

SIXTH EDITION

Introduction to

PUBLIC

HEALTH

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To Allan S. Schneider

We will miss you



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Preface

In the Preface to the *First Edition*, I wrote about the public's general ignorance of the field of public health and my own uncertainty about what public health was when, in 1986, I first went to work for the newly established School of Public Health, a collaboration between the University at Albany and the New York State Department of Health. After working with public health professionals from the Department of Health to design curricula for the programs at the school, and after teaching an introductory course in public health for more than 10 years in collaboration with many of the same health department faculty, I feel much more confident about what the term means. After the bioterrorism scare of 2001 and the public health disasters of Hurricane Katrina in 2005 and Hurricane Sandy in 2012, I believe that the public has a better sense of the field as well.

As I wrote in the Preface to the *First Edition*, I believe that every citizen should know something about public health, just as they should know something about democracy, law, and other functions of government. Public health issues are inherently interesting and important to almost everyone. They are featured almost every day on the front pages of newspapers and in the headlines of television news programs, although often they are not labeled as public health issues. One of my goals is to help people put these news stories into context when they occur.

The *Sixth Edition* of this text follows the plan of the first five editions, bringing it up-to-date and including new developments in infectious disease, injury control, environmental health controversies, the reform of the

American healthcare system, and many other issues. I have illustrated public health principles by presenting stories that have been in the news; some of these stories have been ongoing sagas that have been supplemented with each edition. The *Second* and *Third Editions* focused on political interference with science, but as discussed in the *Fourth Edition*, the Obama administration vowed to restore honest science as a basis of policy decisions. Issues new to the *Fifth Edition* included the Ebola epidemic, the risks of traumatic brain injury to retired professional athletes, and the implementation of President Obama's healthcare reform law, the Patient Protection and Affordable Care Act. The *Sixth Edition* takes up the disaster of the opioid crisis, the arrival of the Zika virus and the resurgence of measles; the risks of driving while drugged, which the United States must now face with changing marijuana laws; and the rapid spread of vaping among America's youth. It also describes the reemergence of political interference with science during the Trump administration.

I have tried to make this text easily comprehensible to the general reader. One of the things that makes public health fascinating to me is the fact that it is often controversial, depending on political decisions as well as scientific evidence. The politics are frustrating to many practitioners, but it is often the politics that puts public health in the headlines. I hope that by describing both the science and the politics, I will contribute to making public health as fascinating to the readers as it is to me.

Mary-Jane Schneider



PROLOGUE

Public Health in the News

What is public health? It is an abstract concept, hard to pin down. Reports about public health appear in the news every day, but they are not labeled as public health stories, and most people do not recognize them as such. Here in the prologue are four major public health stories of the modern era that bring the abstraction to life. The ongoing AIDS epidemic, perhaps the greatest challenge that the public health community has faced in the past 50 years, illustrates the multidisciplinary nature of the field and the complex ethical and political issues that are often an inherent component of public health. The outbreak of waterborne disease that sickened more than 400,000 people in Milwaukee, Wisconsin, in 1993 was the consequence of a breakdown in a routine public health measure that has protected the populations of developed countries for most of the past century. Lest we forget that maintaining the health of the population requires constant vigilance, it has become apparent that white non-Hispanic American men and women in midlife, especially those with a high-school education or less, have been experiencing increases in mortality and morbidity since the turn of the century. The face of this decline is the opioid crisis, but the problems are rooted in more basic social and economic trends. Finally, the terrorist attacks in the fall

of 2001 made it clear that the national security of the United States depends not only on the U.S. Department of Defense, but also on the American public health system.

AIDS Epidemic

On July 3, 1981, *The New York Times* ran a story with the headline: “Rare Cancer Seen in 41 Homosexuals.”¹ The cancer was Kaposi’s sarcoma, a form of skin cancer that is rare in the United States but more common in equatorial Africa. The victims were young gay men living in New York City or San Francisco, and 8 of the 41 had died within 24 months of being diagnosed. The report noted that several of the victims had been found to have severe defects in their immune systems, but it was not known whether the immune defects were the underlying problem or had developed later. Most of the victims had engaged in multiple and frequent sexual encounters with different partners, the article said, but there was no evidence that the disease was contagious, since none of the patients knew each other.

On August 29 of that same year, there was another story: “2 Fatal Diseases Focus of Inquiry.”² A rare kind of pneumonia called pneumocystis had been striking gay men with

a 60% fatality rate. According to *The New York Times*, 53 cases of pneumocystis had been diagnosed. Also, the number of cases of Kaposi's sarcoma had grown to 47, and 7 patients had both diseases. No one knew why gay men were affected, but speculation suggested that there might be a link to their sexual lifestyle, drug use, or some other environmental cause. The article noted without comment that one woman had also been reported to have pneumocystis pneumonia. A scientific task force had been formed at the Centers for Disease Control and Prevention (CDC) to investigate what was going on. There was no further news in *The New York Times* about what would become known as AIDS until May 1982.³ In that article, the underlying commonality of the immune defect was recognized, and the condition was called gay-related immune deficiency syndrome (GRID). While immune deficiencies had been known and studied previously, most were genetic conditions that afflicted children from birth or were caused by immunosuppressive drugs used to prevent rejection of transplanted organs. The total suppression of the immune system by whatever means leads to many infections, one of which eventually kills the victim. Speculation about the cause of GRID generally focused on a sexually transmitted infectious agent, although there was a suspicion that multiple factors might be involved, perhaps including drugs or an immune response to the introduction of sperm into the blood through sexual contact.

As the number of reported cases grew, CDC scientists interviewed people with GRID, questioning them about their sexual behavior and partners. The sexual activities of gay men became the focus of scientists and the news media alike—reports of promiscuous and anonymous sex in public baths and use of drugs to enhance sexual pleasure emerged—which tended to worsen many people's already negative view of gay men. Linkages were found that began to confirm that a sexually transmitted infectious agent was responsible. But the investigations were hampered by lack of funding. President Ronald Reagan had been inaugurated

in January 1981 on a conservative platform, and his administration was not interested in a disease that affected people who behaved in ways so unappealing to the general population. Nor was there much concern on the part of the general public. Most people felt no threat to themselves, although people who lived in New York, San Francisco, Los Angeles, and Miami, where most of the cases had been reported, might have felt more cause for concern.

