

CHAPTER 4 Part I

PREFERRING ANARCHY AND CLASS DISPARITY

“Public health is purchasable. Within natural limitations a community can determine its own death-rate....No duty of society, acting through its governmental agencies, is paramount to this obligation to attack the removable causes of disease.”

— Dr. Hermann Biggs, New York State Commissioner of Health, 1913

“Government is not the solution to our problem, government is the problem.”

— Ronald Reagan, Presidential Inaugural Speech, January 20, 1998

“As the scientific case for public health becomes stronger, politics and popular support has not kept pace. Public health programs in the United States — and the situation is similar in many other countries — are either not being improved or, in many cases, are being allowed to wither....Overt resistance to public health is rare. On the contrary, public health has been subject to the death of a thousand cuts, some of them noticed, others not.”

— Daniel Callahan, The Hastings Center, 1998¹

The twenty-first century dawned with America’s public health system in dire disarray. Some might argue that there actually was no system, per se, but a hodge-podge of programs, bureaucracies and failings.

As incredible as it might seem, given America’s breathtaking prosperity of the close of the 1990s, most of the problems and crises noted in the health apparati of Central Africa, the Indian subcontinent and former Soviet Union could also to one degree or another be found in the United States. American public health leaders of the 1990s were struggling to ensure that the

nation's food and water were safe, that diseases like HIV and hepatitis C didn't overwhelm the populace, that the country's children were appropriately vaccinated: Item by item the travails of the rest of the world were also America's. And America had its own additional bugbears, reflecting unique political and economic dimensions of the society.

If the former Soviet states suffered from an overemphasis on the public health needs of the collective, at the expense of the individual, America at the end of the twentieth century was reeling under the weight of its new-found libertarianism: the collective be damned, all public health burdens and responsibilities fell to the individual. It was an odd paradigm and an about-face from the attitudes and sense of duty that had formed the foundation of American public health at the dawn of the twentieth century. While the 1991 end of the Cold War brought public health chaos and despair to the losing side, for the American victors it unleashed a national me-first sentiment that flourished during the country's most phenomenal and lengthy period of economic prosperity.

Less than a decade after the fall of the Berlin Wall, the middle class of the United States had grown blasé about the word "millionaire," the New York Stock Exchange scaled heights that would have been unimaginable in the 1980s, and few citizens of the United States seriously doubted that the New World Order hailed in 1991 by then-President George Bush meant anything less than American dominance over the global marketplace.

It seemed, in short, a good time to be smug — if you were an American.

The nineteenth century and early twentieth century creators of America's public health systems would have found this emphasis on individualism amid such grand prosperity shocking.

For them, the health of a community was the key measure of its success, and if pestilence and death stalked even one small segment of the population it was a stark indication of the community's political and social failure. They were zealous in their beliefs, imbued with a sense of mission and, in most parts of the country, empowered by law to execute their plans — even if such efforts entailed battles with governors, mayors or legislative politicians: “The public press will approve, the people are prepared to support, and the courts sustain, any intelligent procedures which are evidently directed at the preservation of the public health,” New York City health official Dr. Hermann Biggs declared in 1900. “The most autocratic powers, capable of the broadest construction, are given to them under the law. Everything which is detrimental to health or dangerous to life, under the freest interpretation, is regarded as coming within the province of the Health Department. So broad is the construction of the law that everything which improperly or unnecessarily interferes with the comfort or enjoyment of life, as well as those things which are, strictly speaking, detrimental to health or dangerous to life, may become the subject of action on the part of the Board of Health.”² If disease raged, the objective, in short, was to stamp it out by any means necessary.

These crusaders would find it amazing to witness the erosion of America's public health infrastructures during the later twentieth century, the low status ascribed to public health physicians and scientists, the legal limitations placed on their authority, and the disdain with which Americans viewed their civil servants. In the early 1890s America led the world in designing and executing the primary missions of public health; in the 1990s, the same nation turned its back on most of the key elements of the enterprise known as Public Health.

“Skepticism voiced today about the role of government too often neglects the very beneficial impact public agencies have made in the lives of their citizenry, particularly in the field of public health,” write the University of Pennsylvania’s Gretchen Cordran, Henry Williams, and Rose Cheney.³ “Yet by 1930 infectious epidemic disease and exceedingly high mortality rates had been brought largely under control with the direct assistance of a well-established municipal services bureaucracy. The health issues we face today are not the same as those a century ago, but we would be prudent to recognize past successes and how they were achieved.”

For example, American hospitals had once been death traps from which few patients emerged in better health than they had been in when they entered. Public health zealots of the late nineteenth century cleaned up the hospitals, ordered doctors and nurses to scrub up and brought death rates way down.

But a hundred years later, while Zaire might have been the only nation with the dubious distinction of having twice spawned Ebola epidemics out of its hospitals it was hardly alone in an apparent state of helplessness before wave after wave of nosocomial, or hospital-acquired, infections. Throughout the former Soviet Union infection control — or the lack thereof — was in a calamitous state. In the poor regions of the world resource scarcities could always be blamed when dangerous microbes passed from one patient to another via the hands of a physician, who, ironically, had sworn to the first maxim of medicine: do no harm.

But scarcity could hardly explain why nosocomial disease was, like a dark horseman of death, sweeping over American hospitals. Nor could lack of resources justifying the apparent

helplessness and impotence with which public health officials greeted the tidal wave of mutant, drug-resistant superbugs.

Even in wealthy America hospitals had become places where many patients grew *sicker* than they had been when they checked in, catching diseases on the wards. By 1997, 10 percent of all patients who spent more than one night in the average U.S. hospital acquired a non-viral infection nosocomially, carried to their fragile, ailing bodies on contaminated instruments or the hands of medical personnel. (The burden of viral nosocomial infection was difficult to calculate. The U.S. Centers for Disease Control felt confident that blood screening and basic hospital hygiene had eliminated nosocomial spread of the AIDS virus, HIV by 1985. But other blood-borne viruses, particularly hepatitis types B, C, and D, and herpes viruses continued to spread in medical settings well into the 1990s.)⁴ The more severely ill the patients, the greater their likelihood of being nosocomially infected. This was simply because individuals in an intensive care unit recuperating from, for example, open heart surgery were subjected to far more potentially-contaminated needles, shunts, devices, and manipulations than were, say, women recovering from childbirth. In intensive care units the odds that any given patient would be infected in this way approached fifty-fifty. And all too often those infections were fatal.⁵

A few hospitals in the United States cooperated with the CDC to form the National Nosocomial Infection Surveillance System. Their lab work showed steady increases in the percentage of drug-resistant organisms that could defy conventional treatments in every population of common hospital microbes during the 1990s.⁶ A University of Iowa-run Sentry Antimicrobial Surveillance System in Europe, Canada, and Latin America spotted the same

trend, as did a WHO global surveillance network that monitored the emergence of mobile rings of DNA that carried drug resistance genes. These rings, called plasmids, were readily shared among bacteria, even across species.⁷

For reasons nobody could quite pin down, New York City had the highest rates of drug resistant bacterial diseases and deaths in its hospitals.

“We seem to be leading the nation on this, which is a dubious number one position, to say the least,” the city’s Health Commissioner Dr. Margaret Hamburg said with a sigh.⁸ Hamburg’s assistant commissioner, Dr. Marcelle Layton, said in 1997 that the city faced an unparalleled scale of public health challenges that might be contributing to the steady rise in drug resistance her staff had observed over ten years.

“There are 53,000 people per square mile in New York City,” Layton said, and “about 200,000 of them are HIV-positive. A quarter of the population lives below the poverty line. One point three million have no health insurance.”

Layton stopped and shrugged her shoulders, her body language saying, “What can we do?” And, indeed, public health officials all over America were stymied, as they anxiously watched death tolls rise, the bugs mutate, vital drugs get rendered useless, but lacked any powers to stop what seemed an inevitability: the arrival of the post-antibiotic era. And nowhere was that terrible prospect looming more precariously than in the nation’s hospitals.

Unfortunately, hospitals had become physicians’ sacred grounds, not to be trampled by public health authorities. A century earlier Layton’s counterparts could have marched in and shut down any hospital that, like Kikwit’s Ebola-spreading General Hospital, created epidemics. Not

so in the 1990s. Instead Layton and her counterparts nationwide counted death tolls and issued warnings.

The numbers were truly horrible. One of the key sources of nosocomial infection was contaminated intravascular catheters. Such devices were placed in nearly all post-surgical patients. If contaminated with pathogenic bacteria or fungi the result was blood poisoning, or septicemia. Twenty-five percent of the time such septicemia episodes during the 1990s proved fatal. For the 75 percent of such patients who survived, nosocomial infection added an average of \$33,000 in medical costs. In 1996 there were an estimated 400,000 nosocomial septicemia survivors in the United States whose total additional treatment cost was \$13.2 billion.⁹ Even comparatively conservative estimates made in the early 1990s by the Centers for Disease Control and Prevention put the annual nosocomial septicemia toll at “more than 100,000” cases, with death rates as high as 35 percent and excess treatment costs of \$40,000 per life saved.¹⁰

The bottom line: by the close of the 1990s somewhere between 100,000 and 150,000 Americans were dying each year, felled by infections they caught inside U.S. hospitals. Though they entered these facilities in hopes of cures and treatments, for these patients the hospitals were killing fields. And the deadliest of nosocomial microbes were newly emerging, mutant bacteria that could resist antibiotic treatment.

The crisis brewing in New York City during the nineties involved four ubiquitous pathogens: *Enterococcus faecium*, *Enterococcus faecalis*, *Streptococcus pneumoniae*, and *Staphylococcus aureus*. The *Enterococci* were troublesome, but not usually lethal, intestinal bacteria that produced digestive problems, diarrhea, and bowel and colon pain and spasms. If an

individual was highly stressed or immune deficient — as were the cases with most hospitalized individuals — these bacteria (particularly *faecium*) could be lethal.

Strep and staph were, of course, far more worrisome. Strep pneumonia bacteria were leading causes of ear infections, disease-associated deafness, pneumonia deaths, and what was commonly called strep-throat. Severe strep infections could result in bacterial colonization of the meninges tissues, leading to meningitis and life-threatening infections of the central nervous system. In the pre-antibiotic era, 30 to 35 percent of all *S. pneumoniae* infections were fatal.¹¹

In 1996 *S. pneumoniae* was the leading cause of pneumonia in the United States, producing four million adult cases annually. Outpatient treatment costs alone topped \$1 billion a year. And for patients over sixty years of age such infections were, despite vigorous antibiotic treatment, fatal about 7 percent of the time.¹²

Staphylococcus aureus was the cause of wound infections, sepsis (blood poisoning), toxic shock syndrome, bedsores, osteomyelitis bone disease, endocarditis heart infections, boils, abscesses, and bacterially-induced arthritis. Because some strains of the organism exuded powerful toxins, staph infections could be terrifying, escalating in a matter of hours from little more than a small, pus-producing contamination of a wound to life-threatening blood poisoning and cardiac arrest. It was primarily because of staph infections that tens of thousands of soldiers' limbs were amputated during the Civil War and World War I.

Staph bacteria are spheres one micron in diameter that tend to cluster in tight groups, like grapes on a vine. Under stress, the organisms can expel the water from their cytoplasm and go into a dormant state as hard, dry “beads.” In that state they are virtually invulnerable and can

survive in air, water, food, soap, soil — almost anywhere. Strep are also spherical, but rather than forming clusters, they tend to gather single-file, forming long chains, like pearl necklaces. They, too, are capable of resisting environmental stress by expelling water and going into a dormant state.

New York's troubles with these organisms had been severe in the late nineteenth and early twentieth centuries, but had virtually disappeared with the arrival of the penicillin era. These were among the first microbes to acquire penicillin resistance, however, and all over the city by the early 1990s Hamburg's department was finding strep that was resistant, or completely impervious, to penicillin.¹³

A city health department survey of forty child health clinics conducted between January 1995 and November 15, 1996 found that 13.8 percent of children's *Streptococcus pneumoniae* infections involved strains that were partially resistant to the penicillin class of antibiotics, and 6.5 percent were completely invulnerable to the drugs. Some strains were also resistant to a list of antibiotics that doctors usually turned to when penicillins failed — including erythromycin, trimethoprim sulfamethoxazole (TMP/SMX), cefotaxime, tetracyclines, and chloramphenicol.

A city-wide survey of seventy-three hospitals found that penicillinase-resistant infections in all age groups of patients had soared from 8 percent in 1993 to more than 20 percent in 1995, said Layton in a speech to the 1996 American Public Health Association meeting in Manhattan. The incidence of resistant strep was highest in children under one year of age, with eleven cases per 100,000 New York City infants occurring in 1995.

That year, Hamburg noted, only one antibiotic was still universally effective against New

York City strep *pneumoniae*: vancomycin. It was also the only treatment for drug-resistant staph—MRSA (methicillin-resistant *Staphylococcus aureus*) — which by 1993 represented fully a third of all staph cases in the United States.¹⁴

And there was the rub: three different species of common bacteria were acquiring powerful drug resistance capacities simultaneously. And all three left medicine with the same last resort drug: vancomycin.

In 1986 in Europe and in 1988 in New York City, vancomycin-resistant *Enterococci* emerged in hospitals.¹⁵ And once these VRE (vancomycin-resistant *Enterococci*) strains appeared, their numbers and geographic distribution quickly rose. By 1993 in Baltimore hospitals, for example, 20 percent of all enterococcal infections were VRE.¹⁶ And Baltimore's VRE incidence was comparatively low. In Philadelphia, a third of all enterococcal infections in 1994 were VRE, and death rates among VRE patients were 53 percent, unless they were treated with high doses of chloramphenicol.¹⁷

The critical concern was that the vancomycin-resistant enterococci would share their resistance genes with strep or staph. Test tube studies in the early 1990s showed that VRE resistance genes were carried on mobile transposons, or plasmids, and that the changes they mediated in the enterococci could also be carried out in strep or staph bacteria.¹⁸

Remarkably, some enterococci actually became “addicted to vancomycin,” Rockefeller University microbiologist Alexander Tomasz said. The bugs not only could *resist* vancomycin, they actually evolved to *depend upon it*.¹⁹

Looming over New York City in the mid-1990s, then, was the prospect that, within a

hospitalized patient who was infected with enterococci, some VRE would share its awesome genetic machinery with staph or strep, resulting in a terrifying, highly contagious superbug.

It was a truly nightmarish public health prospect.

By the close of the twentieth century, New York City's hospitals had become the environs from which one of Gotham's most significant public health threats emerged. Self-ruled, stubbornly opposed to government scrutiny, the hospitals, however, insisted on self-regulation. And the threat grew: a threat that endangered the public's health.

"We're just waiting for the other shoe to drop," Hamburg said nervously. Hamburg's staff, together with Rockefeller University microbiologist Alexander Tomasz and scientists from the local Public Health Research Institute and area hospitals, formed the BARG — Bacterial Antibiotic Resistance Group — in 1993 to watchdog microbial trends in the area. And Hamburg warned the area's hospitals in the strongest possible terms that their infection control standards needed to improve or they would soon see death rates soar due to drug-resistant microbes. The New York State Department of Health toughened infection control guidelines, too, and ordered that every single hospital employee in the state — from intake receptionist to brain surgeon — had to undergo state-certified infection control training every year, beginning in 1994.

As part of that first year's training, infection control nurse-specialist Kathleen Jakob stood before a standing room only audience of more than 250 physicians, nurses, and medical students at the prestigious Columbia College of Surgeons and Physicians in Manhattan. White-coated senior physicians sat alongside blue-jeaned janitors and ward clerks sporting layers of costume jewelry. The social classes of the hospital were compelled, if only for the sake of

meeting state regulations, to commingle. For nearly four hours, feisty, petite Jakob hammered home the statistics and science of infection control, making it clear that the practices of a millionaire surgeon were just as likely to cause the emergence and spread of drug-resistant mutants as the behavior of a janitor.

Jakob warned the health providers that lapses in infection control usually were the unintended results of becoming overly habituated to the hospital environment. “People outside the medical profession have a very hard time discussing rectal abscesses over dinner,” Jakob said, drawing guffaws from the medical students. “We don’t. We don’t see our environment the way visitors do. We get so used to it that we don’t see risks, the chaos, the filth.”

But when it came to controlling the spread of tough bacteria inside hospitals, the time-honored Semmelweis Technique for scrubbing hands before touching patients — an insight that had revolutionized medicine more than a century earlier — had more than met its match. Now microbes such as *Staphylococcus* were capable when dormant of living on tabletops, curtains, clothing, even in vats of disinfectant. Despite strict scrubbing, careful health workers could pick up such organisms when their uniforms brushed against a patient’s wound or sheets, and then carry the bug to the next patient’s bedside.

Of the more than 14,000 germicides registered in 1994 with the U.S. Environmental Protection Agency, few could kill such bacteria in their dormant states, and some required hours of soaking to guarantee disinfection. Indeed, some bacteria had acquired additional super-capabilities to resist disinfectants and soaps. They could, for example, shunt all chlorine-containing compounds out of their membranes, rendering all bleaches utterly useless.

The only cleansers guaranteed to kill dormant bacteria were quaternary ammonias and formaldehydes, Jakob told her Columbia audience. And those compounds were associated with cancer and birth defects, so the Environmental Protection Agency discouraged their use on neonatal and pediatric wards.²⁰

An alternative to cleansing was cooking the germs in autoclaves, flash sterilizers, gas chambers, and steamers. But there, too, hospitals were encountering problems because of the tenacity of the bacteria, the sloppiness of personnel, and new medical equipment that was extremely difficult to clean. Additionally, some bacteria mutated to tolerate high temperatures, forcing either longer or hotter sterilizations.

The only way hospitals could track lapses in infection control was to monitor the organisms found in their sicker patients and run laboratory analyses to determine which — if any — antibiotic could still kill those microbes. If highly resistant bacteria were uncovered, tests were done on patients bedded nearby. If they were infected with the same bacteria, a stern-faced Jakob told her anxious audience, “It’s a sure sign that a break in infection control took place somewhere on the ward.”

At that point, every piece of equipment on the ward, every millimeter of surface area, each television set, chair, bed — *everything* — had to be scrubbed thoroughly with effective disinfectants. Patients had to be placed under quarantines (ranging from total, air-lock isolations to merely being asked to remain in their rooms, away from other patients), all ward personnel had to be tested to determine whether any of them carried the mutant bacteria in their bloodstreams, and all staff operational procedures needed to be scrutinized to determine where lapses might

have occurred.

Sometimes the microbes — particularly MRSA — proved so tenacious and resistant to disinfection that hospitals had no choice but to shut down the ward, strip it of all organic matter (rubber, cotton, wool, silicone, plastics), repaint all walls, retile all bathrooms, and apply new linoleum to all floors.

Only after that mammoth task was completed, and all equipment had been replaced, could the once-contaminated wards be reopened.

Such procedures were horribly costly and almost always led to patient lawsuits against hospitals. And all too often the carrier of resistant microbes turned out to be a nurse or doctor who unknowingly harbored the germs in his or her blood; harmless to the healthcare worker, but lethal to the susceptible patient. So it was in the hospitals' and health providers' interests, whether they recognized it or not, to take tedious steps to avoid such extreme contamination.

It sounded straight forward enough, but even at an elite institution like Columbia Presbyterian — one of America's best hospitals — preventing spread of VRE and other drug resistant organisms was all but impossible.

For example, for Lulu Lanciola, a nurse on Columbia-Presbyterian's dialysis ward, that big job meant going through fifty pair of latex gloves on every four-hour shift. Dressed like an Ebola ward doctor in a full-length hospital gown, a clear plastic apron, thick latex gloves, a mask over her nose and mouth, a large plastic eye protector, and disposable booties, Lanciola gingerly leaned over an elderly diabetic man who had contracted vancomycin-resistant enterococcus during his long hospital stay.

Lanciola's other patient — kept eight feet away — had multidrug-resistant pneumococcus. To ensure that she didn't unwittingly carry a mutant bacterium from one patient to the other, Lanciola swiftly completed a blood test on the VRE patient, gave him a gentle pat, then raced over to the biohazard disposal bin, stripped off her gloves, donned a new pair, and went to check on her other patient. She repeated this routine at least fifteen times during the four-hour shift, as did her counterparts in hospitals all over America. Despite infection control efforts that rivaled those implemented by international experts in Kikwit during the Ebola virus epidemic, however, American dialysis patients in the late 1990s commonly carried VRE, MRSA and a host of other deadly, drug-resistant germs. .

In a different wing of the Columbia hospital, nurse Janise Schwadron was handling post surgical intensive care patients. When word came that the patient in "Contact Isolation" had to be taken downstairs for a CT scan, Schwadron sighed, "What a pain."

In addition to recuperating from lung transplant surgery, the patient was infected with a mutant strain of enterococcal bacteria resistant to *every* antibiotic used for its treatment. To protect the rest of the hospital's patients moving the patient to radiology was quite a job. Everything that touched the patient had to be disinfected before and after making the move. Schwadron, a sixteen-year veteran nurse, made a mental list of what would have to go with the patient: oxygen tank, monitor, portable respirator, a box of emergency response equipment, the patient's gurney, sheets, pillow, bedpan...

She ordered up three helpers. Then — dressed in head-to-toe protective gowns, latex gloves, and gauze masks — they began scouring every inch of each piece of equipment before

changing the patient's bedding. Hours later, after the CT scan room had also been disinfected and the transplant patient was back, Schwadron relaxed. A simple diagnostic test that usually involved just two employees and an hours time had taken up more than six hours time for five employees, as well as a heap of expensive protective gear.

About two million of the forty million people who were hospitalized in 1994 in the United States became infected with bacteria, whether from other patients or from contaminated workers or equipment.²¹ Up to 1.2 million of those infections involved antibiotic-resistant bacteria, which killed some 70,000 of those patients. And, for those who survived, treatment costs were astonishing: some \$4.5 billion was spent in 1993 just to cure cases of antibiotic-resistant hospital infection.

“The presence of [antibiotic-resistant] infections may well tip the balance on a patient in ICU,” said Dr. Neal Steigbigel, infectious diseases chief at the Bronx Montefiore Medical Center. “That’s why infection control has become a very important program in all modern hospitals. It’s become very sophisticated, but there need to be more people trained in the area.”

When a wave of multiple-drug-resistant tuberculosis had surged through New York City hospitals in 1990-92, it left a wake of fear among nurses and physicians — fear that was underscored by the death of health professionals who contracted the disease from patients. So when news of VRE surfaced in hospitals, staff sometimes panicked. It was, after all, a potentially untreatable infection. Schwadron, for example, often oversaw drug-resistant TB patients and vancomycin-resistant enterococcus patients simultaneously. “I don’t mind the TB patient,” she said. “Respiratory isolation is pretty easy to deal with. You just slop on a pair of

gloves and pull on your masks.” But a patient with vancomycin-resistant enterococcus was something different. “Even if you take out your pen to write on his chart,...if you take the pen with you into the next patient’s room, you might spread the bacteria,” she said.

Schwadron was also responsible for watching others who entered the transplant patient’s room, from family members to attending physicians — reminding them to follow proper precautions and, if they failed to do so, ordering them off the ward. Additionally, of course, she carried an obligation to respond to emergencies. That, she said, was the hardest part of the job: “You gotta put a gown on and gloves,” she explained. “That extra minute or so could make the difference whether the patient lives or dies. It’s a big responsibility. Big responsibility.”

And some of the patients themselves seemed to do everything they could to make matters worse.

Nurse Charlene Dionio had barely caught her breath after the patients’ lunch hour when she spied a middle-aged woman patient strolling down the hall clad in an odd mix of street-tough clothing and hospital pajamas. “There she goes,” Dionio said with exasperation. “What am I supposed to do? Look! Look, she’s going into that patient’s room.”

Normally, patients who insisted on walking the halls and popping their heads into other patient’s rooms were nothing more than a nuisance. But The Wanderer, as the nurses at Columbia-Presbyterian referred to this woman, was infected with VRE. If, in her travels, The Wanderer were to meet with another patient infected with a mutant version of either staph or pneumococcus, they could easily infect each other, their bugs could share genes, and both patients could end up carrying completely drug-resistant staph or pneumococcus infections.

In the late nineteenth century day of public health pioneer Hermann Biggs, recalcitrant, belligerent patients like The Wanderer would have been restrained, placed in quarantine or locked up for the good of the community. But in 1994 such actions weren't legal. The only power nurses had over The Wanderer was the power of persuasion — and the patient wasn't heeding their pleas. Indeed, she had slapped a nurse who tried to push her away from nibbling food off another patient's tray.

Public health had lost so much power and authority by the 1990s that Commissioner Hamburg's options did not include the three steps that offered the greatest likelihood of slowing the spread of deadly drug-resistant bacteria. All evidence indicated that physician over-prescription of antibiotics was driving drug resistance, but years of successful American Medical Association lobbying had stripped public health authorities of all powers to affect doctors' prescription practices. Ideally, Hamburg would like to have put vancomycin in some special legal category, requiring doctors to seek the Department of Health's permission before using the precious drug. That might preserve its utility a few years longer, but she and her colleagues nationwide were powerless to implement such a stopgap measure.

The second option was to order both forced confinement of patients who carried highly drug-resistant strains of bacteria and mandatory testing of medical personnel on a routine basis to ensure that they weren't unknowingly infected with such bugs. But there, too, Hamburg's legal powers were minimal. Indeed, inside hospitals all over America there were modern "Typhoid Mary" doctors who flatly refused to undergo tests to see if they were carriers of drug-resistant bacteria.

One New York City burn ward — the largest burn treatment center east of the Rockies — had an outbreak of MRSA, which was extremely dangerous for burn patients because so much of their bodies were exposed, unprotected by skin. Every single person who worked on the ward, save its chief physician, was tested. All came up negative as MRSA carriers. The physician refused to be tested. When that physician transferred to another hospital, that hospital, too, experienced a MRSA outbreak. But Hamburg's department could do nothing legally to compel the physician to undergo testing or treatment to cleanse the lethal bugs from his body.

When the legal authorities of public health were stripped during the mid-twentieth century, nobody anticipated that hospitals would become centers not only for disease treatment but also of disease creation. VRE first appeared in the United States in 1988 when it was reported in three New York City hospitals. But a survey of twenty-four hospitals in New York City, neighboring Long Island, and Westchester County found it had surfaced in every single one by the beginning of 1994. The survey of New York City hospitals found that between January 1989 and October 1991 there were one hundred VRE patients, forty-two of whom died. Usually they died of the conditions for which they were originally hospitalized — heart attacks, cancer, diabetes, etc. But in nineteen cases, or more than a third of the deaths, the mutant enterococci killed them directly.

Nationally, cases of VRE increased twenty-fold between 1989 and 1993, and about 7.9 percent of all 1994 enterococcal infections involved the mutant bacteria, according to the Centers for Disease Control and Prevention. That was up from less than 1 percent just four years previously.

Hospital-by-hospital, it was extremely difficult to obtain information on VRE rates — nobody wanted their institution labeled a center of drug-resistant bacteria, and public health authorities were powerless to order hospitals to be candid about their nosocomial infection rates. So Hamburg had to cut deals with the hospitals, promising to keep secret the details of their VRE rates in exchange for gaining access to their laboratory records. Publically, she said, the department could never reveal, “‘Hospital X has this much VRE.’ We will say, ‘Overall, there’s this much in hospitals in the city.’ That’s the only way we can do it.”

All but three hospitals in the New York metropolitan area declined to provide an inquiring reporter with their VRE details. The subject was publically taboo. The three hospitals that were forthcoming all reported steadily climbing VRE rates.²²

“Hospitals do feel an enormous pressure, in terms of their attractiveness, to underplay such problems,” Hamburg said. “It’s foolish, though. Wishing or hiding won’t make the problem go away.”

One institution that was very open about its VRE situation was Cabrini Hospital, a private facility in Manhattan that in 1993 published a detailed rundown of VRE cases detected on its wards between 1990 and 1992. Over a thirty-six-month period, Cabrini treated 2,812 enterococcus cases, 213 of which were vancomycin-resistant. More important was the trend over time. In 1990, 85 percent of all enterococcal infections were fully vulnerable to vancomycin. By the end of 1992 only 25.8 percent of all enterococcal infections treated in the hospital remained fully susceptible to the drug.

“We have been living in an era when if you got sick, there was always a pill to take,” said

Rockefeller University's Tomasz in later 1995. "We are approaching an era when that will no longer be true. The pharmaceutical industry has almost stopped trying to make new antibiotics. The rules of the game used to be if you saw resistance, you used more antibiotics. But now there are bacteria out there that are armed to the teeth."

Dr. William Greene, an infectious-diseases specialist at University Medical Center at Stony Brook, remembered a time in the 1950s when the very first penicillin-resistant strains of staphylococcus appeared. "There was no alternative then, no other drug. And the FDA urgently requested that [drug company] Eli Lilly bring vancomycin forward onto the market, even though they hadn't yet developed the product into a pure form," Greene recalled in 1995. "The vancomycin was so impure that it was greyish, and lots of people suffered toxicities. But they had to rush it to the market because there were untreatable staph outbreaks occurring in nurseries, on surgical floors, in burn units, all over."

"Every bacterial species you can name has increased its level of drug resistance over the last twenty years....It is probably the Number One public health issue in the United States," the CDC's expert Dr. William Jarvis declared in 1995. And, he insisted, if VRE ever shared its resistance genes with staph or strep. "it would be a catastrophe."

At Columbia-Presbyterian Jakob was called in to help control the VRE-spreading patient. Struggling with the dilemma posed by The Wanderer's hallway strolls, Jakob was realistic in her view of the problem. She reiterated the list of infection-control procedures that nurse Dionio and her colleagues should follow when handling The Wanderer, then sadly walked off the ward. She shook her head once out of earshot of her colleagues, acknowledging that she hadn't been able to

solve The Wanderer issue. She sighed and said that, regrettably, each day the specter of incurable, completely drug-resistant diseases loomed closer.

“When MRSA first appeared people were really quite concerned,” she said. “But then it got to the point where half the staph cases were MRSA, so people come to say, ‘Well, this is a fact of life. We have MRSA.’ And others said, ‘Let’s keep it to a dull roar, do whatever we can to limit the damage.’ Here at Columbia we’re operating on the ‘dull roar’ principle, but plenty of other institutions have given up on even trying to limit spread of MRSA because it’s so hard to do.”

By 1997 the trend regarding MRSA and VRE was clear in New York City and nationwide, Dr. Louis Rice of Emory University said.²³ “If we want to control resistance in the community, we have to control it in the hospital first, because that’s where it starts.”

And the larger the hospital, the more deadly MRSA and VRE lurked on its wards, Rice continued. In 1997 hospitals with fewer than two hundred beds had MRSA in 16 percent of their staph-infected patients, but hospitals with more than two hundred beds had a 27 percent incidence of MRSA. The implication was that infections spread more readily in the chaotic atmosphere of large, generally public hospitals.

Once these organisms surfaced in a hospital, “infection control is not going to be the answer,” Rice insisted. “I’m not all that optimistic that we’re going to be able to control this.”

When resistant organisms surfaced on a ward, drastic clean-up and escalated infection control could slow their spread, Rice said, but hospitals also needed to take radical steps to change their prescription practices; for example, completely stopping vancomycin use when VRE

emerged. Still, he acknowledged with a shrug, even that didn't always work. One hospital reacted to its first MRSA outbreak by ordering a full stop to use of methicillin, telling doctors to instead use mupirocin on their staph patients. In a year, staph infections in that hospital went from involving 2 percent to 64 percent mupirocin-resistant organisms.

New York-Cornell Medical Center had a similar experience with drug resistant *Klebsiella* infections: switching all antibiotics simply led to emergence of multidrug-resistant *Klebsiella*.

On the other hand, changing drug use practices had, indeed, lowered bacterial disease rates in some other settings, Rice said, indicating that when it came to controlling mutant bugs in hospital ecologies, "one size definitely doesn't fit all."

At Queens Hospital in New York City Dr. James Rahal had discovered that the nature of the mechanism a resistant bug used to get around antibiotics was a key determinant of how tenacious that bug could be: were plasmid transposons the key to its resistance or was it actual mutations of the bacteria's DNA? The latter, Rahel argued, were the toughest to eradicate once they emerged.²⁴ After all, plasmids could pop out of microbes as readily as they popped in, making resistance a transient event. But if a germ mutated, if its chromosomes were altered, resistance was permanent not only in that individual microbe but in all its progeny for generations to come.

For example, Rahal said, the percentage of *Klebsiella* infections in his hospital that were resistant to ceftazidime went from 6 percent in 1988 to 37 percent in 1995. Those were transposon forms of resistance and were moderately controllable through drug-switching and standard infection control measures. But in 1995 a new strain of chromosomally resistant

Klebsiella emerged in the hospital — a form that had mutations in its primary DNA — and by Christmas of that year every single *Klebsiella* bacterium they found in the hospital was fully resistant not just to ceftazidime, but to the entire cephalosporin class of antibiotics.

At that point, the hospital ordered a full stop on the use of cephalosporins to treat *Klebsiella* infections. And then a strange thing started happening: resistance emerged in an entirely different microbe population. The hospital decreased its total cephalosporin use, for all purposes, by more than 80 percent during 1996, and increased use of the expensive alternative drug imipenem by 59 percent. That cut *Klebsiella* drug resistance down by nearly half. But it prompted emergence of imipenem-resistant *Pseudomonas aeruginosa*, a pneumonia-causing organism.

“So the problem just shifted from one microbe population to another,” Rahal sadly concluded.

With clean-up so tough, and new superbugs emerging in the best hospitals in America, “I suppose that we’re back in the pre-antibiotic era now,” said Dr. Matthew Scharff of Albert Einstein Medical School in the Bronx. Speaking before a 1993 gathering of the Irvington Trust, an investment banking group that funded medical research, Scharff said patients who underwent cancer chemotherapy, transplant surgery, radiation or who had AIDS commonly died of what, for other people, were fairly benign fungal or bacterial infections, even though they received high intravenous doses of antibiotics. *Staphylococcus*, *Meningococcus*, *Pneumococcus*, *Cryptosporidium* — all those germs could devastate such people.

“In the absence of our own immunity even antibiotics cannot kill these agents,” Scharff

said, adding that even otherwise healthy individuals were at increasing risk for some diseases because the bugs had acquired drug resistance.

The evidence was clear on the cancer and AIDS wards of large hospitals in the greater New York area, Scharff insisted. Some 10 percent of all people with AIDS died from cryptococcus — a ubiquitous fungus found in bird droppings. Once it got into their brains, the microbe caused meningitis. Similarly, a variety of bacterial infections were essentially incurable in cancer lymphoma patients: former First Lady Jacqueline Kennedy Onassis died in New York as a result of such an infection.

Scharff thought that doctors in public health pioneer Hermann Biggs's day, before invention of antibiotics, had had at least a partial solution to the problem: antisera. In the early twentieth century physicians injected samples of the bacteria that were infecting their patients — say, pneumococci, which caused pneumonia — into a horse. The horse made antibodies against the pneumococci. The doctors withdrew blood from the horse, separated out and purified the antibodies, and injected the resulting antiserum into their dying patients.

“About 30 percent of the time it worked,” Scharff said. “It was highly statistically significant. It was a successful treatment.” But it was also often toxic because humans developed acute allergic reactions to horse proteins that were residual in the antisera.

At the close of the twentieth century, however, technology existed that would allow scientists to make pure human antisera in mice or in test tubes. So-called monoclonal antibodies were in use for other medical purposes, and Scharff's group had already made anticryptococcal monoclonal antibodies and proven that they worked in immunodeficient mice.

Scharff and his colleague at Einstein, history buff Dr. Arturo Casadevall, dug up unpublished results of an experiment conducted on three severely immunodeficient patients treated during the 1960s at Albany Medical Center in New York. The patients suffered from cryptococcus and were treated with injections of antisera made in rabbits. Blood tests showed that the amounts of cryptococcus in the patients' bloodstreams plummeted, and the patients made additional antibodies of their own against the fungus. Unfortunately, those researchers ran out of antisera, treatments stopped, and after just a couple of weeks the life-threatening fungal infections overtook the patients.

Nevertheless, Scharff argued, "I think we should look back at this. We have to. We have nothing else."²⁵

Few New York physicians were willing to accept Scharff's dire view of the situation. Bad as antibiotic resistance problems were, something usually, eventually, worked — most of the time. Or so they argued in the late 1990s.

Not so, said the New York State Senate's Committee on Investigations in early 1999.²⁶ That committee issued a report concluding that hospital-spread infections in New York City, alone, in 1995 had caused 1,020 deaths and \$230 million worth of extra patient hospitalization and treatments. Chaired by Senator Roy Goodman, a Manhattan Republican, the committee drew its conclusions from evidence presented by Nobel laureate Dr. Joshua Lederberg and Tomasz, both of Rockefeller University, Dr. Willa Appel of the New York City Partnership, and rheumatologist Sheldon Blau of the State University of New York Medical Center in Stony Brook.

Based on testimony and studies presented to the Senate committee, its report charged that between 1975 and 1995 the number of days patients were hospitalized nationwide rose 36 percent due to nosocomial infections. In 1995, the report continued, 1.7 million people in the United States acquired infections in the hospital that proved fatal to 88,000 of them and added \$4.5 billion to the nation's health costs.

Further, the report charged, cost-containment measures under managed care were severely exacerbating the problem because nursing staffs were over-worked and so tired that they made mistakes; and more hospitals were cutting costs by replacing skilled nurses with poorly-trained nurses' aides. Within the New York City Health and Hospitals Corporation, for example, nursing staff was cut by 21 percent from 1994 to 1999.

Worse, 70 percent of all such hospital-acquired infections involved drug-resistant organisms, the Senate report charged. In Metropolitan New York City, alone, 7,800 patients acquired drug-resistant staph infections during hospital stays in 1995: 1,400 of them died as a result. More than 20 percent of all New York City staph infections were of MRSA strains.

And about half of all hospital-acquired infections could be eliminated by simply imposing stricter hygiene regulation inside hospitals and reducing the rate at which doctors prescribed antibiotics.

"Some five years ago I entered a good, prestigious hospital," Blau said, "for a routine angioplasty....I developed a hospital-acquired, drug-resistant staph infection, and I was so close to dying that last rites were said." Blau charged that his infection resulted from spread of staph

within the hospital by doctors and nurses who failed to wash their hands and instruments between patients. And, he said, ominously, “the next time you’re in the hospital visiting a relative, you see how often the doctor washes his hands.”

“This is a shocking thing,” Goodman said. “It’s almost unbelievable that something as basic as washing of hands is being ignored by doctors.” Incredible as it might seem American doctors were, apparently, almost as likely to shun essential infection control procedures as were their counterparts in Siberia.

In 1998 the New York City Partnership, an organization representing more than 700 local businesses, initiated a bold program to monitor drug resistance in Gotham. Six hospital chains within the city gave their patients’ microbe samples to the Public Health Research Institute for sophisticated DNA analysis. The intent was to track the area’s microbial resistance patterns and look for correlations with local physicians’ prescription practices.

But Blau insisted that the real problem was the basics: washing hands, clean stethoscopes, hygienically sterilized instruments. “The simpler the solution, the better,” Blau said. In the absence of radical improvement in health care workers’ hygienic practices, Blau insisted, “I think that it’s apparent you’re going to see more and more superbugs.”

The Senate report scolded New York hospitals: “Health-care workers seek to heal us and, first and foremost, must do no harm. Yet their failure to consistently follow even the simplest hygienic practices is a major reason for the contraction of bacterial infections in hospitals. Good long-term financial incentives exist for hospitals to insist on strict infection control procedures; yet short-term financial considerations have militated against the consistent use of such

procedures.”²⁷

For Lederberg the very fact that humanity was in this accelerating race against rapidly-evolving microbes left a bitter taste in his mouth. Four decades earlier he had won a Nobel Prize for demonstrating how bacteria evolve, eluding antibiotics. In the 1950s he warned the scientific and medical communities that unless carefully used antibiotics would become less useful with time simply because the microbes were master mutators. By the close of the 1990s evidence supporting his prognostications was abundant, but public health actions aimed at preventing the otherwise inevitable end of the antibiotic era were nearly nonexistent. A dignified man, Lederberg rarely expressed public anger. But he was, nevertheless, enraged. He felt that the solutions were many and attainable, but lack of social, political, and economic will was blocking every rational path towards restoration of hospital safety and drug efficacy against resistant bacterial populations.

