All Causes Per 100,000 Population**

	<b>Manhattan and Bronx 1873–1875</b>	<b>Greater New York 1923–1925</b>	<b>Percent Change</b>
Scarlet fever	80	1	–99
Diphtheria and croup	235	11	–95
Diarrhea under five years	335	22	–93
Diseases of the nervous system	252	39	–85
Pulmonary tuberculosis	404	84	–79
All other causes not listed	874	316	–64
Acute respiratory diseases	352	164	–53
All causes	2890	1220	–42
Bright's disease and nephritis	100	69	–31
Violence	120	85	–27
Cancer	41	113	+176
Heart disease	89	255	+187
Diseases of the arteries	8	61	+650

Source: Reprinted with permission from C.E.A. Winslow, *Public Health at the Crossroads*, *Am J Public Health*, Vol. XVI, No. 11, p. 1077, © 1926, American Public Health Association.

poor.<sup>13,23,24</sup> A disease-oriented approach to public health became important for health officers and local health agencies.<sup>23</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>24</sup> Public health professionals continued to emphasize social reform with the realization that disease, even those caused by germs, could not be separated from living and working conditions.<sup>13</sup> By the early 1900s, the stage had been set for the fore-runners of our contemporary public health agencies. The initial spurs to community action were threats from the environment, water, and food, resulting in epidemic disease. Options for collective action had been used for centuries, including isolation, quarantine, and waste disposal. The momentum for organized public health activities increased as urbanization and population growth exacerbated outbreaks of disease and unsatisfactory health conditions. The twin models of organized sanitary practices and government structures for public health activities that began in England became of major importance in the United States as was seen with the regulatory authority of the burgeoning public health agencies throughout the country.

### **Changing Scope of Public Health Practice and the Accomplishments of Public Health in the 20th Century**

In the early part of the 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. 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>25</sup> This translated into major gains in

our nation's health over the last 125 years. Life expectancy has increased by greater than 30 years, and the quality of life has remarkably improved. For example, the death rate from all causes in New York City was 31 per thousand in 1824, 41 per thousand in 1851, and 29 per thousand in 1875. By 1925, this rate had dramatically fallen to 12 per thousand. Similarly, in 1879–1880, the average life expectancy in New York City and Brooklyn was 36 years; by 1919–1920, life expectancy had increased to 53 years, an increase of 47 percent in a 40-year period.<sup>26</sup> And as pointed out by Winslow and others, public health activities in reducing environmental and infectious disease threats were responsible: “Our achievements were almost wholly based on the organized application of the sciences of sanitary engineering and bacteriology.”<sup>26(p1079)</sup>

Attempts to replicate the successes achieved with infectious and environmentally related diseases have been extended to the contemporary health challenges of nutrition, injury prevention, violence, substance abuse, HIV infection, tobacco-related diseases, and other chronic diseases. As early as 1926, Winslow argued early 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. That is a logical position, though a narrow one. Or we may combine this etiological criterion with another based on age and 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 say that the health program must envisage the whole field of the prevention of disease and the promotion of physical and mental health and efficiency.<sup>26(p1080)</sup>

As Americans began to live longer, the impact of injuries and chronic diseases and the potential for prevention of these health threats became a priority for public health workers, including a substantial decrease in cigarette smoking, decline in the rates of heart disease mortality and motor vehicle-associated fatalities, as well as improved quality of the workplace.<sup>27</sup> The 10 great public health achievements in the United States in the 1900s include advances in both communicable and chronic disease prevention, as seen in Exhibit 1-2.

The public may not recognize many of these gains because it has 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, 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>28(p1)</sup>

It is ironic that the very accomplishments in population-based prevention have probably resulted in decreased visibility for public health activities in our communities. When these protective activities work well, illnesses from water, food, and environmental toxins do not occur. In the absence of clearly visible problems, the public knows little about the methods of assurance, and historically collective support for public health resources and programs has been nominal.

## Exhibit 1-2 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, car seats, 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 through 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 tuberculosis 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 technologic 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 human immunodeficiency virus 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 40–70% and tooth loss in adults 40–60%.

Source: Adapted from Ten Great Public Health Achievements—United States, 1900–1999, *MMWR*, Vol. 48, No. 12, pp. 1–3, 1999, Centers for Disease Control and Prevention.

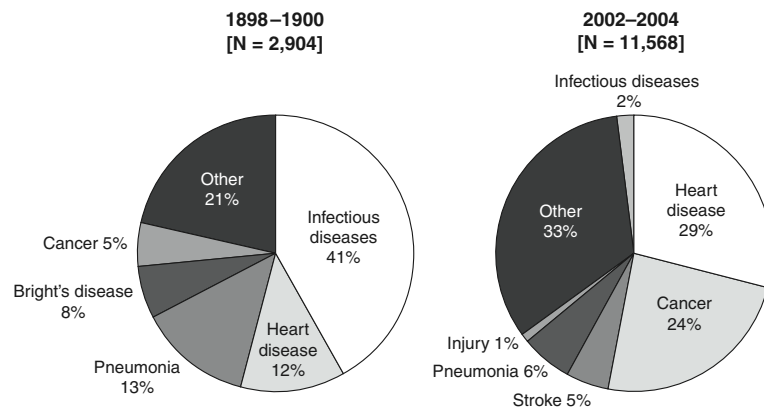
## Public Health in the 21st Century

A critical issue for public health in this century is the feasibility of the extension of the scope of public health practice to the set of today's public health

challenges. In the United States, infectious diseases, although still of critical importance, no longer cause the majority of deaths. One hundred years ago, public health activities were initiated in response to a markedly different pattern of community health, as shown in Figure 1-4. National data show the same transition to chronic diseases (Figure 1-5). Tobacco, alcohol, illicit drugs, firearms, motor vehicles, diet, activity levels, and sexual behaviors are responsible for nearly half the deaths in the United States.<sup>4,5</sup> Monitoring deaths and injuries related to firearms and motor vehicles, studying associations between environmental factors and diseases, surveying sexual and substance abuse behaviors of adolescents, and partnering with other governmental and community agencies to ensure adequate public health preparedness are now staples of local public health activity.