Since early in the epidemic, occasional reports had noted the presence of the immune deficiency in women and heterosexual men, many of them intravenous drug users. By the summer of 1982, cases of the syndrome had also been reported in people with hemophilia who were exposed to blood products used to make a clotting factor and in patients who had received blood transfusions. A study of female sexual partners of men with the syndrome suggested that the disease might also be transmitted by heterosexual relations. A number of babies turned up with a syndrome that resembled GRID, possibly transmitted from their mothers before or at birth. It was clear that the condition was not limited to gay men, and its name was changed to acquired immunodeficiency syndrome (AIDS). The public began to take notice.

By mid-1983, the public began to panic. A report by a pediatrician in New Jersey suggested that AIDS had spread within a family by routine household contact. That scared a lot of people: AIDS was a fatal disease, and people did not want to take any chances of catching it. Inmates in a New York State prison refused to eat meals in a mess hall used by a fellow inmate who had died of AIDS. A New York City sanitation worker with no known risk factors contracted AIDS, perhaps from a syringe protruding from a trash bag. In San Francisco, with its large gay population, the police officers demanded special masks and gloves for handling people suspected of being infected with AIDS. Blood banks reported that blood supplies were critically low because people wrongly feared that they could contract AIDS through donating blood. In New York City, tenants of

a cooperative apartment building tried to evict a doctor known for treating people with AIDS. In a few well-publicized incidents, schools refused to allow children with AIDS—usually children with hemophilia—into the classroom. A special telephone information number on AIDS, set up by the federal government, was swamped with 8000 to 10,000 calls per day. Fundamentalist preachers and conservative legislators fulminated that AIDS was God's punishment for abominable behavior and that people with AIDS deserved their fate.

Meanwhile, although controversy still restricted federal funding for AIDS research, biomedical scientists were competing to identify the infectious agent, which most scientists believed would turn out to be a virus. Despite the ill repute of many AIDS patients, the disease was of great scientific interest, and the growing public concern promised to reward with acclaim and financial benefits the scientist who isolated the virus. On April 23, 1984, the U.S. Secretary of Health and Human Services convened a press conference to announce that Dr. Robert Gallo of the National Cancer Institute had discovered the virus—now known as the human immunodeficiency virus (HIV)—and that a vaccine would be available within five years.⁴ While both of those statements proved to be less than accurate—Gallo's priority claim was disputed and eventually disproved, and after more than 35 years an effective vaccine has still not been developed—the discovery did promise to allow testing of blood for exposure to the virus. Just a year later, blood banks in the United States began screening donated blood, greatly reducing the risk to transfusion recipients and people with hemophilia.

Now, nearly four decades after the first reports on AIDS were publicized, most of the hysteria has faded, while many of the direst predictions have been realized. By the end of 2015, more than 1.2 million people in the United States had been diagnosed with AIDS, and approximately 700,000 had died, while an estimated 1,122,900 people were living in the United States with HIV.^{5,6} The proportion

of women diagnosed with HIV infection increased steadily over the first two decades and has remained stable since then at approximately 20%.⁷ A great deal more is known about the disease. New drugs have “miraculously” restored health to some dying patients and offer hope that HIV is becoming a chronic, manageable condition rather than a progressively fatal disease. However, there is still no cure, and the only prevention is the avoidance of risky behaviors.

The question of how the government should respond to the AIDS epidemic raised some of the most difficult ethical and political issues imaginable in public health. Every new scientific discovery stimulated new dilemmas. Most of the controversies pitted two opposing principles against each other: the protection of the privacy and freedom of the individual suspected of being ill, and the protection of the health of potential victims at risk of being exposed. This conflict is common to many public health problems. Historically, the protection of the public has taken precedence over the rights of the individual. Thus, the principle of quarantining patients with dangerous infectious diseases such as plague, smallpox, or tuberculosis has been generally accepted and upheld by the courts. However, in the case of AIDS, the issues were more complicated.

Because people with AIDS belonged to stigmatized groups who may have been exposed to the virus through illegal behavior (intravenous drug use or homosexual acts that were still illegal in many states), they bitterly opposed being publicly identified. Gay men, who had only recently achieved a degree of liberation from public oppression, were very well organized politically; they effectively opposed some measures that would have normally been considered standard public health practice, such as reporting the names of diagnosed patients to the health department. They had well-founded fears of being discriminated against for jobs, housing, access to health insurance, and so on. Major political battles erupted over issues such as whether gay bathhouses should be

closed and whether AIDS should be declared a communicable disease, which would legally require names of patients to be reported to the local health department. As HIV infection has become more controllable, much of the controversy surrounding it has subsided.

AIDS is particularly difficult for government to deal with because the only effective way to prevent its spread is to change people's behavior. There are precedents for governmental efforts aimed at promoting behavior change—campaigns to promote smoking cessation, use of bicycle helmets, and healthy diet and exercise—but their success has been mixed. Generally, the weight of a law adds significantly to the government's success in promoting healthy behavior, as in the case of seat belt laws and laws against drunk driving. However, the behavior that spreads HIV is very difficult to control by law; intravenous drug use is already illegal under federal law everywhere in the United States, and homosexual acts were also illegal in many states until the U.S. Supreme Court declared these laws unconstitutional in 2003. From the beginning, public health officials recognized that AIDS could be prevented only by persuading people to reduce their risk by limiting their exposure, which requires convincing them to control powerful biological and social urges.