“We’re running out of bullets for dealing with a number of these infections,” Lederberg pronounced soberly, slowly shaking his white-bearded head. “It looked as though it was going to be a successful conquest, and by the middle of this century we thought we had beaten the demons. This was unfortunately a prematurely declared victory....We’re not alone at the top of the food chain....Event after event is coming along to remind us that we really have been turning our backs.

“Are we better off today than we were a century ago? In most respects, we’re worse off.”

Citing declining government support for public health, increasing globalization of humanity and its microbial hitchhikers, and the rise of managed care in America, Lederberg held

out little hope for the future.

“The world really is just one village. And our tolerance of disease in any place in the world is at our own peril,” he insisted. “Patients are dying because we no longer have antibiotics that work. And there’s no way we’re going to eradicate all of these organisms. We have to learn to live with them, as moving targets.”

It was possible to develop new antibacterial drugs, Lederberg insisted, if the pharmaceutical industry were so motivated. And it was possible to control the spread of resistant bacteria, if public health authorities were sufficiently funded and empowered to do so.

“But to say public health is going to be left out in the cold by Washington is an understatement,” the visibly angry Lederberg continued. “It’s already out in the cold. Public health — that system is very close to being in a shambles at this time.”

It took centuries to build that public health system, and less than two decades to bring it down. Once the envy of the world America’s public health infrastructure was, at the end of the twentieth century, in a shambles.

Given its history this was, indeed, a sad state of affairs.

I.

*“Hot, dry winds forever blowing,
Dead men to the grave-yards going:
Constant hearses,
Funeral verses;
Oh! what plagues — there is no knowing!”
— Philip Freneau, written during the great yellow fever epidemic,*

Philadelphia, 1793

Children born in London in 1600 could expect to live an average of twenty-five to twenty-seven years. If they survived their first ten years of life — and fewer than a third did — the youngsters had a reasonable shot at living to the ripe old age of forty.

If, fifty years later, descendants of those London children were fortunate enough to be born in the American colonial cities of New Amsterdam or Boston, their odds of living long enough to know their own grandchildren would be significantly better than the odds for their peers in the fetid cities of Europe: London, Berlin, Paris, Rome, and the like.²⁸

At its founding in 1625, New Amsterdam was a tidy, small settlement of fewer than 1,000 people, most of them emigrants from Holland. Located at the southwesterly tip of a long island, the town faced a natural harbor that promised to become one of America's major shipping ports. To the town's far north lay the British village of Boston, settled primarily by Protestant fundamentalists from London. And to New Amsterdam's south were the British colony of Virginia and France's gulf port, New Orleans.

The Virginians were the first to enact a public health law, in 1629, requiring the recording of such vital statistics as the birth, marriages, and causes of death of the colony's residents. Over subsequent years each of the colonial outposts similarly began mandating such record-keeping.

In 1634 Boston passed the first of what would be a long list of colonial laws aimed at reducing pestilence by controlling the very sorts of urban filth that then filled the redolent, rat-

infested streets of Europe. The Boston law banned the dumping of garbage at the town's common harbor landing site. In short order the towns and cities of colonial America would enact laws forbidding construction of shallow privies (or latrines), dumping of garbage and human waste into drinking water supplies, leaving dead animals and their slaughterhouse remains on common streets and herding livestock through main thoroughfares, and also mandating horse manure clean-up. By and large, as the colonial populations grew, enforcement of these sanitation and hygiene laws would prove lax, even nonexistent. With time and immigration the swelling cities became so unkempt, verminous, and smelly that they literally bred the agents of disease as well as assaulted the human senses. In the hot summer weeks the stench would bring stinging tears to the eyes. And from the swamps would come waves of pestilence-carrying mosquitoes.

Bad as the colonial towns were, however, their odor and filth couldn't begin to compare with that which was commonplace in European cities of the day. For the cities of America, the worst was still two centuries in the future.

During the period of Dutch rule (1625-1664) New Amsterdam authorities managed reasonably well. The town, inhabited as late as 1660 by fewer than 4,000 people,²⁹ was made up of a fairly disobedient lot. Orders on behalf of the common health were, however, generally followed.³⁰ But in the seventeenth century even the most sage of colonial leaders had little understanding of the relationship between the environment and health. If cleanliness was next to godliness in their eyes it had more to do with aesthetics than with hygiene. The placement of towns, and their subsequent patterns of sprawl and urban development, had little to do with the public's health and everything to do with happenstance, economics, trade, and access to water.

When New Amsterdam yielded peacefully to British rule in 1664 and its name changed to New York, most of its populace lived near one of several swamps or marshy spans of landfill: Rutgers Swamp, Stuyvesant's Meadows, Beekman Swamp, the Collect between Broad Way and Catherine streets, Lispenard's Swamp. These watery expanses bounded the city with greater intimacy and social impact than the Hudson and East Rivers. Into the wetlands New Yorkers dumped their dead animals, personal wastes, and assorted garbage. Visitors found New York a town of decent brick houses connected by "streets [that] are Nasty and unregarded, ye which they excuse at this time, saying the Multitudes of buildings now going forth are ye Occasion."³¹

And every summer mosquitoes would swarm off the swamp lands spreading diseases, most of which were never named or understood during the seventeenth century. The feeding insects, jumping feverishly from human to horse to hog, spread viruses and parasites among the people and their livestock so readily that the month of June, and the heat it would bring, triggered annual concern among New York's leaders. The diseases of summer were numerous, and their symptoms as disparate as mild fevers and headaches, internal bleeding, convulsions, deafness, delirium, hallucinations, and death.

Explanations for these summer fevers, and the subsequent winter chills, were elusive. No one understood the relationship between mosquitoes, rats or other vectors and the diseases that plagued their lives. In the tradition of ancient Greece's medical master Hippocrates, the putrid environs of colonial towns and cities were thought to form a miasma which in and of itself caused illness and death. By the late seventeenth century the concept of miasma — literally "bad air" — was refined to include a sense that various types of infested air posed different disease

threats: putrid, swampy, moist, foul airs each bore peculiar threats. To the colonialists, many of whom voyaged to America in search of the freedom to practice their particular religion, the whims of God or the Devil were also able to affect these miasmatic airs: the actions that sparked the Salem witch trials of 1692 in Massachusetts, for example, were blamed on Satan but may actually have been ignited by a wave of mosquito-borne viral encephalitis.³² And when a slave ship arrived in New York in 1689 bearing not only chained Africans but also the smallpox virus, local physicians declared the resultant epidemic “as a particular hand of God....”³³

But limited as they were in their understanding of the origins of disease and contagion, the colonial leaders did comprehend that poorly prepared foods and unclean, fouled waters were unsafe for human consumption. New York’s toughest laws were enforced upon bakers, slaughter-houses, well-diggers, and marketers, who were warned that “Noe unwholesome or Stale Victuall Shall be Sold in the Markett undr the Payne of Forty Shilling. Noe Blowne meat nor Leprous Swine Shall be Sold in the Markett under the Paine of forfeiting the Same and forty Shilling.”³⁴

Colonial leaders also recognized, despite their lack of any theory of contagion, that great epidemics followed the arrival of ships with ailing crews and passengers. While the great Plague ravaged London in 1665, the port cities of the Americas held British ships offshore in strict quarantine. This set a striking precedent: thereafter each colony instituted increasingly strict quarantine regulations, detaining ships and even incarcerating their crews on islands offshore for periods of time deemed safe, for the sake of the public’s health.

Despite such early public health efforts, the colonial cities were visited periodically by

epidemics of such magnitude as to seem terrifying in retrospect. For example, smallpox hit New York in wave after wave of deadly assaults beginning in 1679. A viral disease spread from person to person via casual contact, smallpox was lethal in 20 to 30 percent of all cases and left survivors with characteristic pox scars. Given the extraordinary frequency with which smallpox attacked New York between 1679 and 1776, the surviving population must have been a sorry-looking lot, their faces scarred and distorted by near-death brushes with the disease. Women of the landed classes often hid their pox scars beneath layers of stifling white grease paint and powders.

Though New York's leaders took a variety of measures over the decades to control smallpox, they never understood the two key factors responsible for its spread: slavery and human contact. The virus undoubtedly entered colonial cities via a variety of social routes, but slave ships filled with dying Africans or black men and women from the Caribbean islands were its chief modes of global transport. By 1700 the slave trade was so vigorous in New York that Africans constituted 15 percent of the population and auctions of human beings were a visible daily occurrence. When slave ships off-loaded their human cargo for auction, the virus readily spread in the most densely crowded parts of the city, particularly around the market places.

The fury of smallpox could be awesome. In 1731, for example, one out of every three New York residents suffered from the disease and 8 percent of the population perished in just three months time.

Smallpox did, however, provide something of a mixed blessing for the colonialists; for while Europeans and Africans could often mount effective immunity against the disease the

Native American population could not. By the time the British took over New York in 1664, more than 90 percent of the local indigenous population had perished from the pox, and the survivors offered no resistance to European expansion up Manhattan Island and across the harbor to Brooklyn, Long Island, and Staten Island. Smallpox similarly obliterated American Indian tribes in Massachusetts, prompting Pilgrim leaders to declare that “the good hand of God favoured our beginnings...in sweeping away the great multitudes of the Natives by the Small Pox.”³⁵ In Epidemics and History Sheldon Watts offers this vignette concerning a 1637 smallpox epidemic in Connecticut: British troops raided a Pequot village that was in the throes of smallpox. Unable to put up any resistance, the Pequots were systematically butchered by the British. One of the conquerors wrote of the incident: “It was a fearful sight to see them thus frying the fire and the streams of blood quenching the same, and the horrible stink and scent thereof; but the victory seemed a sweet sacrifice [to almighty God].”³⁶

Many African slaves were immune to smallpox because in some parts of Africa people had long practiced inoculation on their children. In the procedure, scabs produced by people in the throes of the disease were scraped with a sharp instrument which was then scratched on the skin of a child, causing — in most cases — a minor immunizing illness. Though far from being an ideal vaccine, and occasionally lethal, the procedure did effectively immunize for life most children who were so treated.

Rev. Cotton Mather of Boston learned of this practice (either from one of his slaves in 1706 or from medical dispatches from Istanbul) and encouraged vaccination throughout white Massachusetts. His efforts met with mixed results,³⁷ as did subsequent smallpox vaccine

campaigns in Europe. Though Mather showed the efficacy of the technique in Boston in 1718, one out of every twenty to one hundred of those vaccinated died. Doctors in both the Americas and Europe often opposed to the immunizing strategy, both because it could prove lethal in some cases and because any coherent explanation for why it worked was lacking at the time.

In 1776 General George Washington ordered that all of the Revolutionary Army troops undergo the vaccination procedure, marking the first military public health campaign in North America. As a result, British troops suffered wave after wave of the disease, which had little or no effect upon the Revolutionaries. And in recognition of that marked difference, physicians in the new United States began to more vigorously support vaccination. Vaccine popularity would improve markedly after 1798 when England's Edward Jenner would announce discovery of a far safer, effective smallpox vaccine made from cowpox, a bovine form of the virus.³⁸

In addition to smallpox, New Yorkers and other colonialists suffered and died in enormous numbers from measles, scarlet fever, typhoid fever, malaria, and a host of other diseases, nearly all of them infectious. Life expectancy in colonial New York and other American towns followed a pattern similar to what would be seen two hundred years later in post-colonial developing countries. Most disease and death occurred in the first five years of life, with about half of all recorded deaths among New Yorkers striking infants and toddlers. The second largest number of deaths struck children aged six to twelve years, typically caused, again, by infectious diseases.

If a child survived to the age of thirteen, his or her odds were reasonably good, in the absence of extraordinary epidemics, of surviving well past the age of forty. The incredibly high

infant and child mortality skewed life expectancy averages downward, indicating that few New Yorkers survived to see their fortieth birthday. But in truth, many grandparents, even great grandparents, thrived in colonial New York, and if one survived the first two decades of life it was not unheard of to reach ages well over sixty-five years. A key exception was women of childbearing age: maternal mortality was perhaps as great as one death in every five deliveries.

Despite the ravages of smallpox, the disease that sparked the greatest fear, claimed enormous numbers of lives, and ignited public health policies for decades to come was yellow fever. Little was understood about yellow fever, and where there is ignorance, there is terror. Further, unlike most of the microbes that attacked the colonialists, yellow fever killed adults and people of all social classes.

It would begin with a headache and fever that hit suddenly, as if the head had been hammered. For a fortunate few this state of dull, feverish pain would persist for a few days, then wane to wellness. But more commonly it merely marked stage one of a rapidly escalating, horrible illness. The headache pain would swiftly sweep down the spinal cord, causing agonizing muscle contractions. The patients would double over in excruciation, nauseated and vomiting dark, often bloody, fluid. Soon their fever would rise and the patients lay in bed for days on end, delirious, sweating profusely, occasionally overcome by shaking fits of chills. The yellow fever virus would then be attacking their livers, causing the patients to turn yellow and hemorrhage blood.

In Philadelphia, Dr. Benjamin Rush, who would become one of the signers of the Declaration of Independence, saw more than his fair share of yellow fever deaths. He described

the symptoms as “violent,” listing yellow tinges around the eyes, nausea, black-colored vomit, hiccoughs, and “a deep and distressed sighing, comatose delirium.” In some cases, blood-colored splotches would appear on the skin which, Rush noted, “resembled moscheto bites....They appeared chiefly on the arms, but they sometimes extended to the breast. Like the yellow color of the skin, they appeared and disappeared two or three times in the course of the disease, [in most cases being] a harbinger of death.”³⁹

Depending on the strain of virus and the level of immunity in the local population as a consequence of prior yellow fever epidemics, death would claim anywhere from 5 percent to half of everyone infected.

Unbeknownst to the Americans of the seventeenth and eighteenth centuries, the yellow fever virus was passed from one person to another by *Aedes aegypti* mosquitoes. As the insects, which thrived in the marshes and swamps of the East Coast, fed on infected people, they drew viruses into their salivary glands. Flying about in search of another blood meal, they might next bite, say, the patient’s care giver and inject the yellow fever virus.

The early Americans had no idea, of course, that the disease was caused by a mosquito-carried virus; but they did recognize that yellow fever seemed to be a new disease that could claim whole families at a time and was not seen back home in England or northern Europe. It arose during the hot summer months, especially following heavy rains, and epidemics didn’t wane until the first frost.

Yellow fever wasn’t actually a new disease, it just seemed so to the white colonialists and American Indians. Both the virus and its *Aedes aegypti* carrier were native to West Africa, and,

like smallpox, they made their way to the Americas via slave ships.⁴⁰ Until slavery was outlawed in America following the Civil War, the disease-carrying mosquitoes were reintroduced to port cities such as New Orleans and New York over and over again. In some cases, the virus a human slave cargo introduced was especially virulent, and the consequent epidemics were of almost unimaginable size and devastation.⁴¹

When yellow fever struck a city like New York, panic, on a scale that would be difficult for twenty-first century readers to envision, would strike. And for good reason: the death tolls were astounding. In the summer of 1702, for example, yellow fever killed 12 percent of the New York population. And rarely did a summer pass between then and the subsequent one hundred years in America without the disease ravaging one city or another between New Orleans and Boston.

Because the colonialists and early American leaders recognized that these horrid epidemics usually came on the heels of a visit by a ship, typically from the Caribbean or ports to the south of Charleston, fear of yellow fever prompted passage of ever tougher quarantine laws and creation of offshore detention centers for ailing crew, passengers, and slaves.

In 1743 New York City was hit by another particularly lethal wave of the disease. Those who had the means fled New York, generally to the nearby village and penal colony of Greenwich,⁴² or across the East River to the Brooklyn farmlands. For most New Yorkers, however, flight was not an option, and the 1743 epidemic claimed at least 200 lives,⁴³ perhaps three times more, or 5 percent of the population.⁴⁴ During that epidemic, an immigrant physician from Scotland began to see the light. Dr. Cadwallader Colden walked from house to

house, treating the ailing and taking careful note of trends. He recognized a connection between homes located around filthy standing water and higher incidences of disease and surmised that poor water supplies, inadequate diet among the city's poor children, and general filth caused yellow fever. In a series of striking essays⁴⁵ Colden drew the old miasma theory of disease towards a new concept — what would eventually be dubbed sanitarianism. With some subsequent refinements, sanitarianism would become the key framework for all American public health activities for more than 150 years.

Colden recognized that yellow fever, for reasons he couldn't fathom, arose from the fetid swamps and stagnant pools of water that surrounded New York. Slaughterhouses abutted the fringes of the city ghettos which, in turn, were edged by swamps and marshes. Not surprisingly, both farmers and butchers found these marshes and ponds ideal depositories for offal and animal wastes. The stench exuded from the waters was produced by thick layers of algae that fed off this steady supply of nutrients; and into the rich layers of algae water, *Aedes aegypti* females laid their eggs.

Colden didn't draw all of these connections. Rather, he was influenced by ideas then developing in England regarding links between the environment of poverty and emergence of disease. Those ideas were first espoused by William Petty in London in 1662⁴⁶ and were a common conceptual addendum to early eighteenth century theories of miasma.

In practical terms, Colden's yellow fever theory translated into a call for clean water and improved sanitation in New York. Both were tough goals for a city that, remarkably, lacked any source of fresh water save that drawn from wells, and had long failed to enforce the garbage and

waste regulations that, among other things, forbade dumping refuse into those few vital wells. Physicians generally ignored Colden's "notions," as they were dubbed, as well as those of other medical thinkers of the day. Interestingly, if they had any opinion regarding the origins and causes of yellow fever, doctors tended to opt for views that reflected their personal politics rather than science, religion or miasma theory. For example, more conservative physicians blamed "outsiders" — immigrants and visitors — while progressive political thinkers were more likely to accept the idea that yellow fever arose from some local source, such as Colden's "bad water" hypothesis.⁴⁷

More typically, physicians embraced the vaguer, ominous sense of disease causation described by Sir John Pringle of Philadelphia: "...when the heats come on soon, and continue throughout autumn, not moderated by winds, or rains, the season proves sickly, distempers appear early, and are dangerous."⁴⁸

In the summer of 1793 the American Constitutional Congress gave up on its task of designing a new government and fled Philadelphia, as did hundreds of the city's residents. Yellow fever swept the city, which every morning resonated with the police cry, "Bring out your dead! Bring out your dead!" By the end of the summer of 1793, fully 16 percent of the population of Philadelphia had died of yellow fever and word of the terrible epidemic spread all over the American states.

After the New Year of '94, New York City's leaders gathered to decide how to defend their populace against a plague that they felt confident would eventually visit their town of 33,000 residents. The city appropriated its first Public Health Officer and designated Governor's

Island in the harbor as a mandatory quarantine center for people with the disease. It was the first time New York prepared in advance for a public health emergency, giving a designated leader powers sufficient to override the resistance of the anti-quarantine business community that resented intrusions that interfered in commerce.

When yellow fever surfaced in the summer of '95, more than half of the population of New York fled the city in a matter of days. The designated Public Health Officer, Dr. Malachi Treat, bravely went on board an "infected ship," caught the disease, and promptly died. That left the city without its first health leader.

A hastily organized Health Committee, comprised of civic and medical leaders, spent four weeks denying there was an epidemic and another six weeks executing vigorous quarantines of the often-denied cases. The epidemic waned with winter, having claimed 750 lives, or about 2 percent of the New York City population. The Health Committee stood down, 20,000 people returned to the city, and everyone breathed a sigh of relief.

But the mosquitoes had simply gone into their winter dormancy, carrying the viruses with them. And as the leaders of New York abandoned their public health posts in 1796-97 and returned to everyday life, the viral population levels in the mosquitos rose.

In August of 1798 New York had heavy rains; the marshes and ponds filled and overflowed. By the end of the month nine people were dead of yellow fever, panic had broken out and, again, thousands of people fled the city. This time New York was to face the full force epidemic it had prepared for in '94, and ignored thereafter.

The Health Committee reconstituted itself and ordered a variety of measures to clean up

the city and quarantine the sick. But their clean-up effort did not address open stands of water and therefore failed to eliminate the pestilential *Aedes aegypti*.

So massive was the exodus from New York City that this time the economy collapsed and all food markets closed. In September the Health Committee had its hands full simply feeding the remaining populace and coaxing the city's physicians out of abandoning their posts.

By autumn, more than two thousand New Yorkers, or approximately 4 percent of the city's total population, had died.⁴⁹ More significantly, nearly one out of every ten individuals who had remained in New York throughout the epidemic, most of them the poorest residents of the city, had succumbed.

Nearly every summer thereafter for thirty years, yellow fever revisited New York during the hottest summer months, claiming between .5 percent and 2 percent of its population. After the 1798 epidemic the rich of New York routinely departed during summer months as a precautionary measure, idling July thru September at country estates located north of the Manhattan village of Greenwich, far from the mosquito-infested slums. And year after year, word of yellow fever deaths opened the human flood gates as thousands of people fled, leaving an economically beleaguered, diseased city behind.

Desperate to control the economically devastating scourges of smallpox and, in particular, yellow fever, the New York State Legislature in 1796 passed the nation's first comprehensive public health law. It created the office of a State Commissioner of Health, a New York City Health Office, pest houses for isolation of infected citizens, vigorous maritime quarantine regulations and a system of fines for failure to comply with quarantine and sanitation

ordinances.⁵⁰

Yellow fever fear inspired a wave of similar organized public health activity elsewhere in the United States. In 1798 Congress ordered creation of the United States Marine Health Service, conceived of as an agency that would monitor sailors and protect American ports from incoming disease. Two years later the nation's capitol was built upon a large swamp located between the strategic states of Maryland and Virginia. Immediately overrun by yellow fever, smallpox, viral encephalitis, and a host of other diseases, Washington, D.C. constituted a public health disaster from the moment of its conception. In 1802 the District of Columbia enacted a series of public health ordinances, modeled after those in New York.

In 1805, facing yet another summer yellow fever onslaught, New York City created the nation's first Board of Health. Armed with a budget of the then considerable sum of \$8,500 and authority to do whatever it deemed necessary to stop yellow fever, the Board set out to sanitize the city. The Board worked in tandem with John Pintard, the country's first City Inspector.

Pintard, a Princeton graduate and man of commerce, had a hand in nearly every aspect of New York City political life during the late eighteenth and early nineteenth centuries. By modern standards he was a self-made millionaire who had a strong sense of civic responsibility. He would found the nation's first savings bank, promote construction of the Erie Canal, organize the New York Historical Society, and help create the Tammany Society — originally a progressive organization that favored universal suffrage and backed the presidency of Martin Van Buren. Pintard took his City Inspector duties very seriously, creating a model system for the recording of vital statistics and epidemic numbers and levying heavy fines against “nuisance violators,” or

individuals who dumped garbage and wastes where they oughtn't.

Both Pintard and the Board of Health were strongly supported by New York's powerful commerce class in 1805. But as the city's efforts paid off, and yellow fever diminished, the popularity of public health measures ebbed. By 1819 the Board of Health's budget had fallen to a mere \$500, and the business community was lobbying for its elimination.

The clash between New York's wealthiest men of commerce and its civic authorities over public health was a classic conflict between pursuit of short term profit and prevention of often longer term threats to the populace. Men of commerce, most of whom depended directly or indirectly on foreign trade and shipping, recognized the need for strict health measures during epidemics, even where such steps as quarantines impeded their business operations. But in the absence of crisis the economic impacts of such activities far outweighed any perceived health benefits, and opposition arose from the commercial sector.

This theme — of tension between business and health sectors — would repeat itself so frequently in coming decades in America as to constitute a primary motif of the nation's struggle for population health.

By the second decade of the nineteenth century no one could deny that New York's filthy waters, swamps, and undrained street wastes were linked to epidemics. It didn't matter whether one followed miasma, sanitarian or religious theories of the origins of disease — by 1815 the city was so obviously awash in liquid filth that its role in disease was undeniable. Potter's Field, located in Greenwich Village, was full of the dead from the 1798 yellow fever epidemic seven years earlier,⁵¹ most of whom had resided in the city's poorest, most water-logged

neighborhoods. When the fever struck again in 1805, Pintard estimated that 75,000 of the city's residents fled to the village of Greenwich. Disease did not follow, and death rates among those who thereafter remained in Greenwich Village — out of fear of the pestilence in New York — were markedly lower. Other than population density, the chief difference between Greenwich Village and New York City was water: the village had natural drainage and no swamps.

New York City had no drainage or sewers, and it had plenty of swamps.

Before New York's business community completely abandoned the Board of Health in 1819, steps were finally taken to rid the city of some of the most disgusting, polluted, redolent, pestilential stands of marshes and water. The ironically named Fresh Water Pond — which was anything but “fresh” — was filled with dirt and stones over a period of years until, by 1807, the entire span along Broad Way and Grand Streets was dry land.

In 1818 inventors Robert Fulton and Eli Whitney conceived of turning a small stream that ran along New York City's northern border and to the East River into a large drain. By year's end, water and waste from the city were diverted into this canal, an open, fetid affair, and directed to the river. The East River was actually a tidal basin, however, and it ebbed and flowed with ocean currents. The drainage canal, located along what would later be called Canal Street, simply carried disgusting effluents into a body of water that, depending on the tides, might bring them right back to lie stinking on the city's southern shores.

The same year Fulton and Whitney conceived of the canal, engineer Edmond Genêt in Paris published a series of landmark essays postulating that sewage systems that carried all wastes away from cities, depositing them far from any potential source of water for consumption

or bathing, would effectively reduce human disease. Genêt hypothesized that sewers ought to be covered, located underground, and capable of carrying all of a metropolis's waste a great, safe, distance away.

Genêt's insights were a public health revelation that would eventually be put into practice, rendering European and American cities liveable. But it wouldn't happen overnight; and many cities — notably New York — would suffer more years of pestilence and death before those in governance and commerce would willingly foot the bill for sewer construction.

By 1790, virtually every drop of water New York's citizenry drew from a well or stream was polluted — the filth simply seeped down into the aquifers. The city leaders knew that they couldn't avoid the expense of an aqueduct of some kind to bring genuinely fresh drinking water to the city. Engineers estimated that the city needed three million gallons of water a day and recommended construction of an aqueduct from the Bronx River.

In stepped Aaron Burr, a first-order scoundrel. Burr took charge of the project, happily accepted the city funds for aqueduct construction, deposited them in his own newly-created Manhattan Company (later to be called Chase Manhattan Bank) and gave the city not the promised aqueduct but a shoddy network of wells and piping that drew water from polluted Fresh Water Pond. The epidemics continued.

By 1819 commercial sector pressure brought New York's Board of Health to its knees, curtailing not only its activities but even meetings. And, predictably, the city suffered another yellow fever epidemic in 1822. It killed 230 people. And when Asian cholera reached New York in 1832, the city was unprepared, despite ample word of its devastating impact in Europe:

3,513 people, 1.5 percent of the population, perished. The epidemic increased the city's excess mortality rate by 54 percent.

Once again, faced with undeniable disease carnage, the business community backed off, allowing a spate of Board meetings, quarantines, and health inspections. But by 1835 the power of Tammany Hall — which had become a corrupt political machine that would manipulate New York and national politics for more than a century— was virtually synonymous with entrepreneurial interests in the city. Tammany seized control of the Board, stacked it with cronies, and corruption set in. Between 1837 and 1847 the Board's yearly budget fell from \$14,000 to \$2,000. Worse yet, nearly all of that paltry \$2,000 was spent on staff champagne parties at which the Tammany scoundrels celebrated their good fortune.

Again in 1848 the city got plenty of advance word of a highly virulent strain of cholera sweeping across Europe. And, again, its eviscerated Board of Health took no effective steps. In 1848 to 1849 more than eight thousand New Yorkers, approaching 2 percent of the population, died of cholera. And over the subsequent four years another two thousand New Yorkers perished of the ongoing cholera outbreaks and new epidemics of scarlet fever and smallpox. Worse yet, the overall death rate in the city was rapidly rising, reflecting additionally appalling statistics for measles, whooping cough, typhus and a host of other diseases.

By 1845 the New York City death rate overall (the number of annual deaths per 1,000 New Yorkers) would be higher than it had been in 1790. In 1850 it would reach a level not seen since the devastating yellow fever epidemics of the 1700s, more than one hundred years previously.⁵² Indeed, death rates in 1850 would be a full 10 percent higher than those estimated

for 1750.

Clearly, the public's health was failing. This was not progress.

Ironically, New York City's health laws and its Board of Health became models for the nation. If Tammany corruption rendered those laws unenforced in New York and staffed Gotham's Board of Health with fools and cronies the structures were still sound ideas. So much so that, propelled by the fear of yellow fever and cholera cities all over America adopted New York's Board of Health laws: Washington, D.C., Boston, Chicago, New Orleans, and dozens of other cities all created boards of health between 1810 and 1840 that were nearly identical in structure and intent to that originally designed in New York City in 1805. Sadly, in New York City, where corrupt leaders flouted those laws, between 1815 and 1839 alone the annual death rate increased from 28 per 1,000 to 30.2 per 1,000. By 1850 it would be an astounding 48 per 1,000, meaning that about 5 percent of the population died annually, most of them victims of infectious diseases.

Such was not the case everywhere in the United States in 1849 to 1850. On the eve of the Civil War many Americans — particularly residents of the newly annexed western territories and war-claimed former Mexican states such as California — were experiencing vast improvements in life expectancy and overall health.

During the first three decades of the nineteenth century, the European-descendant populations of territories to the west of the Mississippi were few and scattered. The lack of densely populated cities, such as New York, Boston, and Philadelphia in the East, spared the west many of the scourges of disease that were ravaging the thirteen original states.

The territory of Minnesota, for example, straddled a vast network of rivers and lakes, among them, at its eastern border, the Mississippi River as it poured out of Lake Superior. Five thousand of the territory's 84,000 square miles were covered by water that froze during the region's icy winters then thawed, and spawned hordes of insects each summer. The territory's southern region was prairie: vast tracts of open plains that thawed each spring to reveal miles of tall grasslands that were chomped down efficiently by nomadic herds of tens of thousands of bison. Those buffalo were, in turn, hunted by Chippewa and Sioux Indians who migrated seasonally across the enormous open landscape.

The rest of the Minnesota territory offered a markedly different ecology into which great Arctic storms, made more furious by moisture from the region's great lakes, blew for four or more months of the year, plunging the area into winters that were among the most severe in all North America. The first Europeans who ventured into the hostile climes were French fur trappers and traders who found Minnesota's waters rich with beavers and bears. They adopted the Sioux name for the region, "Minnesota," or cloudy waters

President Thomas Jefferson successfully obtained Minnesota in 1803 from the French as part of the Louisiana Purchase, and during the 1830s U.S. military outposts throughout the territory leveraged land purchases from the Sioux and Chippewa.

While New York City leaders were in the midst of battles involving the Board of Health, invading microbes, and the metropolis's business community, Minnesota was torn by rather different conflicts. The first European and American settlements, comprised predominantly of determined, native-born easterners, were struggling against the elements. And the Chippewa and

Sioux were fighting for their lives, having been overwhelmed by wave after wave of European microbes — chiefly smallpox, measles, and influenza.⁵³

Throughout the time of Minnesota's early settlement, when fewer than 100,000 whites ventured to build farms, churches, and villages in the territory, there were skirmishes and killings pitting settlers against the few surviving Sioux. But after Minnesota joined the United States in 1849, U.S. military efforts in the region became more aggressive, and warfare between whites and Indians grew bloodier. The tension would gradually escalate, culminating in a bloody war in 1862, defeat of the Santee Sioux, and their forcible relocation to prairie lands south of Minnesota where all but one thousand of them would perish within a year.

The Indian Wars would affect Minnesota public health for more than a century, as tensions would remain unresolved and the handful of surviving Sioux and Chippewa would find it all but impossible to assimilate into the white culture. The great Sioux uprisings of the later nineteenth century, culminating in Little Big Horn and the Battle of Wounded Knee in the 1890s, would be direct outgrowths of the shame and massive death toll heaped upon the Santee. The surviving Indians of Minnesota and the neighboring Dakotas would, for more than one hundred years thereafter, consistently register the poorest health of any peoples residing in the prairie states. They had and continue to have markedly lower life expectancies, higher infant and child mortality rates, astounding levels of alcoholism and diabetes, and overall disease rates many times higher than those seen in the dominant white population.⁵⁴

The first wave of immigrants to Minnesota was largely composed of American-born easterners. By 1840, however, the mostly Anglo-Saxon-descendant immigrants were being

outnumbered by foreign-born Swedes, Germans, Norwegians, Danes, and a smattering of other northern Europeans.⁵⁵ For these peasants the dangerous and extremely expensive voyage to mysterious Minnesota constituted the only way to obtain large tracts of farmland for themselves and their children. Their home countries were simply too crowded, and purchase of Swedish or Norwegian farmland was virtually impossible. Brutal as Minnesota's weather could be, the Northern Europeans were accustomed to long, dark, frigid winters, and the first settlers swiftly formed networks linking them to their home country. By 1840 there were towns all across Minnesota that had local governance structured identically to the collective farms in Norway or Denmark and prairie life was marked by a striking spirit of community not then predominant in the eastern American cities.⁵⁶

Nevertheless, it was a hard-scrabble existence. Though the epidemics that ravaged the east were rarely as pronounced among the sparsely populated whites of Minnesota, many perished every year from cholera, malnutrition, malaria, and waves of child-killers such as scarlet fever and diphtheria.

No organized public health effort was in place in Minnesota at the time, nor would one surface until well after the Civil War. Instead, Minnesotans relied on remedies and folk wisdom brought from Europe as well as on the advice of a motley crew of pseudo-physicians and snake oil salesmen. Anyone could hang up a shingle claiming to be a physician or healer, and in the western territories of the early nineteenth century the profession tended to attract scoundrels.⁵⁷

To be fair, doctors were hardly a sophisticated lot anywhere in America during the first four decades of the nineteenth century. The oldest American medical school, established by

Benjamin Franklin in Philadelphia in 1765, graduated only a handful of doctors every year, and most American “physicians” hadn’t undergone any training at all. In 1780, for example, there were about 4,000 doctors practicing medicine in New York City, only 400 of whom had ever obtained a medical degree.⁵⁸ Though medical schools had been established in New York and Boston before the American Revolution — institutions that would eventually be known as Columbia University College of Physicians and Surgeons and Harvard Medical School — few practitioners ever availed themselves of such academic training.⁵⁹ And, as the typical sojourn in medical school lasted a mere nine months, with the bulk of that time spent studying Latin and philosophy, even those who did have training were ill prepared for handling epidemics. In 1869, the President of Harvard University would denounce his school’s medical training as “not much better than a diploma mill.”

It was widely believed in the early nineteenth century that the best physicians were French and the greatest medical teacher was Dr. Pierre Louis in Paris. Those who wished to garner the highest paying medical clientele typically were, themselves, from America’s wealthiest families and were able to pay for passage to and studies in Paris.⁶⁰

But these were not the physicians of America’s frontier. Regions like Minnesota were served in the early 1800s by female midwives and men who mixed folk remedies and local Indian curatives with whatever they might have read regarding French medicine. Hot red peppers, steam baths, prayer, local roots and herbs, soil minerals, mercury, arsenic, bleeding, and “trusting in nature” were the vogue. The body was thought to be composed of good and bad humours which produced illness if out of balance. Among top physicians in New York,

Philadelphia, and Boston at the time, the French concepts of clinical training and skepticism about folk medicine were taking hold. Not so on the frontier.

However, in the far west at that time, the climate of California could offer health despite the paucity of physicians or organized public systems of health and medicine.⁶¹

The Spaniards, who founded El Pueblo de Los Angeles in 1781, and Mexicanos found southern California a paradise on Earth, replete with ample sunshine, a year-round temperate climate, rich agricultural soils, and vast tracts of open land for grazing livestock. Their ranchos grew massive during the eighteenth and early nineteenth centuries under, variously, Spanish, French and Mexican rule. By the 1820s the California-born *ranchero* owners, or Californios, were trading with Yankees from the East. And word of the state's astonishingly favorable climate spread. It proved an immediate magnet for ailing easterners and Midwest pioneers. Yankees made their way to Los Angeles hoping to recover from tuberculosis and other, unidentifiable, scourges of health. If public health was deficient then in Philadelphia, New Orleans, St. Louis or Chicago there was a solution for the adventurous: Move to California. Mark Twain wrote back word to the east that life in California "is so healthy that you have to leave the state to die."⁶²

It was a New York newspaperman, John O'Sullivan, who sounded the cry that would propel American policy westward for the remainder of the nineteenth century. "The American claim is by the right of our manifest destiny to overspread and to possess the whole of the continent which Providence has given up for the development of the great experiment of liberty and federative self-government entrusted to us. It is a right such as that of the tree to the space of

air and earth suitable for the full expansion of its principle and destiny of growth,” O’Sullivan wrote in 1844 in the New York Herald.

In less grandiose terms, appealing to individual fortune seekers, New York Tribune editor Horace Greeley wrote pieces that popularized the phrase “Go West, young man!”

And so they would.⁶³

Back east, meanwhile, the cities were suddenly being deluged with immigrants, largely from famine-struck Ireland. Most of them never made their way further west than the first slums into which they settled in New York, Brooklyn, Philadelphia or Boston. Between 1840 and 1860 4.5 million of Europe’s poor landed in the U.S.’s eastern ports, swelling the already densely populated tenements and slums. More than 3.5 million of them never left New York.

The result was an ever worsening public health catastrophe. Epidemics swept over the cities regularly, claiming huge tolls among the poor.⁶⁴

The combination of waves of impoverished immigrants and overall urban disorder was driving the public’s health downward. None of America’s densely-packed cities had appropriate infrastructures: safe water, decent housing, paved streets, sewer systems, ample safe (not rotten) food, and public health control of contagion. In 1850 the average U.S. male life expectancy was thirty-six years, female was thirty-eight years. Huge epidemics were part of the problem: in 1853, for example, 11,000 residents of New Orleans died in just two months of cholera. But the real factors holding down life expectancy were huge maternal and child mortality rates.

In 1857, twenty-four out of every fifty-four pregnancies in the United States resulted in postpartum puerperal fever, an infection physicians and midwives did not then understand. As a

result of puerperal fever, nineteen of every fifty-four pregnancies proved lethal to the mother.⁶⁵ Given that most women at that time gave birth to more than six children, the risk of premature death over the course of their reproductive lives was enormous.

Child mortality was also astronomical. In 1850 children growing up in large American cities had about fifty-fifty odds of reaching the age of five years without succumbing to disease or malnutrition. Odds were even worse — three to one against them — for children of the poorest urbanites: immigrants and African Americans.

In 1825 in New York City, for example, one out of every three deaths was among babies under two years of age. In 1816 that ratio had been only one in five.⁶⁶

Among African American New Yorkers, both slaves and free,⁶⁷ death rates in all age groups were even greater than among poor European immigrants and were three times higher than among whites in general (i.e. all whites, including the poorest). In the 1820s African Americans typically constituted 12 to 15 percent of the city's death toll, though they comprised less than 8 percent of the population. (A century and a half later, African Americans would still be dying in disproportionate numbers, and their average life expectancies would remain well below those of their white counterparts.)

What was missing from American urban society — but would soon appear — was a middle class. Prior to the Civil War, most of the country's cities were largely populated by the working poor, entrepreneurial poor, and desperately poor. A small, elite group of urbanites possessed enormous wealth and employed large numbers of servants. They and the poor lived parallel but rarely intersecting lives.