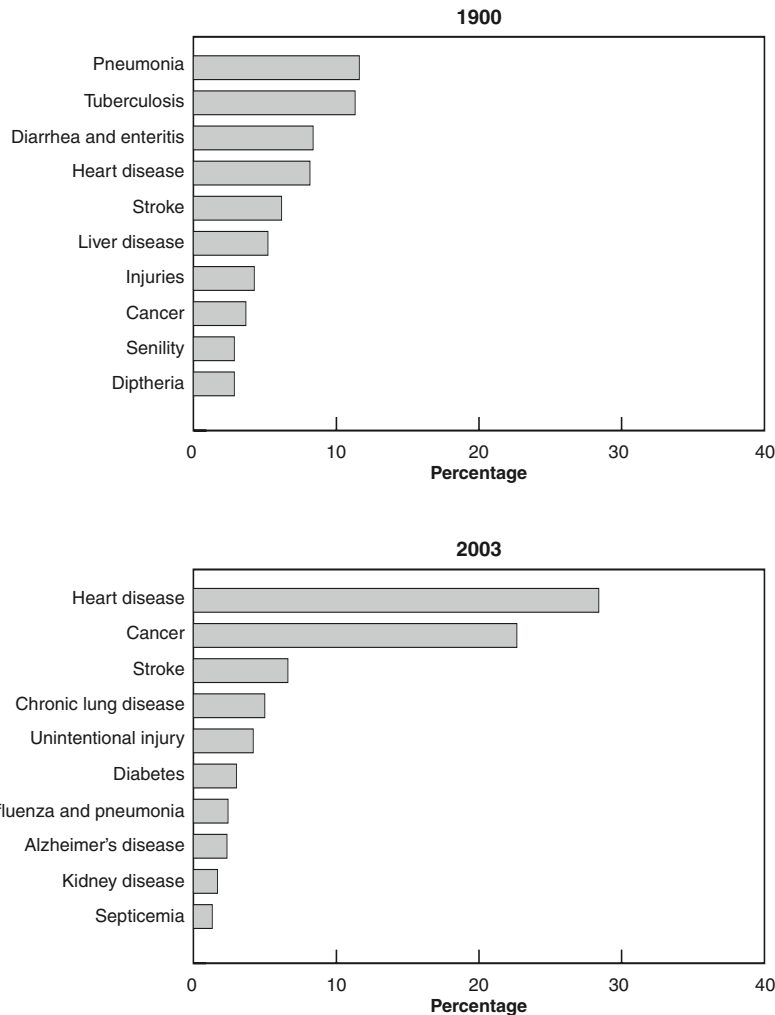
Public health emerged to control communicable diseases related to industrialization and urbanization of the 1800s and 1900s. Epidemics of chronic disease were the next target of public health activities, including atherosclerotic heart disease, cancer, chronic obstructive lung disease, and diabetes. A third group of problems gained attention in the late 1900s: domestic and street violence, substance abuse, and HIV/acquired immune deficiency syndrome (AIDS).<sup>15</sup> Now, several events over the past decade have resulted in a new emphasis on public health preparedness. These events include: (1) the terrorist acts of September 11, 2001, followed by the anthrax attacks through the US postal system; (2) the emerging infectious diseases such as West Nile Virus, severe acute respiratory syndrome (SARS), monkeypox, and most recently the global spread of avian influenza (H5N1); and (3) the havoc caused by hurricanes Katrina and Rita in 2005.

Local and state health departments are on the front line protecting the public health of communities, providing resources, monitoring performance, and providing technical assistance and surveillance. Can the successes achieved in life expectancy and quality of life by public health activities in the 1900s be extended to impact the wide array of contemporary problems?



**FIGURE 1-4 Leading Causes of Death in Syracuse, NY, from 1898 to 1900 and from 2002 to 2004**

Source: Onondaga County Health Department, 2004, Onondaga County, New York.



**FIGURE 1-5 Ten Leading Causes of Death as a Percentage of All Deaths in the United States in 1900 and 2003**

Source: Adapted from the *MMWR*, Vol. 48, No. 29, 1999, Centers for Disease Control and Prevention, and 2003 data from the National Center for Health Statistics.

## The Contemporary Concept of Health: The Basis for Action

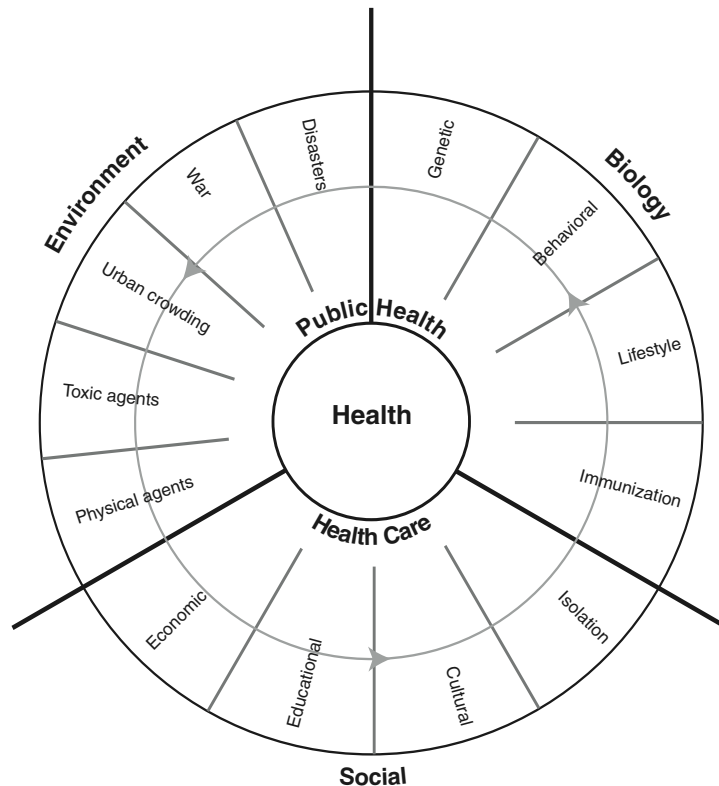
The constitution of the World Health Organization broadly defines health as “a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity.”<sup>29</sup> The IOM Committee on Using Performance Monitoring to Improve Community Health worked with a definition of health that relies on community participation: “Health is a state of well-being and the capability to function in the face of changing circumstances. Health is, therefore, a positive concept emphasizing social and personal resources as well as physical capabilities. Improving health is a shared responsibility of health providers, public health officials, and a variety of other actors



in the community who can contribute to the well-being of individuals and populations.”<sup>30(p41)</sup>

As discussed earlier, health has multiple determinants. Factors important to health, illness, and injury are social, economic, genetic, perinatal, nutritional, behavioral, infectious, and environmental.<sup>31</sup> Interaction of these factors determines the health of individuals and populations (Figure 1-6). A basic public health and epidemiologic model is that ill health is a product of the interactions between the host, the agent, and the environment. Environment includes physical environment, conditions of living, and the presence of toxic and infectious agents. Social factors of importance include poverty, education, and cultural environments, including social isolation. Biologic factors include genetics and other influences, including behaviors that determine the susceptibility of the individual to disease.

The epidemiologic distribution of disease is determined by factors that influence the host's contact with disease agents and that determine host susceptibility. The availability of the susceptible individual host and the presence of the agent are both influenced by the environment. This fundamental interaction producing ill health is true for infectious agents as well as noninfectious disease. In this model, agents can include nutritional deficiencies or excesses, toxins, substances, firearms, and so forth. The critical contribution of this model is that effects on health are produced by interactions of multiple



**FIGURE 1-6 Determinants of Health**  
Source: Copyright © 2000 L.F. Novick

factors, as shown in Exhibit 1-3. In addition, the model demonstrates that there are many opportunities to prevent disease by interrupting any linkage.