Beginning with the earliest attempts at AIDS education, conflict arose between the attempt to communicate effectively with people most likely to be at risk and the likelihood of offending the general public by seeming to condone obscene or illegal acts. Conservatives argued—and still argue—that the only appropriate AIDS education message is abstinence from sex and drugs. C. Everett Koop, the Surgeon General of the United States when the AIDS epidemic emerged, was originally known for his right-to-life views. Later he became an unexpected hero to public health advocates by taking a strong stand in favor of frank AIDS education. While stressing the importance of mutually faithful monogamous sexual

relationships and avoiding injected drugs, he nevertheless advocated education about the advantages of condoms and clean needles, and he urged schools to teach children about safe sex. In response, Senator Jesse Helms, a powerful conservative from North Carolina, denounced safe sex materials aimed at gay men as “promotion of sodomy” by the government and sponsored an amendment banning the use of federal funds “to provide AIDS education, information, or prevention materials and activities that promote or encourage, directly or indirectly, homosexual activities.”^{8(p.218)} Today, sexual education and condom availability programs, while not as strictly limited as they were in past decades, still face barriers. In New York City, for example, many public-school buildings are leased by the New York City Department of Education from the Catholic Church, which allows only abstinence-based sexual education and forbids condom availability programs on their premises.⁹

Drug regimens introduced in the mid-1990s that are capable of controlling the damage the virus wreaks on the immune system stimulated new medical, ethical, and economic challenges. These drugs have side effects that may prove fatal for some patients and have long-term adverse effects in others. Complicated regimens for taking many pills per day have been simplified, but new problems of viral strains resistant to the drugs have arisen. These strains may be transmitted to others. Moreover, the drugs are expensive, representing 60% of the projected \$326,500 lifetime cost of HIV treatment per infected individual in the United States,¹⁰ well beyond the budget of most patients, although government programs pay for the treatment of many patients. The federal government allocated \$21.5 billion for HIV-related medical care in the United States in 2019.¹¹

The history of the AIDS epidemic vividly illustrates that public health involves both science and politics. It took the science of epidemiology—the study of disease in human populations—to determine the basic nature of the disease and how it is transmitted. The

biomedical sciences, especially virology and immunology, were crucial in identifying the infectious agent, determining how it causes its dire effects on the human organism, developing methods to identify virus-infected blood, and devising drugs that can hold the virus at bay. Biostatisticians help design the trials that test the effectiveness of new drugs and, eventually it is hoped, vaccines—believed to be the greatest hope for controlling the virus. In the meantime, behavioral scientists must find ways to convince people to avoid actions that spread the virus.

The politics of the AIDS epidemic shows the tension between individual freedom and the health of the community. There is a strong tradition of the use of police powers to protect the health of the public in all civilized societies. But the United States also has a strong tradition of individual liberty and civil rights. Politics determines the path the government will take in balancing these traditions. Public health is not based on scientific facts alone, but rather depends on politics to choose the values and ethics that determine how science will be applied to preserve people's health while protecting their fundamental rights.

Cryptosporidium in Milwaukee Water

In early April 1993, an outbreak of “intestinal flu” struck Milwaukee, causing widespread absenteeism among hospital employees, students, and schoolteachers. The symptoms included watery diarrhea that lasted for several days. The Milwaukee Department of Health, concerned about the burgeoning number of cases, contacted the Wisconsin State Health Department, and an investigation began.¹²

Stool samples from the most severely ill patients had been sent to clinical laboratories for testing, and these tests yielded the first clues about the cause of the illness. Two laboratories reported to the city health department that they had identified *Cryptosporidium* in samples

from seven adults. This organism was not one that most laboratories routinely tested for, but starting April 7, all 14 clinical laboratories began looking for it in all stool samples submitted to them—and they began finding it. Ultimately, 739 stool samples tested between March 1 and May 30 were found positive for *Cryptosporidium*.

Cryptosporidium is an intestinal parasite that is most commonly spread through contaminated water. In people who are basically healthy, the severe symptoms last a week or so. In addition to the watery diarrhea, the symptoms of infection with this pathogen include varying degrees of cramps, nausea, vomiting, and fever. The infection can be fatal in people with a compromised immune system, such as AIDS patients or people taking immunosuppressive drugs for organ transplants or cancer treatment.

In Milwaukee, public health officials immediately suspected the municipal water supply, which comes from Lake Michigan. They inspected records from the two water treatment plants that supplied the city, and suspicion immediately fell on the southern plant. The inspectors noted that the water's turbidity, or cloudiness, which was monitored once every 8 hours, had increased enormously beginning on March 21, an ominous sign. On April 7, city officials issued a warning, advising customers of the Milwaukee Water Works to boil their water before drinking it. On April 9, they temporarily closed the plant. Looking for evidence that the water was indeed contaminated with *Cryptosporidium*, they discovered that a southern Milwaukee company had produced and stored blocks of ice on March 25 and April 9. Testing confirmed that the organism was present in the ice.

Meanwhile, public health investigators were trying to determine how many people had been made sick by the contaminated water. Reasoning that only the most severely affected patients would go to a doctor and have their stools tested, they began a telephone survey of Milwaukee residents. On April 9, 10, and 12, they called randomly selected phone numbers and asked the first adult who answered

whether anyone in the household had been sick since March 1. Of 482 respondents, 42% reported having had watery diarrhea, which was considered to be the defining symptom of the illness. In a more extensive telephone survey conducted on 1663 people in the greater Milwaukee area between April 28 and May 2, 30% of the respondents reported having had diarrhea. Half of the respondents whose water came from the southern plant reported the symptoms, while only 15% of those whose homes did not get water from the Milwaukee Water Works had been ill. These individuals had probably been exposed at work or from visiting the affected region.¹²

The investigators, who reported the results of their study in the *New England Journal of Medicine*, estimated that at least 403,000 people were made ill by the *Cryptosporidium* contamination of the Milwaukee water supply.¹² The number of deaths has been estimated to be 54; 85% of them were AIDS patients, whose compromised immune systems made them especially vulnerable.¹³ In discussing how the contamination had occurred, the investigators speculated that unusually large amounts of the organism may have come from cattle farms, slaughterhouses, or human sewage swept into Lake Michigan by heavy spring rains and snow runoff. Flaws in the water treatment process of the southern plant led to inadequate removal of the parasites. After the problem was diagnosed, the southern water treatment plant was thoroughly cleaned, and a continuous turbidity monitor was installed that automatically sounds an alarm and shuts down the system if the turbidity rises above a certain level.