Increasingly, eastern cities were under the political control of naturalized citizens who considered immigrants riff-raff, even animals. As the urban centers became more and more crowded, and less and less liveable, the elite tended to abandon civic society, leaving such municipal responsibilities as garbage collection to working class political leaders voted into power by their peers.

In the absence of a strong, civically-invested middle class, the cities became centers of political corruption. And the public's health worsened.

This theme of public health — the need for support from a sizeable middle class — would resonate throughout the future history of America. In the absence of a middle class, the rich simply lived separate and unequal lives, maintaining spacious homes along clean, tree-lined boulevards and raising their families through private systems of health, education, and cultural training. That a city might starve, politically and economically, in the absence of the elite's interest and finances seemed of little but occasional Christian concern to them. And the poor lacked the education, money, and skills to choose and run an effective government.

American public health would improve in tandem with the rise of the urban middle class, which paid taxes, supported cleanliness and public education, recognized and abhorred corruption and, as home owners, had an investment in their cities. This was the interest group that would put into practice public measures based on the notion that “cleanliness is next to Godliness.” In 1820 such a social class was virtually nonexistent; by 1850, pockets of middle class professionals and small businessmen were surfacing in most American eastern cities. And following the Civil War, the middle class would steadily expand in America, becoming by the

mid twentieth century the dominant force in municipal and regional political life.⁶⁸

In 1842 two crucial documents were published that compelled urban leaders and physicians to consider health in the light of the social, particularly class, context of industrialization. In London, Dr. Edwin Chadwick published Report on the Sanitary Condition of the Labouring Population of Great Britain, a remarkable survey of that country's living standards right down to the numbers of people using any one privy and the odor of particular London neighborhoods.⁶⁹ Chadwick would, under twentieth century labeling, be considered an epidemiologist and perhaps a demographer — and very good ones at that. But his contribution went well beyond dry, statistical accounts of English filth, poverty, and pestilence. Chadwick correlated the three.

Chadwick called for organized Public Health. And he defined its mission as one of sanitary clean-up. An old-fashioned miasma thinker, Chadwick believed that if one lived amid filth, disease would be your constant companion. Thus, the way to rid England of pestilence and premature deaths was give her a good scrubbing. It was in the 1840s an astonishingly revolutionary insight.

Chadwick's counterpart in the United States was New Yorker John Griscom, who published The Sanitary Conditions of the Laboring Populace of New York in 1842 and his battle cry, Sanitary Reform, in 1844.⁷⁰ Griscom's goal was slightly less ambitious than Chadwick's: he didn't hope to scrub clean an entire nation, just New York City. By 1845 New York was inhabited by 371,223 people, more than half of them foreign-born immigrants. Up to a dozen of these immigrants might occupy a single tenement room and share outdoor plumbing and privies

with more than 200 other residents of their multi-storied, airless building. In hot summer months, these buildings reeked of human sweat and sour cooking odors. During cold winter months, the air worsened further, as the few windows were kept shut and the buildings filled with the thick, black smoke of burning coal.

By the 1840s New York and most other large American cities were horribly crowded, disgustingly dirty affairs. Horse manure formed a thick, redolent layer over all of the streets, dead animals were usually left for days wherever they fell, tenement garbage was piled high in every vacant space, and everyone, save the rich, had to walk through this filth daily.

Worse yet, factories and sweatshops were often located in the middle of tenement neighborhoods, adding evermore noise and air pollution. People of all ages, many of them children and most of them immigrants, worked ten to fourteen hour shifts in such places. The rural poor were slightly better off, as their daily toil was often performed outdoors, where they at least breathed fresh air and children's growing bones could absorb Vitamin D.

There was, in short, plenty about which Griscom could rant in his call for sanitary reform. And by 1845 he had followers in the form of a loosely organized civic group known as the sanitarians that advocated New York cleanliness. Their call soon spread all over the United States, with the ranks of sanitarians swelling swiftly to include Christian leaders, civic activists, politicians, some doctors, and the growing middle classes. Their target was filth, which generally was seen to be associated with immigrants. Like England's Chadwick, the American sanitarians weren't particularly interested in raising the standard of living of urban workers. In fact, many nativist⁷¹ sanitarians abhorred those workers, and saw them as little more than animals. Blaming

the poor for their own poverty, they labeled slum and tenement residents lazy, idle, and immoral.⁷²

The early sanitarians in America were also reluctant to rely on government to fulfill their dreams of hygiene. Most Americans in the 1840s were staunchly anti-government, as well as anti-intellectual. They were more likely to rally around a cry from the pulpit than from the steps of City Hall.

And they had plenty of cause for such suspicions. In New York, for example, a corrupt Board of Health frittered away its funds while typhoid fever killed 1,396 people in 1847 and the annual death rates soared. An 1849 cholera epidemic killed 5,071 (possibly 8,000) New Yorkers. Though money was allegedly spent on garbage collection, the mountains of waste never seemed to diminish. By 1854, New York would have one of the highest recorded death rates in the industrial world: that year 52 people died for every 1,000 residents, or some 30,000 individuals, most of them children under twelve.

As in the first half of the century, a visit to a physician in the late 1840s could be a rather risky affair, not to mention painful.⁷³ The medicines were likely to be toxic and often fatally poisonous. Procedures such as bloodletting were still practiced, and the rising tide of surgery was practiced in the complete absence of anesthesia other than alcohol-induced stupor.

Surgery was also performed in the complete absence of sterility. If physicians washed their hands, it was merely to eliminate unsightly blood or smelly fluids. If they washed their instruments, it was, again, a matter of aesthetics, and it never involved methods of cleansing that would have been sterilizing. It would be years before even the tiny elite of university-trained

American physicians would learn of the Semmelweis Technique, and decades before that technique would be put into practice by doctors in, for example, Minnesota or California.

In the 1840s Ignaz Philipp Semmelweis, a Hungarian-born physician practicing in Vienna, conducted a brilliant experiment that would revolutionize medical hygiene. All over Europe and America at that time, mothers were developing puerperal fever after delivery. Painful infections in their vaginas and uteri would rapidly develop into sepsis, and the new mothers would develop skyrocketing fevers, sink into delirium, and die.

Semmelweis noticed in his Viennese hospital that some physicians and nurses had fewer puerperal fever patients than others. He experimented with a theory, dividing the obstetrics ward in half, maintaining standard practices on one side, and on the other side instructing all nurses, doctors, midwives and visitors to vigorously scrub their hands and arms with soap and boiled water before touching the mothers or their newborns. None of the mothers on the scrub side died of puerperal fever.

As word of the “Semmelweis Technique” spread in Europe, physicians reasoned that such scrubbing might also reduce the incidence of post-surgical infections, and bars of soap soon appeared in doctors’ offices and hospital wards all over France, Austria, Germany, and England.

Such was not the case in the United States, where outside of the most sophisticated medical offices in New York, Philadelphia, and Boston, no one would practice the “Semmelweis Technique” until well into the 1890s. Medicine was, quite simply, far cruder in America, and physicians were reluctant to incorporate any new ideas into their practices, especially if a procedure offered no hope of enhancing profits. More than a century later Semmelweis’

admonitions would still be overlooked by doctors, nurses and medical personnel who spread disease within their hospitals.

Two other crucial European discoveries went largely ignored in America for decades. In 1848 the British Parliament passed the Public Health Act. This legislation compelled every city and town in the United Kingdom to construct water systems, sewers and proper drainage, and pave primary thoroughfares: a feat accomplished in just over twenty years.

American health leaders failed to take note. Nor did they jump on Dr. John Snow's 1853 revelation in London. When that city was paralyzed by wave after wave of cholera epidemics, Snow noted that cholera death tolls were not uniform across London. Rather, they concentrated in key, poor, neighborhoods, particularly one along Broad Street. Noting that all of the Broad Street residents drew their water from a single pump, Snow simply removed the pump's handle, compelling residents to pull their supplies from another, safer source. The neighborhood's cholera epidemic promptly stopped. Though Snow had no concept of the bacterial cause of cholera, he realized that filthy water carried the disease.

This was all lost on Americans. Throughout America in the 1850s truly awful epidemics were just beginning to ignite action. In Providence, Rhode Island, Dr. Edwin Snow harangued the city government for months until, in 1850, he won passage of the nation's first compulsory vaccination law, mandating smallpox inoculation of school children. The Providence law came thirty-nine years after Boston instituted the country's first government-subsidized vaccination effort for its poor residents. Many years and court challenges would pass before such laws would take hold elsewhere in the United States. And resistance to vaccination, despite its clear efficacy

as a disease prevention strategy, would remain one of the themes of public health 150 years later.

New York City's population would be without safe, fresh water until the mid-1860s, when the Croton Aqueduct was completed. The city's first genuine sewer system wouldn't begin construction until 1850. Once again corruption and government ineptitude stood in the way of Gotham's health. And it was no time for such foolishness: an ancient Asian scourge would soon overwhelm the city — cholera.

Just as yellow fever had pushed the first public health measures in America, the terror of cholera was enormous. And it became the impetus for both change and inappropriate panic in the mid-nineteenth century. When rumors spread of cholera's arrival to a region cities sought, and usually obtained, authority to forcibly detain the disease's victims in hospitals or pesthouses — facilities that functioned as little more than holding cells for ailing individuals, generally those from the poorest classes. Though such measures surely violated all concepts of personal liberty and usually proved lethal to the sufferers, quarantine enjoyed a fair amount of popular support, primarily because cholera was such a horrifying disease.

An individual could feel fine strolling around New York's Gramercy Park on a sunny afternoon, and in an instant be overcome by a wave of illness so powerful as to drive him to his knees. Faint, weak, and suddenly exhausted, the victim would suffer the humiliation and shame of uncontrollable vomiting and diarrhea. Once in bed, his fluid loss would continue unrelentingly as the *Vibrio cholerae* bacteria released poisons into his bloodstream. Feverish and severely dehydrated, he could be semiconscious and calling out to imagined demons or groaning in agony all in just a few hours time. Family members were instructed by physicians to drip

water into the victim's mouth and wash him down with cooling fluids. The disease spread within the family, as the *Vibrio* was exuded in the victim's diarrheal fluids and vomitus, contact with which was contagious. In addition, if the local water supply was the source of cholera contamination, rehydrating the victim simply offered superinfection.

Death could claim the cholera victim in fewer than eight hours, his cadaver depleted of fluids, his parchment-like skin easily pulled away from the flaccid muscle beneath. More than half of all sufferers of acute cholera in the Americas during the 1850s died of the disease, the progress of which varied only in the amount of time that passed between the first hammering shock of the illness and death. If his household was typical the death of the Gramercy Park stroller would soon be followed by that of his wife, children, servants — anyone who came in contact with his soiled clothing or bedsheets.

A cholera victim's neighbors often demanded that he be removed to a pesthouse. Not realizing that the source of the cholera was probably the shared neighborhood water supply or local market produce that was handled by someone infected with the disease, urbanites shrank from their fellow human beings, fearing contagion was in the air. After several cholera epidemics, the New York Board of Health designated a farm on Staten Island as its cholera pesthouse in 1857. During that summer, the notorious Quarantine Riots broke out as local Staten Island residents laid siege to the site and ultimately burned it to the ground. Their grievance was that the presence of a pesthouse in their midst would bring down local property values.

The sanitarians missed the message of John Snow's Broad Street pump. Rather than accept the possibility that a contagious agent might lurk in unclean water, the sanitarians

continued to insist that filth, in and of itself, was the cause of disease. Spurred by fear of cholera, their zeal was boundless, and prompted the first American sanitarian gathering, the U.S. Quarantine and Sanitary Convention, convened in 1857.

Sanitarians in the city of New York in 1855 set up the nation's first street sweeping service, employing horse-drawn pumps and scrubbing devices. The city, unfortunately, put the service's operation in the hands of corrupt companies run by cronies of municipal administrators: the city remained slovenly, verminous, and redolent.

After four more years of filth and corruption an angry reaction arose from the middle class, spawning the New York Sanitary Association. At the urging of this new citizen's action group, that year the New York City Board of Health set out to clean up Hog Town, the single most odoriferous and disgusting locale in the metropolis. Located where, a century later, Rockefeller Center would stand, Hog Town was comprised of hundreds of pig sties, dozens of slaughterhouses, and some ten thousand free-roaming hogs.⁷⁴ Foul as their stench might have been, however, the Hog Town denizens were not the cause of Gotham's human diseases. For years the Board of Health nevertheless waged war with the hog farmers, eventually driving the industry off Manhattan all together.

While civic leaders targeted hogs, dirt, and horse manure, more sophisticated notions of disease were percolating overseas, especially in Germany. In Berlin, for example, botanist Matthias Schleiden and physiologist Theodor Schwann recognized that all large living things, including human beings, were composed of cells which were, themselves, alive and capable of reproduction. The Schleiden/Schwann cell theory vividly demonstrated universality in the biota

of Earth, linking humans and plants in a suddenly less mysterious chain. Rudolf Virchow took that cell theory a dramatic step further, proving that all cells arose from other, parent cells — thus disproving the Lamarkian notion of spontaneous generation. In 1858 Virchow published Die Cellularpathologie, which drew from his extensive laboratory studies to demonstrate that human illness functioned at the cellular level. The following year in Paris, Dr. Claude Bernard published the first modern book of human physiology, which radically improved French medical education. And intellectuals all across Europe were abuzz with the idea of evolution, Charles Darwin's Origin of the Species having just been published.

Though these leaps of knowledge would soon have a radical impact on European science and medicine, Americans were much too preoccupied to take notice.

War was brewing.

By 1862 when Louis Pasteur published in France his theory of the existence of “germs,” America was locked in a war that nearly brought down the United States. At the Civil War's end in 1865, some 600,000 Americans lay dead and epidemics raged uncontrolled from New Orleans to Bangor, Maine. By far the majority of deceased soldiers — perhaps 375,000 of the 535,000 non-civilian deaths — were victims not of bullets and cannon, but of disease, chiefly malaria, dysentery, typhoid fever, scarlet fever, pneumonia, smallpox, and tuberculosis. Even the 160,000 soldiers who died of battle wounds were killed by hideous health care practices that resulted in the amputation of most injured limbs and proved fatal to 62 percent of those with chest wounds and 87 percent with abdominal wounds.⁷⁵

The Union troops dubbed their seemingly endless bouts of dysentery “the Tennessee

quick step” or “the Confederate disease.” Confederate troops, for their part, faced battles in 1864 with upwards of 40 percent of their troops suffering measles, typhoid fever or dysentery. Whenever soldiers of either side encamped beside swamps or cannon holes filled with water, malaria and yellow fever were their companions.⁷⁶

During the three bitter years from the spring of ‘62 to the spring of ‘65, the war’s epidemics spread to besieged cities and towns, claiming untold numbers of civilians who were caught in the microbial crossfire. What had already been very bad, worsened.

In New York City the war heightened tensions between immigrants, African Americans, nativists, and politicians. Public health had been in sorry enough shape before the war, thanks to Tammany Hall’s corrupt rule of the city characterized by charges of ballot box-stuffing, political corruption and Irish versus African American voting blocks. The Civil War dramatically worsened matters.⁷⁷

At war’s end, life expectancy and mortality rates for New Yorkers would be the same as they had been a decade earlier: in 1865 as in 1855, thirty-four of every 1,000 New Yorkers would die annually. While public health improved in most other northeastern cities, save among soldiers, New York’s stagnated. Mortality rates among poor immigrant children were the chief factors driving these grim numbers: 73 percent of the poor never reached the age of twenty.⁷⁸

In 1865, at war’s end, Francis Boole was Tammany Hall’s man in charge of the New York City Inspector’s Office. Under the careful tutelage of Tammany leader William “Boss” Tweed, Boole in a matter of months hired 928 public health “inspectors,” all of them cronies who either did nothing for their wages or used their inspectorial authority to blackmail the owners of

restaurants, bakeries, slaughterhouses, produce markets, and private hospitals. The Board of Health was similarly inept, corrupt, and stacked with “Boss” Tweed’s sycophants.

In far off Minnesota, Dr. Charles Hewitt was fighting his own war on corruption. His targets were not, however, the likes of Tweed and his thugs but the state’s physicians. A native New Yorker, Hewitt knew what constituted quality medical care in the 1860s — and what most certainly did not. Hewitt moved to Minnesota in 1858, shortly before it became a state. He adopted it as his own and energetically set to work to map the demography of the territory’s population, health, and disease. As he traveled between towns with names like Red Wing, Goodhue and Shakopee, Hewitt was astonished by what passed for medical care.

“There is so little fact and so much theory, that I am sometimes tempted to think a medical practice founded upon the honest experience of one practitioner of sterling common sense would be safer and more successful than a practice based on what is vauntingly called ‘the united experience of centuries.’ Practice never will be correct til the practitioner knows what he is about. Such a proposition may seem very plainly true — it is so — but plain as it is it expresses what I think is the great fault among those who are honored with the title M.D.,” Hewitt wrote in 1856.⁷⁹

Convinced that many Minnesota physicians were unintentionally killing their patients with toxic tinctures, salves and potions, and that the doctors were worsening public health catastrophes such as smallpox epidemics through inept handling of patients, Hewitt went on a professional rampage. In doing so he drew the ire of most of the state’s medical practitioners. Despite attempts by rival doctors to discredit him, Hewitt’s words resonated with average

Minnesotans who were sick to death of paying for hocus-pocus, snake oil, and Christian homilies each time one of their children came down with scarlet fever, measles or malaria. Across Minnesota Hewitt's campaign against medical charlatans won the New Yorker praise and popularity. Hewitt used his notoriety to pressure the state's political leaders into creating a Board of Health and a rudimentary vital statistics system that tracked Minnesotans' births, deaths and diseases.

Hewitt became Minnesota's first secretary of the State Board of Health, and his office was soon deluged with reports of epidemics claiming thousands of Minnesota residents — chiefly from scarlet fever, smallpox, and diphtheria. Having earned the public's trust with his battles against quacks, Hewitt began behaving like a government official, ordering hand cleansing among health care workers, smallpox vaccination statewide and quarantines of the sick. He told the state's politicians that if they gave his office legal support the legislators could, in return, trust in him: he would stop epidemics and slow disease. It was a trust Hewitt would never betray, though the politicians would often fail to keep their side of the bargain.

In 1877 Hewitt began a disease detective tradition that some one hundred years later would be one of the state's true claims to fame. Smallpox had broken out and, not satisfied merely to issue pamphlets calling for immunization, Hewitt set out to find the source of the outbreak — the index case. In so doing, Hewitt demonstrated that well before the issue was settled in the east, he favored a contagion — rather than the sanitarian — theory of disease origin. While Hewitt certainly supported clean cities, such filth could hardly explain the spread of smallpox in his sparsely populated, largely rural state. No, Hewitt reasoned, smallpox was

caused by something that was spread from person to person.

Though he didn't know what, exactly, that "something" was, he felt certain that only the existence of a communicable, deadly entity of some sort could explain why quarantine could effectively slow epidemics. Hewitt soon spotted a connection between the first 1877 case of smallpox in Minnesota and a recently constructed train line that connected St. Paul to neighboring Wisconsin. The first case in the state, he discovered, was a woman who caught the disease in Wisconsin, boarded the St. Paul and Sioux Railroad, and traveled to Mankato, Minnesota. She unwittingly spread the illness to fellow passengers on the train who, in turn, took smallpox to towns all over the state. At all train stations that were at the state's borders Hewitt established check points where physicians examined passengers and crew for signs of smallpox. He stopped the epidemic in a matter of days, leaving only seven dead Minnesotans in its wake. It was, by 1877 standards, a spectacular feat.

Hewitt used that smallpox victory to once again castigate the physicians, telling them it was high time they accepted his contagion theory of disease and commence some local detective work when measles, scarlet fever or other microbial scourges surfaced among their clientele. In the post-Civil War nineteenth century, however, physicians typically held public health in open disdain, seeing it as little more than a combination of meddling government and sanitarian scrubbers. Hewitt had already alienated scores of doctors by exposing their medicinal frauds. Now he dared demand that they accept his belief system, seeing diseases as ailments caused by as-yet-undiscovered, mysterious, contagious elements, the spread of which was preventable. In Minnesota, and all across America, doctors balked at the notion. They felt their autonomous

powers over patients were threatened. And they resisted the population-based activities of Hewitt and his compatriots. The healers, it seemed, opposed the would-be preventers of disease.⁸⁰

Friction between healers and preventers, between would-be curers and sanitarian scrubbers and, eventually, between independent doctors and government regulators would form another lasting theme of American public health. A century and a half later this tension would limit Dr. Margaret Hamburg's ability to control antibiotic-resistant diseases in New York, as she would be powerless to change physicians' prescription practices. In the 1860s Hewitt ran Minnesota public health services, but was at odds with organized medicine. All over America men like Hewitt would for decades do battle with the American Medical Association and individual physicians.

The severity of such tension would vary across the nation because American public health grew up in a manner entirely different from its counterpart in Europe. There, public health policies were promulgated from the top down, birthed as an essentially federal (or royal) function: American public health, in a manner characteristic of its fervor for democracy, arose from the local level, and no two cities or states had precisely the same policies. In some regions, medical systems grew along with those of public health; in most, they followed separate, often oppositional courses. Not only was there no genuine federal leadership in public health in nineteenth century America, few states had laws and policies that extended to all of their counties and cities. In New York and Massachusetts, for example, New York City and Boston were the tails that wagged their state health dogs.

On the East Coast the large cities were getting still bigger and more crowded. So their public health needs revolved around essential urban services, such as sewers and paved roads. Out on the prairie men like Hewitt were focused on quarantines and epidemic control. And in the far west health wasn't even on the political agenda. Nearly the only thing on western agendas was land, and the mad scramble to bump Indians and Spanish — descendant people off their land, in favor of Anglo, or Yankee, control. By 1865, at the end of the distant Civil War, the destitute Californios were huddled into the state's first ghettos, located in neighborhoods of Los Angeles such as Chavez Ravine.⁸¹

The homicide rate in Los Angeles soared as race wars — better termed real estate battles — broke out between Californios, Mexicanos, Indians, and Anglos. In 1850 the entire population of Los Angeles County was just 2,300 people: forty-four of them were murdered in such fights that year. And when shooting and killing between Californios and Anglos wasn't adequate bloodletting, Indian hunting could take its place. Groups of Anglos would ride out into the hills surrounding the vast Los Angeles Basin in search of Indians who resided around Tehachepi or Cahuenga or towards the Mojave. Statewide, such vigilantes committed so many brutal murders that by 1860 fewer than 32,000 California Indians remained alive.⁸²

It was a lawless world that would soon change with completion of railroad lines connecting California to the east and, internally, to itself. But in 1870 Los Angeles still averaged a murder a day, saloons were routinely emptied by brawls, men so outnumbered women that prostitution — and syphilis — was rampant. There was only one bank in town and it was just two years old. The first fire department was still a year in the future.

So when, that year, the California State Board of Health was established and immediately requested vital statistics data from every county, there was no authority in Los Angeles that could heed the call. Indeed, even twenty-six years later, in 1896, twenty-five of California's fifty-seven counties would fail to file such data and Los Angeles's contributions would be irregular and sparse.

Back east, however, improvements were on the way. Fed up New Yorkers created a new agency, the Metropolitan Board of Health, bypassing the Tammany-controlled corrupt city leadership. The new agency, which combined Manhattan and Brooklyn authorities, took control in 1866 at a time when one out of every thirty-six New Yorkers died annually, marking one of the highest mortality rates then in the world. London's, in contrast, was one out of forty-five. In virtually every disease category, New York health was worse in 1866 than in 1776 and — as it would turn out — the worst it would ever be. The very social elements that signaled progress for elite New Yorkers — fantastic shipping trade all over the world, an enormous cheap labor pool of ex-slaves and immigrants, racial divisions that ensured no organized rebellion could occur, soaring real estate prices — dreadfully worsened the lots of average residents of Gotham. The wealthy of Gramercy Park had access to decent water and sewers, but most New Yorkers had neither. Indeed, drinking water, sewer conditions, the safety of local produce and housing had all worsened considerably for New York workers in 1866, compared to those in 1776. Any disease adapted for spread via human waste and contaminated water would find the ecology of 1866 Gotham spectacularly favorable.

Spurring creation of the new, un-corrupt Metropolitan Board of Health was word of an

enormous, terribly virulent cholera epidemic in Paris. Having seen European health catastrophes slam their city previously, New Yorkers were determined to take whatever measures seemed necessary to head off this latest threat.

Reflecting New York's Republican Governor's determination that the new body prove both legitimate and powerful, its members included three physicians, a prominent businessman and the Police Commissioner. The key member of the Board would prove to be Dr. Elisha Harris, a zealous believer in disease surveillance and in record keeping. After the French cholera epidemic spread to England and thirty-five ailing passengers were subsequently spotted aboard a British ship by alert New York Harbor inspectors, the Metropolitan Board declared a state of emergency and gave itself powers never previously used in pursuit of the city's health. Ardent sanitarians all, the Board ordered immediate cleaning of every street and sewer in Manhattan and Brooklyn — which was done in under thirty days. The Board ordered certain hospitals and dispensaries to function as emergency cholera treatment centers. And the police were given full authority to enforce the Board's edicts.

Crucially, Dr. Harris made the bold contagionist assertion that cholera infected people as a result of contact with water that was contaminated with fecal matter from other cholera victims. Like Minnesota's Hewitt, Harris was connecting observations to reach a correct conclusion about transmission, but in the absence of any knowledge of the nature of the agent that caused the disease. He knew, of course, of John Snow's Broad Street pump experiment in London, but Harris went a critical step further, mixing the Snow observation with Semmelweis's insights.

Harris told New Yorkers to wash their darned hands with soap and clean water.

By summer's end it appeared that all of the tough Board measures had paid off: though cholera had ravaged Paris and London and would wreak havoc throughout the United States, New York came away with only 600 deaths⁸³ — victory indeed compared to the 8,000 who perished in the city's 1849 epidemic.

Emboldened by its success, yet mindful of New York's still terrible overall death rate, the Metropolitan Board and its subsequent bureaucratic incarnations grew more powerful, and clashed with Tammany Hall. The Board would never again find itself completely under the control of corrupt interests. In 1865 the newly-formed American Social Science Association had called for creation of civil services across the country in which the day-to-day affairs of government were executed "scientifically" by politically non-partisan professionals. But the struggle against Tammany Hall-inspired corruption would require political skill and vigilance on the part of health officials for another ninety-five years. So great was the influence of Tweed and his cronies that in 1868 the Democratic National Convention was held inside Tammany Hall itself.

Tammany-controlled judges and attorneys plagued the Board of Health for decades with lawsuits and injunctions, blocking as many quarantines and other actions as possible. The goal was to eliminate Board enforcement of violations committed by Tammany-allied businesses or by Irish owners of tenement buildings. To gain public support for their obviously self-interested efforts, the Tammany machine rallied Irish tenement residents, telling them — falsely, of course — that the rules and regulations were being used prejudicially against their neighborhoods and that quarantines bypassed "Niggers" — the Irish immigrants' key enemies — in favor of

targeting those who had recently arrived from Erin.

A similar tension between immigrants and blossoming public health departments surfaced in other American cities as the flow of poor European immigrants hastened west. In Milwaukee, Wisconsin, for example, the population grew 182 percent between 1850 and 1870, largely due to German and Polish immigration. Housing density soared, along with infectious disease death rates. Creation of a city Board of Health in 1867, modeled after New York's Metropolitan Board, was immediately greeted with suspicion by the immigrants. And for three decades tensions between the immigrants and Board of Health would rise, eventually reaching violent levels over immigrants' refusals to be vaccinated against smallpox. As was the case with Tammany's political manipulation of poor Irish immigrants, politicians in Milwaukee manipulated animosity against the Board of Health, claiming evidence of anti-German and anti-Polish prejudice. Wave after wave of smallpox swept over Milwaukee between 1860 and 1900, making it the city's number one killer. With each outbreak the Board tried, with the assistance of the police, to find smallpox victims, isolate them in pesthouses, and vaccinate all of their relatives and neighbors. By 1894 a vigorous anti-vaccine campaign led by political opponents of Milwaukee's leadership and fueled by anti-police sentiments, would culminate in enormous riots and an attempt to lynch the city's health commissioner. The greatest numbers of smallpox deaths would, of course, occur in precisely the neighborhoods most violently opposed to quarantine and vaccination.⁸⁴

Another perennial theme of public health, which would haunt America well into the twenty-first century, arose: tension between the health concerns of native-born Americans and

the fears and suspicions of recent immigrants. In the mid-nineteenth century the U.S.-born population often saw immigrants as little more than sources of disease and filth, readily blaming them for all epidemics and, indeed, supporting sanitarian interventions that prejudicially targeted the newly-arrived poor. Even when prejudice was not behind health department actions political leaders could readily tap immigrant apprehensions, guiding the newly-arrived Americans to see discrimination where it did not exist. Throughout the nineteenth century public health leaders tended, on balance, to side with the needs and biases of the native-born population. During the twentieth century the imbalance would persist, prompting federal officials to, for example, designate Haitian immigrants a “risk group for AIDS.” And the same public health agencies would underplay issues that did preferentially afflict immigrants, such as the impact of pesticides on the health of Mexican farm workers, the remarkably high infant mortality rates seen in Latinos living in Los Angeles and a plague outbreak among Chinese immigrants in San Francisco. Throughout the twentieth century, public health leaders would, with considerable difficulty, walk a fine line between the exigencies and suspicions of the immigrant communities and those of the native born.

Despite such social challenges, the American sanitarians achieved great victories in the early 1870s. In New York, for example, Dr. Charles Chandler managed to finagle funds out of the Tammany-controlled coffers for construction of the city’s first public health laboratory. Memphis, Tennessee, Louisville, Kentucky, and New York City all built or improved their sewer systems, and each of those metropolises saw nearly instantaneous positive results as mortality rates plummeted.⁸⁵

Though grave epidemics still lay in store, the sanitarians' power and influence was on the rise, and America's health would never again reach the nadirs seen during the mid-nineteenth century.

Indeed, public health was about to discover the tools for the conquest of disease.

II.

It is in health that cities grow: in sunshine that their monuments are builded. It is in disease that they are wrecked; in pestilence that effort ceases and hope dies.

— *Annual Report of the Commissioner of Health, Milwaukee, 1911*

In retrospect, the turn of the century now seems to have been a golden age for public health, when its achievements followed one another in dizzying succession and its future possibilities seemed limitless.

— *Paul Starr*⁸⁶

In Europe during the late nineteenth century a great intellectual revolution was underway that would as profoundly change the way human beings viewed their role on Earth as had Darwin's 1859 delineation of evolution or Isaac Newton's proofs a century previously of the basic laws of physics.

In rapid succession many of the great microbial terrors that claimed millions of human lives every year would suddenly become less mysterious. Some would be understood, identified, analyzed, even controlled and cured. No longer shrouded in enigma, most epidemics wouldn't

need to be ascribed to such dark and frightening forces as the wrath of God, retribution for collective sin, Satanic visitations or evil spirits. Disease would suddenly become definable and, with that, be relegated to the status of problems humanity might solve.

The great debates of the past — spontaneous generation, miasma theory, sanitarianism versus contagion — would be resolved, or would take on new tones, as Science stepped into the picture. And if public health would suffer from any intellectual sins amid the pell mell delineation of disease information they would be arrogance and hubris.

On the eve of this great revolution, however, a host of essentially nonscientific measures had, by the 1880s, already vastly improved the public's health. Without such bold insights leaders had nevertheless taken many measures that kept their populaces healthier. Sewer and privy construction, improved drinking water quality, quarantine policies, street cleaning, enforcement of safer food, meat and milk production standards, paved roads — each of these measures had had its impact. In addition, railroad and teamster transport networks developed in post-Civil War America radically improved people's diets as fresh crops made their way into urban centers in bulk and at prices most working families could afford. While many children still lacked protein-rich and adequately varied diets, there was no doubt that fewer of them were nutrient deficient and malnourished in 1875 than had been so two decades earlier. In addition, many cities — notably New York and Boston — set up distribution stations that doled out fresh milk to poor children. That alone had a profound impact on the strength and stature of urban youngsters.

Though housing in urban areas remained atrocious for many of America's poor,

sanitarians were doing their utmost to improve the squalor surrounding tenements and slums. Horse-drawn transport ensured that manure continued to be a source of consternation, but most cities and large towns had taken steps by 1870 to ban free-roaming livestock and to limit the environmental impact of slaughterhouses. Furthermore, those businesses were slowly being shoved to the urban perimeters or the countryside under the pressure of rising city real estate values.

In New York City, for example, the death rate from nearly every infectious disease began to decline after 1870. In its earliest days, New York had been devastated by yellow fever and smallpox, and though both of those diseases would linger during the 1870s, they would never claim more than 0.15 percent of the population in a given year — a marked downturn from the 12 percent yellow fever had killed in 1702 or the 8 percent toll taken by smallpox in 1731.⁸⁷

In the 1840s it had been cholera that claimed the lion's share of lives. It had peaked in 1849 with a mortality rate of almost 2 percent of the population. Tuberculosis had claimed its highest death toll among New Yorkers in the years 1815-1819⁸⁸ but would not become a serious target of public anxiety or government action until its death rates had already fallen 238 percent from an average yearly peak of 650 per 100,000 to 276 per 100,000.

These three chiefly adult diseases fell as swamps were drained, window glass installed, sewers built, vaccination improved, and, perhaps, because nutrition was enhanced.

Still to come were ebbs and flows in the great scourges of childhood: measles, whooping cough, diphtheria, typhoid fever, and scarlet fever, each of which would, just forty years later, claim comparatively minor numbers of American lives.⁸⁹

By the end of the Civil War, however, the *Aedes aegypti* mosquito, introduced to American seaports via slave ships only a century earlier, had overrun the Mississippi Valley from the river's headwaters in Minnesota all the way down to its delta at the Gulf of Mexico. During hot summers in the Deep South, the mosquitoes swarmed in numbers so great as to make life outdoors all but intolerable.

And in 1878 the most devastating plague of them all, caused by yellow fever, struck the towns and cities of the Mississippi Valley with such ferocity that 100,000 people were sickened and at least 20,000 died. The death toll in hardest hit Memphis exceeded 10 percent of the city's population,⁹⁰ and New Orleans lost 5 percent of its population. Nearly every family in those cities buried at least one relative, and grief left its sobering mark on the culture for years afterwards.

The epidemic was handled the only way people knew how, by removing the sick from amid the well and, in severe outbreaks, completely depopulating entire cities, driving the terrified populace into the countryside. Such depopulation campaigns were, when necessary, executed at gunpoint by police, U.S. military units, and local militias in response to mayors and governors who earnestly believed that they were fulfilling their public health trust. Sadly, such actions often put people in even more direct contact with the the mosquitoes that were the vectors of the disease.

Yellow fever was dubbed The King of Terrors, and its relentless path of devastation along the Mississippi had a powerful effect on the national psyche. When President Rutherford B. Hayes delivered his 1879 State of the Union Address, he had to report that despite a booming

economy, peace and record crop yields, the nation was in debt. The cause of the arrearage was that “fatal pestilence” yellow fever.

“It is impossible to estimate with any approach to accuracy the loss to the country occasioned by this epidemic. It is to be reckoned by the hundred millions of dollars,” Hayes said, citing a figure that would, in its late twentieth century equivalent, have amounted to hundreds of billions of dollars.⁹¹ Though the Civil War wasn’t long out of national memory Hayes called upon northerners to put aside old animosities and come to the aid of the former Dixie states. What was at stake, President Hayes insisted, was the health of all and maintenance of the very fabric of the nation.

At Hayes’s bidding, Congress promptly passed the Harris Bill, creating a National Board of Health that was vested with broad powers of quarantine and epidemic control. And just four years later, urged on in part by the epidemic’s legacy, Congress also passed the Civil Service Act, which sought to professionalize and upgrade the quality of government workers, notably those dedicated to improving the nation’s health.

With the devastating yellow fever epidemics at center stage, it was initially hard for sanitarians and health leaders to take note of the staggering scientific advances that were occurring across the Atlantic. Government energies were focused upon rebuilding the grief-stricken, disassembled communities of the South. Further, the sanitarians, among whom Christian moralists predominated, were slow to note advances in science. In the United States, even those with a scientific orientation were hard-pressed to grasp immediately the totality of what was happening in Europe. Though the American Public Health Association was formed in

1872, it would be years before the organization implemented policies based on the staggering European revelations. News arrived slowly and only in increments, and the air of excitement that was invigorating scientists from Rome to Edinburgh was not felt with the same immediacy in North America.

Antiseptics were discovered in 1870 by England's Dr. Joseph Lister, who found that by pouring carbolic acid on a wound or a suture site infection there would never take hold.

Drs. Robert Koch in Berlin and Louis Pasteur in Paris were racing to identify the germs that caused diseases. In 1876 Koch discovered *Bacillus anthracis*, the bacterial cause of anthrax. The following year, Pasteur published evidence that "germs" caused septicemia, or life-threatening blood fevers. And the next year, Pasteur scooped Koch, turning the German's *Bacillus anthracis* discovery into a vaccine for anthrax — which he used successfully on sheep. The next year, Pasteur discovered that attenuated, or deliberately weakened, forms of smallpox and anthrax could have an immunizing impact, causing fewer side effects and risks to the vaccinees.

In 1880 Pasteur published his landmark Germ Theory of Disease, in which he argued that all contagious diseases were caused by microscopic organisms that damaged the human victim at the cellular level — as Virchow had argued — and spread from person to person.

The already brisk tempo of discovery then, remarkably, quickened.

The following year, Russia's Ellie Metchnikoff, working at Pasteur's laboratory, found that in the pus that surrounded wounds and infections were powerful disease-fighting cells he called phagocytes. And he argued that disease was something of a battle, that pitted phagocytes,

or white blood cells, against germs.

In Berlin, Paul Erlich went a step further, discovering that animals who survived an infection had substances in their blood that could successfully fight off the disease in other affected animals. He called the agents of ailment toxins and his newly discovered substances antitoxins. So enthusiastic was Erlich about the miraculous powers of antitoxins that he dubbed them “magic bullets.”

Back in Paris, Emile Roux, working with Pasteur, developed a rabies vaccine and successfully immunized dogs. The same year — 1881 — in far off Havana, Cuba, Dr. Carlos Finlay demonstrated that *Aedes aegypti* mosquitoes carried yellow fever.

The dizzying pace of discovery, which dazzled the European public, was just beginning. In 1882 Koch trumped Pasteur, discovering *Mycobacterium tuberculosis*, the cause of TB.⁹² And in 1884 he discovered *Vibrio cholerae*, the cause of cholera.

Barely had the ink dried on newspaper headlines worldwide trumpeting the great news about cholera, when Pasteur successfully vaccinated Joseph Meister against rabies. Cities and charities all over the world raised funds to ship children to Paris so they could receive Pasteur’s magic anti-rabies potion. In 1885, four children were sent from New York.

And in 1889, back in Berlin, Emil Behring discovered a diphtheria antitoxin.

Among the most progressive public health leaders in America it was understood that these discoveries had suddenly filled their previously sparsely stocked shelves with a delicious new shipment of tools. If the identity of each great microbial killer was established, diagnostic tests, vaccines, and cures couldn’t be far behind. Suddenly there was a rationale for vaccination,

which they had long urged but never could explain to skeptics. Now, they reasoned, vaccination worked because small amounts of germs prompted the body to make antitoxins that filled the blood and protected the vaccinee.

In Minnesota Charles Hewitt hungrily devoured every parcel that, however belatedly, brought the thrilling news. In 1873 he built a public health laboratory, modeled directly on the one Charles Chandler had erected seven years earlier in New York. When smallpox slammed Minnesota in 1877, Hewitt again turned to New York for a strategy. He discovered that the previous year that city had constructed a laboratory for mass production of vaccines and had mandated immunization of all school children.