A contemporary example of the agent-host-environment model can be seen with the transmission of HIV in a community, which is determined by: (1) infection of individuals with the infectious *agent* HIV, (2) susceptible *host individuals* with risk behaviors related to unprotected sex or needle-sharing drug use (or, in the past, a history of blood product transfusion prior to widespread screening of blood products), and (3) the presence of an *environment* that does not constrain the development of risk behaviors and provides opportunity for interaction between infected and susceptible individuals. The agent-host-environment model facilitates public health intervention because disease can be interdicted by addressing any one of these factors, as shown in Figure 1-7. Reducing the transmission of HIV through a needle exchange program is a successful strategy based on environmental intervention. Successful development of a vaccine would modify host susceptibility. Attempts to change the infectivity of this agent are far more difficult with HIV but have been important in curtailing the transmission of other diseases.

### Physical Environment

Housing, urbanization, overcrowding, and the availability of quality water have been described as being critically important to the health of the public and were a focus of early community efforts. A wide array of problems, including infectious diseases, injuries, and chronic illnesses, can be partly attributed to poor environmental conditions.<sup>32</sup> With the diminished prevalence of infectious diseases as a cause for mortality, there has been a rise in chronic conditions, including cardiovascular disease, cancer, and chronic lung disease. Environmental exposures, including those in the workplace, are important to the increased occurrences of these conditions.<sup>33</sup>

Concern with the environment extends far beyond sanitation. Physical and chemical factors are important in the ecosystem and directly influence health. Air pollution containing potentially hazardous chemicals, biologic and chemical contamination of foods, and environmental carcinogens are all important to the health of the community.<sup>34</sup> Exposures to pesticides may have a major environmental impact, but the health risks from such exposures need to be better understood. Because there can be a long latency period between such environmental exposures and potential effects on mortality and morbidity, developing public health approaches to minimize the impact can be very challenging.

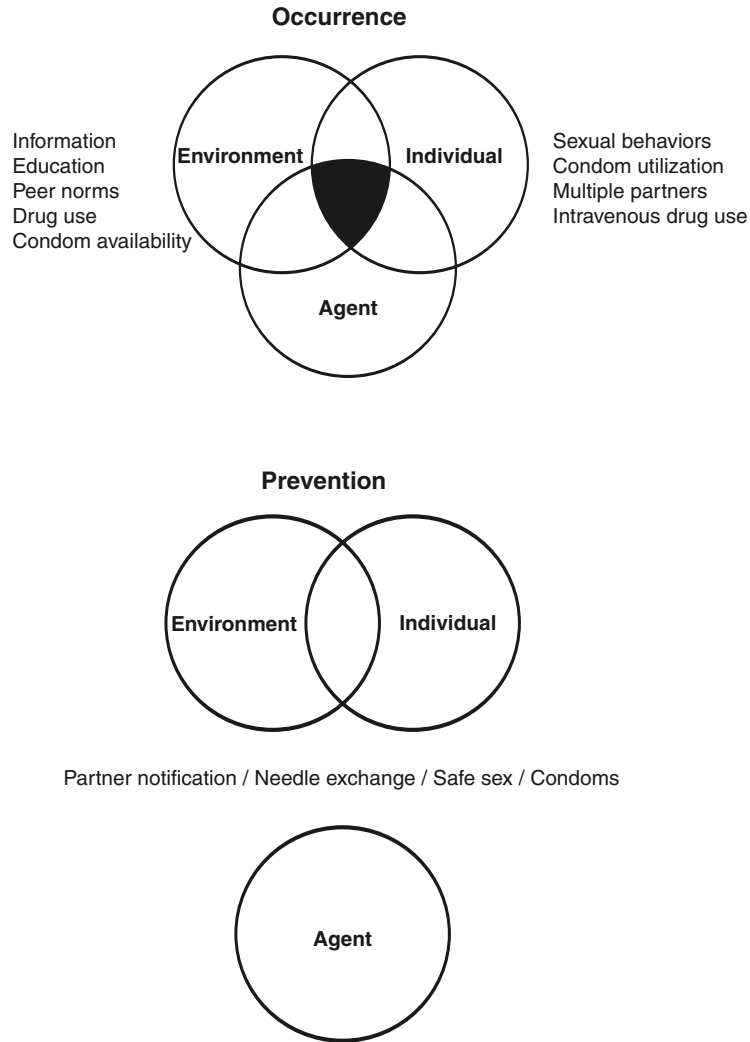
Issues that currently constitute environmental health priorities for action include wastewater treatment, safe drinking and recreational water sources, ambient air standards, childhood asthma, lead toxicity, indoor air quality, food-borne illness, and household and industrial chemicals.<sup>35</sup> In addition to these concerns, since 2001 there has been increased concern for the environment with respect to the potential impact of a radiological or chemical weapon of mass destruction.

The physical environment also includes the structural work and home environment. Advances have been made in improving the safety of the workplace and homes (e.g., laws mandating fences around swimming pools). Conversely, decreased physical activity over the last few decades is attributed

### Exhibit 1-3 Classification of Agent, Host, and Environmental Factors That Determine the Occurrence of Diseases in Human Populations

<i>I. Agents of Disease: Etiologic Factors</i>	<i>Examples</i>
A. Nutritive elements	
Excesses	Cholesterol
Deficiencies	Vitamins, proteins
B. Chemical agents	
Poisons	Carbon monoxide, carbon tetrachloride, drugs
Allergens	Ragweed, poison ivy, medications
C. Physical agents	Ionizing radiation, mechanical
D. Infectious agents	
Metazoa	Hookworm, schistosomiasis, onchocerciasis
Protozoa	Amoebae, malaria
Bacteria	Rheumatic fever, lobar pneumonia, typhoid, tuberculosis, syphilis
	Histoplasmosis, athlete's foot
Rickettsia	Rocky Mountain spotted fever, typhus
Viruses	Measles, mumps, chickenpox, smallpox, poliomyelitis, rabies, yellow fever
<i>II. Host Factors (Intrinsic Factors): Influence Exposure, Susceptibility, or Response to Agents</i>	
A. Genetic	Sickle cell disease
B. Age	
C. Sex	
D. Ethnic group	
E. Physiologic state	Fatigue, pregnancy, puberty, stress, nutritional state
F. Prior immunologic experience	Hypersensitivity, protection
Active	Prior infection, immunization
Passive	Maternal antibodies, gamma globulin prophylaxis
G. Intercurrent or preexisting disease	
H. Human behavior	Personal hygiene, food handling, diet, interpersonal contact, occupation, recreation, utilization of health resources
<i>III. Environmental Factors (Extrinsic Factors): Influence Existence of the Agent, Exposure, or Susceptibility to Agent</i>	
A. Physical environment	Geology, climate
B. Biologic environment	
Human populations	Density
Flora	Sources of food, influence on vertebrates and arthropods as a source of agents
Fauna	Food sources, vertebrate hosts, arthropod vectors
C. Socioeconomic environment	
Occupation	Exposure to chemical agents
Urbanization and economic development	Urban crowding, tensions, and pressures; cooperative efforts in health and education
Disruption	Wars, floods

Source: From *Foundations of Epidemiology, Third Edition* by David E. Lilienfeld and Paul D. Tolley, copyright 1994 by Oxford University Press, Inc. Used by permission of Oxford University Press, Inc.