Cryptosporidium contamination is probably much more common than is generally recognized. It is difficult to control because the organisms are both widespread in the environment and resistant to chlorination and other commonly used water disinfection methods. *Cryptosporidium* was first recognized as a waterborne pathogen during an outbreak in Texas in 1984 that sickened more than 2000 people.¹⁴ Many other pathogens

may potentially surprise us with waterborne outbreaks; according to a report by the Institute of Medicine, only 1% of the organisms associated with disease that might be found in water have been identified.¹⁵

The United States has one of the safest public water supplies in the world. Nonetheless, according to the CDC, an estimated 4 million to 33 million cases of gastrointestinal illness associated with public drinking water systems occur annually.¹⁶ Many communities are still using water treatment technology dating to World War I, while population growth, modern agricultural technology, toxic industrial wastes, and shifts in weather patterns due to climate change are challenging the limits of the aging infrastructure. Updating the infrastructure is expensive—but waterborne disease outbreaks are also expensive. An analysis of the Milwaukee outbreak in terms of medical and productivity costs done by scientists from the CDC, the City of Milwaukee Department of Health, the Wisconsin State Division of Public Health, and Emory University yielded an estimate of \$96.2 million.¹⁷ These authors estimated that, based on the approximately 7.7 million cases of waterborne disease annually, waterborne disease outbreaks cost \$21.9 billion each year in the United States. They recommended that the cost of the outbreaks should be considered when costs of maintaining safe water supplies are calculated. Safe drinking water—one of the most fundamental public health measures—is by no means assured in the United States.

Deaths of Despair: The Declining Life Expectancy of White Americans

In 2012, the life expectancy of Americans at birth was 78.8 years. In 2017, it was 78.6 years.¹⁸ This small downtick may at first glance seem innocuous, but it was the first time in nearly 80 years that life expectancy in

the United States fell over a five-year period. Moreover, there were no contemporaneous high-casualty wars or disease outbreaks during this period, a major expansion of health insurance coverage had occurred, and the economy was increasingly thriving. The steady march forward in longevity in the United States, an apparent triumph of public health and modern medicine, had stopped. What was happening to the health of Americans?

A closer look at the data shows that the worrisome trend began in the late 1990s, and was driven by a sharp increase in mortality among less-educated middle-aged white Americans. The left panel of **Figure 1** shows this trend for 45- to 49-year-olds, along with the near mirror image for less-educated middle-aged black Americans. The deteriorating health of white Americans appears even more striking when juxtaposed to the continuing improvements among middle-aged residents of other rich countries, shown in the right panel of Figure 1. The gap in mortality rates between black and white Americans is shrinking, but perversely this is because white Americans are dying at increasing rates.

One immediate cause is what researchers Anne Case and Angus Deaton have famously

called “deaths of despair”—suicide, alcohol-associated deaths, and drug overdoses, especially from opioids. **Figure 2** shows these alarming trends and how they center on the less educated.¹⁹

In 2017, there were 72,284 fatal drug overdoses in the United States (provisional data show a slight downtick since then, to 69,029 deaths over the 12 months ending February 2019).²⁰ This exceeds the peak annual number of U.S. deaths attributable to car crashes, 54,589 (in 1972); HIV, 50,628 (in 1995); and guns, 39,773 (in 2017).²¹⁻²³ The rate of fatal drug overdoses among whites ages 45 to 54 reached 40 per 100,000 in 2017, and overdose is now the leading cause of death of Americans younger than the age of 50.²³

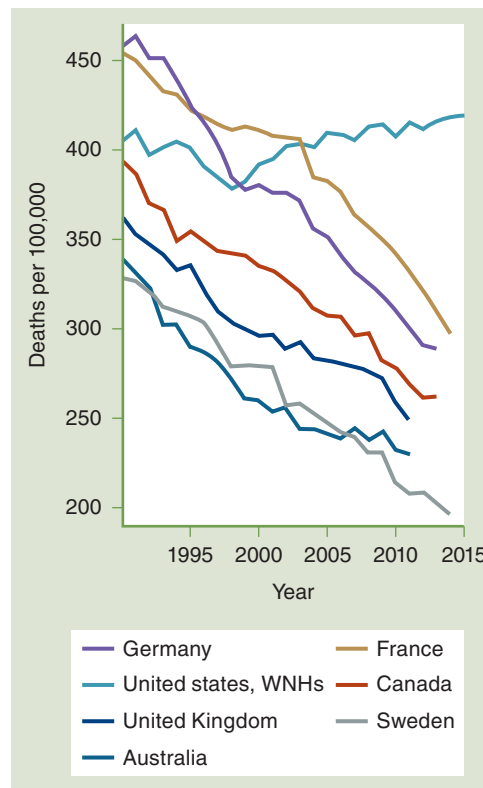
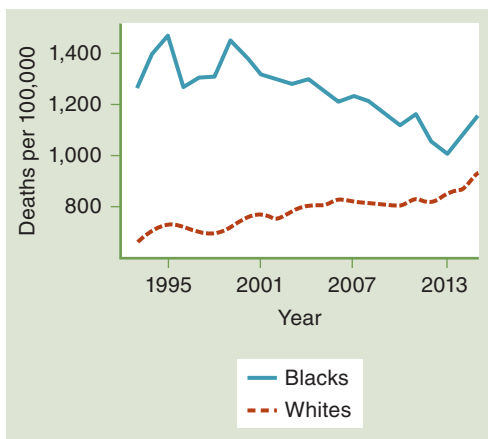


Figure 1 All-Cause Mortality Rates
 Left panel: Black and white non-Hispanic Americans, ages 50 to 54, with a high school degree or less education, 1992–2015. Right panel: White non-Hispanic Americans (WNHs) and residents of other countries, ages 45 to 54, 1990–2015.