Hewitt began to lobby the Minnesota legislature, asking for funds to build such a vaccine center, purchase a microscope, and travel to New York and Europe where he might learn more about the great revelations of the day. For the first time, the state's political leaders had to vote on funding for a scientific pursuit that most did not comprehend. Hewitt proved a forceful persuader and would later instruct public health colleagues nationwide on the importance of becoming politically adept. Here, Hewitt sounded yet another lasting theme of American public health: the necessity that well-honed political skills be in the hands of those most directly involved in ensuring the community's healthy well-being.

In 1888 the State of Minnesota, population 1,447,578, bought its first microscope — a Zeiss light scope that, to Hewitt's delight, sat perched on a benchtop in his new laboratory. For joyful hours he pored over his precious Zeiss, gazing at a world he had never imagined existed. Millions of infinitesimal creatures darted about, but Hewitt could not begin to tell which were

diphtheria, or tuberculosis or other disease-causers.

He felt he simply had to travel to Europe to sit at the feet of the great Koch and Pasteur.

This was awfully lofty thinking for a man who commanded an annual state budget of \$500 and single-handedly ran the health department in a state largely populated by recently immigrated Scandinavian farmers. But Hewitt typified the zealous disease-fighters of his day in that once his intellect had been titillated there was no turning back. As early as 1871 he told the Minnesota State Medical Society of his conclusion that “antiseptics act by destroying all sources of decay in producing the death of organic living germs,” a striking conclusion drawn from Lister’s discovery of the antiseptic properties of carbolic acid. It seems that Hewitt already had ideas Pasteur would later refine as the Germ Theory of Disease.

In 1889 Hewitt made his voyage and visited and worked in laboratories in Dublin, London, Berlin, and Paris. He learned not only techniques of research but also the overall concept of the scientific method: forward an hypothesis, construct a controlled method for testing that hypothesis, and derive conclusions based only on the revealed data (not on hoped-for results). His number one lesson was a dangerous departure from the Christian-informed principles underlying sanitarianism: Let Science be your guide.

When Hewitt returned to Minnesota after a year overseas, he was a changed man. His intellect was sharpened, his laboratory skills were honed, and his zeal and optimism were at their zenith. No challenge seemed too great to Hewitt: he had been to the metaphorical mountaintop, received the holy word of germ theory, and knew precisely what path he and his adopted state should now follow.

It would not be an easy journey, nor would he meet with sudden success.

Hewitt's state faced a strange division on matters of health that he was powerless to control: an extraordinary rift existed between two towns that straddled the headwaters of the Mississippi River. On the eastern side was the staid, comparatively sophisticated town of St. Paul, which, by the 1880s, was busily erecting most of the defining structures of America's better cities: bridges, vaulted churches, paved, tree-lined boulevards, a city hall, and cultural centers. As early as 1854 St. Paul had established a city board of health. On the west side of the Mississippi was far more free-wheeling, immigrant-packed Minneapolis, a town that would just as soon go without most aspects of government, taxation, and civic development. Not only did Minneapolis lack a board of health, it didn't even have a health officer on the payroll until 1867.

In 1882 each town voted on whether or not to spend considerable funds to build a system to bring the metropolis untainted water from nearby lakes rather than continue to use wells that were contaminated by ground water seepage from the sewage-filled Mississippi. At the time, both cities were suffering significant typhoid fever and cholera epidemics, and child diarrhea rates were astronomical. Hewitt's census concluded that about 1,450,000 people lived in Minnesota at the time and 14,700 died annually — with typhoid fever one of the chief causes of death. Typhoid fever and diarrheal diseases typically killed 800 to 1,000 children annually in the Twin Cities (Minneapolis and St. Paul), about 10 percent of the annual cases of those diseases. There would seem, then, to have been ample incentive for adopting new water policies.

Or so Hewitt and the cities' health officers thought.

After much debate, St. Paul voted in favor of spending the money, and during the 1880s

its typhoid fever, cholera and diarrheal disease rates progressively dropped as the water system reached more neighborhoods. In contrast, Minneapolis not only voted against the proposal but continued to oppose such expenditures for three more decades — and suffered escalating typhoid fever and diarrheal disease rates as a direct consequence. Typhoid fever would drop to insignificant levels in St. Paul by 1900 but would soar in Minneapolis to epidemic proportions well into the 1930s. In 1935 Minneapolis would suffer a typhoid fever epidemic that sparked one case of the disease every hour throughout the summer, killing one victim in ten.

On the eve of the 1882 water vote, Minneapolis's only health officer, Dr. A.H. Salisbury, rebuked the city's citizenry and political leaders: "But when the water they drink is first filtered through stable refuse and privy-vaults; when the air they breathe comes from cesspools and sewers; when their food is drawn from diseased slop-fed cows, this infant mortality is not so surprising... Let us, then, no longer drink the filth drained from ten thousand cesspools and flavored with the putrid carcasses of dead animals, but unite in demanding pure, wholesome, healthful water."⁹³

Sadly, Minneapolis was unmoved, and Hewitt and his local colleagues were defeated.

Hewitt had better luck with the state's legislature.

Shortly before Hewitt left for Europe he had, thanks to his impressive political skills, maneuvered passage of some key laws. At his urging, Minneapolis appointed its first meat inspector in 1886 in the wake of a wave of hundreds of food poisonings in that city. The next year the state passed an act mandating that Hewitt's department maintain vital statistics records on all Minnesotans: births, marriages, deaths, causes of death, and the like.

Now Hewitt was ready for far more serious action. He set to work improving his laboratory, pressured the legislators for a Health Department staff, and vowed to take steps that would, he claimed, soon eliminate smallpox, tuberculosis, and diphtheria from Minnesota.

A similar trend of rapid transformation of public health activities was underway all over America. In the ranks of the leadership and/or staff of health departments nationwide were individuals who whole-heartedly embraced Pasteur's germ theory of disease, reveled in the new-found possibilities of their laboratories, and, practically overnight, changed the methods, strategies, and tactics of government public health. Past measures of disease prevention and epidemic control may have been effective — at least in some cases — but they lacked scientific explanation. Without a clear rationale for draining swamps or vaccinating children, health advocates had little choice but to await an epidemic and, capitalizing on the public's hysteria, twist the arms of politicians and men of commerce in order to obtain the desired laws and funds.

The germ theory changed that. While funding would continue to ebb and flow with the tide of politics and the level of public concern about contagion, support for prevention efforts became more sustainable. Advocates could now use their new laboratories to provide scientific evidence of a specific contamination or infection. And, in addition, they could prove to skeptics that a particular intervention was, indeed, responsible for lowering germ levels in the social milieu where it had been applied.

In short, public health suddenly had an empirical basis that rested upon demonstrable facts.⁹⁴

Nowhere was the impact of germ theory more powerfully felt than in New York City

which, in a few short years, would metamorphose from one of America's sorriest, most cesspool-like excuses for a metropolis into the world's paragon of government action on behalf of the public's health.

Toiling in that city's laboratory were Drs. T. Mitchell Prudden and Hermann Biggs, both of them firm adherents to the germ theory of disease. This duo was determined to develop rapid screening tests for identification of dangerous germs in food, water, and human samples. By 1885 they had found ways to crudely identify bacterial contamination of milk and water, but their first real triumph came two years later when they discovered how to spot cholera *Vibrio* in fecal samples. Their test deployed cholera antitoxins, Erlich's "magic bullets," against the toxins secreted by cholera bacteria, and it was first used on samples taken from passengers and crew aboard an incoming ship. When they got a reaction to a sample in their test tubes, Biggs and Prudden were certain that the person from whom it was taken was carrying cholera.

The implication was profound: rather than quarantine an entire ship and risk the wrath of both paying passengers and the businessmen waiting on shore for the cargo, science could identify a handful of cholera carriers who ought to be detained for isolation and treated, and the rest could step out onto New York's docks.

Biggs and Prudden pushed for routine use of the procedure, but they were initially rebuffed by stingy city officials. Once again, Tammany Hall had seized control of the New York Health Department, forcing the "resignation" of dozens of physicians and scientists and prompting the following from the *New York Times*: "The Board of Health cannot be used as a political machine in the service of Tammany Hall, or managed under the sway or direction of

politicians, without driving from its assistance all physicians of high standing in the community.”⁹⁵

Biggs and Prudden were able to float above the impact of the corruption, protected by virtue of having been appointed to the city’s laboratory in 1885 by none other than President Grover Cleveland. In the 1880s the United States still lacked much of a federal public health infrastructure, but the great Mississippi Valley yellow fever epidemic had sobered Washington politicians. Amid an ever-escalating tidal wave of immigration, mostly from Europe’s poorest and most marginalized social classes, the nation’s leaders feared that the immigrants, perceived as “filthy, dirty foreigners,” would import further epidemics. As most immigrants passed through New York harbor, President Cleveland reasoned that he ought to place a pair of top scientists inside that city’s spanking new bacteriology laboratory.

By the late 1880s metropolitan New York (meaning all five boroughs of what would, when eventually combined, constitute New York City) had nearly 2 million residents, about half of whom lived in Manhattan. About 40 percent of the population had been born on foreign soil. On any given day the harbor was a beehive of ships, buzzing in and out to sea or across the East River to Brooklyn.⁹⁶

Amid all that activity, the protection of the nation from contagion imported through the port of New York — whether real or imagined — rested on just two sets of shoulders.

Theophil Mitchell Prudden was, at the time of his federal appointment in 1885, a thirty-six year old graduate of Yale Medical School. The son of an immensely wealthy New York family, Prudden was one of the rare members of his social class who dedicated his life to science.

Educated at the best of America's schools, Prudden was well-versed in Europe's bumper crop of scientific discovery and imbued with a youthful zeal over Pasteur's germ theory. During the early 1880s he studied in the best laboratories of Germany and Austria and even toiled beside the great Robert Koch. When President Cleveland selected Prudden, the young scientist was on the faculty of Columbia University, teaching its first courses on medical applications of histology, pathology, and bacteriology. A skilled orator, Prudden preached the gospel of germ theory and contagion and left converts in his wake wherever he went.

Hermann Michael Biggs was ten years Prudden's junior but already an awesome presence on New York's medical landscape. A native of that city, Biggs had trained for medicine at Bellevue Hospital, though his scholastic experience paled compared to that of Prudden. What he lacked in academic training, however, was more than compensated for by his uncanny political skills. More than any other individual in America in his day, Biggs understood the intimate relationship between politics and public health and could successfully maneuver around corruption, complacency, and cronyism. In less than twenty years, backed by the power of the germ theory, Biggs would move public health from near the bottom of New York's ladder of political clout and public esteem to the top. By the end of his era of influence, public health in New York City and state — and, by example, all over America — would have powers so great as to outweigh those of Tammany Hall, mayors, police commissioners, and even the titans of commerce.

Although the nation's first bacteriology laboratories were actually established elsewhere (in Laurence, Massachusetts, Ann Arbor, Michigan, and Providence, Rhode Island), it would be

the New York City bacteriologists who would reshape both their usefulness and their authority. Prudden would prove to be the intellectual giant, Biggs the street-savvy political force.⁹⁷

In 1888 the city's Board of Health named Biggs and Prudden "consulting pathologists," appointing them as city employees. The pair immediately set to work to confirm Koch's discovery of the bacterial cause of tuberculosis and to demonstrate that the germ resided in the sputum and lungs of infected individuals. It was passed from person to person, they argued, via coughing, shared utensils, drinking glasses and spit. In light of Biggs and Prudden's demonstration of a physical basis for contagion, the Board ruled that physicians should be required to report all tuberculosis cases by name to the Department of Health. Those physicians who served wealthy and middle class clients largely refused to do so and decried the measure as "autocratic" and "dictatorial." It would be years before Biggs and his colleagues would successfully pressure compliance from New York's doctors.

Prudden and Biggs then turned their attention to dairy cows, which were known frequently to suffer from tuberculosis. At the scientists' urging, beginning in 1890 all dairy cows in metropolitan New York had to undergo TB tests, and neither milk nor meat from infected cows could be sold. The following year the duo showed scientifically that the bacteria in diseased cows was indeed passed to their milk and, potentially, from there to humans.

Though the final point — that people could catch tuberculosis as a consequence of consuming contaminated milk — wouldn't be proven until 1896, the links appeared clear enough before then for Biggs in New York and Hewitt in Minnesota to call for mandating both TB inspection of milk and the destruction of diseased cows. These findings and actions came within

four years of Koch's discovery of *Mycobacterium tuberculosis* — remarkably fast, given that scientific information and laboratory samples crossed the Atlantic only at the pace of steam ships.

As old scourges such as smallpox and yellow fever receded and cholera took a temporary hiatus, diphtheria surged all across America — nowhere worse in the early 1890s than in New York City. The bacterial disease typically struck children during cold winter months and was highly contagious. From 1880 to 1896 New York averaged 2,000 diphtheria deaths each year — some years far more. In 1881, for example, the disease killed 4,894 New Yorkers, most of them small children, and increased the city's overall mortality rate by 14.5 percent. In 1887 diphtheria's toll was 4,509 people.⁹⁸ That was the year the Department of Health showed that it was possible to improve ailing children's chances of surviving *Corynebacterium diphtheriae* by forcing a breathing tube past the bacterially-induced mucous plug that typically blocked the back of the throat. But this was hardly adequate, and more than 10 percent of all children who contracted the disease eventually succumbed.

Biggs and Prudden did not yet realize — but soon would discover — that survivors of diphtheria continue to spread living, deadly bacteria to others for more than six months. And, like TB, diphtheria could grow in cows and be passed to children in contaminated milk.

Overshadowed by yellow fever, smallpox, and cholera, diphtheria hadn't claimed significant numbers of New Yorkers prior to 1870, but by 1885 it killed 170 of every 100,000 residents yearly.⁹⁹ Amid the growing concern about diphtheria, Biggs and Prudden were ecstatic in 1889 when Behring discovered a “magic bullet” diphtheria antitoxin in the Koch lab. It

seemed possible, the New Yorkers dreamed, that diphtheria could soon be relegated to the status of “insignificant infections.” Like Minnesota’s Hewitt, Biggs agitated for funds to make the voyage to the great Koch laboratory in Germany in hopes of finding a way to cure diphtheria.

But first Prudden and Biggs were to face a far more threatening microbe — New York’s familiar nemesis cholera. In 1892 *Vibrio* surfaced in Hamburg, Germany and spread so rapidly that Prussian officials were swiftly overwhelmed.¹⁰⁰ What began as a smattering of isolated cases in that city soon spread to more than 10,000 victims. By summer’s end, 8,605 residents of Hamburg would be dead, and the epidemic would be raging across the entire European continent.

For New York health officials, word of an especially virulent cholera in Europe came at a terrible time. Tammany Hall had just regained control of the city government, the pace of immigration was quickening, and labor tensions threatened to explode in the wake of the strike and July 6th battle between workers and Pinkerton guards at Andrew Carnegie’s Homestead steel plant in nearby Pennsylvania. To stem the spread of disease, the U.S. Public Health Service opened an immigrant screening center on New York Harbor’s Ellis Island and expected laboratory assistance from the understaffed New York City Department of Health.

Fortunately, before the Tammany thugs could get their hands on the Health Department budget, Biggs and Prudden created the Division of Pathology, Bacteriology and Disinfection, which oversaw the department’s laboratories and partially insulated their budgets. A few powerful businessmen raised \$200,000 in private funds for the Division, and — despite Tammany-inspired indolence on the part of government — the entire city underwent a thorough scrubbing. When the first cholera carrier arrived in New York Harbor aboard the *Moravia* late

that summer, Biggs and Prudden's fecal screening test was in routine use, and the choleric individual was identified and isolated aboard a floating hospital in the East River. As other ships arrived from Europe and, in particular, from Russia where 2,500 people were dying daily from the disease, their ailing passengers were laboratory-identified and isolated in the same manner.

A handful of cases escaped that safety net into the city's thousands of tenement. But they, too, were discovered thanks to an army of hundreds of health department staff and summer corps volunteers — most of whom conducted school health programs during the rest of the year. This zealous group hunted through every housing unit in search of diarrhea victims and filled privies and toilets with disinfectants.

Thanks to these actions, in 1892 only nine people died of cholera in New York City, while tens of thousands perished from Vladivostok to Lisbon to London.

It was a phenomenally successful demonstration of the strength and dynamism of germ theory-based public action. The forces of sanitarianism, embodied in the armies of white-coated street sweepers, privy scrubbers, and summer corps volunteers, worked in tandem with the laboratory-based scientific efforts of Biggs and Prudden.

The impeccably dressed Dr. Biggs was an overnight sensation and the hero of New York. Though he was barely thirty years of age, Biggs captured the confidence of once-cynical New Yorkers by keeping his collar stays stiff, his pince-nez wiped clean, and his fingernails well manicured. To the sanitarians, young Biggs' stern, chiseled face, tidy, short brown hair and mustache looked — well, clean. For older physicians and scientists, Biggs could exude preternatural maturity. And, when necessary, for the Tammany scoundrels Biggs could put on a

face of fierce determination and wily insight.

As the first frosts of '92 hit New York, allowing the city to accept as truth the seemingly impossible, tiny cholera death toll, Biggs made sure that every newspaper, community group, and politician gave his laboratory full credit. And he seized the euphoric moment to push more ambitious programs and greater public support of science and, in particular, of microbiology. By all accounts, Hermann Biggs was a remarkably immodest man, but in bustling, aggressive New York arrogance that appeared to be justified by experience was a much-admired character trait.

The only thing that slowed down the confidently tenacious Biggs was a severe economic recession that held the American economy in its grip from 1893 to 1897 and offered little prospect of significant funds for the Department of Health. Money would always be in short supply. But not so popular support or lofty goals. The social environment was, coincidentally, also metamorphosing to Biggs's advantage as it called for greater civic responsibility and an end to the enormously wide gulf that separated the country's small, wealthy class from the vast majority of its citizens.

Built thirty years previously, New York's 843 acre Central Park had become a vibrant nexus of culture and nature in which people of all classes intermingled, enjoyed concerts, ice skated atop the once-fetid malarial swamps, and pursued spring romance upon the great lawns. The major thoroughfares of the metropolis were fully paved, and cobblestones lined thousands of small byways. Horse-drawn trolleys carried passengers along dozens of lengthy routes, unfortunately adding to the stench of manure. But by 1890 the populace was abuzz with talk of "pneumatic tunnels," "underground trains," and steam-powered subways. In 1894 the city voted

to begin subway construction, which would continue for decades thereafter.

Amid such signs of civic pride and development, another, far more activist, movement was underway which more directly affected the activities of Biggs, Prudden, and the Department of Health: the anti-tenement movement. In New York its most influential activist was Danish-born photographer and writer Jacob Augustus Riis. Seven years after immigrating to the United States in 1877, Riis went to work for the New York Tribune, where his tireless documentation of the squalor and despair in the city's slums and tenements brought him great notoriety. In 1890 Riis wrote his masterpiece, How the Other Half Lives. In prose and photographs this book starkly revealed the lives of the immigrant poor of New York's Lower East Side. Riis was no socialist or liberal, and some of his writings not only blamed the poor for their own squalor but were flagrantly anti-Semitic, anti-Irish, and hateful of Chinese immigrants. Yet his appalled readers also got a visual image of tenement hell holes and a vivid description of their odors, sounds, and claustrophobia. In the worst of them, located on what was called "Lung Block," could be found the city's densest concentrations of infant mortality, tuberculosis, and pneumonia.¹⁰¹ Lung Block was inhabited by 4,000 people, ten-fold more than lived on any average New York block. Crammed five or six to the room, its inhabitants witnessed 265 cases of tuberculosis during the 1880s for a case rate of 6.6 per 1,000 people — possibly the highest in the world at that time.

Of one tenement building in Lung Block Riis wrote:

The ground floor of the house is a pork shop where huge cauldrons of pork fat boil day and night. Even from the roof above we noticed the sickening odor. Inspecting the cellar, we found a strange odor of gas. The floor as usual was damp uneven earth. A huge sewer main ran along one side. In this we found

three gaps the size of your fist, and....hence the odor, which mingled with the other odors in the pit outside.

Riis estimated that there were 1.5 million people living in such New York City tenements in 1890, or about 60 percent of the population of Metropolitan New York.¹⁰²

The lives of New York tenement dwellers were made all the more grim by the appalling conditions of their workplaces and schools, all of which were also under scrutiny by social activists of the so-called “gay Nineties.” In 1886 the New York State legislature had passed America’s first set of women and child labor protection laws, and six years later New York City set the legal minimum age for child laborers at fourteen years. This angered industries such as textiles and hat-making that had long employed children as young as five or six, claiming that their tiny hands had the dexterity needed for needle and bead work. In addition, union agitators, anarchists, socialists, and communists, spurred to action by the 1892 Homestead steel factory strike and shootout in Pennsylvania, were all gaining strong followings in both New York’s most impoverished neighborhoods and in the parlors of the educated elite. Similar social movements were arising across the industrialized Northeast and Midwest. Even in the Pacific states of the Far West, socialists and anarchists were finding favor among poorly paid laborers.

Chief among the demands shared by all these geographically and ideologically disparate movements was the call for greater occupational safety.

In the mid-1880s the Massachusetts Bureau of Statistics of Labor issued reports on working conditions that affirmed the link between poor health and adverse labor conditions. One such report, focused on textile mills, found that:

The health of many girls is so poor as to necessitate long rests, one girl being out [of the

factory] a year on this account. Another girl in poor health was obliged to leave her work, while one reports that it is not possible for her to work the year round, as she could not stand the strain, not being at all strong. A girl... was obliged to leave on account of poor health, being completely run down from badly ventilated work rooms and obliged to take an eight months rest; she worked a week when not able, but left to save her life. She says she has to work almost to death to make fair compensation (now \$12 per week).¹⁰³

The same winds that would in twenty-seven years blow the Bolsheviks into power in Russia were gusting all over America in 1890. In the streets of New York, Russian immigrant Emma Goldman shouted for a revolution that would overturn the wealthy classes. The Socialist Labor Party organized German immigrants. Jewish organizers were creating what would become a nationally popular Socialist Party of America. On behalf of anarchist German immigrants, Johann Most's Freiheit openly advocated for terrorism and sabotage. The anarchist sect Pioneers of Liberty similarly rallied Yiddish-speaking immigrants, and the publication L'Anarchio reached out to poor Italians. By 1890 such agitation had sparked riots, protests, labor stoppages, and mob attacks upon food delivery vehicles and warehouses. In 1895 a Brooklyn riot would escalate to include pitched gun battles between workers and police.¹⁰⁴

Less radical reformers such as Alice Hamilton¹⁰⁵ and Florence Kelley bridged the sanitarian and workers' movements by decrying what they believed was clearly a tuberculosis triad: poor working conditions, densely-packed tenement housing, and malnutrition. In 1890 charity groups claimed that one out of every four New York City working class families lost a relative to tuberculosis that year — a phenomenal, yet genuine, claim.

On an entirely different front, a variety of organizations were demanding improvement in the lots of women and children. From the upper classes came the Suffragettes who marched the streets demanding women's right to vote. Anarchist Emma Goldman lamented "the fierce, blind

struggle of the women of the poor against frequent pregnancies” that forced them to raise “sickly and undernourished” children amid squalor. In Greenwich Village, Margaret Sanger, the wife of a wealthy businessman, published and distributed pamphlets on birth control, decrying the extraordinary death toll among women who, despite the continuing risks of puerperal fever and other pregnancy-associated ailments, were expected to give birth to six or more children.

In one speech, Sanger described to her listeners “the group who have large families and have for generations perpetuated large families”:

I know from my work among those people that the great percentage of these people that are brought into the world in poverty and misery have been unwanted. I know that these people are just as desirous to have means to control birth as the women of wealth. I know she tries desperately to obtain the information....In this group, what do we have? We have poverty, misery, disease, overcrowding, congestion, child labor, infant mortality, maternal mortality, all the evils which today are grouped in the crowd where there are large families of unwanted and undesired children.¹⁰⁶

Abortion was on the upsurge all over America, particularly in crowded cities, despite strong opposition to the procedure among religious leaders and physicians.¹⁰⁷

All of this social unrest and discontent would grow, further polarizing urban America over coming decades. For the expanding middle classes and the old, native-born elite of eastern cities, these movements were cause for considerable consternation and evoked two key responses: anti-immigrant sentiments and capitulation to nominal reform sparked by fear of all-out social unrest and disease contagion.

All of this worked to the advantage of the new public health advocates such as Hermann Biggs. Hardly advocates of social revolution or anarchist revolt, yet increasingly aware of a connection — biological or epidemiological — between poverty and disease, public health

leaders offered the wealthy and middle classes a safe ground for compromise.

The middle class embraced to an extreme the idea of a germ theory of disease, becoming germ-phobic. While the wealthiest New Yorkers may have abhorred germs, they could avoid the riffraff or escape to distant estates. The middle class, however, felt trapped. For them, everything from public library books to dust could harbor lethal germs. Germicide sales boomed, and ladies and gentlemen always carried handkerchiefs with which to cover their faces at the first sight or whiff of garbage cans, unwashed people, dead animals or “sewer gas.”

Germ phobia drove the widespread popularity of the journal Sanitary Engineer which heavily supported “scientific plumbing” and the National Association of Master Plumbers. And by 1890 installation of a ceramic toilet had become a key sign of class distinction. Civic sanitary associations, which sprang up in every middle class community of the day, declared that all manner of diseases lurked in privies and old-fashioned water closets, including a raft of ailments never proven to be associated with water or human waste.¹⁰⁸

Porcelain toilets, along with easy-to-sanitize tile floors and ceramic faucets and bath fixtures, were the rage in the 1890s, despite their considerable cost. Such a toilet could be had for \$40, water filters for \$60, and floor tiles sufficient for a typical bathroom for \$5 to \$10. But the appliances were only part one of the cost: plumbing that brought in safe water from a city source and pumped it throughout the house could easily double the cost. For middle class households, which typically lived on \$1,200 to \$5,000 a year, it was a tough sum to raise. For working class households, which averaged \$600 a year, it was impossible.¹⁰⁹

Fear of germs was prompting families to spend money on their kitchens, as well. In rural

America such extravagances would be unobtainable for another four decades, but in the major cities of the United States by 1890 kitchens had sinks, piped water, and ice boxes. The former allowed women to scrub dishes clean. The latter offered the far more important health benefit of reasonably cooled foods and a resultant lower risk of salmonella, botulism, and other food-borne diseases. By 1890 ice boxes were as common in New York City as stoves, meaning they were ubiquitous in middle class homes.

This germ phobia and resolute commitment to stomping out the bugs ultimately fueled support for grand public health schemes. Because the middle and upper classes were convinced that the poor — particularly immigrants — were the source of all truly terrible microbial scourges, they were willing to pay the price in higher taxes for biological, as opposed to class, warfare. The sanitarians supported provision of some health hygienic services to the working people in America's cities. By 1890 in New York City, for example, nearly a quarter of all health care was provided free by tax-supported municipal dispensaries, and in 1887 the Board of Aldermen had agreed to spend funds to install toilets in all of the city's public schools. But the sanitarians also imposed a moralistic judgmentalism that openly expressed disdain for the religious, family, and cultural lives of the poor. As the National Association for the Study and Prevention of Tuberculosis put it after the organization's creation in 1904, "Through the Agency of enlightened selfishness...the upper 10,000 are learning that their sanitary welfare is indissolubly connected to that of the lower 10 millions."¹⁰

Harper's Weekly put the matter of class tensions starkly in 1881 with a cartoon depicting a conversation between the goddess Hygeia and a top hatted man of wealth. Pointing to streets of

filth and poverty, Hygeia berated the man, saying, “You doubtless think that as all this filth is lying out in the back streets, it is of no concern of yours. But you are mistaken. You will see it stealing into your house very soon, if you don’t take care.”¹¹¹ By 1890 the message was hitting home. The public health revolution began.

Projects of enormous scale, which would profoundly improve communities’ health, were undertaken at the behest of the wealthy and middle classes. The most grandiose was executed in Chicago, under the leadership of engineer Ellis Chesbrough. He oversaw construction of a vast network of sewers during the late nineteenth century, most of which were brick tunnels six feet in diameter that ran under the city and emptied into the Chicago River. To accomplish this, Chesbrough actually elevated the city, neighborhood by neighborhood, to get it above the water table. However, the flow of the river carried the sewage into Lake Michigan, the primary source of Chicago’s drinking water. So Chesbrough oversaw construction of a massive, hand-dug tunnel sixty-nine feet below the surface of Lake Michigan. The tunnel reached two miles into the lake, drawing water from a distance thought to be well beyond the Chicago River’s sewage. As the population of Chicago grew, dumping more sewage into the system than it could safely absorb, the city actually reversed the flow of the Chicago River, added parallel drainage canals, and carried its waste to the Illinois River.¹¹² By 1900 the city of Chicago would have successfully re-engineered the natural flows and drainage of two rivers and three canals in order to deal with its sewage and tunneled two miles out into the largest of the Great Lakes to tap its fresh water.

Slightly less grand, but nonetheless ambitious, water and sewer schemes were executed

all over America following demonstration of the so-called Mills-Reincke Phenomenon,¹¹³ which showed that a community's cholera rate correlated with its water pollution levels. And in 1893 Providence health officials inspired further civic action nationwide by demonstrating that adding coagulants to water filters eliminated most bacterial contamination: the bacteria adhered to the coagulants and were easily trapped inside basic filters.

Back in Gotham, Biggs and his colleagues set the immodest goals of completely eliminating diphtheria and tuberculosis. Though Biggs declared a "War on Consumption" in 1893, he first set his sights upon diphtheria and, like Minnesota's Hewitt, made the journey to Europe to learn from the masters of microbiology. The New Yorker settled into the laboratory of Louis Pasteur, working beside Emile Roux.

Though Roux was a dozen years Biggs's senior, the French physician was a born collaborator who had since his earliest days in the Académie de Médecine in Paris put aside any thought of personal glory and deferred to his mentor and master, Pasteur. It was Roux, far more than Pasteur, who figured out the practical and scientific details of vaccine design, use, and production.¹¹⁴

By the time Biggs reached Paris, Pasteur was an old, much-celebrated man who rarely set foot in the laboratories he had inspired. France had a few years previously showered the scientist with every one of its highest accolades and named the complex of laboratories that had sprung up around the great microbiologist L'Institut Pasteur. When Biggs reached the 15th arrondissement of Paris, he found L'Institut flanked by the majestic Boulevard Pasteur. A few years later the road forming the western side of L'Institut would be named after Emile Roux. Hospitals,

laboratories, universities medical institutes, and streets worldwide were named in honor of Pasteur, and his moniker was known to all of the world's educated citizens. Arguably, he was the most famous and revered man of the day, and upon his death in 1895, Pasteur's stature would rise to near mythic proportions.

Young Biggs's visit to L'Institut and the Roux laboratory was, then, of extraordinary significance, not just for the career of the man but for the city and state of New York. Unlike Hewitt, Biggs was already a fully trained laboratory scientist when he reached Paris, and his skills were an asset to Roux. Roux developed a technique for making large quantities of diphtheria antitoxin by infecting horses and drawing their "magic bullet"-laden serum. At Roux's side, Biggs learned how to refine the technique, making the antitoxin safer and more powerful.

Upon his return to New York in 1894, Biggs immediately set to work with his staff building a diphtheria antitoxin production facility and lobbying for funds. The Hospital for Sick Children in Paris had just begun using diphtheria antitoxin with remarkable results — an immediate 50 percent reduction in pediatric death rates. Seizing upon that evidence, Biggs did something almost unheard of in 1894: he held a press conference. And for weeks he systematically and deftly maneuvered several of New York's many newspapers into supporting his diphtheria antitoxin laboratory. The New York Herald, in particular, trumpeted the cause and called upon readers to donate money for the laboratory. The Times used the need for such a lab, and Tammany Hall's refusal to devote tax dollars to the cause, as further grounds for attacking government corruption. By early 1895 Biggs's charitably-funded laboratory was the world's

largest diphtheria antitoxin producer and was also mass manufacturing smallpox and anthrax vaccines and a host of other “magic bullets.”

The City sold or gave away the antitoxin, depending upon the income level of the clientele of given physicians. Most New York doctors initially opposed use of the medicine, or lobbied with the drug companies to demand that rights to the “magic bullets” be turned over to the private sector for commercial production. But Biggs stood his ground and, through successful newspaper campaigns, rallied public support for use of the antitoxin. Soon distraught immigrant mothers from the tenements were turning up in dispensaries demanding “magic bullets” for their ailing children.

And diphtheria death rates in New York City plummeted, going from an 1875 high of 296 per 100,000 people to 105 per 100,000 in 1895 to 66 per 100,000 five years later. By 1912 New York’s diphtheria death rate would have fallen to just 2.2 per 100,000 residents per year.¹¹⁵ Soon every city in America was buying antitoxin from the Biggs laboratory.

Amid such heady success, Biggs turned his energies upon tuberculosis which, in 1895, killed 291 of every 100,000 New Yorkers. Though this was a marked decline from the 1815-1819 high of 650 per 100,000, New Yorkers were far more distressed about tuberculosis at the close of the nineteenth century than they had been at its opening. And the reason for their anxiety was also the source of Biggs’s optimism: discovery of the *Mycobacterium tuberculosis*. TB had always found victims in all social classes, but it was concentrated among the poor. The scientific reasons for such an association with poverty weren’t clear, but more affluent New Yorkers could console themselves that TB was unlikely to invade their stately homes because the

disease seemed to arise from the miasma of squalor. Discovery of a germ that caused TB suddenly made the affluent nervous. Could a servant's cough spread it? Might a visit to the South Street fish market envelop the shopper in a cloud of TB germs? The germ theory of TB had a very different effect on the people raising their voices on behalf of the working classes. If the microbe concentrated its lethal force among the poor, they reasoned, it must be the conditions of the working classes that facilitated TB germs.

For Biggs and like-minded public scientists, the discovery of the germ source of *phthisis*, as the Greeks had called it, meant that it was possible to analyze the apparent links between poverty and tuberculosis by deciphering which factors were truly responsible for the microbes' spread. Ever since tuberculosis first made its sweep across Europe during the expansion of the industrial revolution, every manner of explanation for the disease had been put forward. Although in Victorian England the pale skin, thin limbs, and glowing eyes of young women with consumption were considered highly attractive to young men, most of the world reviled TB, and individuals who coughed up blood because of their pneumatic infection were condemned or feared.¹¹⁶ No one had understood how tuberculosis spread among humans or from bovines to humans, nor could they begin to do so until Koch discovered the causative germ. Once the *Mycobacterium tuberculosis* was found, researchers like Biggs could, for the first time, base their TB control strategies on evidence of transmission. With the cow's milk connection already established, Biggs successfully pushed through a state law requiring pasteurization of milk.¹¹⁷ Coupled with laboratory screening of cows health as well as their milk, pasteurization virtually eliminated the bovine risk for human acquisition of tuberculosis.

In 1896 Prudden and Biggs got the Board of Health to outlaw spitting in public places — as a TB control measure. And the Board hired Dr. Josephine Baker, a zealous advocate of child health, to run programs targeting the schools. Baker set out to identify and isolate every single tubercular child in New York City.¹¹⁸

Biggs collected crusading allies, among them Dr. Edward Livingston Trudeau, himself a TB sufferer, who was indefatigable despite his chronic illness. By 1895 the sanitarium Trudeau founded at New York's Saranac Lake had become a model for the nation, typifying humane isolation and care of consumptive patients. Few other sanitariums existed, however, and most were located too far from the urban centers of the nation to prove practical depositories for impoverished victims of consumption.

Biggs and Trudeau joined forces to pressure New York to build a sanitarium within the city. But New York's physicians opposed virtually every move Biggs made regarding tuberculosis. They not only denounced his mandatory TB case reporting law, they also flagrantly violated both the letter and intent of most of the tuberculosis-related elements of the health code. Biggs's proselytizing of the germ theory did little to change the essentially bigoted attitude most physicians had toward TB. At the very least it was associated with the "slovenly and indolent" lower classes. At worst, physicians argued, it was a Jewish disease, brought to America by "weak Hebrews."¹¹⁹

Physicians were also increasingly disdainful of laboratory scientists who, they claimed, wiled away their days in comfortable surroundings making intellectual forays into the world of microbes, while doctors toiled in the real realm of human pain and pathology.¹²⁰ They viewed

TB reporting mandates as declarations of war and Biggs as the enemy's General. Both the New York Academy of Medicine and American Medical Association came out in opposition to the TB reporting statute and appealed to the state legislature in hopes of overriding it.

Trudeau and Biggs, on the other hand, cultivated their share of powerful supporters. The Metropolitan Life Insurance Company, which was based in Manhattan, rallied behind their War on Consumption. Citizens' anti-TB leagues were sprouting up all over the country, and they, too, recognized the paramount importance of success in New York. Jacob Riis and other housing reform activists were solidly behind the War on Consumption. And Biggs, skillfully mixing the rhetoric of germ theory with hints of the class warfare propaganda then abundant in New York, cultivated the press and won their staunch editorial support. Whenever possible, Biggs wrote articles for the leading newspapers and gave speeches — careful to ensure the presence of several sympathetic journalists in the audience.

“If as many deaths occurred daily for one month from Asiatic cholera in New York as regularly occur from pulmonary consumption, the city would be well-nigh depopulated from the panic resulting,” Biggs wrote in one of his articles.¹²¹

In an 1897 speech before the British Medical Association¹²² Biggs enumerated his War on Consumption strategies, tactics, and biases and received worldwide press attention for delivering the first clearly delineated strategy for attacking the disease. Many of his comments, delivered before a hall full of openly skeptical physicians, became the often-quoted battle cries of TB-fighters world wide. Just thirty-six years old, Hermann Biggs was already the undisputed leader of the new public health movement:

The government of the United States is democratic, but the sanitary measures adopted are sometimes autocratic, and the functions performed by sanitary authorities paternal in character. We are prepared, when necessary, to introduce and enforce, and the people are ready to accept, measures which might seem radical and arbitrary, if they were not plainly designed for the public good, and evidently beneficent in their effects. Even among the most ignorant of our foreign-born population, few or no indications of resentment are exhibited to the exercise of arbitrary powers in sanitary matters. The public press will approve, the people will support, and the courts sustain, any intelligent procedures which are evidently directed to preservation of the public health.

The most autocratic powers, capable of the broadest construction, are given to them under the law. Everything which is detrimental to health or dangerous to life, under the freest interpretation, is regarded as coming within the province of the Health Department. So broad is the construction of the law that everything which improperly or unnecessarily interferes with the comfort or enjoyment of life, as well as those things which are, strictly speaking, detrimental to health or dangerous to life, may become the subject of action on the part of the Board of Health.

It was a declaration of war, not only against tuberculosis but against any group or individual who stood in the way of Public Health or the sanitarians' Hygeia. That included corrupt politicians, patronage-appointed commissioners of Public Health, impoverished immigrants, civic and religious groups, mayors, governors, police captains, and — critically — doctors. Biggs and his counterparts nationwide stood their ground. And Biggs had one secret advantage: he was, himself, an excellent physician who counted among his patients some of New York's most powerful politicians. At the end of the 1890s control of Tammany Hall was shifting out of the hands of the old "Boss" Tweed sorts into cleverer circles that had influence over the national Democratic Party. To the helm of the new patronage machine came Charles F. Murphy — no friend of public health, but a man who owed his life to none other than Dr. Hermann Biggs, his physician. Under Murphy's leadership Tammany Hall remained as corrupt

as ever, but Biggs had a bizarre political alliance that he could exploit discreetly, when necessary, to out-manuever his opponents.

So Biggs successfully fought off the recalcitrant physicians and in 1897 was named Chief Medical Officer of New York City, despite stiff opposition. Once again, his remarkable political skill had brought him triumph.

Biggs won the TB reporting battle by defeating an AMA proposal in New York's State Legislature that would have rescinded his department's edict.¹²³ His battles with consumption — as well as with the medical profession — were just beginning.