**FIGURE 1-7 Community Prevalence of HIV Infection**

Source: Copyright © 2000 L.F. Novick

in part to the changing environment; the development of communities without sidewalks and with long distances between homes, schools, and stores discourages physical activity and contributes to the obesity epidemic.

### Socioeconomic Factors and Disparity

Social and economic factors and their influence on life processes are among the most powerful influences on health.<sup>36</sup> As Chadwick and Shattuck noted in the 1800s, the poor lived shorter, less healthy lives than did the affluent. Despite this early insight into the profound impact socioeconomic factors have on health and despite tremendous gains in public health, disparities persist. In a 2004 editorial in the *New England Journal of Medicine*, Stephen

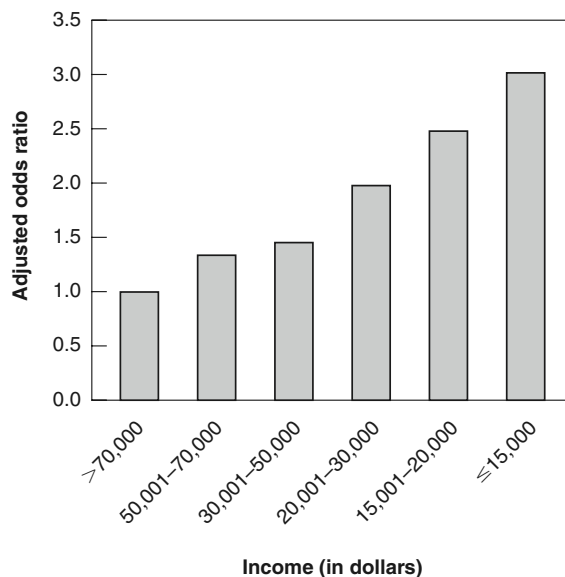
Isaacs and Steven Schroeder remark on the improvement of health status in the United States over the past 100 years, but they note:

Any celebration of these victories must be tempered by the realization that these gains are not shared fairly by all members of our society. People in upper classes—those who have a good education, hold high-paying jobs, and live in comfortable neighborhoods—live longer and healthier lives than do people in lower classes, many of whom are black or members of ethnic minorities. And the gap is widening.<sup>37</sup>

Disparities in health outcomes exist when comparing income, levels of education, and race or ethnicity, with each one of these factors being independently associated with health outcomes.

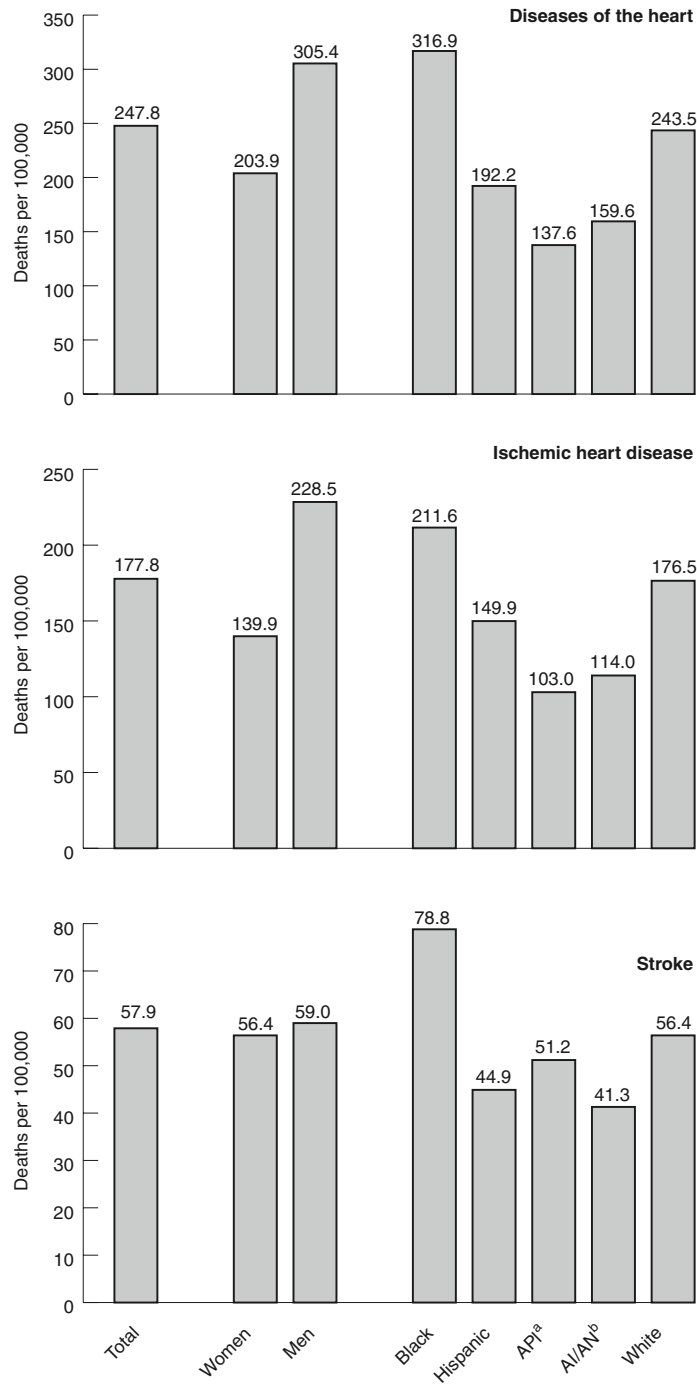
The health disadvantage of those in lower income brackets is not isolated to only one or two diseases, but rather elevated death rates for the poor are evident in almost all of the major causes of death and in each major group of diseases, including infectious, nutritional, cardiovascular, injury, metabolic, and cancers.<sup>36</sup> This effect is graphically noted in Figure 1-8; the adjusted odds ratio for all-cause death is approximately three fold greater for those who earn less than \$15,000 per year compared to those who earn more than \$70,000 per year.

Heart disease is the leading cause of death in the United States and is one of the areas in which disparities are most evident (Figure 1-9). Unfortunately, these trends in disparities are evident for virtually all diseases and cut across all age groups, affecting even the youngest in our community. An illustration of higher lead levels in impoverished children when compared to children from more affluent families is shown in Figure 1-10.