Reproduced from A. Case and A. Deaton, “Mortality and Morbidity in the 21st Century,” *Brookings Papers on Economic Activity* 2017, no. 1 (2017), Figures 1.2 and 1.3.

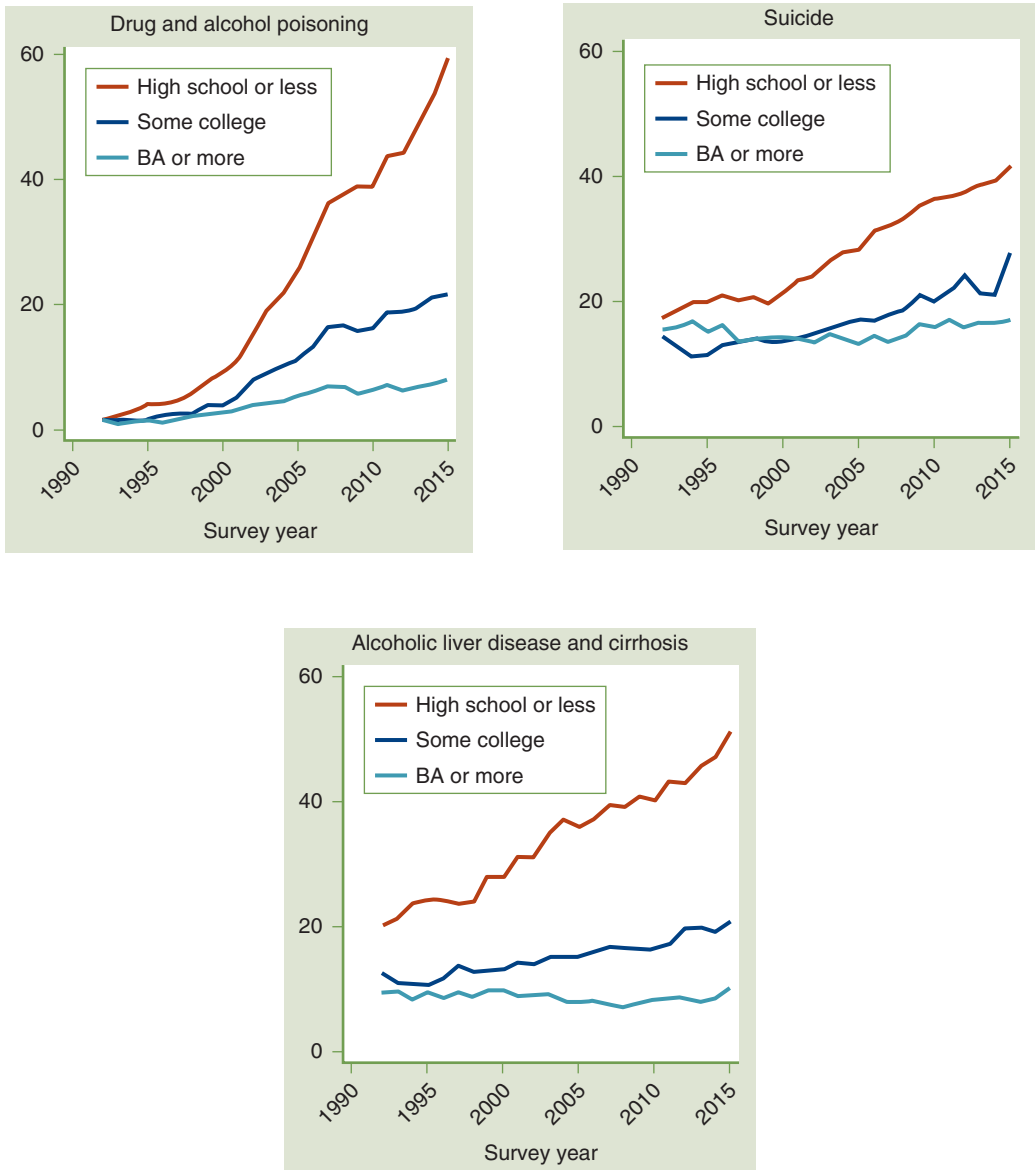


Figure 2 White Non-Hispanic Mortality of Americans Ages 50 to 54 by Education Class, 1992–2015

Reproduced from A. Case and A. Deaton, "Mortality and Morbidity in the 21st Century: Appendix," *Brookings Papers on Economic Activity* 2017, no. 1 (2017), Figure 7.

Nevertheless, deaths of despair do not wholly explain the increasing mortality. The other major contributor is a slowing in the decrease in heart disease mortality rate among whites. This rate had been falling by about 2% per year in the decades prior to 1999, but thereafter slowed to approximately 1% per

year, with no decline at all occurring over the period 2009 to 2015. For blacks and Hispanics, heart disease mortality rates have continued to decline, falling 2.7% and 2.5% per year from 1999 to 2015, respectively. The reason for the slowing improvement in heart disease among whites is not entirely clear, but some experts

believe the obesity epidemic in the United States, long expected to affect long-term health outcomes, is starting to appear. This explanation alone is not entirely satisfactory, however, as obesity rates for black and Hispanic Americans have also been increasing but without a slowing of heart disease improvements.¹⁹