It was 1898. America was at war with Spain; Teddy Roosevelt was leading troops up San Juan Hill in Cuba; and New York consolidated into one gigantic metropolis incorporating the boroughs of Manhattan, Brooklyn, Bronx, Staten Island, and Queens. Overnight Biggs and his colleagues became responsible for the health of 3.4 million people, the largest concentration of humanity on Earth at that time.

Such numbers must have seemed staggering to the 50,000 residents of far off Los Angeles County, even though that area was itself in the grip of a tremendous real estate boom. A consortium of wealthy men, “robber barons” to their critics, had bought up railroad access rights for the region during the 1870s and formed the Southern Pacific Railroad Company. The company, dubbed The Octopus by Los Angelenos, had a tentacle wrapped around every facet of the region's political and economic life. Los Angeles County's unique geography made it more dependent upon a rail system than any like community in the far west. The populated area of the county was growing horizontally rather than vertically, and, in general, it lacked a genuine core.

The actual City of Los Angeles rested in a huge basin that was flanked to the east and north by mountains. Its logical shipping port, San Pedro Harbor, was a full day's horse ride to the south.

Alliances of farmers, local businessmen, and workers organizations formed to oppose the rising power of Southern Pacific, for though the Octopus was needed, it was almost universally loathed by the citizens. The Octopus was so flagrant in its flouting of the law and its price gouging practices that it made an ideal target for anti-monopoly efforts.¹²⁴ But the movers and shakers of Los Angeles cared little about what a paltry 50,000 Californios might think. Instead, their eyes were on the tens of thousands of Midwesterners who would soon arrive, U.S. currency in hand, lured by real estate advertisements promising vast, open, and climatologically ideal land. Allied in the development scheme were the Octopus, an array of real estate developers, and the Los Angeles Times newspaper.

In 1887 that group kicked off a sales campaign that would, in just forty years, increase Los Angeles County's population an astonishing twenty-four fold. And, like African metropolises a century later, Los Angeles would grow so rapidly that its governance — and its public health — would be unable to keep pace. By 1930 it would not only be the most heavily populated urban center in California, but number one in the entire West. The boom began in 1887 because that was the year the last spike was driven connecting all of the Southern Pacific lines to the transcontinental Santa Fe Railroad, making it possible for a family to board a train in New York's Grand Central Station and, several days later, disembark in Los Angeles's Union Station. The developers deployed squads of hucksters to the big cities of the East and Midwest to offer seemingly terrific deals in Los Angeles specifically to white, mostly native-born

Americans. A Chamber of Commerce, comprised of realtors, was formed in Los Angeles to officially sponsor the real estate boom, and ad space was purchased in newspapers throughout the Great Plains and the prairie states.

WHO IS THIS LUCKY MAN? This means you. Here is a little speculation that will discount anything in the market. Eighty-five acres of choice land, suitable for the successful growing of strawberries of the finest kind, as well as any small fruit or vegetable, in the town of Compton, has been subdivided into 16 tracts...will be distributed among the lucky purchasers of the 16 tickets now for sale.¹²⁵

During the 1890s most of the fish who took the bait advertising Los Angeles were Protestant, white Midwesterners. They came for all sorts of personal reasons, but the sunny, mild climate was a primary attractant, particularly for those who suffered chronic tuberculosis, asthma or other respiratory ailments. Los Angeles was also attractive to adherents to a host of newly-popular religious and health movements that generally opposed current medical practices and even the germ theory of disease. It was, after all, easier to shun such things as diphtheria antitoxin and tuberculosis sanitariums if one lived where temperatures rarely dipped below 45 degrees Fahrenheit and could soar above 75 degrees Fahrenheit without even a hint of humidity. In comparison to the Midwest, staying healthy, even in the absence of medical care, was relatively easy. So California became the nexus of staunch opposition to the likes of Hermann Biggs and Charles Hewitt. And as California's role in national politics would increase, so would its negative impact on implementation of strong public health practices.

Among the immigrants to Los Angeles during the 1890s boom, for example, were followers of the Christian Science faith which opposed all forms of vaccination and medical treatment;¹²⁶ Sylvester Graham believers who closely adhered to his program of vegetarianism,

Graham Crackers, and abstention from alcohol; those who favored Colonel George Waring's assertion that germs were humbug and proper hygiene was sufficient for healthy living;¹²⁷ early German-style homeopaths; and, generally, adherents to the belief that "every man is his own doctor." The latter relied heavily upon self-administration of folk remedies — many of which dated to Medieval Europe.

By and large, the new settlers were a middle class, U.S.-born, straightlaced, teetotaling lot, disinterested in science or newfangled European ideas about nature and health. They came in droves to a place that just a couple of years previously had had the highest murder rate in the country and transformed it almost overnight into a series of staid, respectable towns, complete with white picket fences and steepled Protestant churches. For all, California was a sort of "giant outdoor sanitarium"¹²⁸ — relaxing, civil, warm, and soothing.

In the late 1890s two industries gingerly began in Los Angeles County that would ultimately transform the place and the nation: oil and movies. Enormous deposits of petroleum rested just below the surface of much of the county, as well as off-shore. In places such as La Brea, lakes of the black goo bubbling with natural gas and belching forth the bones of saber-toothed tigers and the Indians who had hunted them. By 1900 the oil industry would be booming, and in areas like Long Beach the once pristine, healthy air was filled with the eye-stinging fumes of petrochemicals pumped by Rockefeller's Standard Oil Company. In future decades those chemicals, and their daughter compounds emitted from automobiles, would form Los Angeles' greatest public health challenge.

As businesses boomed, so did the size of the blue collar work force, which was drawn

heavily from Gold Rush-era descendants from Northern Californian and European immigrants fleeing tenement life in the East.¹²⁹ African Americans also made their way to Los Angeles, which offered a less discriminatory social environment than in the East or Midwest and therefore the promise of opportunity. California's white population was not, however, less hostile because it was more enlightened. Rather, its anxiety was focused elsewhere — upon Mexicanos, Californios, Mexican-Americans (Anglos blurred these distinctions), and Chinese immigrants. While the white middle and working classes of Los Angeles were eager to displace these populations and prevent further immigration from south of the Mexican border or across the China Sea, The Octopus, Standard Oil, and big Los Angeles developers desperately needed the Mexicano and Chinese labor force. In part, they used these workers in order to undermine the socialist-leaning white laborer force, but the dominant exigency was for rapid, cheap construction of such massive projects as roads, bridges, railway stations, schools, oil derricks, and irrigation systems. From the earliest days of Los Angeles development in 1887 to the dawn of the twenty-first century, Southern California business would remain dependent upon immigrant Mexican labor, the general white population would oppose the enfranchisement and legal permanent residence of that same labor force, and the tension this dynamic engendered would underscore every single aspect the county's politics, culture, and economics.

Los Angeles's ultimate demographic pattern was already in place by 1899. Characterized by relentless population expansion across nearly 500 square miles — about half the size of the state of Rhode Island — the domination of white, Midwestern, conservative, middle class values, and businesses dependant on a non-citizen labor force, this pattern would become, and remain,

the county public health system's major challenge.

By 1900 at least forty-four towns had sprung up within Los Angeles county, and most of them lacked even a hint of governance. Developers put in a few roads, surveyed the property lines, sold off the lots, and walked away rich. It was up to an amalgam of strangers, all of them new to the place, to decide how to raise and spend taxes. Not surprisingly, even by the late 1920s most of the towns would still lack health officers or medical facilities. All of these towns shared an immediate need for water, sewage disposal, safe food products, hospital facilities, vaccination, and laboratory services, and collection of vital statistics. Yet only the city of Los Angeles could begin to pay for such things.

By the second decade of the twentieth century leaders of most towns and cities within the county favored creation of a single County Board of Health which would, under contractual agreements, execute the duties of public health for the entire region. Such a board was created in 1915¹³⁰ when the county's population was approaching 700,000 people, three quarters of whom were white. Initial health surveys were conducted that year by the county's first Health Officer, Dr. J.L. Pomeroy, revealing a wide racial gap in all disease rates as well as in death rates — most markedly, infant mortality. In the white population, eighty of every 1,000 infants born died before their first birthdays. Among the Mexicans and Mexican-Americans, however, infant death rates routinely exceeded 200 per 1,000 births, and in 1916 would top 285 per 1,000 — that is, nearly one third of their babies perished in infancy.

Pomeroy, a practical though uninspiring man, told the leaders of the county's many towns that "it must be clearly recognized that diseases recognize no boundary lines, and that the health

and social problems of the rural areas...are closely associated with those of urban areas.”¹³¹

So from its inception, organized public health in Los Angeles was more a county than a city function, and, also from the beginning, took on the role not of Biggs’s anti-disease crusades but of a service provider. Rather than ruffle feathers with great Biggs-style campaigns, Pomeroy’s county team concentrated on racing to give the ever-burgeoning towns and cities of Los Angeles the basics: food and water inspection, vaccines, and medical care. It made sense at the time, as the basics were desperately needed and the epidemics that ravaged the East were less severe in the mild climate of the West. Service provision was a critical characteristic of Southern California’s concept of public health: from the outset, government was the sole medical treatment provider for poor Los Angelenos and the primary provider for the entire populace. The California State Legislature passed a law at the turn of the century requiring that every county be fully responsible for the “indigent sick and dependent poor.” The state put the entire managerial and financial burden for that care upon the counties, and there it would remain a century later. So from its outset in Los Angeles the border between public health and medicine was blurred; and in coming decades this distinctive characteristic would prove expensive, stifling and, ultimately, politically disastrous.

By 1927 Pomeroy’s department was responsible not for the mere 700,000 residents present when it started eight years previously, but for 2,206,864 people. Every minute the numbers of needy Angelenos swelled, and there was barely time to think or reflect upon priorities.

“In [the Los Angeles County Department of Health’s] speed to catch up and fit in as an

adequately functioning unit of County service, it has been unable to smooth out and perfect some of the details which would make it a smoother running and more efficient and economical machine,” an American Public Health Association advisory team concluded in 1928.¹³²

In 1927 Pomeroy had 400 employees working under him and a budget of \$590,245. And every dime was needed, as Pomeroy’s staff was constantly building an infrastructure from scratch. Towns popped up overnight where there had been only desert, so the Los Angeles public health system was constantly under primary construction. The only thing predictable for Pomeroy’s planners was that every year they would have to serve far more people. The rate of growth not only far exceeded anything seen anywhere in the world at the time, it did so in the almost complete absence of supporting infrastructures. Pomeroy could not forecast into which towns the human tidal wave from the Midwest would settle, what epidemics they might bring, how the demographic balance would shift by race or by age or to what political master they would have to answer. Biggs might have had Tammany Hall to contend with in New York, but at least from year to year he knew the players and could, in his wiley fashion, maneuver. But in Los Angeles the only consistent feature was change.

As the population continued to grow, the borders between towns blurred, and greater Los Angeles took on the character of a network of interlocking suburbs — people lived and worked in separate, sometimes fairly distant, places. Nowhere in the world was the automobile initially embraced as wholeheartedly as it was in Los Angeles where developers designed special roads they called freeways to serve as conduits for human movement.¹³³

The still-sparse population and favorable climate were Pomeroy’s only allies, holding Los

Angeles death rates well below those of most of the United States: 7.9 per 1,000 residents per year. During most of the Pomeroy years, the leading cause of death was heart disease, but steadily rising tuberculosis death rates gained the number one position by 1927, a year TB claimed 139 of every 100,000 people. In contrast to New York City¹³⁴ and similarly dense eastern metropolises, the majority of Los Angeles's annual deaths were among people over fifty years of age, with children under ten years of age accounting for just 14.5 percent of the total. Most of those youngsters succumbed to diphtheria, measles or whooping cough — and to smallpox.

The nation's strongest anti-vaccination movement arose in Los Angeles and consistently blocked all attempts to impose both compulsory immunization of school children and some uses of diphtheria antitoxin. Though more than two million people resided in Los Angeles County by the end of the Roaring Twenties, fewer than 100,000 took advantage of free vaccination programs; most of the population actively opposed immunization.

Anti-vaccine organizations sprouted up all over California during the early twentieth century, driven by Christian Scientists, opponents of the germ theory of disease, and groups generally opposed to government interference in personal affairs. As a result, smallpox rates rose steadily. At a time when most of the country saw the disease disappear, and virtually no one east of the Mississippi died of smallpox, California's case load jumped from about 500 per year in 1912 to 5,579 in 1921.¹³⁵

In most of the country, vaccine opposition hit its peak in the 1890s, but in the far west it was still an effective obstacle to public health in the 1930s. There, public health leaders ran into

legal and political opposition at every turn despite the fact that the legal situation had improved markedly in 1905. That was the year the U.S. Supreme Court ruled in *Jacobson v. Massachusetts* that government authorities were not violating the intent of the Constitution but had acted appropriately when they mandated immunization of children. The rights of individuals to opt for or against a medical procedure were far outweighed, the Court ruled, by the powerful need to protect the community as a whole.¹³⁶ Particularly persuasive to the Court was evidence that unless more than 90 percent of a community was vaccinated, diphtheria and smallpox germs would remain in the population to pose a threat to all whose immunity weakened over time or was never boosted with vaccines. Thus, by refusing vaccination individuals were not simply taking a personal risk but imperiling the entire community. In addition, the Court said, police or states could enforce “reasonable regulations” in order to “protect the limits of the public health and safety.”

Despite the 1905 ruling, as each new vaccine was developed and health authorities pushed to add it to the list of compulsory child immunizations, the pattern of opposition was repeated. It surfaced when New York City passed a compulsory diphtheria vaccination law in 1920, when typhoid fever immunizations were introduced during the same period, following initial rounds of polio immunization in the early 1950s, and later with measles, rubella, whooping cough, chicken pox, and hepatitis vaccines.

As early as 1905, then, another critical and lasting theme of public health was emerging, largely from the Far West: the needs of the community versus the rights of individuals. In the twentieth century, public health leaders and courts would tend to interpret — and reinterpret —

appropriate balances between those often opposing needs, generally falling into positions that reflected the cultural and political moods of the nation at that time. Because during the early part of the century bacteriology-based public health was perceived as extraordinarily powerful and the background of disease was obviously grim and urgent, both public health leaders and the courts tended to tip the balance far in the direction of community needs. By the end of the century, the scales would have swung to the opposite extreme, favoring individual rights.

Between 1901 and 1930 New York City officials routinely deployed police officers and zealous nurses or physicians to the homes of those suspected of carrying disease, and force, or the threat thereof, was commonly used to overcome vaccine refusers. In some cases, police officers pinned the arm of those who refused while a city nurse jabbed it with a vaccination needle.

Moving westward, however, there was a gradient of discontent with Los Angelenos in the extreme opposition to such public health measures. In mid-western Minnesota, public acceptance of immunization, along with general support for public health, began to wane after Republican Governor David Clough fired Secretary of Health Charles Hewitt in 1897, putting staunch party supporter Dr. Henry Bracken in his place. Hewitt's dismissal was harshly condemned by all but the most avid Republican newspapers in the state, and many reporters wrote that it was prompted by Hewitt's refusal to donate funds for Clough's 1895 campaign.¹³⁷

"Governor Clough has aroused the indignation not only of the old school physicians of the state but citizens generally familiar with and interested in the doings of the state board of health," declared the Mankato Daily Review in a typical editorial.¹³⁸

Hewitt had created public health for Minnesota, serving the state for twenty-five years at an inglorious salary. His replacement, Bracken, was initially more of an old-fashioned sanitarian than a germ theory advocate. He traveled widely delivering speeches on hygiene and, ironically, given the conditions of his original appointment by Clough, on the need for “politics-free health.” During his first eleven years in Minnesota office, Bracken seemed to be akin to Dr. Almus Pickerbaugh, the health crusader lampooned in Sinclair Lewis’s 1925 Pulitzer Prize-winning book Arrowsmith. Lewis satirized the sanitarians’ nonscientific zeal with poetry written by his character, health officer Pickerbaugh:

Oh, are you out for happiness or are you out for pelf?
You owe it to the grand old flag to cultivate yourself,
To train the mind, keep clean the streets, and ever guard your health.
Then we’ll all go marching on.
A healthy mind in A clean body,
A healthy mind in A clean body,
A healthy mind in A clean body,
The slogan for one and all.

But in 1910 Bracken nearly died of typhoid fever. The experience stunned the Pickerbaugh-like sanitarian. As had Hewitt years before, Bracken set off for the great laboratories of Europe to study British and French models of public health organization. He saw the Semmelweis Technique practiced in Paris hospitals, the infectious disease control measures used on Scottish livestock, and the health laboratory standards of London.

Thoroughly converted, Bracken returned to Minnesota three months later determined to turn the state’s health practices upside down. He had come to understand the state’s need to have a microbe detective who could use the laboratory as a tool to track down the sources of epidemics and determine how diseases were spreading. Dr. Hibbert Hill was recruited as the first

State Epidemiologist — a position for which his years in Brooklyn’s Bureau of Sanitation and in the Bacteriology Department at Harvard University had left him well prepared. Hill built up a staff of dogged disease detectives that soon became admired nationwide.

Hill’s group first set to work proving that the higher rates of typhoid fever and cholera in Minneapolis, compared to St. Paul, were due to its horrible water supply. Hill’s data was so convincing that Minneapolis politicians finally relented in 1910 and spent money for water filtration and chlorination.¹³⁹ Typhoid fever rates declined but did not zero out. Bracken then pushed for use of a recently-invented typhoid fever vaccine that, like the diphtheria vaccine, was based on a type of antitoxin. He faced strong anti-vaccine opposition.

Bracken’s conversion to germ theory and his continuing public statements regarding “meddlesome politicians” and the need for vaccination didn’t sit well with the state’s legislature. Unlike his predecessor, Bracken was a lousy political maneuverer, and in 1913 he found his budget slashed by 12 percent. With just \$73,500 a year at his department’s disposal, Bracken struggled to keep public health activities alive in Minnesota. Worse, in 1914 the Governor appointed an Efficiency and Economy Commission which, among other things, recommended abolition of the state’s entire department of health. Though the department’s death knell wasn’t ultimately tolled by the legislature, Minnesota’s small state health infrastructure battled for survival for another decade.

With the health department so weakened, there were few who could counter the loud anti-vaccine voices raised statewide. As a result, few Minnesota municipalities enacted compulsory vaccination laws until the 1930s, and rates of voluntary immunization often were well below 40

percent of any given community's population. Minnesota suffered needless, preventable epidemics of diphtheria (4,269 cases in 1922) and smallpox. In 1925 smallpox hit Minneapolis, which had repeatedly voted against compulsory immunization. Next door, St. Paul remained unscathed, having mandated vaccination years before.

Remarkably, such adversity for public health came during a time of spectacular scientific and social success for the profession. In 1900 the American Public Health Association began to professionalize the calling by giving advanced degrees. At the same time, the Walter Reed Commission confirmed Carlos Findlay's suspicions connecting *Aedes aegypti* mosquitoes to spread of yellow fever and recommended draining the swamps of Panama to destroy the insect's local breeding sites. By the time the Panama Canal was finished in 1913, the effort, led by U.S. military physician William Gorgas, virtually eradicated the disease from the Canal Zone, and similar drainage campaigns were underway all over North and South America.

Their imaginations fired by the bacteriology revolution that was in full swing, philanthropists in New York and other U.S. cities in the East endowed other bold campaigns. John D. Rockefeller created a scientific foundation bearing his name which declared war on hookworm. In 1906 the foundation threw the then astonishing sum of a million dollars towards the goal of eliminating the disease, which that year afflicted nearly two of every five residents of the former Confederate States.¹⁴⁰ Ten years later Rockefeller's foundation put up millions of dollars to create the Johns Hopkins School of Public Health in Baltimore. It opened just seven years after other philanthropists funded the creation of the Harvard School of Public Health.¹⁴¹

A foundation set up by steel tycoon Andrew Carnegie aimed to improve the quality of

education in the 160 medical schools of the time. Abraham Flexner, who was put in charge of the effort, in 1910 wrote arguably the single most influential indictment of medical education ever published in the English language.¹⁴² The Flexner Report, as it was called, not only revealed in truly gruesome detail the abominations of medical training at the time, but recommended detailed steps for repair, with the ultimate goal of transforming American medical schools into rigorous centers of science.¹⁴³

The primary benefit of this for public health care came from the far higher level of belief in germ theory and vaccinology among graduates of the improved medical schools. And hospitals were transformed from nineteenth century warehouses that merely isolated the diseased from the community into genuine treatment centers.¹⁴⁴

But as physician skills and hospital quality improved medical costs rose. And with that came debate over what, if any, role government should play in the provision not only of essential public health services, but of medical treatment. New York City already had public hospitals, funded by tax dollars. Out west Los Angeles County was well on its way towards being the sole provider of medical care in its region. But no state, and certainly not the U.S. Congress, had yet addressed the question of where responsibility for paying for medicine lay.

In 1911 the British Parliament passed the National Insurance Act, guaranteeing free medical care for all residents of the United Kingdom. Inspired by the British law, many Americans similarly sought universal medical coverage. In 1912 the American Association for Labor Legislation initiated a vigorous national health insurance lobbying campaign in Washington, D.C., offering a bill that would have enacted a U.S. system quite similar to that

created in the U.K. The American Public Health Association officially supported the move and, for the first time, some of its members acted as Capitol Hill lobbyists.

In 1915 the California legislature passed a resolution supporting, in principle, national health insurance.

But the country was at war with Kaiser Wilhelm's Germany and the entire issue of health insurance got quite deliberately wrapped up in anti-German sentiments.¹⁴⁵ Physicians, who feared national insurance would result in price controls that would make medicine unprofitable, charged that the entire concept was "made in Germany."¹⁴⁶ In Brooklyn, prominent AMA member Dr. John O'Reilly declared that "compulsory Health Insurance is an UnAmerican, Unsafe, Uneconomic, Unscientific, Unfair and Unscrupulous type of Legislation [supported by] Paid Professional Philanthropists, busybody Social Workers, Misguided Clergymen and Hysterical women."¹⁴⁷

And in 1919 the American Medical Association passed the resolution that became its battle cry: "The American Medical Association declares its opposition to the institution of any plan embodying the system of compulsory contributory insurance against illness, or any other plan of compulsory insurance which provides for medical service to be rendered contributors or their dependents, provided, controlled, or regulated by any state or the Federal Government."¹⁴⁸

California voted in a popular election later that year on whether or not to adopt the American Association for Labor Legislation's proposal. It was rejected soundly by a vote of 358,324 to 133,858. The objections of the AMA, coupled with fear of organized labor, were key to the defeat.¹⁴⁹

For the rest of the twentieth century, universal health insurance would be disparaged in the United States as “socialized medicine,” opposed by organized medicine and defeated when brought to popular vote. Public health leaders would continue for decades their efforts in support of universal access to medical care, but their on-going struggle was indicative of two trends: public health’s increasing alienation from organized medicine and its ever-expanding burden of health care for the indigent. Though provision of medical care had never been public health’s primary mission, over time it would take on that responsibility — particularly in the very communities in which the middle classes most ardently opposed “socialized medicine.”¹⁵⁰ In coming decades Los Angeles County, for example, would see increasing voter antipathy toward “socialized medicine” yet would become the sole medical provider for millions of poor people.¹⁵¹

Hermann Biggs and his colleagues had yet, however, to reach the apex of their power and prestige. Having spared millions from the horrors of cholera, diphtheria, and tuberculosis, the New York City Department of Health at the turn of the century enjoyed tremendous support from the city’s newspapers, middle class, and philanthropic community. And staffing its many divisions were zealous crusaders for health so convinced of their mission as to seem devoid of doubt. Biggs often spoke of the “absolute preventability” of disease, proudly noting that nowhere else in the world had “sanitary authorities” had “granted to them such extraordinary and even arbitrary powers as rest in the hands of the Board of Health of New York City.”¹⁵²

Biggs, acting as the city’s Chief Medical Officer, assigned one Dr. William Park to develop powerful tools of diagnosis and gave him full authority, laboratory space, and a staff. Park’s mission was to find ways to rapidly identify individuals who were disease carries. Lina

Rogers, the city's public health nurse, commanded a battalion of nurses who would use Park's inventions to screen children in the public schools — with or without parental permission — and treat infected youngsters with antitoxins, forced quarantine or whatever intervention Biggs deemed appropriate. During summer months when schools were closed, these same nurses would tromp through New York's 361,000 tenement buildings searching for tuberculosis sufferers.¹⁵³ Once identified, the TB victims were removed from their families, often with police assistance, and placed in newly-constructed city sanitariums or shipped to Trudeau's Saranac Lake center.

The Health Department set up a laboratory for drug regulation much akin to what would, decades later, become the nation's Food and Drug Administration. By Biggs's authority the lab screened products sold in pharmacies looking for signs of improper manufacture or adulteration. Any evidence thereof resulted in immediate, police-enforced destruction of all supplies of the drug — whether or not the manufacturers or distributors objected. There were no hearings, trials or negotiations, just immediate action that in some cases bankrupted the affected manufacturer.

Similarly, Biggs would allow no rotten or contaminated milk or food products sold within his jurisdiction, and hundreds of thousands of pounds of dairy products, produce, and meats were summarily destroyed by Biggs's department every year.¹⁵⁴ Again, there were no hearings or appeals and if sellers objected, the police were happy to overturn their vending carts or seal their shops. Though such measures would, by late twentieth century standards, seem grievous abuses of civil liberties, the department's personnel were acting with its legal authority, and popular sentiment rested squarely on the side of perceived community good.

At the close of 1902 the Board of Health boasted in its annual report:

The condition of the public health during the year, in spite of the steady increase in population and the continued congestion in the more crowded districts, has been better than for any year since the organization of the Department. The death rate has fallen to 18.75 per thousand as compared with 20.00 in 1901 and 20.57 in 1900. The deaths numbered 68,085 as compared with 70,720 in 1901 and 70,875 in 1900. The death rate in the section corresponding to the former City of New York was 19.49 per thousand, not only the lowest on record, but not approached in any year since 1814, which year presented an unusually low death rate, 19.66; but the latter has always been questioned by statisticians on the ground that in the first half of the nineteenth century records of mortality were loosely kept. The death rate of 17.88 in the Borough of Brooklyn is the lowest in that section since 1866, and in all probability the lowest ever recorded in the City of Brooklyn.

While the mortality from infectious diseases varied considerable from that of the previous year, presumably following certain laws regarding which students of medicine must still confess ignorance, yet it is to be noted that in 1902 there was a marked decrease in the number of deaths from those diseases, chiefly the contagia, which are regarded as largely preventable.¹⁵⁵

It was vintage Biggs: braggadocio based on demonstrable facts.¹⁵⁶ For example: despite lingering anti-vaccination forces, the department responded swiftly to a smallpox epidemic in 1902¹⁵⁷ administering an astounding 810,000 immunizations. Though it could offer no effective treatment for tuberculosis, Biggs's War on Consumption efforts were paying off, and the 1902 death toll — 773 — was 2.29 per 1,000, down from 2.50 the previous year. Though the number of diphtheria cases was on the rise (15,319 in 1902 versus 12,329 the previous year), death rates from that disease had fallen by 12 percent in two years thanks to the use of antitoxin. The laboratory's 1902 production of that life-saving elixir was an impressive 157,975 cubic centimeters — more than enough for all of the northeast region's diphtheria cases.

It was a busy, successful year, and in the annual report Biggs couldn't resist boasting just a bit more and thumbing his nose at skinflint Tammany politicians:¹⁵⁸

It is estimated that the value of every life on the average in this country is not less than \$2,000; the cost of each life to the community at 20 years of age is at least that amount. The 6,000 deaths from tuberculosis saved during the last year as compared with the number which would have occurred had the death rate been the same as it was in 1886, means the saving in the City of lives worth twelve million dollars. If we add to this sum the cost of sickness and the loss of the services and wages of these persons during the long illness, averaging at least six months, we have an additional cost of at least \$300, making \$1,800,000 more, or a total saving to the City during 1902, as compared to 1886...of nearly \$14,000,000. The total appropriation made by the Board of Estimate for the maintenance of the Department of Health for the year 1902 was \$984,391.48.

There can be no question, I believe, as to the fact that no expenditure made by a nation, city or community brings such large returns to the community in health, happiness and prosperity as that made for the conduct of its sanitary affairs. These expenditures bring returns not of three or five or even ten percent, but of one hundred, five hundred, and one thousand percent.

It was a classic cost/benefit rationale for public health, written eight decades before such monetary arguments would become essential components of all government health programs.

The authority and success of the New York City Department of Health grew with each subsequent year. Despite legal challenges, some of which went all the way to the U.S. Supreme Court, the department expanded powers, requiring certification for all milk sales; taking charge of physician licensing and hospital inspection; mandating huge mosquito abatement and marsh drainage efforts; forcing student vaccinations and school medical inspections; gaining dominion over the street sweepers' department; and issuing midwife licenses. The department even outmaneuvered Tammany on tenement issues, ordering destruction of some of the worst buildings and finding legal cause to fine or jail the owners of many others. To fend off the many lawsuits against it, the department maintained a full time legal staff — the first of its kind in the United States.

Further expanding their sphere of authority, Biggs and key members of the public health community — notably, U.S. Army Major George Soper — began to act on their increasing conviction that healthy human beings could be carriers of disease.¹⁵⁹ At first their notion of “carriers” was little more than a hunch, based on patterns of outbreaks in the city. Then, in 1902, Robert Koch gave a speech in Berlin arguing that apparently healthy human beings were, in fact, the primary sources of *Salmonella typhi*, the bacterial cause of typhoid fever.¹⁶⁰ The following year Koch proved his theory by setting up monitoring stations across southwest Germany that took stool samples from identified typhoid cases. Using laboratory tests of the individuals’ feces, Koch showed that fifty-five of the 482 cases became healthy carriers of the disease who passed the bacteria in their stools for more than three months after recovering from the illness.¹⁶¹

Aware of Koch’s hypothesis, Biggs’s staff began tracking typhoid outbreaks that occurred in areas of New York where safe water, proper sewage, and food inspection had eliminated other vectors that could spread the microbe. Soper was hired by a private family to investigate a strange outbreak. He wrote later: “In the winter of 1906 I was called upon by Mr. George Thompson, of New York City, to investigate a household epidemic which had broken out in the latter part of the preceding August at the Thompson country place at Oyster Bay.... It was thought by the owner that, unless the mystery surrounding the outbreak could be satisfactorily cleared up, it would be impossible to find desirable tenants for the property during the coming season.”¹⁶² Soper’s investigation revealed a trail of typhoid cases that had occurred between 1900 and 1907 among seven wealthy New York families and their servants. A total of twenty-six people contracted typhoid fever in these households; one died of it.

The single common factor in all of the households was a cook/servant named Mary Mallon. Having immigrated from Ireland in 1883, by 1907 Mallon was thirty-seven years old, single, and had been employed in some of the most prominent New York households.

Mallon was working in a posh Park Avenue home when Soper found her in 1907 and requested blood and fecal samples. The outraged Mallon responded by trying to stab Soper with a fork, and the scientist fled. “I expected to find a person who would be as desirous as I was for an explanation of the way in which the typhoid had followed her,” Soper recalled. “I hoped that we might work out together the complete history of the case and make suitable plans for the protection of her associates in the future. Science and humanitarian considerations made it necessary to clear up the whole matter. My interview was short. It started in the kitchen and ended almost immediately at the basement door. Reason, at least in the forms in which I was acquainted with it, proved unavailable. My point of view was not acceptable and the claims of science and humanity were unavailing. I never felt more helpless.”¹⁶³

Soper presented his evidence to Biggs, who, thinking it wise to have a female approach the Irishwoman, deployed Dr. Josephine Baker. Like Soper, Baker surprised Mallon who hid inside a closet. When found and asked for a stool sample, Mallon hurled invectives and attempted to flee. The physician requested police assistance and five officers had to carry Mallon, kicking and screaming, to an ambulance where Baker sat on the still resisting cook during the ride to the hospital. Mallon’s stools were, indeed, contaminated with *Salmonella typhi*.¹⁶⁴ In a landmark of public health action and authority Biggs and his department ordered Mallon detained against her will on small North Brother Island in New York’s East River. And

there she remained for three years, during which time she waged a letter-writing campaign in her own defense, insisted that the very notion of a healthy typhoid carrier was hogwash and leveled a legal attack against the health department.

For their part, the city's health officers were morally conflicted over Mallon's case: they had no idea how long an individual might remain a disease carrier and shuddered at the notion of incarcerating Mallon for the rest of her life.¹⁶⁵ It was a classic public health dilemma, pitting individual rights against the safety of the community at large.

Further muddying the waters, in newspaper accounts and public sentiment Mallon became emblematic of every dimension of conflict between natives and immigrants. That she was unrepentant and had a fiery temper and a foul mouth, only reinforced the stereotyping of the immigrant Irish at the turn of the twentieth century. Worse yet, she was a servant in the homes of wealthy native New Yorkers, and the Mallon case gave the city's upper classes cause to question the contagion potential of all of their staffs. The health department was under considerable pressure, therefore, to make an example of Mallon.

After two years of lonely isolation on North Brother Island, Mallon sued the New York City Department of Health, and her case came before the state's supreme court in 1909. The court ruled, based on Soper's evidence, that the health department was within its rights in detaining Mallon, even though no one, in that day, could present a scientific explanation of the carrier state.¹⁶⁶ Mallon's blood and stools were tested throughout her incarceration, and her typhoid levels were found to fluctuate from near zero to quite high. Doctors at Riverside Hospital on North Brother Island tried a range of therapies on Mallon, none of which appears to

have done much good and all of which raised the cook's ire.

In early 1910 the health department cut a deal with Mary Mallon: she would be released provided she sign a legally-binding agreement to never again work as a cook or food handler. Mallon, once released, retained attorneys and unsuccessfully sued the city.

In 1907, the year Mallon was captured, New York City had 4,426 typhoid fever cases, 740 of which proved fatal. Those were the largest numbers the city had witnessed since 1900. By the time Mallon filed her lawsuit in 1911, there were just 3,450 typhoid cases and 545 deaths in the city — a 66 percent reduction in the per capita case rate. In addition, a typhoid fever vaccine had just been developed in several laboratories.¹⁶⁷ By 1913 the overall New York City death rate — from all causes — had fallen 50 percent from its 1866 level. In the autumn of 1914 Dr. S.S. Goldwater was appointed New York City Commissioner of Health, and Biggs, at the age of fifty-five years, became commissioner of health for the entire state of New York.

And Mary Mallon took the pseudonym “Mrs. Brown,” disappearing.

Mrs. Brown promptly went to work for Sloane Hospital — as a cook. Cases of typhoid fever soon followed and prompted scrutiny from the health department. Investigators linked Mrs. Brown to Mallon. By the time Mallon was rearrested, however, she had cooked at the hospital for five months and infected at least twenty-five people, two of whom died — bringing her total to fifty-one cases and three deaths. As before, when authorities confronted Mallon she fled, this time into nearby woods. Eventually captured after a police chase, Mallon was sent to Riverside Hospital on North Brother Island, where she died, embittered and alone, in 1938.¹⁶⁸

There was little public or media sympathy for “Typhoid Mary” Mallon. “Mary’s status

after her second arrest has been totally different from that which she possessed after her first,” Soper’s account concluded. “This is true both as to the legal aspects and public sympathy. Whatever rights she once possessed as the innocent victim of an infected condition precisely like that of hundreds of others who were free, were now lost. She was now a woman who could not claim innocence....She was a dangerous character and must be treated accordingly.”¹⁶⁹

The health department’s authority grew with increased public support for its use of the courts and police to restrain individuals for the community’s sake. Upon the occasion of his resignation from the New York City Department of Health, Biggs reminded the city’s voting populace why they should continue to support health officials’ unprecedented legal authority, even intrusion into people’s private lives:

I do not believe the citizens of New York fully realize how far in advance of most of the great cities of the world our administration of the health service has been. During frequent trips to Europe in the last twenty years, I have made a careful study of the work of the health authorities in Great Britain, France and Germany, and have been greatly impressed with the fact that they were slowly, and often very incompletely, adopting the measures which have proven most successful here. This fact has been long recognized in Europe and the authorities there constantly look to New York for suggestions and directions in new methods in sanitary work.¹⁷⁰

Biggs was undoubtedly gilding the lily a bit, but it was also true that under his leadership New York City had become a world class model of government public health action.¹⁷¹ This trend was not limited to innovations in sanitarian policies, for basic research science was also shifting continents. In the 1820s France had led the western world’s race of medical discovery. By the 1840s, it was Germany that dominated medical sciences and, with the exception of the Pasteur laboratory, produced most of the key discoveries of the latter half of the nineteenth

century. By 1910, however, France had become an almost insignificant player in medical science, and the U.S. output was, by far, dominant. Most of the American discoveries emerged from laboratories in New York City.¹⁷² With war brewing in Europe, scientific research in England, France and Germany suffered further setbacks during the second decade of the twentieth century: scientists could not freely travel and share their results; many European laboratories came to a standstill as their employees were drafted into military service; resources for medical research dwindled amid need for war spending; and government priorities shifted towards weapons-related research. By World War One's end, U.S. science was in a position of dominance and would, in most fields of research, remain there throughout the twentieth century.

Germ theory crusaders continued to triumph in New York. And the New York City Department of Health made an ambitious registry of every single tenement room in the metropolis, noting the names of each resident and his or her health status. It was the most comprehensive health atlas ever compiled, particularly noteworthy given it tracked people who, collectively, spoke more than twenty different languages. Meanwhile, Biggs had turned his formidable energies on the whole state. His goal was to create a rural public health network of disease surveillance and small clinics that spanned New York from Niagara Falls to Montauk, Long Island.¹⁷³

Everything, it seemed, was working in favor of public health.

Until 1916. And polio.

The incidence of poliomyelitis had slowly been creeping upwards in New York — indeed, nationwide — for years. The earliest case may have been spotted in rural Louisiana in

1843,¹⁷⁴ but the first physician to record a poliomyelitis epidemic was Ivar Wickman of the Stockholm Pediatric Clinic in Sweden in 1905. Wickman described children who suffered spontaneous paralysis that was in some way related to inflammation of the spinal cord.¹⁷⁵ No one had managed to isolate the organism responsible for polio, as, for example, had Koch for tuberculosis. But by 1908 researchers in Vienna and New York City had shown that blood from polio-stricken people, when injected into monkeys, caused the disease in the primates. It was, therefore, an infectious disease, ignited by a germ.

The microbe responsible for polio would not be successfully isolated and grown in laboratories for more than forty years. Until then, it shared with smallpox, rabies, and yellow fever — like polio, all viral diseases — the dubious honor of being an infectious disease whose microbial agents could be indirectly demonstrated to exist but not seen or understood. Viruses are orders of magnitude smaller than bacteria and could not be viewed through the microscopes of the early twentieth century. Science, and with it public health, had hit a major roadblock.

Worse yet, it would be decades before experts would understand that it was the triumph of turn-of-the-century public health that caused polio: the microbe was ancient, but the disease was not. Before sanitarians set to work cleaning up the waters of European and North American towns and cities, infants were exposed to minute, immunizing doses of the virus from the moment they were weaned, providing them with a sort of natural vaccination effect. As water supplies were rendered nearly disease-free, childhood exposure to the polio virus became a rare event. The generation born after 1900 in cities like New York, Boston, Chicago, Paris and London had little, if any, immunizing exposure to the microbe.

All it took to spark an epidemic, then, were a few days during which water supplies were inadequately filtered — a common occurrence during the hot summer months when bacterial growth and lower water levels increased the concentration of microbes. Summer also marked the time when human beings were most exposed to water — they drank more of it, swam in it, ate iced products, and rinsed the then abundant fresh produce.