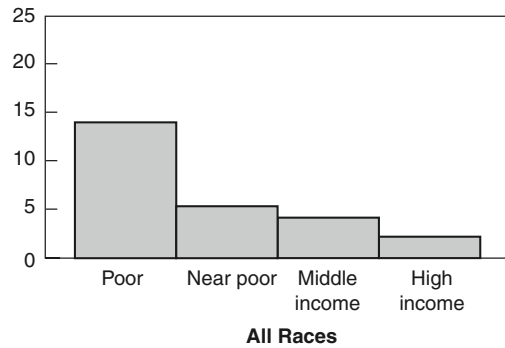
**FIGURE 1-8 Adjusted Odds Ratio for Death from All Causes According to Annual Household Income, 1972–1989**

Source: Reprinted with permission from Massachusetts Medical Society. S. Isaacs et al. Class the ignored determinant of the nation's health, *N Engl J Med*, Vol. 351, pp. 1137–1142. Data are from McDonough et al. The group with an annual household income of more than \$70,000 (in 1993 dollars) is the reference group.



**FIGURE 1-9 Death Rates from Diseases of the Heart, Ischemic Heart Disease, and Stroke, United States, 2001. Age Adjusted to the 2000 US Population.**

Note: <sup>a</sup>API = Asian/Pacific Islander <sup>b</sup>AI/AN = American Indian = Alaskan Native  
 Source: Reprinted with permission from Lippincott, Williams, and Wilkins. From G.A. Menash, et al. State of disparities in cardiovascular health in the United States, *Circulation* Vol. 110, pp. 1233–1241, 2005. Data are from the Centers for Disease Control and Prevention.



**FIGURE 1-10 Elevated Blood Level Among Children 1-5 Years of Age by Family Income: United States, Average Annual 1988-1994**

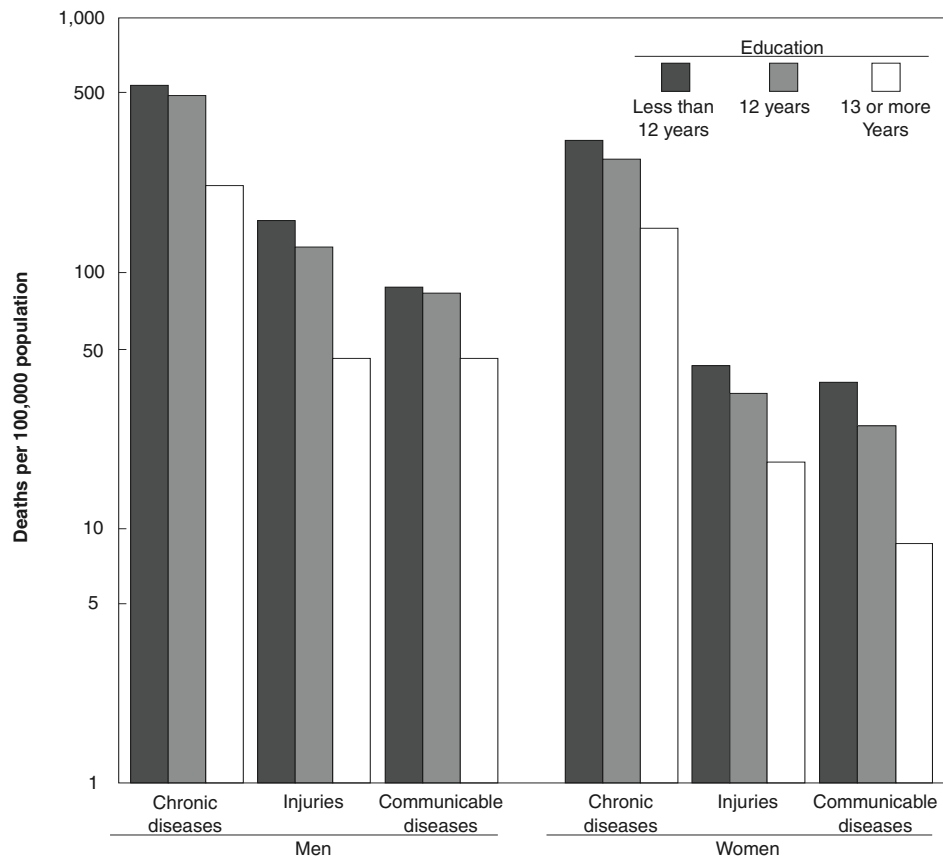
Source: Reprinted from US Department of Health and Human Services, *Health United States, 1998 Socioeconomic Status and Health Chart Book*; 62.

Life expectancy appears to be more related to income inequalities than to average income or wealth.<sup>38</sup> In a study of the relationship between total and cause-specific mortality with income distribution for households of the United States, a Robin Hood index measuring inequality was calculated and found to be strongly associated with infant mortality, coronary heart disease, malignant neoplasms, and homicide.<sup>39</sup> Despite decreases in mortality, widening disparities by education and income level are occurring in mortality rates. Mortality rates for children and adults are related both to poverty and to the distribution of income inequality.<sup>40</sup> Growing inequalities in income and wealth will likely continue to be a significant determinant of disparities of health in the near future.

The relationship between health status and education for selected causes of death is shown in Figure 1-11.<sup>24</sup> In McGinnis's classic article on the actual causes of death, tobacco was the leading cause of preventable deaths.<sup>4</sup> In the follow-up article by Mokdad, tobacco and physical inactivity/poor nutrition are the most common actual causes of death.<sup>5</sup> Both tobacco consumption and obesity are clearly inversely related to educational status as illustrated in Figures 1-12 and 1-13. The health of mothers and children, another priority target of public health efforts, has also been demonstrated to be associated with educational status. As an example of this, adolescent childbearing rates are seen in Figure 1-14.

Finally, disparities of health outcomes related to race and ethnicity have been extensively studied. Despite the ever-increasing body of knowledge that there is a strong association between race and ethnicity and most health outcomes, disparities persist, and in some cases, are widening. The IOM's 2002 report, *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care*, found that one of the factors contributing to these disparities was a "significant variation in the rates of medical procedures by race, even when insurance status, income, age, and severity of conditions are comparable . . . racial and ethnic minorities are less likely to receive even routine medical procedures and experience a lower quality of health services."<sup>41</sup>

When taking into account known, measurable associations between education and income, the impact of racial disparities is markedly reduced, with differences in the relative contribution of educational level to racial disparities



**FIGURE 1-11 Death Rates for Selected Causes for Adults 25–64 Years of Age by Education and Sex: Selected States, 1995**

*Note:* Death rates are age adjusted. Injuries include homicide, suicide, unintentional injuries, and death from adverse effects of medical procedures. Rates are plotted on a log scale.

*Source:* Reprinted from US Department of Health and Human Services, *Health United States, 1998 Socioeconomic Status and Health Chart Book*; 91.