Two factors in particular triggered the opioid crisis. First, in the 1990s, medical groups began arguing that untreated pain was pervasive and should be treated more aggressively. Previously, the medical profession had focused on treating acute pain, such as that experienced after surgery, but not chronic pain, such as that from a back injury.²⁴ Second, the pharmaceutical company Purdue Pharma introduced the painkiller OxyContin and undertook an intense marketing effort for this medication. The company's CEO stated that "the launch of OxyContin tablets will be followed by a blizzard of prescriptions that will bury the competition. The prescription blizzard will be so deep, dense, and white." The company's sales representatives advised doctors to push the highest doses possible because they were the most profitable, telling doctors that fewer than 1% of patients were susceptible to the risk of addiction—a wildly inaccurate claim with no scientific basis. The apparent logic was that the long-acting nature of OxyContin, compared to shorter-acting competitors like Percocet and Vicodin, would appeal less to drug abusers. The U.S. Food and Drug Administration (FDA) accepted this claim despite the lack of evidence, and it became the company's chief marketing message.²⁵

Reports soon emerged that OxyContin was finding its way onto the black market, where users discovered they could crush the pills into white powder to create a pure high-grade heroin-like narcotic.²⁶ Despite the mounting human toll, the company continued to claim its drug was less addictive than alternatives and hired former New York City mayor and September 11 hero Rudolph (Rudy) Giuliani in 2002 to fend off governmental action.²⁷ These efforts generally worked until

2007, at which point the company was forced to settle claims that it had misrepresented the dangers of the drug. The company paid \$635 million in fines and its top three executives pled guilty to misbranding the drug.²⁵ As researcher Angus Deaton noted in his 2018 testimony before the Joint Economic Committee of the U.S. Congress, "Selling heroin is profitable and illegal. Selling prescription drugs is profitable and legal. . . . Our health care system has sometimes been better at generating wealth than at generating health."²⁸

In response to the alarming trends, Purdue eventually did replace OxyContin, in August 2010, with an abuse-deterrent reformulation, which when crushed turned into a gummy substance that was not easily snorted or injected. The street quickly adapted by moving from OxyContin to heroin, which had become readily available and was less expensive, and the rates of addiction and overdoses only accelerated.²⁴

Starting in 2013, fentanyl, an even more concentrated painkiller, which had legitimate medical uses such as treating pain from open-heart surgery, emerged on the black market. Because of its low price and high potency, it was being cut into the formulation of illicit opioids. But the unregulated nature of this market meant that users often did not know what they were taking, leading many to consume far higher doses than they expected. This, in turn, has pushed the rate of overdoses even higher. **Figure 3** shows the trends in fatal opioid overdoses over the last two decades, including the three waves—prescription pills, heroin, fentanyl—that have killed so many Americans, among them musicians Prince, Tom Petty, Lil Peep, and Mac Miller, and actors Philip Seymour Hoffman and Heath Ledger.

While the drug epidemic has played a central role in the deteriorating health of less-educated white Americans, opioids are less the root cause than, in the words of Case and Deaton, "an accelerant . . . that added fuel to the fire, and made an already bad situation much worse."²⁸ The root cause is more complex and must also explain the

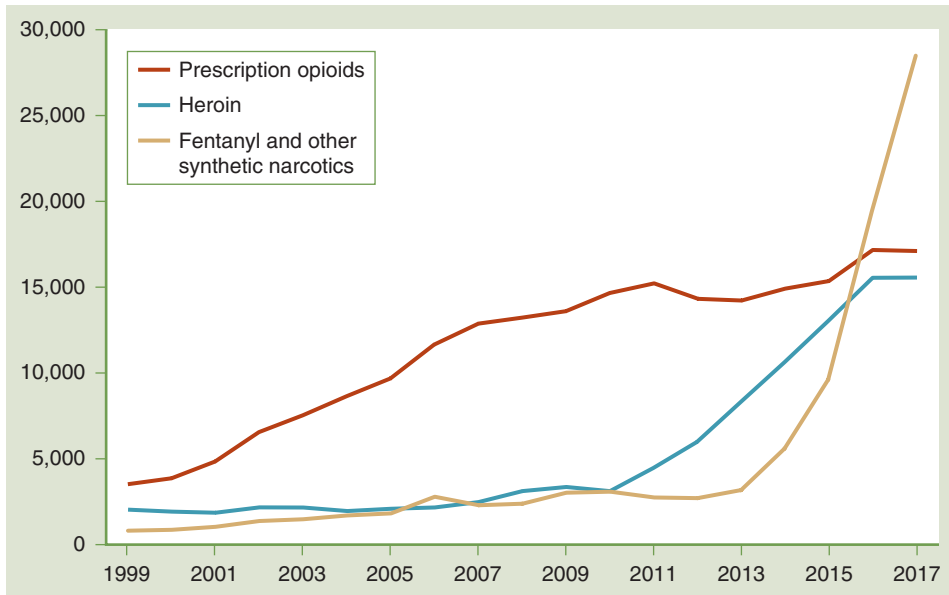


Figure 3 Opioid Overdose Deaths in the United States, 1999–2017

Data from National Center on Health Statistics, "Number of National Drug Overdose Deaths Involving Select Prescription and Illicit Drugs," CDC WONDER, National Institute on Drug Abuse, <https://wonder.cdc.gov/mcd.html>, accessed September 16, 2019.

continuing improvements in the health of more-educated white Americans, black and Hispanic Americans of all educational levels and ages, and residents of other rich countries. (Canada is perhaps most similar to the United States in having had 4460 opioid overdose fatalities—73% involving fentanyl—in 2018, in a country with about one-tenth of the U.S. population.²⁹) The root cause must additionally account for the dramatic rise in suicide and alcohol deaths, both of which were well-known causes of death long before these recent trends emerged.