The first U.S. outbreak of polio occurred in Vermont in 1906 and was swiftly followed by cases all over American. Probably because sanitarianism was such a uniquely American crusade, two-thirds of the 8,000 polio cases reported from around the world between 1905 and 1909 occurred in the United States.¹⁷⁶

Polio typically struck non-immune children during their summer school holidays. Initially appearing to be nothing more than a cold or mild flu, after two or three days the child would suddenly be unable to walk, his muscles would go into uncontrollable spasms or fall flaccid, and paralysis might soon follow. The lucky ones recovered days or weeks later just as mysteriously as they had first fallen ill, and possibly even got off unscathed. More commonly, however, victims remained to some degree crippled by the disease, as their limbs or backs never recovered from the damage inflicted by the virus. When infections were so severe that such muscle contractions as produced breathing and heart beats were impaired, those youngsters died.¹⁷⁷

When it first struck New York City in the summer of 1907 the disease was so new that the health department didn't even realize an epidemic was underway until it had nearly ended and public schools began to report needing wheelchairs, leg braces, and crutches for newly crippled

children. Careful sleuthing by the health department that autumn turned up some 2,000 polio cases.¹⁷⁸ From then on, parental anxiety rose with each subsequent summer. Between 1910 and 1914 there were 30,000 more polio cases in the United States, 5,000 of them fatal.

On June 6, 1916 New York City pediatricians reported the year's first cases of poliomyelitis — found among residents of the densely populated waterfront area. By month's end, cities all over the United States were witnessing their historically worst polio outbreaks. Recognizing that they were facing an enormous epidemic, the New York City Department of Health and the U.S. Surgeon General turned to a novel solution — publicity. They reached out to the nation's newspapers, civic organizations, and schools urging hygiene as the best defense against polio. On the eve of the Fourth of July holiday the Surgeon General declared that “a state of imminent peril to the Nation” existed.¹⁷⁹

The New York epidemic seemed to have begun in a Brooklyn neighborhood that was largely inhabited by Italian immigrants, and as the summer wore on the city's new mayor, John P. Mitchel, and its health commissioner, Dr. Haven Emerson, grew convinced that the mysterious diseases was of Italian origin. They were wrong, of course. Indeed, 75 percent of all those struck by polio that summer were native-born New Yorkers. Nevertheless, as the terrible toll of paralyzed and dead children mounted, Mayor Mitchel appealed to the federal government. Was there a polio epidemic underway in Italy? he asked. Could anything be done to slow the tidal wave of Italian immigration? Surgeon General C.H. Lavinder responded that, no, there was no unusual poliomyelitis epidemic raging in Italy, but he assured Mitchel that U.S. officials at Ellis Island would scrutinize all in-coming Italians for evidence of polio infection. Few cases would

be found that summer among the newly arriving Italians.¹⁸⁰

Meanwhile, the Department of Health drew upon its ambitious atlas of the city's tenements to deploy teams of nurses, police at their sides, to those with sizeable Italian populations. And all households — Italian or otherwise — containing a poliolytic child were placed under quarantine.

All over the city signs were nailed over entry doors:

INFANTILE PARALYSIS (POLIOMYELITIS)

Infantile paralysis is very prevalent in this part of the city. On some streets many children are ill. This is one of those streets.

KEEP OFF THIS STREET

Hoping to spare his children from polio, Methodist pastor William Harvey Young shipped his family to Missouri that summer and stayed behind to minister to his New York City congregation. He wrote to his wife, “We are now in the midst of a spreading epidemic of infantile paralysis. The best Drs. of the city are on the job, and in spite of all they can do the cases increase, and the rate of mortality still remains very high.... I keep telling the children the advice that is printed in the papers each day and will get them to be as clean and careful as possible.”¹⁸¹

The Department of Health ordered a delay in the opening of schools. By September 25, 1916 the epidemic appeared too be slowing and the city counted the sad tally. By the end of November Commissioner Emerson reported that 9,023 New York City children had contracted the disease, 2,449 of whom had died. Of the nation's polio cases that year (27,000 cases, 6,000 deaths), fully one third had occurred in New York City. Half the New York cases were among Brooklynites.

The following year the entire city held its breath as the first heat wave of 1917 hit. The health department issued hygiene pamphlets, urging parents to scrub their children, homes, dishes, and clothing. And at the end of the year, the department, with considerable relief, reported that just 138 cases of the disease had occurred in the five boroughs — a sharp decline that was reflected nationwide. Sanitarians, convinced that their quarantine and hygiene measures had, once again, stopped a germ in its tracks, were relieved.¹⁸²

It would be decades before scientists would understand that quarantine had no value in epidemic polio control because most adults were naturally immunized polio carriers. A child's own parents, siblings or friends might be dangerous sources of contagion. Only a vaccine could prevent polio and that innovation would be four decades more in coming.¹⁸³

Though polio seemed in retreat in 1917 it was not a time of contentment in America. It was World War I and millions of young men, Americans among them, were mired in the trenches of Europe. On the home front, temperance leagues, largely led by Christian women's groups, successfully pushed Congress to pass the Eighteenth Amendment to the U.S. Constitution prohibiting nationwide "the manufacture, sale or transportation of intoxicating liquors." The Prohibition law reflected widely publicized middle class moral indignation over what was portrayed as an epidemic of drunken fathers and husbands — generally pictured as working class.

Though the impetus for Prohibition was not public health, it was obvious that alcoholism was unhealthy, not only for the drinker but, potentially, for the entire family. Because most visible alcoholics in 1917 were men — women generally not being allowed at the time to enter bars and saloons — Prohibition was a cause celebre for Suffragettes and Christian women's

societies. Winifred Spaulding of the Colorado chapter of the Women's Christian Temperance Union called upon "noble minded girls" to be morally superior to their husbands and maintain a Christian household even in the presence of a drunkard mate.

The temperance movement began as a fundamentally white Protestant assault, bitterly opposed by Catholics, immigrants, and urban populations. In 1917, however, most Americans were rural Protestants, easily swayed by Carrie Nation and her bands of axe-wielding women who busted up bars and saloons. More sophisticated audiences were won over by the likes of Frances Willard, who argued that such social evils as poverty, malnutrition, violent crime, venereal diseases, suicide, and child abuse all originated with alcohol-swilling men.

When Congress passed the Eighteenth Amendment, popular evangelist Billy Sunday declared: "The reign of tears is over. The slums will soon be a memory. We will turn our prisons into factories and our jails into storehouses and corncribs. Men will walk upright now, women will smile and children will laugh. Hell will be forever rent."¹⁸⁴

To the contrary, Prohibition spawned a public health catastrophe fueled by a massive crime network that embraced gangs and smugglers from Cuba and Mexico all the way to Vancouver and Nova Scotia. Customer demand for alcohol never waned, and in cities like New York, Prohibition actually increased both alcohol consumption and the use of narcotics. Once overlooked bohemian neighborhoods became immensely popular centers of speakeasies, opium dens, and chic clubs where the super-rich eagerly and licentiously rubbed elbows with the era's most daring intellectuals, dancers, artists, and musicians. And while federal authorities chased trucks loaded with bathtub gin, physicians openly prescribed as alternative sources of recreational

levity medicines rich in morphine, opium, laudanum, belladonna, absinthe, marijuana, and cocaine — all of which were sold and swapped in speakeasies.¹⁸⁵

Nationwide, crime rates jumped 24 percent during the first year of Prohibition. Jails, contrary to Billy Sunday's forecast, filled to 170 percent of capacity. Bribery and extortion of government officials swiftly became so commonplace as to barely raise eyebrows among news readers.¹⁸⁶

In 1919 the New York City Department of Health sadly reported that there were at least 100,000 drug addicts in Gotham, users primarily of opium or cocaine. As the era swung into the Roaring Twenties, the numbers of alcoholics and drug addicts rose. Newly appointed Commissioner of Health Dr. Royal S. Copeland charged that some New York physicians were writing upwards of 200 prescriptions every day for drugs. Copeland called for help from the eight-year-old Federal Bureau of Investigation, which staged a series of raids and seized narcotics supplies from physicians and medical warehouses. But this highly publicized action did little to slow the flow of narcotics or the rising popularity they enjoyed in the city's speakeasies and music clubs.

Copeland, who had gained office through Tammany Hall corruption and supplanted his highly regarded predecessors through a series of probably illegal maneuvers, nevertheless feared the impact Prohibition was having upon New York. He fought to place all matters related to drug addiction within his department and turned Riverside Hospital into an addiction treatment center. But the police, many of whom were addicted to the bribes and largess that rained upon them thanks to Prohibition, fought Copeland. By 1920 Copeland's drug treatment funds were

dried up and Riverside was closed, having managed to rehabilitate less than 5 percent of its patients. Copeland's agency expressed chagrin in its 1920 annual report, bemoaning the absence of "the deserving kind of addict, of which we hear but never see."¹⁸⁷

Another continuing theme of public health had emerged: the battle pitting those who would medicalize drug and alcohol addiction against those who would criminalize it. Though in coming decades public health would witness an occasional victory, Americans would generally opt for law enforcement approaches to illicit drugs. After repeal of Prohibition in 1933, concern about alcoholism would rarely enjoy such a powerful spotlight again, but concern about illicit drugs would swell steadily throughout the century.¹⁸⁸

As if their impotence in the face of polio and Prohibition's impact on alcoholism and drug addiction hadn't been humbling enough for the public health advocates, 1918-19 brought the most terrible disease humanity had witnessed in more than a century. It dwarfed the great Mississippi Valley yellow fever epidemic of 1878, and even Philadelphia's 1793 cholera epidemic paled by comparison. Like polio in 1916, what arrived was a virus about which virtually nothing at the time was known: influenza.¹⁸⁹

It began during the summer in Kansas, where infantry and cavalry were training before being sent to the Great War in Europe. The outbreak initially seemed unremarkable, and the soldiers were shipped across the Atlantic, sparking a global pandemic that, by its end in early 1920, would have claimed an estimated 20 to 25 million people worldwide.

By November of 1918, every one of the 5,323 hospitals in the United States was overwhelmed; nearly all of their 612,251 beds were filled. On the eve of the pandemic in 1917,

the national death rate due to influenza was 164.5 per 100,000 annually. It soared to a staggering 588.5 per 100,000 in 1918. In 1919 it was 223 per 100,000; in 1920 it was 207.3 per 100,000. And in 1921 it fell dramatically to 98.7 per 100,000.¹⁹⁰

So overwhelmed were public health authorities that virtually all of their other activities had to yield to influenza control. “The outstanding features of the work of the Bureau were the enormous increase in volume of the work of all divisions due to the war and the campaign against the epidemic of Spanish Influenza,”¹⁹¹ read the New York City Department of Health’s 1918 report, “the business end of which was handled by the office of the Secretary, and involved appointment of 557 temporary employees and disbursement of \$140,000 in personal service and purchase of supplies.”¹⁹²

In 1918 in New York City 98,119 people died from all causes — an increase of 19,544 over the previous year. More than 10,000 of those deaths occurred between September 15th and November 16th that year and were due directly to influenza. During those same weeks, 9,722 pneumonia deaths were reported, most of them also due to the flu epidemic. Typically, influenza was a lethal disease for the elderly rather than for young adults and children, so health officials were startled to note that most of the flu deaths involved people under forty-five years of age. The epidemic even, uncharacteristically for influenza, boosted infant and child mortality rates.

The death toll was truly staggering. In early September the health department received reports of a dozen flu deaths a day. After a steady climb, the largest daily toll — 809 deaths — was reported on October 20. Over the seven weeks of the 1918 epidemic, New York city averaged 27 deaths per 1,000 residents per week — a terrible rate, but hardly the nation’s worst.

Philadelphia averaged 53 deaths per 1,000 per week; Baltimore, 47; Boston, 40; Newark, 32.

And the epidemic circled the planet, returning to strike the United States twice more. By the end of 1919, New York City had cumulatively lost 25,669 people to the disease, most of them (19,553) residents of Brooklyn or Manhattan.

With quarantine out of the question — there simply were too many flu cases in the city — the health department had little to offer. Otherwise helpless, it counted the numbers and raced about collecting bodies. Other forces stepped in to fill the vacuum: in the absence of a clear understanding of the influenza virus, every manner of crackpot and quack sold elixirs, masks, vapors, alcoholic tinctures, and hundreds of other items.

In Minnesota's St. Paul and Minneapolis the initial death tolls were far lower, probably because of lower population densities. Combined, the cities lost 1,235 people to influenza in 1918, with death rates per 1,000 citizens of 12 for Minneapolis and 18 for St. Paul.

When the epidemic first hit Minnesota, State Health Commissioner Dr. Henry Bracken urged politicians and physicians to marshal their resources. His initial approach, in early September, was ignored, but Bracken persevered. He sternly warned the people of Minnesota and the State Board of Health that they were, “dealing with the most serious epidemic of any kind you have ever been up against.”¹⁹³

Bracken mobilized the Red Cross, National Guard, and local U.S. Army personnel. Tent hospitals were erected in cities across Minnesota, all public establishments (schools, theaters, sporting events, churches, bars and museums) were ordered closed statewide, and people were advised to stay inside their homes until the influenza had passed.

Between September 1918 and November 1929 Minnesota suffered repeated bouts of the deadly influenza which struck its icy expanses more frequently than any place in North America.¹⁹⁴ At a time when less than 2.3 million people lived in the state, most of them in rural areas, influenza's toll was ultimately shattering. In 1918 some 7,520 perished; in 1919 another 2,579, and in 1920 the number was 1,700. In sum, Minnesota lost 0.5 percent of its total population to the flu, with the highest losses in Duluth, St. Paul, and Minneapolis.

The Los Angeles County records make little specific reference to the influenza epidemic, though California also suffered terrible losses. The records do show enormous increases in mortality in 1918, when influenza struck a single, powerful blow to the county. Infant mortality leapt from 92 per 1,000 in 1917 to 134.4 per 1,000 in 1918 — a 32 percent increase. Most striking were the differences in mortality rates by ethnicity: white Los Angelenos' infant mortality rates increased 5.4 percent over those two years from 67.5 per 1,000 babies to 71.3. For recently immigrated Japanese infant mortality increased from 79.5 in 1917 to 111.38 in 1918, a 29 percent increase. And among Mexican Americans in Los Angeles, whose infant mortality rate in 1917 was already a staggering 255.1 per 1,000 babies, the 1918 influenza pushed the death toll to 348.1, a 27 percent increase.¹⁹⁵

When influenza hit Los Angeles County there were 884,500 people living there. Only a handful of obstetricians and pediatricians and forty midwives practiced in the entire county. The county had less than one nurse per 6,000 residents, though the County Department of Health was working to train and recruit more nurses.

Remarkably, few Los Angelenos seemed at the time to realize how ill-prepared their

government was, or recognize the collective scope of their tragedy. The community had already taken on a flavor that would define it culturally and politically for decades: detachment. Unlike the hamlets and cities of the East and Midwest, Los Angeles County's towns lacked history, connection or community. In New York, Boston or Chicago, buildings were crammed one smack against another and neighbors knew one another well — whether they liked it or not. Even San Francisco had achieved a packed verticality in which a death in one household was inescapably observed by many others. Los Angeles was unique in having detached, horizontal housing, usually surrounded by yards and lawns. Strangers to their neighbors, families enjoyed greater privacy than their eastern counterparts — and greater anonymity. Death might carry off a child unobserved, raising little collective consternation or fear.

Still, for health officials from New York to Los Angeles, the 1918-19 epidemic was an awful slap in the face of their otherwise triumphant achievements. It mattered not whether, as was the case in New York City and Minnesota, the populace was grimly aware of its collective loss, or seemingly numb, as was the case in Los Angeles. Polio, drug and alcohol addiction, and influenza — each highlighted crucial shortcomings of the sanitarians. There were, after all, limits to their power over the microbes and the social forces of disease.

In its 1920 annual report the New York City Department of Health struck an almost plaintive note that was in sharp contrast to Biggs's braggadocio of the previous decade:

While a very few years ago, the slogans, "Safety First," and "Health First," had been popularized to a very considerable degree, one might term the present state of affairs in practically every civilized country as showing an attitude which may be characterized as indicating consent to permit a "Health Last" policy to govern. These observations are not irrelevant as a matter of stock-taking. This low ebb of interest in social welfare activities... is reflected in the progress of public health

activities. The trend of times makes evident the need for sane, aggressive leadership, in such things that promote human welfare....

One who takes stock of public health work is inevitably led to those observations by the obstacles to progress which have been ensured by governmental public health bodies in various communities throughout the country. The dislocations which have been caused by the shock of war have, by no means, left us morally or socially bankrupt, but voices of strong leaders not only in the medical world, but of those interested in civic affairs, are needed to bring about a readjustment that will enable public health officers throughout the county to resume the march of progress which was halted by war. In this stocktaking it is aimed to sound a constrictive rather than a pessimistic note. These observations, it is hoped, will be so interpreted....

Most people have, in recent years, lost sight of the fact that the foundation upon which the Health Department is laid is its machinery for prevention, control, and supervision of communicable diseases. This fact has been taken for granted so long that it has come to be overlooked.

The trust citizens had placed in their public health leaders seemed somehow unwarranted.

Recent triumphs over diphtheria, yellow fever and cholera were lost from the collective memory.

But who in 1920 could blame the public if its faith in government health services was diminished? Hadn't the United States just witnessed a plague that killed an estimated 550,000 to 675,000 of its populace? Weren't there polio-stricken children where none had existed fifteen years earlier? Didn't drug lords and bootleggers like Al Capone manipulate city governments through bribery and intimidation, turning children into alcoholics and prostitutes?

And it was becoming increasingly obvious that the public health triumphs of the early twentieth century were not to be universal in either their implementation or impact. Pomeroy's Los Angeles County officials quietly logged the three-fold differential in mortality rates between Mexican American and white infants, but conducted no studies that might reveal why the disparity existed. Even in the heyday of Biggs's authority in New York City, the roughly ten-

year difference in life expectancies between white immigrants and native-born African Americans constituted little more than a set of statistics dutifully logged year after year.

For a century, health-oriented intellectuals in England and the United States had speculated upon the relationship between poverty and disease, variously concluding that it was either the squalid environs of the poor, the nature of their home life, or “familial tendencies” (a.k.a. genetics) that determined their medical misery. Most of these studies were written by white men, generally of the landed classes, who sought to explain the plight of less fortunate members of their own race.¹⁹⁶ In the United States the added factor of immigration clouded the picture, and native-born white health leaders found bigoted explanations for the poor health of recently-arrived, impoverished workers. Anti-Semitism, stereotypes of Irish and Italian traits, anti-Catholicism, and other prejudiced perspectives offered easy explanations — albeit, as history would show, incorrect ones.

The spectacular monetary gap between America’s richest and poorest citizens was impossible to ignore at the turn of the century. The nation’s gross national product was skyrocketing, from \$16 billion dollars in 1860 to \$65 billion in 1890. And by 1921 it would top \$300 billion. During that period — a time of 19-fold growth in national wealth — average per capita income rose only 5.8-fold. Why? Because it wasn’t really America that got richer but an elite stratum at the top that amassed astonishing wealth. The mathematics of averages masked the true gap: the top one percent of America’s income earners made more money in 1920 than did the bottom 50 percent. Inescapably obvious to public advocates of the day were both the painful poverty of the people on society’s lower rungs and its contribution to the paucity of

healthy options available to them.

But at the turn of the twentieth century it was also common in both England and the United States to subsume concern about poverty beneath a thick layer of moral indignation. Alcohol and drug use, sexually-acquired illnesses, psychiatric difficulties — all of these were ascribed to the moral weaknesses or inferiority of poor people. They were lazy, feeble, immoral, and idle — disease was their comeuppance.

Just as colonial Americans could not see — and certainly never would have accepted — a relationship between slavery and yellow fever or smallpox, so the germ theory crusaders of the early twentieth century, however noble their cause, were incapable of confronting the roots of racial and economic disparities in health. With the rise of social Darwinism during the 1920s, explanations for racial variations in life expectancy and health shifted from the search for moral weakness to evolution and, in primitive form, genetics. For example, the Transactions of the Tennessee State Medical Association contained this 1907 entry:

It is principally the yellow Negro that shows the enormous death-rate from tuberculosis today. In all cases, wherever we find a hybrid race we find a race which has not the stamina, physical, moral or mental of either of the races in the mixture. Then, again, we must remember that in the hybridization, as a rule, we add a vicious tendency to what might be expressed as the lowest strata of the upper race, mixed with the vicious tendency of the lower race. That carries with it to begin with a poor hereditary foundation, one lacking in natural resistant qualities.¹⁹⁷

Thus, African Americans were deemed particularly prone to tuberculosis because of breeding practices used by slave holders of the previous century.

The concept of “racial immunity” to disease was a popular one among physicians and many public health advocates, but not among statisticians and demographers, who saw a very different picture in the disparate mortality rates. “I do not believe that there is such a thing as *absolute* racial immunity to any disease,” wrote Metropolitan Life Insurance actuary Louis Dublin.¹⁹⁸ “The Negro death rates for practically all diseases in the prevention or cure of which care and sanitation are of paramount importance are much higher than among the whites: but this does not prove that the Negroes are, *inherently*, more susceptible to such diseases — or, for that matter, that they are less resistant to them. It is probable that their higher death rate is due more than anything else to ignorance, poverty and lack of proper medical care.”

Dublin calculated that tuberculosis was such a powerful and deadly force in the African American community in 1926 that its elimination would mean that, at birth, “every Negro male baby...would have 3.06 years added to his expectation of life, and every colored girl baby would have an additional 2.97 years.”

In the West the gulfs between the races — Mexican Americans, Chinese, and whites — were equally gargantuan. Due both to the need for self-protection and to real estate discrimination, the Chinese settled in extraordinarily densely populated “Chinatowns,” that rivaled the tenements of New York City for numbers of people crammed into each room. San Francisco’s Chinatown was, by 1920, the most densely populated spot in North America. Not surprisingly, these Chinese urbanites had especially high rates of contact and respiratory diseases

— tuberculosis, pneumonia, influenza, whooping cough, measles, and diphtheria.

Mexican Americans had, by the turn of the twentieth century, become the key unskilled labor force of the West. Separated from the better educated whites in part by language, in Los Angeles as early as 1880, this work force was also divided internally by gender. Mexican American women readily found employment as domestic servants in white households while their husbands and sons roamed the territory in search of hard labor day jobs. By 1920, up to a third of all Mexican American households in Los Angeles County had absentee fathers, and the mothers, who had more than four children on average, typically toiled in a distant Caucasian household.¹⁹⁹ Raised by aunts, older sisters, and grandmothers, the children grew up in barrios, or Mexican American ghettos. These factors no doubt contributed to their far-higher mortality rates, compared to whites, but no one in the Los Angeles County Department of Health during the 1920s had the time or inclination to study the matter.

Average life expectancy for a white boy born in the United States in 1925 was 57.6 years; for a white girl, 60.6 years. For “Negroes and others,” as they were then classified by the U.S. Census Bureau, life expectancies that year were far lower: 44.9 years for boys and 46.7 years for girls.²⁰⁰ That figure was, of course, affected by their far greater infant mortality rates: 110.8 per 1,000 for “Negroes and others” versus 68.3 per 1,000 for white babies.²⁰¹

Throughout the twentieth century, American public health leaders would struggle with questions of race, genetics, ethnicity, and economic class, unable to define the relative impacts those had on individual and population health. And that debate, coupled with social exclusions from the health system, would form a critical, lasting and shameful theme of U.S. public health.

III.

God give me unclouded eyes and freedom from haste. God give me a quiet and relentless anger against all pretense and all pretentious work and all work left slack and unfinished. God give me a restlessness whereby I may neither sleep nor accept praise til my observed results equal my calculated results or in pious glee I discover and assault my error. God give me strength not to trust to God!

— *The Scientists' Prayer, Arrowsmith by Sinclair Lewis, 1926*

Despite the polio and influenza setbacks, Paul de Kruif remained a true believer. Throughout the early twentieth century, he toiled happily in the pathology department at Rockefeller University in Manhattan, convinced that he and the great scientists around him were going to conquer all of humanity's worst diseases. If polio and influenza had proven intractable foes in 1916-1919, de Kruif argued, it would only be a matter of time before they would yield to such laboratory triumphs as had inspired Pasteur's conquest of rabies and Roux's victory over diphtheria.

In 1922 de Kruif met the celebrated young author Sinclair Lewis, and the pair became fast friends. Through de Kruif's eyes, Lewis saw the laboratories of Rockefeller University, the research studies rapidly generated by scientists all of the United States and public health in action. And from Lewis, de Kruif learned how to write compelling prose. The duo voyaged through the West Indies in 1923, visiting various Caribbean islands that were in the grip of *Yersinia pestis*. Lewis marveled at the zeal de Kruif displayed inside Caribbean plague

laboratories and made his friend's efforts the basis of the activities of Dr. Martin Arrowsmith, the hero of his novel Arrowsmith.²⁰²

For his part, de Kruif was inspired by Lewis to write his enduring classic, Microbe Hunters, chronicling the discoveries of Pasteur, Koch and other luminaries of the germ theory revolution.²⁰³ Lewis was later awarded the Pulitzer Prize and Nobel Prize for Literature. And de Kruif became the best known science writer of the first half of the twentieth century, renowned for his 1920s books and articles extolling the praises of science and public health.²⁰⁴

But in 1929 a series of events occurred that shattered de Kruif's rosy world view, crushed his optimism, and prompted him to denounce the very profession he had once reified. On October 29th the New York Stock Exchange crashed after several days of sharp declines, hurling the world into the Great Depression of the 1930s. And as de Kruif traveled the country in the months following that black October day, his eyes opened to a reality he — indeed, nearly all scientists of his day — had never before seen. He nearly boiled over with rage. Watching children dying of rheumatic fever, he wrote:

It isn't as if all this were old science long ago only to be forgotten. It has come to blooming in these very years when it has been my job to report its hopeful story. For it I've been a sort of human loud-speaker, a barker —
— Ladies and Gentlemen: For ten cents, for no more than a dime, you can learn the wonders of the most pain-killing, life-saving spectacle in history! —
So for ten years now I've helped to lure the maimed, the sick, and even those doomed, to this sideshow to see a tantalizing vision of themselves strong-limbed, long-lived, and more and more free from pain. A humanity that might be that, if only.....
Many have been thrilled by this new hope for life for themselves and their own; some have found that new life; but more have been told: This new life is not for you.
I don't know why it took me so long to see that the strength — and life-giving results of the toil of those searchers were for sale; that life was something

you could have if you bought and paid for it; which meant you could have your share of it if you'd been shrewd, or crafty, or just lucky.

It still puzzles me why for so long I found excuses for our ghastly cartoon of a civilization — that's great...that's ruled by the Calvinistic humbug that God has predestined suffering and that suffering is good; that awards its searchers prizes, smirks congratulations at them, and allots the real benefits of their science to the well-heeled few; that turns its face from millions in pain, or hidden-hungry, or dying with an absolutely possible abundance of life-giving science all round them.²⁰⁵

The New York bacteriologist did an about face from public health booster to the profession's sharpest critic. Amid national poverty on a scale America had never previously witnessed, de Kruif saw that years of ignoring the public health needs of the poor or, worse yet, blaming the poor for their own illnesses, were now undermining the very successes he had once loudly trumpeted. At the 1933 meeting of the Child Health Recovery Conference, de Kruif's jaw dropped when former New York City Health Commissioner Havens Emerson, then director of the Minneapolis School of Hygiene, said: "The professional do-gooders among the social workers have expressed concern over the future effects of the depression on public health, there is no support for the belief that the public health will be benefitted or damaged by the world-wide economic debacle."²⁰⁶

But, de Kruif noted, the numbers of malnourished children in New York swelled from 16 percent on the eve of the stock market crash to 29 percent in 1932. And government cutbacks had curtailed vaccination programs in many states, prompting surges in diphtheria that de Kruif decried as "damnable:"

Alas, in 1930, at the beginning of the confusion of our abundance controllers, at the start of that mysterious need to pull in our belts which was a deflation of life as much as it was a deflation of dollars, the control of the abundance of diphtheria toxoid was held to be exactly as necessary as the control of abundance of meat

and milk and bread. Quickly the so nearly beaten microbe demon of diphtheria took courage. Here were the abundance controllers, coming as allies on the side of death! And for the next three years the diphtheria death rates stopped going down, and last year — 1934 — it began to rise. So that five thousand children in our country strangled to death from it. And probably as many as sixty thousand more underwent diphtheria's torture though they were lucky to come alive out of diphtheria's valley of the shadow.²⁰⁷

Sadly, sixty years later de Kruif's rage would resonate when, for remarkably similar social and economic reasons, diphtheria would slaughter children in the countries of the former Soviet Union. But this was not Communism. It was America in the grip of a terrible economic period which, initially, the government of President Herbert Hoover sought to stem through price and supply controls — de Kruif's "abundance controllers." In his travels across America, de Kruif saw a patchwork quilt of health; some communities were seemingly unaffected by the depression while others experienced resurgent tuberculosis at levels he called "murder," crippling rheumatic fever epidemics among children (New York City's rate rose twenty-fold between 1929 and 1934), and soaring child malnutrition. The outraged scientist cited the U.S. Department of Agriculture's own Circular No. 296 on child nutrition and noted that at the end of 1929 7.5 million families in the U.S. were living on diets the USDA deemed unfit.

In a 1935 New York World Telegram editorial²⁰⁸ the newspaper declared: "One hundred and thirty-five thousand pupils in New York City's elementary schools are so weak from malnutrition that they cannot profit by attendance....This is almost one in every five of the children enrolled — 18.1 percent in all."

Sarcastically, de Kruif asked, "Should children eat? Why keep them alive?"

Then he turned his formidable anger to birth issues, chronicling the "fight for life" in

grossly substandard depression-era hospitals.²⁰⁹ All across North America, he argued, presenting mounds of data and anecdotes, basic standards of hygiene had disappeared from hospitals. Mothers were again dying of puerpal fever at rates last seen before Semmelweis's great discovery about hand-washing. Babies were succumbing to "childbed fevers" as they were tended by nurses whose unwashed hands changed one set of diapers after another. Syphilis and tuberculosis rates were soaring and according to the National Tuberculosis Association, by 1937 TB was costing the nation \$647 million a year in medical care and lost productivity. Yet hospitals had no funds to combat these scourges, and departments of public health were on the edge of collapse all over the country. "Let's face it," de Kruif said, "with the poverty of our hospitals and universities deepening and becoming more desperate, with our rulers, comptrollers, budget-balancers, bellowing economy, there is small chance that this wherewithal will be forthcoming to train the new type of death-fighter."²¹⁰

Public health leaders, so recently America's heroes, were shunned, impotent, even forced to act as apologists for government and industry. The Charles Hewitts, Josephine Bakers, and Hermann Biggses of the world were long gone. Into their place stepped bureaucrats.

"In retrospect," Paul Starr wrote in The Social Transformation of American Medicine,²¹¹ "the turn of the century now seems to have been a golden age for public health, when its achievements followed one another in dizzying succession and its future possibilities seemed limitless. By the thirties, the expansionary era had come to an end, and the functions of public health were becoming more fixed and routine. The bacteriological revolution had played itself out in the organization of public services, and soon the introduction of antibiotics and other drugs

would enable private physicians to reclaim some of their functions, like the treatment of venereal disease and tuberculosis. Yet it had been clear, long before, that public health in America was to be relegated to a secondary status: less prestigious than clinical medicine, less amply financed, and blocked from assuming the higher-level functions of coordination and direction that might have developed had it not been banished from medical care.”

The Great Depression killed more than lives and economies: it rang the death knell for the public health revolution. The functions of public health would be saved through federalism, creating ever larger national programs staffed at all tiers of government by often lackluster physicians and bureaucrats.

But when the stock market crashed in 1929, the federal public health effort was a jumbled mess involving forty different agencies that answered to five different cabinet secretaries. A total of 5,000 U.S. government civil servants worked in public health programs of some kind.²¹² It was hardly a force equal to the challenge.

In the United States in the years following the crash every critical indicator of population health worsened, just as they would 60 years later in Eastern Europe following the collapse of the Soviet Union. Suicide rates among males soared, especially among unemployed men aged fifty to sixty-four years. To plot the increase, statisticians had to apply a logarithmic scale, for some age groups had had 100-fold increases in suicides.²¹³ And suicide rates, overall, went from 12 per 100,000 men and women in 1925 to 17.4 per 100,000 in 1932 — the highest rate ever recorded in U.S. history. Between 1929 and 1936 overall life expectancy for men and women, combined, rose slightly from 57.1 years to 58.5 years, but that masked a sharp decline of more

than five years in life expectancy that occurred between 1933 and 1936.²¹⁴ Close examination of the life expectancy data reveals wild fluctuations over the period from 1928 through 1936, the most striking of which were between 1933 and '34. Over that twelve month period, white male life expectancy fell an astounding 12.1 years and non-white men lost 3.3 years.

During the Great Depression, the incidence of death from certain communicable diseases increased significantly nationwide — among them were scarlet fever, diphtheria, whooping cough measles, influenza, and pneumonia. In some regions, tuberculosis and typhoid fever death rates also spiked during the 1930s.

During this period of such obvious need, hospitals all across America went belly-up.²¹⁵ The problem, of course, was that the patients were broke and, regardless of whether they were government institutions or private facilities, the hospitals simply couldn't cover their operating costs. With no money in their pockets, patients shunned the prestigious and private hospitals in favor of free care in government-owned facilities. Between 1929 and 1933 bed occupancy rates in government-owned hospitals rose 20 to 25 percent. During the same time period, private hospital bed occupancy fell 33 percent and church-owned hospitals lost 16 percent of their clientele.²¹⁶

It would be difficult to overstate the impact the Great Depression had on the lives, and health, of the American people. Unemployment ran between 10 and 40 percent in most cities, with industrial centers hardest hit. Sales of consumer products and capital goods collapsed because overnight the consumer market disappeared. Farmers were forced to lower their prices so much that they couldn't cover the costs of harvest and the transport of produce, meat, and

grains to marketplaces. Construction came to a complete halt and only began to recover in the mid-1930s with federal subsidies.²¹⁷

In a marked departure from tradition, about a quarter of all adult women had to find paid work in order to meet family expenses, as few men earned enough to cover their essential costs of living. In 1930 some 60 percent of the American population, or 70 million people, were living at or below the subsistence level, calculated at \$2,000 a year for a family of four.

Entire industries closed their doors. Their former employees turned to relief offices where, increasingly, the city officials in charge turned them away. City coffers were empty. Hardest hit were the African American, Mexican American, and American Indian populations — in their ranks unemployment ran as high as 60 to 75 percent. Also devastated were the beneficiaries of earlier public health triumphs: America's unprecedentedly large population of retired people over the age of sixty-five, which represented 5 percent of the nation's population in 1929. Few of them had pensions or sources of income during the depression, and if they lacked family help, many simply committed suicide or slowly starved to death. Another 8.5 million Americans were farmers, sharecroppers or rural migratory workers. Their lot was, indeed, desperate, as more than a quarter of a million farms foreclosed between 1929 and 1932.

There was no one to turn to for loans to shore up businesses or save farms. More than 5,000 banks collapsed nationwide between 1923 and 1930. Then another 1,345 shut down in 1930, an additional 2,294 in 1931, and 1,453 more in 1932. And thirty-four of the forty-eight states had bankrupted their state banks by early 1933, leaving them without reserves to meet civil service payrolls, execute government projects or address even basic social needs.

Local governments sought all sorts of solutions to the crisis, few of which were judicious or, in the end, effective. New York City, under the mayoral leadership of overwhelmed James Walker, simply as a matter of routine denied relief to every tenth worker who showed up at an unemployment window. Arbitrary as that was, it represented a slightly more enlightened approach than found in the Deep South and West, where all forms of relief assistance were blatantly denied to blacks and Hispanics.

President Herbert Hoover told the nation eight months after the stock market crash, “I am convinced we have passed the worst and with continued effort we shall rapidly recover.”

Within another eighteen months the U.S. gross national product had fallen by nearly a third — the sharpest decline in the country’s history, except, perhaps, at the height of the Civil War. And average unemployment nationwide in 1933 stood at 25 percent, meaning that in virtually every household in the country there was at least one adult who had a job in 1928 but no longer did in 1933. The raw numbers hid the empty feeling most Americans had in their stomachs, the cries of hungry babies, the stunted growth of malnourished youngsters, and the smoldering despair of adult men, their dignity stripped as they begged for work that would earn them only pennies.

In Minneapolis so many men killed themselves in 1932 that the health department had a hard time counting the toll. It soared and soared throughout the year, eventually topping an incidence of 26.1 per 100,000 people — triple the suicide rate a decade previously. In 1933, the Carter Family expressed it in song:

I’m going where there’s no depression,
To the lovely land that’s free from care.

I'll leave this world of toil and trouble,
My home's in heaven, I'm going there.²¹⁸

The alternative to suicide for many families was relocation, and between 1929 and 1940 the nation's demography shifted radically as millions of people moved from one place to another in search of jobs.

And then Nature added insult to injury. Actually, the roots of the disaster were man-made, the result of decades of over-farming the soils of Arkansas, Texas, Oklahoma, and the Great Plains. It struck on April 14, 1935: The Great Dust Storm. Folk singer/songwriter Woodie Guthrie immortalized it:

A dust storm hit, and it hit like thunder,
It dusted us over and it covered us under;
Blocked out the traffic and blocked out the sun.
Straight from home all the people did run.²¹⁹

By the time that dust storm had passed, about 40 million tons of top soil had blown off the farms of Oklahoma. Another duster hit on May 11, carrying off 300 million tons of soil and rendering 332 million acres of the Great Plains and Texas a giant bowl of useless dirt. Tens of thousands of families became dust bowl refugees, forced to abandon their farms for migratory lives of poverty and desperation. Most headed north to Chicago, Detroit, Duluth, and other cities, compounding the employment and housing crises in the urban Midwest. Or they piled their belongings atop rickety trucks and drove west to look for work in the commercial farms of California, Arizona, Oregon, and Washington.

But the "promised land," as Woodie Guthrie and his fellow "Okies" called it, had problems of its own. The "Okies and Arkies" were greeted with sticks, stones, and derision, as

the far western states were in dire enough straits without taking on the troubles of the dust bowl refugees. Again, Guthrie summed it up:

Lots of folks back east, they say,
Leavin' home ev'ry day,
Beatin' the hot old dusty way
To the California line.
Cross the desert sands they roll,
Getting out of that old dust bowl.
They think they're goin' to a sugar bowl,
But here is what they find.
Now the police at the port of entry say,
"You're number fourteen thousand for today."
Oh if you ain't got the do re mi, folks,
If you ain't got the do re mi,
Why, you better go back to beautiful Texas,
Oklahoma, Kansas, Georgia Tennessee.
California is a garden of Eden,
A paradise to live in or to see,
But believe it or not,
You won't find it so hot,
If you ain't got the do re mi.²²⁰

For Los Angeles County the initial impact of the 1929 stock crash was soft, as oil production was booming and the recently dredged San Pedro Harbor hummed with shipping activity. On the eve of the October crash, Los Angeles's oil income for 1929 alone topped the then astonishing sum of \$1.3 billion.²²¹

Conservative Californians placed great faith in their native son, Herbert Hoover — the first Westerner ever elected to the Presidency. Even as the Great Depression worsened, and Californians felt the pain that had already crippled households from Colorado to the Carolinas, most civic leaders accepted as wise policy Hoover's 1932 assumption that "It is not the function of government to relieve individuals of their responsibilities to their neighbors, or to relieve

private institutions of their responsibilities to the public.”

But class war was brewing in the West. “Hooverilles,” clapboard housing slums loaded with dust bowl refugees and itinerant workers, sprang up outside every major western city. Labor organizers, from anarchists with the Industrial Workers of the World (IWW) to Eugene V. Debs socialists, found fertile soil amid the outrage. Many workers embraced the dream of creating a proletariat state akin to what seemed to be a paradise in far off Russia. Trade unionists throughout California staged demonstrations and all manner of protests against the “capitalist bosses.”