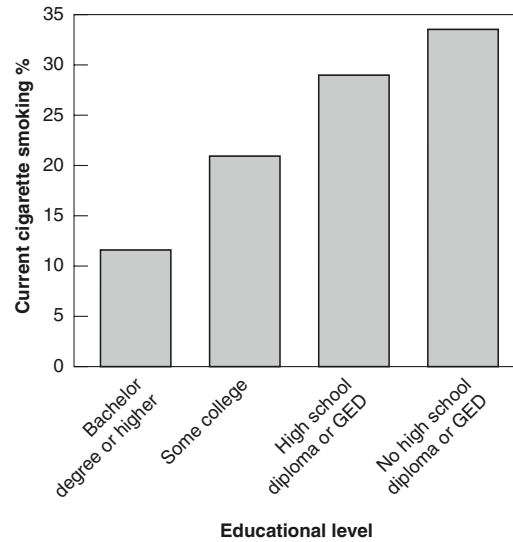
varying by disease.<sup>42</sup> Even adjusting for differences in education and income, disparities persist, leading many researchers to believe that stress associated with either being poor or being a racial or ethnic minority in the United States is an independent risk factor for poor health outcome.<sup>37,43</sup>

In addition to the social factors described above, other social factors, including avoidance of social exclusion, are vital to the maintenance of health. Social exclusion results in not only social, but also economic and psychological isolation.<sup>44</sup> Disruptive effects when individuals migrate and change cultures have also been described as having a deleterious impact on health.<sup>45</sup> Social support systems have a positive influence, and persons with extensive networks generally have longer life expectancies.<sup>46</sup>

## Lifestyle

Personal behaviors play critical roles in the development of many serious diseases and injuries.<sup>47</sup> Behavioral factors largely determine the patterns of disease

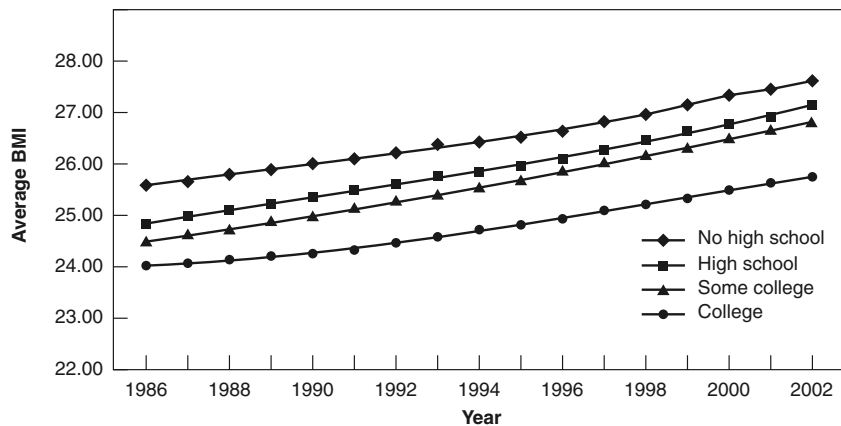




**FIGURE 1-12 Age-Adjusted Prevalence of Current Cigarette Smoking in 2000 among Persons 25 Years of Age and Older, According to Educational Level**

Source: Reprinted with permission from Massachusetts Medical Society. S. Issacs et al. Class the ignored determinant of the nation's health, *N Engl J Med*, Vol. 351, pp. 1137–1142. Data are from the National Center for Health Statistics. GED denotes general equivalency diploma.

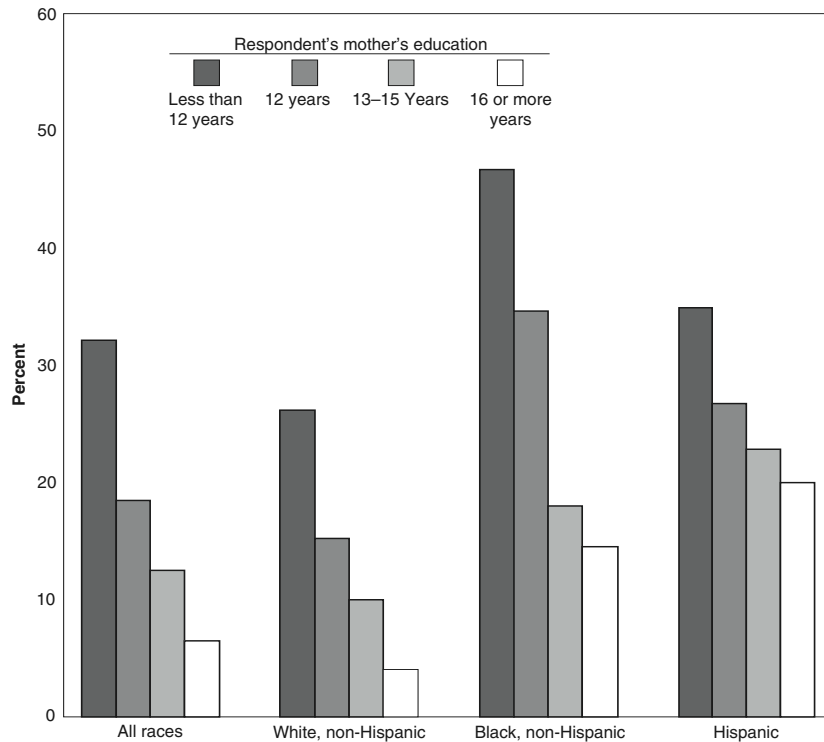
and mortality of the 20th-century populations of the United States.<sup>48</sup> The 1964 surgeon general's report, *Smoking and Health*, concluded that cigarette smoking causes lung cancer, chronic bronchitis, and emphysema.<sup>49</sup> Smoking is responsible for almost 20% of premature deaths in the United States.<sup>4,5</sup> The Framingham study showed the role of cigarette smoking, high serum cholesterol, and



**FIGURE 1-13 Trends in Average Body Mass Index (BMI), by Education: Behavioral Risk Factor Surveillance System 1986–2002.**

Note: BMI = body mass index.

Source: Reprinted with permission from the American Public Health Association. K.D. Truong et al. Weight Gain Trends across sociodemographic groups in the United States, *Am J Public Health*, Vol. 95, pp. 1602–1606, 2005.



**FIGURE 1-14 Percentage of Women 20–29 Years of Age Who Had a Teenage Birth by Respondent's Mother's Education, Respondent's Race, and Hispanic Origin: United States, 1995**

Source: Rerinted from Centers for Disease Control and Prevention, National Center for Health Statistics, 1995 *Survey of Family Growth*.

hypertension in ischemic heart disease.<sup>50</sup> Risk factors including smoking, lack of exercise, substance abuse, and consumption of diets high in fat and calories have increased since the early 1900s, resulting in epidemics of cardiovascular disease, lung cancer, chronic obstructive lung disease, and diabetes.<sup>48</sup> *Our Healthier Nation*, a 1998 United Kingdom report presented to Parliament by the secretary of state for health, stated that the causes of ill health were complex and included lifestyle as a predominant factor: "How people live has an important impact on health. Whether people smoke, whether they are physically active, what and how much they eat and drink, their sexual behavior and whether they take illicit drugs—all of these factors can have a dramatic and cumulative influence on how healthy people are and how long they will live."<sup>44(p5)</sup>

Given the previously noted correlations between socioeconomic factors and personal behaviors (e.g., tobacco use, low levels of physical activity), distinguishing the contribution of lifestyle from the contribution of socioeconomic factors is very challenging.