The increase in deaths of despair seems rooted in the sea change in American society that occurred in the 1980s and 1990s. Less-educated whites born in the 1960s and 1970s were hard hit by globalization and technological advances that shipped much of the manufacturing sector overseas, including its well-paying and previously stable careers that allowed people with limited formal education to enter the middle class. The deterioration of unions, due in part to conservative political

trends of the 1980s, facilitated this transition. Women became increasingly independent and had less practical need for men without stable earnings. The influence of religion and other social institutions that connected communities was waning. Collectively, these factors meant that the social fabric of society had weakened significantly for some Americans.¹⁹

To illustrate the point, among white Americans with a high school degree or less, only 7% of the cohort born in 1960 were out of the workforce by age 35 (in 1995). For the cohort born in 1980, 18% were out of the workforce by age 35 (in 2015). Similarly, for the 1960 cohort, 13% had never been married by age 35, while for the 1980 cohort, 20% had never been married at age 35. In contrast, more-educated white Americans showed no change in these life determinants over time.¹⁹ Moreover, survey evidence shows that half of men out of the workforce are taking pain medication, and two-thirds of these are taking prescription painkillers such as opioids.³⁰ In the words of Case and Deaton, "These slow acting and cumulative

social forces . . . work through their effects on family, on spiritual fulfillment, and on how people perceive meaning and satisfaction in their lives in a way that goes beyond material success. At the same time, cumulative distress, and the failure of life to turn out as expected is consistent with people compensating through other risky behavior such as abuse of alcohol, overeating, or drug use.¹⁹

It now appears that Purdue Pharma, the maker of OxyContin, will settle lawsuits filed against the company on behalf of the roughly 200,000 Americans who have died, and for the additional damage that has been caused, from its products. The company and the family that owns it are expected to pay approximately \$15 billion to more than 2000 state and local governments in an outcome reminiscent of the Tobacco Master Settlement Agreement of 1998 (discussed in Chapter 15, Public Health Enemy Number One: Tobacco). The company will also be dissolved and a new one will be formed that will continue to sell pharmaceuticals, but with its profits going to the plaintiffs. Meanwhile, Purdue Pharma will develop and provide drugs for addiction and overdose treatment.³¹ Unfortunately, the problems facing less-educated middle-aged white Americans may get worse before they get better: As they reach old age, their health problems are likely to compound.

The declining health of less-educated white Americans illustrates the complex interaction between class, race, societal institutions, and availability of vices such as opioids in determining the health of the public. Some of these factors fall squarely within the domain of public health to address, whereas others are more entrenched and require broader efforts to rectify.

Public Health and Terrorism

On September 11, 2001, the United States was attacked by foreign terrorists, and Americans entered a new phase of civic life. Four passenger airliners were simultaneously hijacked;

three were crashed into buildings filled with people going about their work, and one crashed in an empty field in Pennsylvania, apparently headed for another target but stopped by passengers.

The immediate public reaction to these disasters was the activation of emergency response plans in the regions where the crashes occurred. Police, firefighters, and ambulances rushed to the scenes; hospital emergency rooms were alerted; extra doctors and nurses were called in. In the New York City area, healthcare facilities in the whole region readied themselves to receive the expected large numbers of people wounded at the World Trade Center. Unfortunately, much of this preparation was not utilized because there were so few injured people who survived.

Although the disaster of September 11 was unprecedented in its magnitude, it was similar in kind to other emergencies and disasters for which communities plan: plane and train crashes, factory explosions, earthquakes, hurricanes, and so on. In New York, public health agencies were concerned not only with coordinating emergency medical care, but also with ensuring the safety of cleanup workers and area residents. Problems with polluted water, contaminated air, spoiled food, infestation of vermin, and so on, had to be dealt with in lower Manhattan just as they must be dealt with after any natural disaster. The longer-term response to September 11 has focused on law enforcement and national defense, with the goal of preventing future hostile acts by terrorists. The federal government has tightened security at airports and borders; it has attacked or warned foreign countries thought to harbor terrorists; and national intelligence agencies have increased their surveillance of persons and groups suspected of being a threat to the United States, to the extent that there are concerns that civil liberties are being eroded.

In contrast to the dramatic events of September 11, the second terrorist attack occurring in autumn 2001 became apparent only gradually. On October 2, Robert Stevens,

an editor for a supermarket tabloid, was admitted to a Florida hospital emergency room suffering from a high fever and disorientation. An infectious disease specialist made a diagnosis of anthrax, in part because of heightened suspicions of bioterrorism provoked by the September 11 attacks. The doctor notified the county health department, which notified the state and the CDC. After further tests, the health agencies announced on October 4 that a case of inhalational anthrax had been confirmed. An intensive investigation into the source of exposure began at once. Stevens died on October 5.^{32,33}

On that same day, another case was diagnosed in a worker at the same tabloid office where Stevens worked. Tests done throughout the building detected a few anthrax spores on Stevens's computer keyboard and more in the mailroom. The building was closed, and all employees were offered antibiotics to protect them against the development of disease.

On October 9, the New York City Department of Health announced that a newsroom worker at NBC in New York City had developed cutaneous anthrax. She had handled a suspicious letter containing a powder, later identified as anthrax spores.³⁴ Shortly after, a 7-month-old infant, who had visited his mother's workplace at ABC-TV 2 weeks earlier, was diagnosed with cutaneous anthrax. The child had developed a severe, intractable skin lesion that progressed to severe anemia and kidney failure, but anthrax had not been suspected as a cause of these symptoms. After two weeks in the hospital, the infant was correctly diagnosed with anthrax and given antibiotics; he gradually recovered, as did the NBC worker.³⁵ By this time, it was clear that the outbreak was intentionally caused and that a bioterror attack was under way.