Los Angeles’s leaders responded to the mounting tension by targeting Mexicans and Mexican Americans. Their thinking was that by ridding the county of its unemployed Mexicans, pressure among white workers would ease, making it possible to control the influence and activities of communists and anarchists. Beginning in 1931, Los Angeles authorities began raids on the county’s barrios to round up Hispanic workers and send them south across the border. What began as a slipshod operation grew cruelly efficient. As the depression years wore on, sheriffs rounded up Mexicanos in the middle of the night and packed them into trains specially chartered by the county. By sunrise, hundreds of Mexican American men would be in Tijuana, their wives left behind in Los Angeles barrios to fend for the family. In 1933 the county deported some 12,000 men of Mexican heritage in this manner, many of them California-born citizens who had never previously seen Mexico.²²²

Despite such harsh measures by mid-1933 more than 300,000 workers in Los Angeles County had lost their jobs — an extraordinary number, given that the entire population of the

county was less than 800,000 men, women, and children.

In this topsy-turvy atmosphere, all aspects of governance were strained, and public health was no exception. The population of Los Angeles County continued to swell, race and class relations were tensed to a degree not seen since the Franciscan domination of the Indians, tax revenues and funding plummeted, few citizens could pay for their medical care, and both city and county politicians were preoccupied with either red-baiting or rallying support for organized labor.

On the eve of the stock market crash, the County Department of Health had 400 employees, ten years later it had 419. During that time the population it was to serve swelled from about 677,000 people to 900,000, though the numbers involved some guess work, as on any given day, nobody really knew how many Mexicans, “Okies” or Mexican Americans were living in the county. During the depression, the county’s budget for the health department initially increased, rising from \$889,850 for 1929 to \$1.1 million in 1931, then it fell steadily to its 1935 figure of \$703,770.²²³ Department reports from the time have a breathless quality to them, as if even the moments spent hammering at a typewriter were precious. An American Public Health Association assessment of the department’s performance in 1930 found it “severely wanting,” as its beleaguered staff raced about the vast county barely able to meet the populace’s most basic health needs. For example, with just seventy-nine full-time nurses on staff in 1935, the department made 90,006 home visits, mostly for tuberculosis check-ups or for epidemic control. That averages nearly five home visits a day by each nurse — a phenomenal number given the distances these women covered, often on unpaved roads.

Dr. Pomeroy's plans a decade earlier for a network of health clinics spanning the vast county had been quashed under weighty opposition from local members of the American Medical Association who, back in the days of Los Angeles's prosperity in the '20s, would brook no competition from government. By 1935 most of Pomeroy's planned health care system lay in shreds, the victim not only of AMA assault but, probably more significantly, of attack from red-baiters. Provision of health services for the poor, even in times when most Los Angelenos were suffering, was considered "socialistic" by the county's elite, and they followed the Los Angeles Times's lead in denouncing alleged abuse of tax-supported services by the so-called "undeserving poor."²²⁴

In the midst of this chaos, whooping cough, diphtheria, typhoid fever, puerperal fever, maternal and infant mortality, and tuberculosis rates all rose.²²⁵

Then in 1934 polio struck Los Angeles.

The polio virus had, of course, left its mark on the county's children every year since the 1916 epidemic, but the numbers of poliomyelitis cases were on the decline and had fallen from 903 cases in 1930 to 170 in 1933.²²⁶

In May of 1934, however, bizarre polio cases started turning up at Los Angeles County General Hospital, unusual in that many cases involved adults, few suffered paralysis, death rates were low, and most had what appeared to be encephalitis — brain infections that produced an array of psychiatric effects ranging from headaches and mild disorientation to profound visual, auditory, and psychological impairments.²²⁷ By July more than 1,700 people in the county had contracted the strange illness and panic was setting in.²²⁸

County health officials were at a loss to explain how the disease was spreading, why it was causing such bizarre symptoms, how it could be stopped or what treatments might work.²²⁹ For years the department had begged the Board of Supervisors for funds to hire an epidemiologist, but it was rebuffed. So there was no one on board who knew how to investigate an epidemic.

In the absence of scientifically-derived advice, the department buckled before public panic, taking steps that even its own physicians doubted would stall the spread of the virus: summer schools were shut, beer parlors closed, theaters and cinemas debarred, and the public told that because “dust is a germ carrier” housewives ought to scrub down their homes. One circular from the state health department told people to simply “avoid overfatigue.” Realizing its shortcomings, the Los Angeles County Health Department appealed to Rockefeller University polio expert Dr. Simon Flexner who deployed a team of New York scientists to Southern California. By the time they arrived in mid-summer, some 100 polio patients were streaming into the emergency room of L.A. County General Hospital every day.

Worse yet, doctors and nurses were apparently catching the disease from the patients, most of whom were isolated in the contagion ward of the gigantic, 3,000-bed hospital. No one ever determined how the virus spread within the hospital, but by the end of 1934 at least 138 doctors and nurses, out of a hospital staff of 4,500, had contracted the strange form of polio.²³⁰

Flexner’s group at Rockefeller confirmed, based on lab tests of the day, that the epidemic was caused by polio. But it certainly hadn’t behaved like polio. Eventually, the epidemic ran its course, community immunity peaked, and that strain of polio disappeared entirely in 1935 just as

mysteriously as it had arrived ten months earlier.

At its height, the epidemic reached such proportions that every available ambulance and government vehicle was pressed into gathering ailing polio victims — on a few July and August days, these numbered more than 200. And as the toll of polio-infected hospital staff mounted, many healthy doctors and nurses abandoned their posts, leaving the remaining personnel so overwhelmed that stretchers and gurneys, laden with waiting patients, stretched around the block, and for hours on end ailing children and their families called in vain for assistance.

Public health authority completely broke down.

For years afterward, the L.A. County Department of Health spoke with a meek voice, and was rarely able to gain recognition or cooperation from the region's political leaders, physicians or general populace. In its time of greatest need, amid economic catastrophe, Los Angeles had a mere band-aid of a public health service.

And it was hardly alone. Counties, cities, and states all over the United States fell apart between 1929 and 1933 as tax revenues disappeared. In some areas, physicians volunteered their services for epidemic control duty. But before the Presidential election of Franklin Delano Roosevelt, most public health departments in the United States had either already shattered, as was the case in Los Angeles County, or were teetering on the brink of collapse.²³¹

One significant exception was Minnesota, which swung so far to the left during the Great Depression that Roosevelt's Democratic Party became its targeted right wing. Well before the Crash of '29, Minnesota's farmers had grown enraged over agricultural product pricing and distribution trends in the United States. They were convinced, with considerable justification,

that America's farmers were paying a heavy price for the prosperity of the Roaring Twenties. Well before the Crash networks of commodities buyers and sellers dictated low values for agricultural goods and drove the Midwest farmers into poverty.²³² Rising out of the state's Scandinavian cultural tradition came a groundswell populist movement, led by the Minnesota Farm-Labor Party.

Just weeks after the stock market crashed, Minnesotans elected Minneapolis leftist Floyd Olson to the governor's seat, putting his Farm-Labor Party in power. Olson booted most of the former government appointees out of their civil service jobs, replacing them with crusaders for the poor. One exception to the purge was State Health Secretary Dr. Albert Chesley who, since his appointment in 1922, had managed to radically reduce diphtheria rates statewide.²³³ Under Chelsey's leadership, child and infant mortality rates, due to all causes, had also fallen dramatically,²³⁴ and his performance was generally viewed favorably.

Olson's Farm-Labor Party considered social programs, such as those for public health, of paramount importance and dismissed opposition to public welfare as part and parcel of some dark capitalist plot. In its 1932 party platform, Farm-Labor defiantly proclaimed that the capitalist system was "on trial for its life." And Olson that year announced to the state's legislature that he would "declare martial law." He continued: "A lot of people who are now fighting the [social welfare] measures because they happen to possess considerable wealth will be brought in by the provost guard. They will be obliged to give up more than they are giving up now. As long as I sit in the governor's chair, there is not going to be any misery in the state if I can humanely prevent it. I hope the present system of government goes right down to Hell."²³⁵

Olson steered all of Minnesota governance towards service by and for “the little people”: farmers, workers, and the armies of the unemployed. To that end, public health programs during the Olson years were pushed towards provision of medical and disease control services for rural farmers and the urban poor.

And Olson fought FDR and his New Deal programs, labeling Roosevelt a liberal lackey for big capital. Though the state would ultimately benefit from the New Deal, Olson and, after his untimely death from cancer in 1936, his successors denounced the FDR scheme, feeling that it did not go far enough in support of working Americans.

Long after the reign of Farm-Labor ended in the 1940s its impact on Minnesota politics and public health could still be felt. And for six decades Minnesota would be famous for both its high rates of graduated income taxation and strong tax-supported social programs, including public health and provision of medical care for indigent and poor working Minnesotans.

Minnesota was almost unique in its opposition to the New Deal: most governors, mayors and legislators, regardless of their ideological bent, came to welcome the sudden infusion of federal dollars into their local coffers, and by the end of Roosevelt’s nearly three-term presidency, public health in the United States would be federalized. True, each municipality and state would offer its own unique brand of health services and programs, but what was once 100 percent based on local revenues would become dependent on dollars from Washington. And with that largesse would come Washington-dictated policies and increased power and influence for the U.S. Public Health Service.

The USPHS was initially a tiny federal force with authority strictly limited to major ports

of entry into the United States — particularly New York’s Ellis Island and San Francisco’s Angel Island — and to national contagion catastrophes. That changed after a show-down in California in 1901.

In 1900 *Yersinia pestis*, the plague, struck San Francisco’s Chinatown. It was no doubt brought from Shanghai or Hong Kong either by stowaway rats or — less likely, due to incubation time and the duration of sea voyages — by an infected person. During 1900 the *Yersinia pestis* bacteria spread in the densely-crowded Chinatown district of central San Francisco, killing both humans and rats.

Manning the hygiene laboratory for the Angel Island immigration center was USPHS microbiologist Joseph Kinyoun, who had previously worked in New York City and at the Pasteur Institute in Paris. At San Francisco’s Marine Hospital Laboratory Kinyoun analyzed the blood of Chinatown patients and rats and confirmed the presence of *Yersinia pestis*. He immediately alerted California and federal authorities.²³⁶

Governor of California Henry T. Gage dismissed Kinyoun’s findings as hogwash. A strong ally of both Los Angeles Times publisher Harrison Gray Otis and the owners of The Octopus (the Southern Pacific Railroad), Republican Gage would brook absolutely no obstacles to California’s development and population expansion. Any word that the dreaded plague had, for the first time in known history, surfaced in California would surely dampen easterners’ then avid interest in migrating to the Golden State.

So Governor Gage simply said no. There was no plague in California. Period.

Kinyoun, a robust, bearded scientist who had learned street smarts watching Biggs in

action in New York, stood his ground. And nearly eighteen months passed, with Gage and Kinyoun denouncing one another, before any measures were taken to arrest the Chinatown plague. Gage insisted that federal authorities had no jurisdictional right to interfere in the matter and accused Kinyoun and USPHS of “unfair and dishonest methods [that]...never again will be equaled.”

Eventually Kinyoun rallied enough support to force Gage to appoint an independent review commission. In the spring of 1901 that commission confirmed the presence of *Yersinia pestis* in Chinatown. And for the first time in U.S. history, federal health authorities took charge of an epidemic control effort, without a request from or support of state leaders (but at the urgent behest of San Francisco local health officials). For four years USPHS rounded up rats, screened human blood samples, and toiled to stop the plague.²³⁷

The epidemic ultimately ended not through the intervention of Science, but of Nature. The great San Francisco earthquake and fire of 1906 leveled the rodents’ hiding places and drove the surviving rats to starvation.²³⁸

The authority of the USPHS increased again in 1907 when its Dr. Joseph Goldberger demonstrated that the awful disease known as pellagra was not caused by a germ but by a vitamin deficiency due to malnutrition. That finding led to waves of policy recommendations from Washington to the states regarding child nutrition. During the depression, however, pellagra would return, and in 1935 some 3,000 Americans would die of the disease and thousands more would suffer the mental retardation, hallucinations and deranged behaviors caused by the niacin-deficiency disorder. Nevertheless, Goldberger’s discovery offered another landmark for the

USPHS, allowing federal health authorities the opportunity to decipher a critical disease's cause and appropriate strategies for its control.

In 1911 the federal agency again flexed its muscles in another hostile state, intervening in a Yakima County, Washington typhoid fever epidemic, control of which had been thoroughly botched by local authorities. The USPHS scientists successfully halted that outbreak.

The following year, Congress formalized such federal powers, passing the Public Health Service Act. The USPHS was granted authority to intervene at the local level on behalf of the health of all Americans, not just seamen and immigrants, and granted authority over basic medical research.²³⁹ During World War I, Congress put the USPHS in charge of venereal diseases prevention among soldiers and gave the agency \$1 million for contagion control. The following year, Congress added another million dollars for "Spanish Influenza" control.

The first sweeping federal health law, however, came in 1921. Under the Sheppard-Towner Act the USPHS was given annual pots of money from which it was to give states grants for well-baby programs. This set the precedent for a new model of funding that would become the dominant paradigm of the remainder of the century: money would filter from federal sources down to the states and cities, and would arrive already earmarked for implementation of policies that had been decided by federal health authorities and congressional politicians.

Given that, unlike in Europe, public health in the United States had originated at the local level, and matured as a patchwork quilt of very diverse infrastructures each with different rules and authorities, the imposition of such top-down policy-making was odd. It would prove impossible to come up with one-size-fits-all health policies and, over the coming decades, local

public health authorities would often feel conflicted about the federal largesse: they wanted the money but might dispute the policy to which it was attached.²⁴⁰

The Sheppard-Towner Act was a tremendous boon, however, to the states that made use of the funds during the 1920s. The victories Minnesota's Chesley had over the childhood killers — diphtheria, diarrheal diseases, whooping cough, measles — were in large part due to a Children's Bureau he created with Sheppard-Towner funds. The bureau set health targets for the state's children and, through an infrastructure that overlapped with the public school system, improved immunization, nutrition, and general health standards among Minnesota's youngsters. Forty other states similarly took advantage of the Sheppard-Towner money, and many used the funds to create programs modeled directly on those Dr. Josephine Baker had developed a decade previously for New York City. But the sums provided under the act were modest, and in some states wholly inadequate. Worse yet, Congress set a time limit on the act, and all its funds dried up in 1929 — just when the states suddenly desperately needed the federal handout.

Despite the act's lofty purpose — improvement of the health and well-being of America's babies and small children — Sheppard-Towner ran into staunch opposition. The American Medical Association, true to its on-going practice of standing firmly against anything thought to take profits away from private physicians, decried the act as “socialistic.” The Louisiana Medical Association called it “paternalistic and socialistic in nature.” And three states — Massachusetts, Connecticut, and Illinois — declared the act unconstitutional, filing federal law suits to block its implementation on the grounds that no federal agency could tell a state how, or on what, it should spend its money.²⁴¹ That those cases floundered in the courts, never reaching the U.S. Supreme

Court, reflected the judiciary's belief that such protest was groundless.

Nevertheless, for five years Congress debated "Russianization" of America's public health system. The term was coined by those who opposed federally-subsidized public health programs and implied that any further involvement in such matters was, as the AMA said, "creeping socialism."

In 1926 the National Health Council, a consortium of private medical and public health organizations, submitted a report to Congress describing the sorry state of federal involvement in the nation's health. Far from exhibiting evidence of turning into a Stalinist monster, in the United States public health was a feeble and disjointed array of largely leaderless efforts that fell under five different cabinets of the executive branch. Some 5,000 civil servants, working in forty different agencies, played a role in setting public health policy and executing actions of one kind or another. The USPHS was hardly alone, or even in charge.²⁴² After the stock market collapsed and America sank into despair, Congress passed the Randall Act, consolidating all public health-related activities within the U.S. Public Health Service and adding the responsibility for medical care for the nation's 12,000 federal prison inmates.²⁴³

In 1932 former governor of New York Franklin Delano Roosevelt was elected president of the United States, having thoroughly trounced incumbent Herbert Hoover. At the Democratic Party nominating convention in the summer of that year, Roosevelt had called for a "New Deal for America" in which banks and finance were regulated and the state extended its charitable hand to rescue the masses from their dire straits. Braced erect on his polio-paralyzed legs, Roosevelt was America's designated savior.

On his whistle stop railroad campaign across the nation, Roosevelt had told his countrymen that: the \$26 billion that had hemorrhaged from the value of stocks traded on the New York Exchange could be restored through creation of a Security Exchange Commission that would prevent the sorts of financial and banking frauds that had ignited the Crash. The nation's agricultural debt, which totaled \$9.8 billion before the Crash and topped \$15 billion before the coup de gras of the dust bowl in '34, could be erased through a series of farm recovery programs. And labor could be back on the job, earning decent wages, if Congress passed laws allowing unionization and promoting industrial development.

Upon taking office in 1933, Roosevelt surrounded himself with a coterie of advisors, swiftly dubbed "The Brain Trust" by the press, and set to work creating his New Deal. Congress passed nearly every piece of legislation the White House sent it, and by the end of 1933 America was taking the first tentative steps out of the Great Depression.²⁴⁴

The impact on the nation's public health infrastructure was profound and would prove lasting. A dozen agencies were created between 1933-1938, each of which affected the health of Americans. And most of these agencies would, in some form, become permanent components of the U.S. government.²⁴⁵

No one made better use of the New Deal than New York City's dynamo of a mayor, Fiorello LaGuardia. One of the most colorful figures in the history of U.S. politics, LaGuardia was an improbable hero. Born in 1882 in Greenwich Village to an Italian immigrant family, LaGuardia matured into a stocky fireplug of a man who stood just five feet one inch tall in his stocking feet. He had a high-pitched voice, was prone to often hilarious malapropisms and twists

of speech,²⁴⁶ moved with the restless energy of a hummingbird and snapped out fiats with the dismissive air of a Caesar. LaGuardia's restlessness even extended to his political party affiliations, which changed so often that he did not, ultimately, fit into any tidy ideological niche — nor, apparently, did he want to. But he would serve four terms as mayor of New York City, from 1934 to 1945, enjoying a popularity never rivaled by a major municipal politician before or since in the United States.

Even before he ascended to New York's throne, LaGuardia told Roosevelt that he would happily allow the president to use Gotham as a testing — and proving — ground for every New Deal program.²⁴⁷ He made this promise even though his 1933 victory was not assured. LaGuardia had run, and lost, twice before, defeated by the still-powerful Tammany Hall machine led by the notorious Al Smith. It was to differentiate himself from Tammany, which controlled the local Democratic Party, that LaGuardia changed his affiliation to the Republicans. But his views were, and always would be, well to the left of mainstream Republicanism.

During the Roaring Twenties Tammany's grip on the health department was absolute, and it played a role in Hermann Biggs's ultimate exhaustion and disheartened resignation as State Commissioner of Health in 1923. That was the same year Dr. Josephine Baker was forced to resign, a victim of Dr. Frank J. Monaghan's thoroughly corrupt leadership of the health department. In every imaginable way, Monaghan undermined the very programs that had made the department a national model.

But Tammany's greed finally went too far, becoming too blatant even for remarkably corruption-tolerant New York City. Private citizens' organizations dug up enough dirt to force

Monaghan out in 1925, and his successor, Dr. Louis Harris, discovered still more evidence of astounding fraud, patronage, and extortion: at least 200 Tammany appointees were on the Monaghan payroll, though none performed any health-related jobs. In 1924 the department had spent \$340,000 to catch fewer than 5,000 rats. The department's halls were piled with files that had been dutifully filled by honest health workers and never even opened by their corrupt bosses. Health department personnel had routinely accepted, grafted or extorted bribes as part of their milk, food, restaurant, and housing inspection duties. One ring of restaurant inspectors alone had been extorting \$3 million a year from eating establishment owners who were compelled to pay five dollars "protection" a week. A \$1 million fund for contagion control had simply disappeared.

Harris — by all accounts an honest man — ordered a long list of firings, and indictments followed. But the department had betrayed its public trust; its credibility with the public had eroded severely, and it would be years before the once-victimized food and dairy industries willingly accepted its authority. During the Mayor James Walker years (1926-1933) Harris tried his best to revitalize the department, and separated it from the public hospitals it had run for more than a century.²⁴⁸ Nevertheless, in 1928 the private Welfare Council of New York published its Health Inventory of New York City which was highly critical of the health department.²⁴⁹ Nearly every program was, it said, in a shambles. The damage done by Harris's predecessor was simply overwhelming. It was a tragic turnabout for what had not long before been the greatest health program in the nation.²⁵⁰

When LaGuardia took office the New York City unemployment rate was 31 percent, and

more than 20 percent of the employed workforce had only part time jobs. Surveys indicated that at least one out of every five children in the city was malnourished. New York had just been through another polio epidemic in 1931-32 that caused 504 deaths among 4,138 cases. Per capita city health spending was sixty-three cents, and it would fall below fifty-five cents over the following three years. A health department food distribution system that was intended to prevent starvation in poor neighborhoods had been hijacked by gangsters and turned into a ghoulish profiteering operation. As if he wanted to pour salt on New York's wounds, Herbert Hoover's surgeon general, George Cummings, declared in 1931 that there was no evidence that the Great Depression was having any deleterious effect upon New York's, or the nation's, health.

Into this quagmire stepped the man known as the Little Flower, Fiorello.

Tammany Hall chief Al Smith and his top-hatted cronies wore expressions of utter defeat at LaGuardia's inauguration. After 146 years in existence, during seventy-seven of which it criminally manipulated New York City and the National Democratic Party, the Tammany machine was finally vanquished. Lest anyone doubt LaGuardia's intention to pound the nails into Tammany's coffin, the new mayor said in his inaugural speech that he intended "to show that a nonpartisan, nonpolitical government is possible, and if we succeed, I am sure that success in other cities is possible."

Hours later, as he swore in New York's new police commissioner, LaGuardia ordered the police to "Drive out the racketeers or get out yourselves."²⁵¹

And then, when swearing in the new commissioner of health, Dr. John Rice, LaGuardia charged: "I know you'll not try to advertise quack medicine or practice medicine by

correspondence. That would be contrary to the policy of my administration.” From the first, Rice was terrified of LaGuardia. He followed the mayor’s instructions in all matters to the letter; and if he had just cause to disagree, Rice usually sent an emissary to the mayor rather than himself face the diminutive but nearly tyrannical LaGuardia.

Shortly after taking office, LaGuardia announced that every pregnant woman in New York City could have free prenatal care, administered by health department personnel out of the city’s public hospitals. A stunned Rice was left trying to figure out how, with a dwindling budget and low staff morale, this colossal promise could be kept. And then LaGuardia ordered a 10 percent staff reduction. Rice muddled through, but repeatedly begged LaGuardia to find more money.

But, of course, LaGuardia was way ahead of Rice. The conversations with Roosevelt’s Brain Trust paid off less than a year after LaGuardia took office, and a hallmark of his tenure would be his uncanny ability to match New York’s needs with Roosevelt’s New Deal agenda. He used a federal Works Progress Administration (WPA) grant to hire unemployed New Yorkers to take care of mosquito abatement and marshland drainage. Another WPA program matched federal dollars with New York’s need to understand its rising air pollution problems. It employed ninety-one scientists for the most ambitious urban air survey conducted to that time anywhere in the world.

After Congress signaled its concern about venereal diseases in two pieces of legislation, LaGuardia obtained federal money in 1935 to execute a “full-scale assault on VD” that included hiring top scientists and sending health department personnel to Europe to study syphilis and

gonorrhea control programs. A city-wide survey conducted by the federally-funded team discovered, most alarmingly, that, whether out of ignorance or shame, more than half of all syphilis and gonorrhea patients weren't seeking medical help until their ailments had reached incurable tertiary stages.

Between 1935 and 1937 the New York City Department of Health underwent a construction boom, getting new laboratories, clinics and offices — all thanks to federal dollars from the Public Works Administration. By 1937 the department's budget was still way below \$5 million a year — amounting to just one cent on every dollar spent by the New York City government. Yet Rice had it back on track, thanks to additional federally-paid personnel, those new offices, and a clean sweep of the last vestiges of Tammany corruption out of the entire health infrastructure. New Deal money funded training programs that brought Rice's staff up to the highest possible scientific standards. And additional New Deal funds allowed creation of divisions dedicated to cardiovascular disease, population surveys, and nutrition studies.

LaGuardia boasted, "We have cleaned politics out of the Health Department in just the same way that we're chasing microbes, germs and bugs out of our city."²⁵²

During an inspection tour of the department's new laboratories, Rice broke into a sweat while LaGuardia gazed at the white-coated staff hunched over their microscopes, but sighed with relief when the mayor smiled and said he was satisfied that it seemed that "everyone [is] on the job and everyone [is] enthusiastically working."²⁵³

In a 1941 speech LaGuardia framed his commitment to public health in national security terms: "The President of the United States has made it very clear that there should be no step

backward and no losing of any ground that has been gained in public health and economic security and social welfare. Therefore, the government, itself, in its normal public health work, will continue, if not increase, its efforts, and the same is applicable, of course, to state and local health departments.²⁵⁴

One New Deal-funded study revealed in 1937 the highly disparate toll the Great Depression was taking on non-white, versus white, New Yorkers. Mortality rates among African Americans and other men of color were 473 percent higher than among white males. And infant mortality among non-whites was double that of white babies.²⁵⁵

By 1940 New York City's population reached 7,454,995, having jumped by more than half a million people during the depression years. Despite that growth, and the relative poverty of the population, the department enjoyed some serious successes. By finding tuberculosis sufferers early in the course of their disease and sending them to any of the several new sanitariums, the department pushed New York City's TB death rate down by 255 percent. A campaign to improve treatment and prevention of pneumonia cut deaths due to that disease by half. The free prenatal care programs LaGuardia mandated cut the maternal death rate from 50 per 10,000 pregnancies in 1929 down to 27 per 10,000 in 1940.²⁵⁶

In truth, LaGuardia's interest in public health matters had less to do with health, itself, than with job creation and attracting federal dollars to his precious city. And to that end he was more successful than any other state or municipal leader of his day.

In his final term in office, LaGuardia awoke to the startling realization that, despite fifteen years of economic hardship for the people of New York, hospitals and doctors had grown very

prosperous in Gotham — so much so that city employees could no longer afford health care. That put the mayor in a bind: either he had to raise the salaries of tens of thousands of New Yorkers to levels compatible with meeting their family’s medical needs — a move that would spark widespread inflation in the region — or he had to find a way for the city to subsidize health care. He opted for the latter. And in 1944 LaGuardia set up the first municipal health insurance program in the United States. The city covered half of all health expenses for employees earning more than \$5,000 a year, and fully covered costs for lesser-paid city workers.

It was, LaGuardia biographer August Heckscher insists,²⁵⁷ “a revolutionary move, and it aroused the passionate opposition of the medical establishment. LaGuardia was not displeased to have a new set of enemies who could be counted on to overstate their case and whom he could denounce with a fervor that was wearing thin when applied to ‘chiselers’ and ‘punks.’”

But long before LaGuardia took the nation down the path of health insurance, the AMA kicking and screaming in protest each step of the way, he and Commissioner Rice used New Deal money to transform public health activities in Gotham. In the department’s annual report, written at the close of 1938 when New York was experiencing fantastic growth thanks to hundreds of New Deal construction projects, Rice acknowledged that the very mission of public health had changed. Though scourges of contagion, notably syphilis, tuberculosis, bacterial pneumonia, meningitis, and polio, continued to plague the population, “diseases which influence mortality rates” could no longer absorb most of the department’s energies. Rather, said the rather prescient Rice, in the future public health would need to “include consideration of physical and mental disorders which affect the general health and well-being of the community.”²⁵⁸

By that time one out of every five dollars spent by the New York City Department of Health was of federal origin. Given that just four years previously the city public health effort hadn't received a nickel from Washington, that was a marked change of affairs. And in 1940 the department for the first time faced a funding crisis that would prove a harbinger of things to come: changes in White House policies had trickled down the funding ladder through an array of New Deal bureaucracies in Washington, and suddenly New York faced a 21 percent cut in WPA revenues. Having grown utterly reliant upon those Washington dollars, the department went into a panic. Doctors and nurses in many divisions saw their incomes halved overnight, as they were reduced to part time status. That, too, would prove a harbinger of future weaknesses in America's public health safety net.

All over the United States, to one degree or another, public health programs were bailed out during the 1930s by FDR's New Deal programs. And, like New York City, they got hooked on dollars from Washington.

Dependency can be a terrible thing, especially if the terms of a dole are dictated entirely by the donor. In coming decades public health programs would grow increasingly reliant upon Washington's largess, and, therefore, more vulnerable to the whims and priorities of faraway politicians over whom they had little or no influence. Without the political savvy of a Hermann Biggs or the supportive political hustle of a Fiorello LaGuardia, few localities would prove immune to periodic tug-and-pull from Washington.

The New Deal's impact on public health was, however, remarkably positive. And the benefits often came from surprising sources. The health of American Indians improved as a

result of changes in their land rights under the Indian Reorganization Act of 1934.²⁵⁹ Mortality decreased among farmers and “Okie” farm workers as a result of New Deal agricultural programs that helped restore the dust bowl lands and extended low interest loans to rural families. Rural areas saw their food poisoning rates go down as the Tennessee Valley Authority brought electricity to tens of thousands of households, allowing installation of refrigerators. Eight million workers suddenly had money with which to feed their children, thanks to employment with the WPA. Hookworm infection rates declined as southern families earned enough to provide their children with shoes.

Though each aspect of FDR’s New Deal faced some opposition, neither Republicans to his right nor the enormous labor movement and its socialist, communist, and anarchist supporters to his left stood much of a chance of fundamentally altering its course. The 1934 congressional elections swept so many Roosevelt supporters into the House and Senate that Republicans formed an impotent minority that could do little but shout as the New Deal steamroller drove right over them. The New York Times labeled that election “the most overwhelming victory in the history of American politics.”²⁶⁰

Despite its tremendous popularity, Roosevelt’s Brain Trust met its match when the Administration moved to create health insurance and social security programs. Roosevelt’s plan was to set in place a “cradle-to-grave” social insurance program that would cover every American’s health, medical, and pension needs and would be financed through a payroll contribution system. FDR envisioned a system that would serve as a safety net for unemployed workers, offer prenatal care to their pregnant wives, and provide a living wage for retirees. As he

conceived it, every American, regardless of race or class, would come under the U.S. social security umbrella.

That was going too far.

Southern political leaders said they would never vote for a law that might carve cents out of the paychecks of white workers to pay unemployment benefits to “Negroes to sit around in idleness on front galleries.”²⁶¹ The Republican Party said the FDR plan was overtly socialistic and, by said definition, had to be blocked. With less than a fifth of U.S. corporations then offering their employees pension or unemployment options, it was obvious that the business community felt little sympathy for health and welfare needs: the U.S. Chamber of Commerce staunchly opposed FDR’s plan.

And, of course, the American Medical Association chimed in again, with its leaders opposing all of the health insurance provisions of FDR’s social security proposal.²⁶² At their 1934 House of Delegates meeting, AMA members forecast creation of a Soviet-style system under the FDR plan in which they would toil in medical factories, treating patients unknown to them, and earning little money in the process. All incentive for improving the quality of health care would surely disappear, they prophesied.

To be fair, most physicians were feeling the pinch of the depression, as their patients were often unable to pay medical bills. The average California doctor earned 50 percent less in 1933 than in 1928, for example. And in 1935 the California Medical Association voted to endorse the compulsory health insurance proposal, its members feeling that at least under such a system they would receive remuneration for their services. Maverick chapters of the AMA throughout the

country were similarly inclined to support some form of federal health insurance. And in 1938 a Gallup poll found seven out of ten physicians favoring compulsory health insurance.

But the AMA leadership stood its ground, offering an alternative to the physician pay problem: train fewer doctors. Medical schools were told to admit no foreign students and fewer Americans so that need for medical services would increase and doctors could charge more. It was such a phenomenally idiotic idea that many doctors quit the AMA in protest. But the AMA leadership was unmoved.

The Social Security Act of 1935 compromised or defeated all of FDR's original intentions and was a deeply flawed piece of legislation. As the AMA had hoped, it had no provisions for health insurance. To keep Southerners happy, it excluded sharecroppers and domestic workers — the major categories of African American employment in the Deep South. Payment into the system was based on payrolls, so higher wage earners ended up with higher Social Security dividends. This ran precisely contrary to need. And funding the system through payroll taxes meant less spending power for American consumers. In addition, implementation of the unemployment safety net was left up to the individual states, which drew from federal Social Security funds to pay out premiums as they wished. The result would be a wild melange of unemployment compensation policies which, in some states, arbitrarily excluded entire sectors of the labor force.

Thus, for the second time in U.S. history, the possibility of universal health care based on compulsory insurance was raised — and defeated. And the primary force responsible for vanquishing it was, in both cases, the AMA. The Roosevelt Administration would keep trying

for five more years to get health insurance on the congressional agenda, but find itself defending the concept in isolation. The left and organized labor were preoccupied with other issues and paid little or no attention to the debate.

“How can social workers expect the President and the Congress to act on controversial issues in the face of such vociferous and politically powerful opposition to health insurance, if there is no organized expression of public opinion in favor of it?” asked one health reformer in 1937.²⁶³

Paul de Kruif, who was highly critical of the compromises struck in the Social Security Act, eventually concluded that the only hope of salvaging public health in the United States rested with further federalization and creation of a large corps of USPHS officers. He advocated creation of something not terribly unlike the future U.S. Center for Communicable Diseases.

In The Fight for Life de Kruif wrote:

There is beginning to be a revolt of the competent. This year, 1937, there has been issued a new medical declaration of independence — signed by four hundred and thirty of our nation’s death-fighters.

They make bold to say that the health of the people has now become a direct concern of government; that the first step in this people’s fight is to cut down the risk of illness and death by prevention — which means mass prevention or it means nothing. They demand that our public-health services, federal, state, and local, be so expanded and organized as to become the general staff of the people’s fight for life against death, now mass-preventable....

Why cannot our U.S. Public Health Service be entrusted with co-ordinating in the instances of these now-preventable plagues, the people’s fight for life? You hear the wail that this will breed a new bureaucracy. Let this then be remembered: we have an army and a navy supported by the government, by all the people — to defend our nation against threat of human invasion that becomes real not once in a generation. They are bureaucracies, granted.

But is it anywhere advocated that the army and the navy be turned over to private hands and the defense of our country be left to us individuals armed with scythes and shotguns, because the army and navy are bureaucratic?...Who then objects to the organization of a death-fighting army against the far more dangerous subvisible assassins in ambush for all the people — always?...

If you allow our death-fighters — we can assure you they are competent — the money to wipe out such and such and such deaths that cost us billions to maintain, within a generation there will no longer be this drain upon the wealth of our nation.²⁶⁴

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1. Callahan, D. False Hopes: Why America's Quest for Perfect Health Is a Recipe for Failure. New York City: Simon and Schuster, 1998.
 2. Caldwell, M. The Last Crusade: The War on Consumption 1862-1954. New York: Atheneum, 1988.
 3. Condran, G.A., Williams, H., and Cheney, R.A. "The decline in mortality in Philadelphia from 1870 to 1930: The role of municipal health services." Leavitt, J.W. and Numbers, R.L. Sickness and Health in America. Second Edition. Madison: University of Wisconsin Press, 1985.
 4. Vogt, M., Lang, T., Frösner, G., et al. "Prevalence and clinical outcome of hepatitis C infection in children who underwent cardiac surgery before the implementation of blood donor screening." New England Journal of Medicine 341 (1999): 866-870.
 5. Blau, S.P. and Shimberg, E.F. How to Get Out of the Hospital Alive. New York: Macmillan, 1997.
 6. Tenover, F.C. and Hughes, J.M. "The challenge of emerging infectious diseases." Journal of the American Medical Association 175 (1996): 300-304.
 7. Jones, R.N. and Verhoef, J. Presentation to the 37th Interscience Conference on Antimicrobial Agents and Chemotherapy, Toronto, September 29, 1997.
 8. The author interviewed Hamburg and other New York health experts on numerous occasions during the 1990s. Unless otherwise noted in this section, individuals' comments and observations were gleaned from those interviews.
 9. Raad I. And Darouchie, R.O., "Catheter-related septicemia: risk reduction," Infection and Medicine 1996; 13:807-812; 815-816; 823. And Raad I., "Intravascular-catheter-related infections," The Lancet 1998; 351: 893-898.
 10. Jarvis W.R., "Selected aspects of the socioeconomic impact of nosocomial infections: mortality, morbidity, cost and prevention," Infection Control and Hospital Epidemiology 1996; 17: 522-527.
 11. Austrian, R. "Confronting drug-resistant *Pneumococci*." Annals of Internal Medicine 121 (1994): 807-809.
 12. Gleason, P.P., Kapoor, W.M., Stone, R.A., et al. "Medical outcomes and antimicrobial costs with the use of the American Thoracic Society guidelines for outpatients with community-acquired pneumonia." Journal of the American Medical Association 278 (1997): 32-39.

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13. Garrett, L. "Tough bugs thrive." Newsday (November 21, 1996): A20.
 14. Patterson, J.E. "Making real sense of MRSA." Lancet 348 (1996): 836-837.
 15. Frieden, T.R., Munsiff, S.S., Low, D.E., et al. "Emergence of vancomycin-resistant enterococci in New York City." Lancet 342 (1993): 76-79; Uttley, A.H., Collins, C.H., Naidoo, J., et al. "Vancomycin-resistant enterococci." Letter. Lancet 1 (1988): 57-58; and Uttley, A.H., Collins, C.H., Naidoo, J., et al. "Nosocomial enterococci resistant to vancomycin — United States 1989-1993." Mortality and Morbidity Weekly Report 42 (1993): 597-599.
 16. Morris, J.G., Shay, D.K., Hebden, J.N., et al. "Enterococci resistant to multiple antimicrobial agents, including vancomycin." Annals of Internal Medicine 123 (1995): 250-259.
 17. Lautenbach, E. Presentation to the annual meeting of the Infectious Diseases Society of America, San Francisco, September 15, 1997.

The percentage of *Enterococcus* isolates nationally that are resistant to the drug vancomycin:

<u>Year</u>	<u>All Hospitals Surveyed</u>	<u>Patients in Intensive Care</u>
1989	0.3 %	0.4 %
1990	1.1 %	1.6 %
1991	2.8 %	5.9 %
1992	3.0 %	7.1 %
1993	7.9 %	13.6 %

The percentage of *S. aureus* bacteria found in U.S. hospitals that are resistant to the drug methicillin:

<u>Year</u>	<u>Small Hospitals</u>	<u>Large Hospitals (>500 beds)</u>
1980	2.5 %	4.0 %
1981	2.6 %	4.5 %
1982	2.8 %	4.9 %
1983	3.0 %	5.2 %
1984	4.0 %	6.9 %
1985	5.0 %	10.0 %
1986	7.8 %	14.8 %
1987	10.0 %	21.0 %
1988	15.0 %	23.0 %
1989	17.0 %	28.0 %
1990	20.0 %	32.0 %
1991	20.9 %	37.8 %

Source: Centers for Disease Control and Prevention. Mortality and Morbidity Weekly Report, multiple issues, 1980-1999.

18. Boyce, J.M., Opal, S.M., Chow, J.W., et al. "Outbreak of multidrug-resistant *Enterococcus faecium* with transferable *vanB* class vancomycin resistance." Journal of Clinical Microbiology 32 (1994): 1148-1153; Fan, C., Moews, P.C., Walsh, C.T., et al. "Vancomycin resistance: Structure of D-alanine: D-alanine ligase at 2.3A resolution." Science 266 (1994): 439-443; Gilmore, M.S. and Hoch, J.A. "A vancomycin surprise." Nature 399 (1999): 524-527; and Novak, R., Henriques, B., Charpentier, E. "Penicillinase resistant *S. pneumoniae* with decreased vancomycin susceptibility." Nature 399 (1999): 590-593.