## Population-Based Prevention Strategy: Theory into Action

In the past 30 years, public health practice has necessarily changed to reflect the growing understanding of determinants and the changing concept

of public health. The fundamental principle is that the health of the community is dependent on many factors affecting an entire population. Thus the target for public health interventions should be a geographic or otherwise defined population. Because of the broad distribution of most diseases and health determinants, using a population as an organizing principle for preventive action has the potential to have a great impact on the entire population's health. As epidemiologist Geoffrey Rose stated, "A large number of people exposed to a small risk may generate many more cases than a small number exposed to a high risk."<sup>51(p24)</sup> Therefore, widespread problems call for a widespread response, meaning, for a population strategy. For example, the overall burden of heart disease is greater from the many people who are at low risk than from the relatively smaller number who are at high risk. A population-based strategy is directed toward changing the prevalence of risk factors for the entire community, such as a tobacco control program, rather than toward identifying and targeting interventions for high-risk individuals.

A strategy for population-wide prevention based on the interaction between health determinants is shown in Table 1-3. This contract is based on a population-wide target for the United Kingdom—to reduce the death rate from heart disease and stroke and related illnesses among people under 65 years by at least a further third (33%) by 2010 from a baseline in 1996.

The development of a population-based management approach to the prevention of disease and promotion of wellness in the United States has roots in *Healthy People: The Surgeon General's Report on Health Promotion and Disease Prevention*, published in 1979.<sup>47</sup>

Clearly, it takes partnering at all levels to fully realize the impact of any health intervention. Population-based and individual-targeted preventive strategies must be considered to be complementary, not exclusive. Comprehensive population-based prevention strategies may involve screening programs for individuals, such as newborn screening for metabolic diseases, childhood lead testing, colorectal cancer screening, mammography, and Pap smears.

## Healthy People

In 1979, *Healthy People* marked a turning point in the approach and strategy for public health in the United States. Joseph Califano, Secretary of the Department of Health, Education, and Welfare, wrote:

And let us make no mistake about the purpose of this, the first *Surgeon General's Report on Health Promotion and Disease Prevention*. Its purpose is to encourage a second public health revolution in the history of the United States. And let us make no mistake about the significance of this document. It represents an emerging consensus among scientists and the health community that the nation's health strategy must be dramatically recast to emphasize the prevention of disease.<sup>47(pvii)</sup>

The first public health revolution was the struggle against infectious disease in the late 1800s and early 1900s, which involved sanitation and immunization. The second revolution was spurred by the prevalence of chronic disease, including heart disease and cancer. The key to *Healthy People* was the premise that the personal habits and behaviors of individuals determined

TABLE 1-3 A National Contract on Heart Disease and Stroke

<b>A National Contract on Heart Disease and Stroke</b>	<b>Government and National Players Can:</b>	<b>Local Players and Communities Can:</b>	<b>People Can:</b>
Social and economic	Continue to make smoking cost more through taxation. Tackle joblessness, social exclusion, low educational standards, and other factors that make it harder to live a healthier life.	Tackle social exclusion in the community, which makes it harder to have a healthy lifestyle. Provide incentives to employees to cycle or walk to work, or leave their cars at home.	Take opportunities to better their lives and their families' lives, through education, training, and employment.
Environmental	Encourage employers and others to provide a smoke-free environment for nonsmokers.	Through local employers and others, provide a smoke-free environment for nonsmokers. Through employers and staff, work in partnership to reduce stress at work. Provide safe cycling and walking routes.	Protect others from secondhand smoke.
Lifestyle	End advertising and promotion of cigarettes. Enforce prohibition of the sale of cigarettes to youngsters. Develop Healthy Living Centers. Ensure access to, and availability of, a wide range of foods for a healthy diet. Provide sound information on the health risks of smoking, poor diet, and lack of exercise.	Encourage the development of healthy schools and healthy workplaces. Implement an integrated transport policy, including a national cycling strategy and measures to make walking more of an option. Target information about a healthy life on groups and areas where people are most at risk.	Stop smoking or cut down, watch what they eat, and take regular exercise.
Services	Encourage doctors and nurses and other health professionals to give advice on healthier living. Ensure catering and leisure professionals are trained in healthy eating and physical activity.	Provide help to people who want to stop smoking. Improve access to a variety of affordable food in deprived areas. Provide facilities for physical activity and relaxation and decent transport to help people get to them. Identify those at high risk of heart disease and stroke and provide high-quality services.	Learn how to recognize a heart attack and what to do, including resuscitation skills. Have their blood pressure checked regularly. Take medicine as it is prescribed.

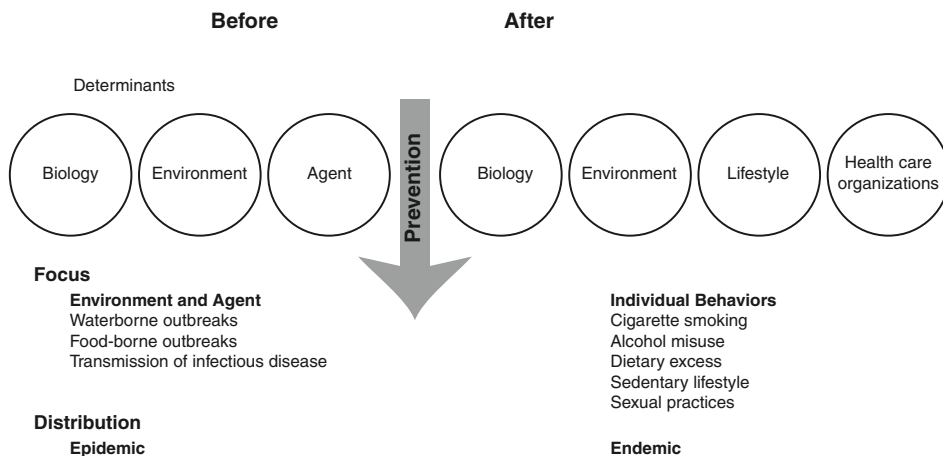
Source: Reprinted from *A National Contract on Heart Disease and Stroke*, presented to Parliament by the Secretary of State for Health, February 1998, © 1998, The Stationery Office, United Kingdom. Crown copyright material is reproduced with the permission of the Controller of Her Majesty's Stationery Office.