On October 15, a staff member working in Senator Tom Daschle's office in Washington, D.C., opened a letter and noticed a small burst of powder from it. Alert to the threat of anthrax, the aide notified the police and the Federal Bureau of Investigation (FBI), and the area was vacated. The letter tested positive for

anthrax. Staff and visitors who were potentially exposed were offered antibiotics, as were workers in the Capitol's mailrooms.³⁶

The bad news continued. At about the same time that workers in the media and in Congress were being exposed to anthrax, the disease was breaking out in postal workers in New Jersey, Maryland, and Virginia, although it took days to weeks to recognize what was happening. While it was known by mid-October that anthrax spores were being sent through the mail, they were not believed to escape from sealed envelopes. As it turned out, postal workers were among the most affected by the outbreak. The Brentwood Mail Processing and Distribution Center in the District of Columbia was closed on October 21 after four postal workers were hospitalized with inhalational anthrax; two of these workers died.³⁷

All told, a total of 22 cases of anthrax were diagnosed over a 2-month period, of which 11 were the inhalational form. Five of the latter group died, one of whom was a 94-year-old woman in Connecticut whose source of exposure was never verified. It was surmised that a piece of mail received at her home had been cross-contaminated by another piece of mail at a postal facility.³⁸ The CDC estimated that 32,000 potentially exposed people received prophylactic antibiotic therapy, which may have prevented many more cases.³⁹ Contaminated buildings, including five U.S. Postal Service facilities, had to be closed and laboriously decontaminated; some of these buildings could not be reopened for more than a year.^{40,41}

Investigation of postal service records determined that letters to the media were mailed in Trenton, New Jersey, in mid-September. The letter to Senator Daschle and one to Senator Patrick Leahy, which was not opened until it was irradiated to kill the bacteria, were mailed in Trenton on October 9. A number of hoax letters—similar to the anthrax letters, and some containing innocuous white powder—were also mailed to media and government offices from St. Petersburg, Florida. Since they were sent before the news broke

about the anthrax letters, they were presumably sent by the same person.

The perpetrator of the anthrax mailings was finally identified in 2008 as a scientist working on drugs and vaccines against anthrax at the U.S. Army Medical Research Institute of Infectious Diseases. As the FBI began to close in on him as a suspect, Bruce Ivins committed suicide. Many of his colleagues doubt that he was responsible, and the case will never be proven in court. The U.S. Department of Justice released its evidence against Ivins and requested that the National Academy of Sciences conduct a review of the evidence.⁴² The Academy's report concluded that the evidence was consistent with Dr. Ivins's lab being the source of the anthrax spores but did not prove it.⁴³ Meanwhile, the anthrax letters that were sent to Senators Daschle and Leahy, and the New Jersey mail collection box from which the letter was mailed, were decontaminated and in 2014 were put on display at the Smithsonian Institution's National Postal Museum in Washington, D.C.⁴⁴

The anthrax attacks terrorized the population far beyond the actual damage done. They also disrupted the public health and emergency response systems out of proportion to the actual threat. Any encounter with white powder evoked panic, causing people to send samples to public health laboratories for testing. At New York State's Wadsworth

Center in Albany, scientists worked around the clock throughout the fall, testing more than 900 samples. Some of the unlikely specimens sent for testing were a pair of jeans, a box of grape tomatoes, a box of Tic Tac breath fresheners, and several packets of cash from automatic teller machines. The largest amount of cash submitted at one time was \$8000, carefully guarded and picked up by police immediately after the anthrax tests proved to be negative (L. Sturman, personal communication).

The events that occurred in the autumn of 2001 disturbed Americans' sense of security within their borders. The 9/11 terrorists' hijacking of four airplanes prompted major efforts to strengthen homeland security through more rigorous screening of airline passengers and of international travelers at the borders—precautions that are now routine and are expected to be maintained. The anthrax attacks called attention to the fact that the public health system is America's best protection from bioterrorism. Increased funding for disease surveillance, public health laboratories, and emergency response systems has strengthened the ability of the public health system to respond to bioterrorist attacks as well as to natural disasters and epidemics. These precautions are just as important as other homeland security measures for Americans to be safe in their homeland.

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About the Authors



Mary-Jane Schneider earned a B.S. in chemistry at the University of Rochester and a Ph.D. in biophysics in 1967 at the University of California, Berkeley, where she met her husband, Allan, also a Ph.D. student. They spent two years as postdoctoral fellows at the Weizmann Institute of Science in Israel. On returning to the United States, Mary-Jane worked as a science writer at the National Cancer Institute in Bethesda, Maryland. She and Allan then moved to New York City where their sons Henry and Joseph were born, and Mary-Jane continued writing about science at the New York Academy of Sciences and then at the Albert Einstein College of Medicine.

In 1986, the family moved to Albany, New York, where Mary-Jane accepted a position at the newly formed School of Public Health, a collaboration between the University at Albany of the State University of New York and the New York State Department of Health. She worked with faculty committees to design academic programs for the School, including Master of Public Health and Doctor of Public Health programs. She later became the director of those programs. Once the School was firmly established, administrators at the University pressed the School to teach an undergraduate course, so as to introduce undergraduate students to the field. Mary-Jane volunteered to coordinate that course, which was team taught by faculty from the Department of Health and the University, beginning in 1994. She searched for a textbook and, finding none, decided to write one herself. That first edition was dated 2000. Much of what she initially learned about public health and included in the book came from attending those lectures by practitioners of the field.

A fortunate result of his mom's career path was that **Henry Schneider** has been immersed in public health from a young age, discussing the issues of the day at the dinner table with his mother Mary-Jane. Henry went on to study physics at Wesleyan University, where he received a B.S. in 1996, and economics at Yale University, where he received a Ph.D. in 2006. Following graduate work, Henry was a professor at Cornell University for a decade. In 2016, he moved across the border to Canada, where he is now a professor in both the Department of Public Health Sciences and

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the Stephen J.R. Smith School of Business at Queen's University, one of the leading research schools in Canada. Inspired by pathbreaking work in medicine, his recent research examines how checklists affect worker behavior, including why checklists seem to improve the quality of medical care in some settings but not in others. His other recent work examines how small psychologically based interventions – so-called “nudges” – can influence people to make healthier and more fulfilling decisions. Henry's background and knowledge has been an invaluable contribution and support in the development of this text.



Mary-Jane and **Henry** in London at the Broad Street pump, the birthplace of modern epidemiology, in October 2019. Henry's son Gus is in the background, leaning against the John Snow Pub, which is named after the famous first epidemiologist, Dr. John Snow, who identified the Broad Street pump as the source of the 1854 cholera epidemic that killed 616 local residents. (See Chapter 4, *Epidemiology: The Basic Science of Public Health*, for more on John Snow and his work.)