“whether a person will be healthy or sick, live a long life or die prematurely.”<sup>47(pviii)</sup> The report urged Americans to adopt simple measures to enhance health, including:

- Elimination of cigarette smoking
- Reduction of alcohol misuse
- Moderate dietary changes to reduce the intake of excess calories, fat, salt, and sugar
- Moderate exercise
- Periodic screening (at intervals to be determined by age and sex) for major disorders such as high blood pressure and certain cancers
- Adherence to speed laws and the use of seat belts

In a change from earlier public health approaches, the role of the individual and personal lifestyle choices was emphasized in this report. Geoffrey Rose observed that in the past, “Actions such as the provision of clean water supplies and sanitation were undertaken for people rather than by people. They have been followed in this century by further centrally provided and regulated measures to protect or improve health, including the immunization of infants and children, fluoridation of water, control of food quality and additives, and (limited) cleaning up of the environment.”<sup>51(p103)</sup> *Healthy People* recognized that individuals did not have complete control, or responsibility, over their health status in part because of socioeconomic and environmental determinants.<sup>47</sup> Yet, healthy behaviors were seen as an individual responsibility with an important influence (Figure 1-15).

A major thrust of the report was a focus on age-related risk. The health problems that affect children change in adolescence and early adulthood and again in old age. At each stage in life, there are different problems and different preventive actions. Infants are most likely to die from congenital malformations or complications of pregnancy (short gestation or low birth weight). Accidents and violence predominate in adolescence; chronic disease



**FIGURE 1-15 Public Health Approach: Before and After *Healthy People* Report**

Source: Copyright © 2000 L.F. Novick

is the major problem in later adulthood and old age. Public health program planning must be attuned to the age-specific diversity of health problems. *Healthy People* set out five age-specific goals in 1977.<sup>47</sup>

These goals with specific objectives were reformulated by a second report issued by the surgeon general in the fall of 1980.<sup>52</sup> *Promoting Health/Preventing Disease: Objectives for the Nation* established quantifiable objectives to reach the broad goals of *Healthy People*. This objective-based population preventive strategy continues today with the *Healthy People 2010* objectives (discussed further in Chapter 2). Measurement of some of these goals that were formulated more than two decades ago demonstrates that progress has continued with respect to public health. For example, the infant mortality rate declined until 2001 when 6.8 deaths per 1000 live births were reported. Although this infant mortality rate exceeded the expectations of the original *Healthy People* goals, it falls short of the HP2010 goals. Despite these advances, clearly more work in population-based management of public health needs to be done. In 2002, infant mortality rates increased to a rate of 7.0 infant deaths per 1000 live births. This increase has been attributed to an increase in the number of babies with extremely low birth weights.<sup>53</sup> In addition to the slight but significant increase in infant mortality rates, racial disparities remain deeply concerning. Although infant mortality rates did decrease for both African-Americans and Caucasians until 2002, the proportional discrepancy between African-Americans and Caucasians remained, resulting in a rate among African-American infants that was 2.4 times that of Caucasian infants.<sup>53</sup> As mentioned earlier, public health gains are not equally experienced by all Americans. According to the World Health Organization, in 2002, the United States ranked 28th out of 192 member states with respect to healthy life expectancy (life expectancy adjusted for time spent in poor health), despite spending a higher percentage of the gross domestic product on health-related expenditures than any other major industrialized nation.<sup>54,55</sup> These daunting statistics are presumably in part due to the disparities in health outcomes.

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Public health as a field of practice has evolved in tandem with historic and contemporary trends in science, disease, and social and environmental conditions. Modern public health practice now extends far beyond the historic focus on infectious disease and environmental threats. The classic IOM report, *The Future of Public Health*, identified the basic challenge for public health as determining methods and implementing activities to resolve a group of health issues that are quite different than contamination of water by a microbial agent.<sup>4</sup> Disparities in infant mortality, emerging infectious diseases, violence, and obesity are examples of contemporary health issues facing the nation's federal, state, and local health agencies. Determinants are a complex mixture of social, environmental, and educational factors. As described in this text, public health methods are being adapted to include new types of collaborative partnerships and community-based prevention that hold the promise of increased effectiveness with our current health problems. The follow-up report, *The Future of the Public's Health in the 21st Century*, emphasizes the necessity of a strong governmental public health infrastructure and community partnerships to ensure an optimally comprehensive and effective public health system.<sup>55</sup>

Abundant examples demonstrate continued challenges that threaten the health of our communities, all requiring vigorous public health action. The line of protection for health hazards can be breached, resulting in significant numbers of illnesses in our community. During 2001–2002, a total of 31 waterborne disease outbreaks associated with drinking water were reported by 19 states. These 31 outbreaks caused illness among an estimated 1020 persons and were linked to seven deaths.<sup>56</sup> Disease outbreaks may be associated with recreational water use as well. In the summer of 2005, over 4000 individuals were reported to have developed a gastrointestinal illness that was associated with a splash park at the Seneca Lake State Park in New York. Cryptosporidiosis was confirmed in over 700 of the cases.

In addition to recurrent familiar threats, the health of the population is challenged by new or emerging threats. In 1999, an outbreak of encephalitis in New York City was identified as being caused by West Nile virus, never previously identified in the Western Hemisphere. This infection, with birds as a reservoir and mosquitoes as a vector, initiated a classic public health response of protection of the community, employing methods of surveillance, information dissemination, and vector control. The five years following the discovery of West Nile virus in the Western Hemisphere were remarkably active for the public health workforce as health threats such as the anthrax attacks in October 2001, the monkeypox and SARS outbreaks in 2003, and the devastating hurricane of 2005, Katrina, challenged public health organization and infrastructure.

To achieve meaningful improvements in population health, contemporary public health organizations engage in a broad scope of activities, many of which now focus on affecting changes in human behavior. The nation's public health system achieved notable improvements in population health throughout the 1900s. Continued progress will likely hinge on the ability of public health organizations and professionals to mount broad-based, multi-sectoral health interventions that address the diffuse social and ecological pathways to population health.

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## Chapter Review

1. Operative components of the definition of public health are *organized* and *community effort*.
2. The majority of the gain in life expectancy in the 1900s (25 of 30 years) can be attributed to public health measures such as better nutrition, sanitation, and housing.
3. Early public health efforts focused on collective action. For scientific advances (e.g., bacteriology) to be translated into community health improvement, the following factors were, and remain, very important:
  - Public information
  - Community acceptance
  - Design of a delivery system for the intervention
4. These early efforts focused on the social and environmental factors of health.
5. Lemuel Shattuck, a strong advocate for public health action in the 1700s, recommended environmental improvement and the formation of public health agencies.

6. Public health activities in both England and the United States were greatly influenced by growing urbanization and industrialization.
7. Scientific advances, particularly microbiology, ushered in a new dimension for the field of public health in the latter part of the 1800s and early 1900s.
8. The changing scope of public health practice was initially concerned with infectious and environmentally related disease but more recently has been extended to nutrition, injury prevention, violence, substance abuse, and tobacco-related and other chronic diseases.
9. The interaction of social, environmental, and biologic factors determines the health of individuals.
10. The public health strategy of prevention begins with the recognition that the health of the community is dependent on an interaction between behavioral and environmental factors.
11. Development and dissemination of *Healthy People: The Surgeon General's Report on Health Promotion and Disease Prevention* established the stage of population-based preventive activities in the United States.

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