19. Farrag, N., Eltringham, I., and Liddy, H. "Vancomycin-dependent *Enterococcus faecalis*." Lancet 348 (1996): 1581-1582.

20. Blau, S.P. and Shimberg, E.F., 1997, op. cit.; Bologna, J.L. and Edelson, R.L. "Spread of antibiotic-resistant bacteria from acne patients to personal contacts — a problem beyond the skin?" Lancet 350 (1997): 972-973; Burnie, J.P. and Loudon, K.W. "Ciprofloxacin-resistant *Staphylococcus epidermis* and hands." Lancet 349 (1997): 649; Caul, E.O. "Small round structured viruses: Airborne transmission and hospital control." Lancet 343 (1994): 1240-1241; Centers for Disease Control and Prevention. "Bronchoscopy-related infections and pseudoinfections — New York, 1996 and 1998." Mortality and Morbidity Weekly Report 48 (1999): 557-560; Centers for Disease Control and Prevention. "Multistate outbreak of hemolysis in hemodialysis patients — Nebraska and Maryland, 1998." Mortality and Morbidity Weekly Report 47 (1998): 483-484; Centers for Disease Control and Prevention. "Nosocomial group A streptococcal infections associated with asymptomatic health-care workers — Maryland and California, 1997." Mortality and Morbidity Weekly Report 48 (1999): 163-166; Hilts, P. "Infection kills four infants, and hospital closes a unit." New York Times (September 16, 1997): A16; and Levitz, R.E. "Prosthetic-valve endocarditis caused by penicillin-resistant *Streptococcus otitis*." New England Journal of Medicine 340 (1999): 1843-1844.

21. These figures include the estimates of previously cited for catheter-induced infection, alone.

22. Officials at Columbia-Presbyterian, which had an aggressive infection-control program, said they didn't see their first VRE incident until January 1994, when a case appeared on the intensive care unit. A year later they saw forty VRE cases.

North Shore University Hospital in Manhasset said they changed sensitivity levels on routine tests for enterococci in the beginning of 1992, increasing the number of low-level VRE cases they found. That change showed sixty-two such cases in 1992, they said, 111 in 1993 and a steady upward climb thereafter.

Long Island Jewish Hospital first became aware of an outbreak in its facilities when a child developed VRE in March 1990, and the microbe spread to about fifteen other children on the pediatric ward. Since then, the hospital had seen about a dozen pediatric VRE cases yearly, administration officials said in 1995. The first adult case emerged at LIJ in February 1991; and

in 1993 there were 175 adult cases. After that, the hospital had instituted tough infection-control measures and limited use of vancomycin. But VRE became a long term problem, surfacing unpredictably throughout the 1990s in the Long Island hospital.

See Lam, S., Singer, C., Tucci, V., et al. "The challenge of vancomycin-resistant enterococci: A clinical and epidemiologic study." American Journal of Infection Control 23 (1995): 170-180.

23. Rice, L. Presentation to the annual meeting of the Infectious Diseases Society of America, San Francisco, September 15, 1997.

24. Rahal, J. Presentation to the annual meeting of the Infectious Diseases Society of America, San Francisco, September 15, 1997.

25. The other pre-antibiotic era approach to killing bacteria involved the use of phages, or bacterial viruses. If properly grown and purified bacteriophages were harmless to human beings, but wiped out all members of a given species of bacteria. At the close of the nineteenth century Germany's Paul Erlich experimented with such phages, calling them "magic bullets" in the war against disease. A century later, fearing the approaching end of the antibiotic era, researchers in Tblisi, Georgia collaborated with Western drug companies in a race to again develop phages technology — before antibiotics were rendered truly useless. See Osborne, L., "A Stalinist antibiotic alternative," The New York Times Magazine; 2000: February 6, 50-55.

26. Senate Committee on Investigations. The Growing Menace of Bacterial Infections. Albany: New York State Senate, 1999.

27. In addition to the Senate report, see Roberts, R., Tomasz, A., and Kreiswirth, B. Antibiotic Resistance in New York City: A Growing Public Health Threat and a Proposal for Action. New York: Bacterial Antibiotic Resistance Group, 1995.

28. In this section I will be referring to data that contrasts the health of Europeans versus white colonialists. I am well aware that this omits data germane to African Americans and Native Americans. Sadly, the factors responsible for their radically shortened life expectancies in the Americas between 1620 and 1865 have little to do with the public health issues under discussion. Africans suffered and died prematurely under conditions of slavery, and Native Americans perished primarily as a result of their lack of immunity to European-introduced disease. Secondary to disease and slavery, they also died prematurely during this period of warfare, forced relocation, and colonial genocidal policies.

It should also be noted that statistics presented in this section reflect availability; that is to say, it is not always clear whether or not public vital statistics include nonwhite residents of the cities or American regions discussed. Where, for example, people of African descent were bought and sold as slaves, their life and death records were generally recorded as matters of

property rather than of human health. Whenever possible, I have endeavored to find demographics that reflect the full spectrum of humanity in America. I apologize for the inherent inadequacies in my efforts, which were often hampered by lack of reliable source information.

29. Population of New York City, 1650-1990

Year	Population
1650	1,000
1698	4,937
1703	4,375
1712	5,840
1723	7,248
1731	8,622
1737	10,664
1746	11,717
1749	13,294
1756	13,046
1770	21,000
1771	21,863
1786	23,610
1790	33,131
1800	60,489
1805	75,770
1810	96,373
1814	95,519
1815	93,630
1816	93,634
1820	123,706
1825	166,086

1830	202,589
1835	270,089
1840	312,710
1845	371,223
1850	515,547
1855	629,904
1860	813,669
1865	871,583
1870	942,292
1875	1,041,886
1880	1,206,299
1885	1,377,085
1890	1,515,302
1895	1,787,412
1900	3,437,202
1905	4,121,678
1910	4,766,883
1915	5,224,591
1920	5,620,048
1925	6,323,190
1930	6,930,446
1935	7,206,000
1940	7,454,995
1945	7,648,000
1950	7,891,957
1955	7,843,000
1960	7,781,985

1965	7,839,000
1970	7,895,563
1975	7,896,000
1980	7,071,639
1985	7,197,000
1990	7,322,600
1995	7,542,500

(Note: Population figures before 1890 are for Old New York (Manhattan and the Bronx).

Population figures after the 1898 unification are for Great New York City (the five boroughs: Manhattan, the Bronx, Brooklyn, Queens, and Staten Island. In 1993 128,292 immigrants were legalized as residents of New York City under a single U.S. Department of Justice action.)

Sources: Condran, G. Changing patterns of epidemic diseases in New York City.’’ In D. Rosner, editor. Hives of Sickness: Public Health and Epidemics in New York City. New Brunswick, NJ: Rutgers University Press, 1995; Duffy, J. A History of Public Health in New York City, 1625-1866. New York: Russell Sage Foundation, 1968; Duffy, J. A History of Public Health in New York City, 1866-1966. New York: Russell Sage Foundation, 1974; Emerson, E. Supplement 1936-1953 to Population, Births, Notifiable Diseases, and Deaths, Assembled for New York City, New York. New York: DeLamar Institute of Public Health, Columbia University, 1941; Emerson, H. and Hughes, H.E. Populations, Births, Notifiable Diseases, and Deaths, Assembled for New York City, New York, 1866-1938, from Official Records. New York: The DeLamar Institute of Public Health, Columbia University, 1941; Rosenwaike, I. Population History of New York City. New York: Syracuse University Press, 1971; Shupe, B., Stains, J., and Pandit, J. New York State Population, 1790-1980: A Compilation of Federal Census Data. New York: Neal-Schuman, 1987; and New York City and New York State Department of Health statistics.

30. For details spanning 1600-1776 in New York, Boston, Philadelphia, and other colonial cities see: Carlson, L.W. A Fever in Salem. Chicago: Ivan R. Dee Publisher, 1999; Duffy, J. Epidemics in Colonial America. Baton Rouge: University of Louisiana Press, 1953; Duffy, J. A History of Public Health in New York City. New York: Russell Sage Foundation, 1968; McKeown, T. The Origins of Human Disease. Cambridge, Mass: Basil Blackwell, 1988; McKeown, T. The Role of Medicine: Dream, Mirage, or Nemesis? Princeton: Princeton University Press, 1979; McNeill, W.H. Plagues and Peoples. New York: Anchor Books, 1977; Porter, R. The Greatest Benefit to Mankind. New York: Harper Collins, 1997; Powell, J.M. Bring Out Your Dead. Philadelphia: University of Pennsylvania Press, 1949; and Watts, S. Epidemics and History. New Haven: Yale University Press, 1998.

31. Said by a Dr. Bullivant in 1697, as quoted in Burrows, E.G. and Wallace, M. Gotham: A History of New York City to 1898. New York: Oxford University Press, 1999.

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32. Carlson, L.W., 1999, op. cit.
33. Duffy, J., 1968, op. cit.
34. Ibid.
35. Watts, S., 1998, op. cit.
36. Ibid.
37. Blake, J.B. "The inoculation controversy in Boston, 1721-1722." In Leavitt, J.W. and Numbers, R.L., 1985, op. cit.
38. It is worth pointing out that no one in his day, including Jenner, understood the concepts of "viruses" and cow, versus human, forms of microbes. For Jenner the discovery was a simple matter of having noted that milkmaids, who were often in close contact with ailing cows, rarely suffered from smallpox. Words and concepts in the text reflect more modern ways of framing discussion of disease. Readers are reminded, however, that these words and ideas were utterly alien, unknown, to the medical leaders of the eighteenth century. Further, there continues to be dispute about how much credit for "discovery" of cowpox vaccine ought to be assigned to Jenner. See Root-Bernstein, R.M. Honey, Mud, Maggots and Other Medical Marvels: The Science Behind Folk Remedies and Old Wives' Tales. New York: Macmillan, 1999.
39. Powell, J.M., 1949, op. cit.
40. McNeill, W.H., 1976, op. cit.
41. By 1700 European port cities were also experiencing waves of yellow fever, but the impact upon the Americas was most acute. This was probably because the American ecology offered especially good opportunities for the *Aedes aegypti* mosquitoes, which quickly became permanent features of the ecology from southern Argentina all the way north to central Canada. These mosquitoes carried not only yellow fever but also dengue fever, which by the late twentieth century represented a serious public health treat to the Americas. See Garrett, L. The Coming Plague. New York: Farrar, Straus & Giroux, 1994.
42. Now called Greenwich Village, located around Washington Square in lower Manhattan.
43. Duffy, J., 1953, op. cit.
44. Burrows, E.G. and Wallace, M., 1999, op. cit. See Table: "EPIDEMICS OF NEW YORK CITY: 1679-1873."

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45. Notably, “Account of the climate and diseases of New York.” See Duffy, J. The Sanitarians: A History of American Public Health. Illini Books Edition. Chicago: University of Illinois Press, 1992; and Duffy, J., 1968, op. cit.
46. Petty, W. “Natural and Political Observations upon the Bills of Mortality.” See Porter, R. and Porter, D. In Sickness and in Health: The British Experience 1650-1850. London: Fourth Estate, 1988.
47. Pernick, M.S. “Politics, parties and pestilence: Epidemic yellow fever in Philadelphia and the rise of the first party system.” In Leavitt, J.W. and Numbers, R.L., 1985, op. cit.
48. Powell, J.M., 1949, op. cit.
49. Rosenwaike, I. Population History of New York City. New York: Syracuse University Press, 1972.
50. During the same period, New York City passed its own tough quarantine laws, opened New York Hospital, built a dispensary (located on the corner of Beekman and Nassau streets in Manhattan) for delivery of health care to the poor and witnessed the opening of Bellevue Hospital, which would come under city control in 1805.
51. Beard, R. and Berlowitz, L.C. Greenwich Village: Culture and Counterculture. New Brunswick: Rutgers University Press, 1993; Burrows, E.G. and Wallace, M., 1999, op. cit.; Jackson, K.T., editor. The Encyclopedia of New York City. New Haven: Yale University Press, 1995.
52. See Table: “NEW YORK CITY DEATH RATES PER YEAR PER 100,000 PEOPLE.”
53. European expansion into North America came chiefly from two directions: from the French- and English-originated colonies of the east coast and from the Spanish and Mexican empires to the southwest. Not surprisingly, the pattern of major epidemics among American Indians reflected that European flow.
- The first devastating epidemics appeared between 1513 and 1533 in the far southeast and southwest of the continent, reflecting early post-Columbus Spanish incursions and settlements. In the northeast of America, 1535 marked the first serious epidemic, following French explorer Jacques Cartier’s landing in Canada.
- As French and Spanish settlement and exploration of the southeast became more aggressive, the Indian populations suffered wave after wave of epidemics between 1535 and 1698. These often eliminated up to 90 percent of all Indian groups that were afflicted. Similarly, Northeast tribes were obliterated by disease largely between 1613 and 1690.
- In contrast, the tribes of the prairie and Great Plains territories were spared such microbial horrors until a century later, reflecting later white ventures into their areas. The first truly

devastating epidemics in those areas hit between 1780 and 1837. See Ramenofsky, A.F. Vectors of Death: The Archaeology of European Contact. Albuquerque: University of New Mexico Press, 1987; and Diamond, J. Guns, Germs and Steel. New York: W.W. Norton and Co., 1999.

As white settlers laid claim to the most comfortable and accessible areas of the Minnesota territory — Minneapolis, St. Paul, and Duluth — tensions with the Chippewa and, chiefly, the Sioux boiled over. Throughout the pre-Civil War nineteenth century, Minnesota was rife with wars, raids, and massacres involving the white settlers, U.S. Army, Chippewa, and Sioux Nations.

The Chippewa and Sioux leaders were, between 1800 and 1860, well aware of the failed diplomatic, trade and military relations between other American Indian Nations and incoming white settlers to their east and south. By 1830 all of the great Nations of the east had been diminished, defeated and/or relocated by the U.S. government, including the Seminoles, Cherokees, Iroquois, Senecas, Mohegans, Chesapeakes, Pequots, Hurons, Eries, and Mohawks. The Sioux, in particular, were cognizant that the strategies of their counterparts to the east had failed, and they determined to retain hold of the northern plains and Great Lakes regions that they had occupied for thousands of years. See Brown, D. Bury My Heart at Wounded Knee. New York: Holt, Rinehart and Winston, 1970.

54. Despite aggressive searching, the author has been unable to find reliable estimates of the original, pre-1763 sizes of the populations of Santee Sioux and Chippewa Nations. Part of the problem is that these Nations were migratory and didn't only reside within the modern borders of the state of Minnesota. Conservatively, however, the toll of disease and warfare upon the Santee and Chippewa between 1815 and 1862 amounted to more than 80 percent of their populations.

55. By 1900, upwards of 60 percent of the Minnesota population would be of German or Scandinavian extraction. See U.S. Bureau of the Census, Census Reports Vol. 1, 1900.

56. White, R. It's Your Misfortune and None of My Own: A New History of the American West. Norman: University of Oklahoma Press, 1991.

57. Jordan, P.D. The People's Health: A History of Public Health in Minnesota to 1948. St. Paul: Minnesota Historical Society, 1953.

58. Public distrust of New York physicians grew to riot proportions in 1788. Rumors spread across working class neighborhoods of ghoulish doctors who dug up the cadavers of their loved ones by moonlight and then cut up the bodies for medical experiments and anatomy studies. Fueled by a child's claim of having witnessed a New York Hospital doctor carving up his, the child's, recently-deceased mother, a mob of 5,000 people stormed Columbia College and New York Hospital, scattering terrified physicians and medical students before it. The doctors took refuge in the city jail, which the horde stormed with angry intent. Three rioters were killed when local militia fired their weapons in defense of the besieged physicians.

59. Starr, P. The Social Transformation of American Medicine. New York: Basic Books, 1982; Ludmerer, K.M. Learning to Heal. Baltimore: Johns Hopkins University Press, 1985; and Ludmerer, K.M. Time to Heal. New York: Oxford University Press, 1999.

60. In his previously cited books on medical education, Kenneth Ludmerer argues that as early as the 1830s French medical instructors had abandoned the rote memorization approach to training doctors in favor of direct contact with patients and problem solving. The handful of Americans who returned each year from such Parisian training knew how to examine a patient and even had a sense of diseases that focused on specific organs of the body. But well into the end of the nineteenth century, most American doctors, regardless of their “training,” had no concept of the relationships between the organs of the body and disease, nor could they perform patient examinations and correctly reach even rudimentary diagnoses.

61. This was not true, of course, for California’s Indian populations, which were nearly eradicated — some tribes actually driven to extinction — by three factors: epidemics, forced cultural assimilation, and the popular pursuit of hunting down Indians for sport. Gutiérrez, R.A. and Orsi, R.J. Contested Eden: California Before the Gold Rush. Berkeley: University of California Press, Berkeley, 1988. Possibly as early as 1542 waves of epidemics swept up the Pacific Coast in the wake of Spanish explorers and conquerors. Like their native counterparts in the east, the California Indians of all tribes lacked immunity to the European microbes. The journals of Meriwether Lewis, maintained during his 1804-06 trek across America with William Clark, a band of American men and Indian scout Sacagawea, bear tragic testimony to the devastation European disease had already — indeed, long before 1804 — wrought upon Native Americans. All across the Great Plains, Lewis encountered the Otos, whose numbers were so diminished by smallpox that they could no longer defend their territory or herds from hostile Sioux. The Arikara tribe literally disappeared before his eyes, becoming extinct in an 1804 smallpox epidemic. Nearing the Rockies, Lewis discovered the smallpox-ravaged Mandans. In modern Oregon, the Lewis and Clark Expedition encountered the once-prosperous Clatsops and Chinooks, finding their numbers greatly diminished by waves of, again, smallpox. In 1825, both those tribes would be driven to the edge of extinction by another introduced disease — malaria.

Sexually transmitted diseases also preceded Lewis and Clark, and by expedition’s end afflicted all of the adventurous team. Lewis was well aware of debate in his day over whether Columbus’ group brought syphilis from Spain to America in 1492 or, conversely, acquired the disease from Native Americans and upon return to Spain introduced the spirochete to Europe. As he traveled, Lewis questioned tribal leaders about the disease, asking when it first appeared and from whom it had come. He came away impressed that syphilis was new to the tribes he encountered, having only appeared after visits by European fur traders during the late 1700s. See Ambrose, S.E. Undaunted Courage. New York: Simon and Schuster, 1996.

By the time the Franciscans created their missions, the Ohlone, Chumash, Hupa, Modoc, Yuma, Pima, and a hundred other tribes in California had already seen their populations diminish tragically from a total estimated population of as high as 310,000 in 1540 to approximately 100,000 in 1846. The missionaries, in their zeal, contributed significantly to that horrifying

decline. White, R., 1991, op. cit.; and Guitierrez, R.A. and Orsi, R.J., 1988, op. cit. Under Serra's master plan, each of the twenty-one missions in California became a center of Indian assimilation that, in just one decade, virtually incarcerated more than 54,000 of those who had managed to survive or escape the imported epidemics. They were baptized, taught Spanish, compelled to abandon all aspects of their traditional cultures and beliefs, and ordered to work — generally without pay. This forced labor was a far cry from the way the Indian adults had fed themselves and their children for millennia. Suddenly they were expected to build adobe structures, irrigate fields, herd cattle, and harvest crops. Failure to comply was punished with floggings, hangings, and torture.

The rapid forced transition from a semi-nomadic hunter-gatherer life to Spanish-style sedentary work proved to be a public health disaster, even for those whose immune systems managed to fight off measles, influenza, and other introduced European organisms. Between 1771 and 1830 the California Indians' death rates skyrocketed and birth rates plummeted. By 1830 their death rate was double the birth rate and their population was disappearing. Cook, S. The Population of California Indians, 1769-1970. Berkeley: University of California Press, 1976.

Like the Santee and Chippewa of Minnesota, California's four score tribes would never recover. They either no longer existed or survived in tiny numbers. Most survivors forgot their traditional languages and cultures. Two centuries after Junipero Serra's first mission was built, California's Native populations would still have the poorest individual and collective standards of health of any group in the state.

62. In Roughing It Twain noted that the very thing that made California so healthful — its climate — was an object of his utter disdain. "No land with an unvarying climate can be very beautiful," he insisted.

63. In 1844 James Polk, an ardent believer in "manifest destiny," was elected president of the United States. Upon taking office he assigned spies — notably Thomas Larkin — to foment discontent among the Californios. It wasn't a tough task, as Mexicano governance of California had thoroughly deteriorated, and few Californios felt strong allegiance to that country. His spies informed Polk that California "would fall without an effort to the most inconsiderable force. Hackel, S.W. "Land, labor and production." In Gutierrez, R.A. and Orsi, R.J., 1988, op. cit.

As, indeed, it did in March of 1845, months before the Mexican-American War secured other Mexican territories for the United States. By that date, the total population of immigrants — non-Mexicanos, non-Californios, non-Indians — was just seven thousand people.

64. In New York City, for example, typhoid fever claimed 1,396 lives in 1847; cholera killed another 5,071 (possibly 8,000) in the summer of '49; smallpox and typhoid fever both hit in 1851, killing 1,600 people; and cholera struck again the summer of '54, killing 2,501. These epidemics, coupled with alarmingly increasing maternal and child death rates, by 1855 drove the New York City mortality rate upwards to 48 deaths per year per 1,000 people. See Table: "EPIDEMICS OF NEW YORK CITY: 1679-1873."

65. Puerperal fever is postpartum infection caused by any of a number of bacterial species. Typically, the women got infected as a result of the horrible standards of hygiene practiced by midwives and obstetricians.

66. As with much of the New York City data cited in this text, this information comes from Duffy, J., 1968, op. cit. These statistics come from Report of the City Inspector in Duffy.

67. New York passed a gradual emancipation law in 1799 under which slaves were freed in a process lasting about a decade. But in the 1850s there were still slaves in New York — escapees from the South. In 1850 there were about 13,800 African Americans living in New York when President Fillmore authorized the Fugitive Slave Law, under which bounty hunters could legally kidnap suspected escapees off the streets of northern cities, and return them to the South. Some 2,000 African Americans “disappeared” from New York over the subsequent two years. Life for African Americans, whether or not they were legally free, was one of acute poverty and fear — all of which no doubt contributed to their declining standards of health. See Burrows, E.G. and Wallace, M., 1999, op. cit.

68. Many observers argue persuasively that the need for large middle classes is fundamental to implementation of public health in any society that operates via an electoral or democratic process. The proper function of civil society requires that the populace feel genuinely invested in its future. Clearly, in the former Soviet Union nations, central Africa and India, middle classes are nearly non-existent. All of these countries are marked by economic and social stratifications similar to those seen in American cities in the mid-nineteenth century: small elites control virtually all of the capital and are rich enough to afford separate, private superstructures that obviate their need to be involved in day-to-day governance. In their place, running the governments and crucial public infrastructures, are the corrupt, greedy and incompetent representatives of the professional and working classes, as well as entrenched civil servants.

It might well be argued, then, that public health cannot exist in a democracy in the absence of a strong middle class. Of course, it could also be argued that democracy itself cannot exist in the absence of such a class force.

69. An excellent rendition of Chadwick’s contributions can be found in the chapter entitled “Public medicine” in Porter, R. The Greatest Benefit to Mankind: A Medical History of Humanity. New York: Norton, 1998.

70. Details can be found in Duffy, J., 1992, op. cit.

71. “Nativists” were American-born whites who favored their rights in U.S. society over and above those of immigrants, African Americans and American Indians. As a rule, nativists were strongly anti-Semitic and racist in their beliefs, blaming “non-natives” for all social ills.

72. This was not so clearly the case in Europe at the time. In the mid-nineteenth century, Americans were far more moralistic and uncaring in their approaches to public health than were their European counterparts. For example, Porter tells us that Rudolf Virchow called upon German physicians to become “attorneys for the poor,” and France’s Jules Guérin announced the need for what he labelled “social medicine.” In general, European public health leaders were far less judgmental of the sick, and more politically engaged, than were their American colleagues. See Porter, R., 1998, *op. cit.*

73. Starr, P., 1982, *op. cit.*

74. Hog Town spanned a section of midtown Manhattan that was bordered by Fiftieth and Fifty-Ninth Streets to the north and south and Fifth and Eighth Avenues to the east and west.

75. Ludmerer, K.M., 1985, *op. cit.*

76. Foote, S. *The Civil War: Fort Sumter to Perryville*. New York: Vintage Books, 1986; and Foote, S. *The Civil War: Red River to Appomattox*. New York: Vintage Books, 1986.

77. President Lincoln called for a draft, for more Union soldiers. This ignited a full-scale riot against the draft on July 13, 1863 in New York City. It was led by Tammany Hall’s Irish backers. For three days men went completely wild, hunting down African Americans as if they were hounds giving chase to foxes. Foote, S. *The Civil War: Fredericksberg to Meridian*. New York: Vintage Books, 1986. They lynched black men; sacked stores, attacked wealthy New Yorkers, and burned down the business of anyone thought to support President Lincoln’s Republican Party.

Lincoln declared martial law, and the riots were finally brought to a halt when the Eighth Regiment Artillery Troop used its howitzers to protect the city’s poshest neighborhoods. Tensions between immigrants — particularly the Irish — and African Americans would stay at tinderbox level in New York for decades. Burrows, E.G. and Wallace, M., 1999, *op. cit.*

78. Duffy, J., 1968, *op. cit.*

79. Quoted in Jordan, P.D., 1953, *op. cit.*

80. Paul Starr offers this summary: “For if the sick are the source of infection, one way to prevent the spread of disease (a recognized function of public health) is to diagnose and cure the people who are ill (recognized functions of medicine). Extending the boundaries of public health to incorporate more of medicine seemed necessary and desirable to some public health officials, but as one might imagine, private practitioners regarded such extensions as a usurpation. Doctors fought against public treatment of the sick, requirements for reporting cases of tuberculosis and venereal disease, and attempts by public health authorities to establish health centers to coordinate preventive and curative medical services.” See Starr, P., 1982, *op. cit.*

81. In the 1950s Walter O'Malley would cut a deal with the city of Los Angeles to move the Brooklyn Dodgers baseball team to California. The state would declare eminent domain, and at gunpoint National Guards roust the descendants of the Californios out of Chavez Ravine so it could become the site of Dodger Stadium.

82. When "Injun hunting," as it was called, proved uninspiring, the harassment and lynching of Chinese men proved ample sport for white mobs, particularly among men whose pursuit of gold had left them bitter and destitute. More than a third of California's Chinese population would "disappear" between 1890 and 1900, victims of "queue-hanging," lynching or starvation. Again, I refer to White, R., 1991, op. cit.

83. There is some dispute on that figure. Duffy says 600 died. Condran argues the total was 1,137. See Duffy, J., 1968, op. cit.; and Condran, G.A. "Changing patterns of epidemic disease in New York City." In Rosner, D., editor. Hives of Sickness: Public Health and Epidemics in New York City. New Brunswick: Rutgers University Press, 1995.

84. Leavitt, J.W. The Healthiest City: Milwaukee and the Politics of Health Reform. Princeton: Princeton University Press, 1982.

85. In Louisville in 1871 some 23 of every 1,000 residents died; by 1874, with completion of its sewer systems, that death rate fell to 16.5 per 1,000. Similarly, Cleveland Ohio's death rate fell during those years from 19 to 18 per 1,000.

And Memphis, which built a state-of-the-art sewer system in 1872, saw its death toll dive dramatically from a high of 46.6 per 1,000 in 1872 to an 1879 level of 21.5 per 1,000.

86. Starr, P., 1982, op. cit.

87. See Table: "EPIDEMICS OF NEW YORK CITY: 1679-1873."

88. See Table: "NEW YORK CITY DEATH RATES PER YEAR PER 100,000 PEOPLE."

89. See Table: "COMPARATIVE MORTALITY DATA BY CITY, 1917."

90. Bloom, K.J. The Mississippi Valley's Great Yellow Fever Epidemic of 1878. Baton Rouge: Louisiana State University Press, 1993.

91. Coming as this did just eight years after the end of the Civil War, the Mississippi Valley epidemic's toll in lives and dollars seems today almost unimaginable. As Khaled Bloom notes in his excellent, previously cited book on the subject, most of the disaster took place in recently-defeated Southern states where, no doubt, the mosquitoes had gained breeding grounds as a result of war damage and the devastation of formerly-Confederate infrastructures. When Hayes sent federal — a.k.a. Union — officials and troops to aid the beleaguered southern cities, it marked a bold gesture in the direction of reconciliation between the recently warring factions.

92. In his landmark paper, “Aetiology of Tuberculosis,” Koch not only offered evidence that *Mycobacterium tuberculosis* was the cause of TB but also laid out the modes of transmission of the germ (which he mistakenly called a virus) and strategies for control of its spread.

“As to the method in which tuberculosis virus is transmitted from the diseased to the healthy no doubts can obtain. In consequence of shocks from coughing of the diseased person, little particles are rent from the cough sputum, sent into the air and so dispersed like dust. Now numerous experiments have taught that the inhalation of finely dispersed phthisic sputum not only makes those sorts of animals sensitive to tuberculosis, but also those capable of resistance to tuberculosis with absolute certainty. That man should be an exception to this is not to be supposed. It may, therefore, be taken for granted that when a healthy human being accidentally finds himself in the immediate neighborhood of the phthisically diseased, and inhales particles of sputum sent forth into the air, he can be infected by them.” See Koch, R. “Aetiology of Tuberculosis.” Translated by Rev. F. Sause. American Veterinary Review 13 (1889): 54-214.

93. As quoted in Jordan, P.D., 1953, op. cit.

94. See Table: “GERM DISCOVERIES 1873-1905.”

95. Editorial. New York Times (June 25, 1892): 29.

96. Before completion of the Brooklyn Bridge in 1883, reporters for The Brooklyn Eagle were able to cover Wall Street’s activities by leaping from boat deck to boat deck to cross the East River.

97. For this section see: Bates, B. Bargaining for Life. Philadelphia: University of Pennsylvania Press, 1992; Burrows, E.G. and Wallace, M., 1999, op. cit.; Bushel, A. Chronology of New York City Department of Health 1655-1966. New York City Department of Health, 1966; Caldwell, M., 1988, op. cit.; Debré, P. Louis Pasteur. Baltimore: Johns Hopkins University Press, 1998; Dubos, R.J. The White Plague. New Brunswick: Rutgers University Press, 1992; Duffy, J. A History of Public Health in New York City: 1866-1966. New York: Russell Sage, 1974; Duffy, J., 1992, op. cit.; Golden, J. and Rosenberg, C.E. Pictures of Health. Philadelphia: University of Pennsylvania Press, 1991; Golub, E.S. The Limits of Medicine. New York: Times Books, 1994; Jackson, K.T., 1995, op. cit.; Leavitt, J.W. Typhoid Mary: Captive to the Public’s Health. Boston: Beacon Press, 1996; Leavitt J.W. and Numbers, R.L., 1985, op. cit.; Mullan, F. Plagues and Politics. New York: Basic Books, 1989; Rosner, D., editor, 1995, op. cit.; Ryan, F. The Forgotten Plague. New York: Little, Brown, 1993; Tomes, N. The Gospel of Germs: Men, Women, and the Microbe in American Life. Cambridge, Mass: Harvard University Press, 1998; Trudeau, E.L. An Autobiography. New York: Lea and Febiger, 1915; Winslow, C.E.A. The Life of Hermann M. Biggs. New York: Lea and Febiger, 1929; and Whitson, S. New York City 100 Years Ago. Albuquerque: Sun Books, 1976.

98. Condran, G.A., 1995, op. cit.

99. See Table: “NEW YORK CITY DEATH RATES PER YEAR PER 100,000 PEOPLE, 1805-1995.”

100. Evans, R.J. Death in Hamburg: Society and Politics in the Cholera Years 1830-1910. Oxford: Clarendon Press, 1987.

101. “Lung Block” was bordered by Catherine, Cherry, Hamilton, and Market Streets.

102. In his book Riis defined a tenement as: “Generally a brick building from four to six stories high on the street, frequently with a store on the first floor...four families occupy each floor, and a set of rooms consists of one or two dark closets, used as bedrooms, with a living room twelve feet by ten feet. The staircase is too often a dark well in the center of the house, and no direct through ventilation is possible, each family being separated from the other by partitions. Frequently the rear of the lot is occupied by another building of three stories high with two families on a floor.”

Tenement estimates for 1890 found there were 37,000 such buildings in New York City, which at the time was Manhattan and the lower Bronx only. In these buildings dwelled 1.2 million people. As a result, New York City had the highest human population density found anywhere in North America, with 522 people per acre. Philadelphia in that year had a population density of 118 per acre, Chicago 83.5. See Crisci, M. Public Health in New York City in the Late Nineteenth Century. Bethesda: National Library of Medicine, History of Medicine Division, 1990.

103. As quoted in Ehrenreich, B. and English, D. Complaints and Disorders. Glass Mountain Pamphlet No. 2, 1973.

104. The so-called Brooklyn Surface Railroad Riot of 1895, involving rail workers and police, eventually was put down by 7,000 armed National Guardsmen.

105. Alice Hamilton moved to Boston in 1919, joining the faculty of the Harvard School of Public Health. She virtually created the science of industrial epidemiology, proving the dangers of occupational exposure to mercury, TNT gasses, benzol, and organic solvents. See Henig, R.M., 1997, op. cit.

106. Sanger, M. and Russell, W. Debate on Birth Control. Girard, KS: Haldeman-Julius Company, 1921.

107. Mohr, J.C. Abortion in America: The Origins and Evolution of National Policy. New York: Oxford University Press, 1978.

108. This marks the beginning of toilet seat phobias. Clearly the old privies and outhouses of America were major sources of the spread of cholera, typhoid fever, and dysentery. But the

source was not the seat, it was the waste itself. This waste was typically deposited only a few feet below the ground and would commonly seep into water supplies and up to ground level during rains and spring thaws. With the advent of the flush toilet, this waste was safely carried away to sewage waste sites. This virtually eliminated the risk, provided that the municipality processed the effluent properly rather than merely dumped it, untreated, into a nearby lake, river or sea. But zealous sanitarians claimed that every surface in a bathroom, from faucets to toilet seats, was a source of diphtheria, tetanus and virtually every other disease known to humanity.

In the twentieth century toilet seat phobia would extend to include polio and all sexually transmitted diseases, allowing syphilitics to tell their spouses they “got it from a public toilet.” With the appearance of AIDS in the 1980s, toilet seat phobia would also embrace HIV.

This is hardly a solely American phenomenon. In the 1990s — one hundred years after the introduction of indoor plumbing — most families living in formerly Soviet countries would deliberately disconnect toilet seats, preferring to squat to avoid alleged contagion.

109. Tomes, N., 1998, op. cit.

110. As quoted in Ehrenreich, B. and English, D., 1973, op. cit.

111. Bellew. “Hygeia.” Harper’s Weekly Vol. 25 (1881): 231.

112. Cain, L.P. “Raising and watering a city: Ellis Sylvester Chesbrough and Chicago’s first sanitation system.” In Leavitt, J.W. and Numbers, R.L., 1985, op. cit.

113. Following the devastating 1892 cholera epidemic, Hamburg scientist J.J. Reincke and Massachusetts’ Hiram Mills compared disease and water pollution notes in Lawrence, Massachusetts and Hamburg. The pair predicted that dramatic declines in death rates would immediately follow creation of water purification systems. Their calculus would prove generally correct, though many communities failed to experience as dramatic an improvement in public health as the two men predicted. See Condran, G.A., Williams, H., and Cheney, R.A. “The decline in mortality in Philadelphia from 1870 to 1930: The role of municipal services.” In Leavitt, J.W. and Numbers, R.L., 1985, op. cit.

114. Debré, P., 1998, op. cit.

115. New York City Department of Health. Annual Report of the Department of Health of the City of New York, 1905 (for 1870-1895), 1915 (for 1900-1915). Note that there is debate on these figures. See Free, E. and Hammonds, E.M. “Science, politics and the art of persuasion.” In Rosner, D., editor, 1995, op. cit. By measurements focused on Manhattan’s tenement areas, the change in diphtheria death rates was from an 1894 high of 785 deaths per 100,000 to just 300 deaths per 100,000 in 1900.

116. Dubos, R.J., 1992, op. cit.

117. Pasteurization is a method of killing bacteria by heating the liquid to 145 degrees Fahrenheit for thirty minutes.

118. Baker, J. Fighting for Life. New York: Macmillan and Company, 1939.

119. In New York, where many Jewish immigrants worked in the garment industry, TB was called “the tailor’s disease.” Long medical treatises were published all over the United States at the time — and well into the next century — arguing that Jews, or “Hebrews,” were inherently weak and susceptible to *Mycobacterium tuberculosis*.

In reality, TB death rates among even the poorest Jewish immigrants were lower than among other poor New Yorkers. The reason may have been the creation of a network of Jewish treatment centers and sanitariums funded by wealthy philanthropic Jews such as Lyman Bloomingdale of department store fame. The star of this treatment chain was National Jewish Hospital for Consumptives, which opened in Denver, Colorado in 1899. See Kraut, A.M. “Plagues and prejudice.” In Rosner, D., editor, 1995, op. cit.

120. Fee and Hammonds say that “compulsory [TB] notification was taken as a declaration of war by the laboratory technicians on the physicians’ status and privileges.” See their work in Rosner, D., editor, 1995, op. cit.

121. As quoted in Caldwell, M., 1988, op. cit.

122. Delivered at the BMA’s annual meeting in Montreal, Canada, Sept. 3, 1897.

123. Standard treatment for tuberculosis in 1899 made no reference to its *Mycobacterium* cause. In fact, physicians trained in the best medical schools of the day viewed consumption as a series of “affectations,” each of which should be differently treated. For the affectation of laryngitis, for example, formaldehyde vapors were recommended. A very long list of drugs were used to treat the affectation of meningitis, including alcohol, belladonna, ergot, opium, turpentine oil, quinine, and mercury. To that list of horrors would, if the affectation of scrofula were present, be added arsenic, gold salts, walnut leaves and hydrogen peroxide. Patients were also advised to muddle through months or years of consumption drinking alcohol mixed with cod liver oil, resting in high altitudes and inhaling large gulps of fresh air, rubbing a variety of oils on their chests, taking mineral baths, eating raw red meats, embarking on a sea voyage (where, again, large gulps of air were considered wise), and consuming huge quantities of eggs and dairy products. See Merck’s Manual. New York: Merck and Co., 1899.

What clearly confounded germ theory proponents was the physicians’ utter inability to abandon such ancient often poisonous, therapies in favor of a preventative and therapeutic approach that focused on the germ itself. Though, in fairness to the physicians, it would be another forty years before drugs that effectively killed *Mycobacterium tuberculosis* would be discovered.

124. White, R., 1991, op. cit.

125. Ibid. Of course, the ads and the promoters neglected to mention one detail: there was no water. The soil and climate might, indeed, be “suitable” for growing strawberries, but Los Angeles County was an arid place of hearty scrub and cacti well adapted to an annual rainfall that barely hit ten inches. The Los Angeles Times estimated in 1899 that there was plenty of water for the newly-doubled population of 100,000. There might still be enough, the paper editorialized, if growth tripled to 300,000 Los Angelenos. But then, the Times predicted, growth would simply have to cease unless an additional supply of water could be found. Ibid.

At the urging of the Times, water would, indeed, be “found” and piped to Los Angeles at tremendous profit by a privately owned water consortium that tapped lakes and rivers up to 200 miles away. A century later, water, or the lack thereof, would remain Southern California’s primary public health, economic and environmental concern.

126. Mary Baker Eddy, founder of the Church of Christ, Scientist was born in New Hampshire in 1821. From childhood, nee Morse Baker, was a devout Christian prone to fits and visions. As a young woman she became a follower of Phineas Parkhurst Quimby, a mesmerist who used hypnotism, magnets, and communing with the spirits of the dead to heal. Quimby was in sharp conflicts with physicians and charged that “disease was conceived in priestcraft and brought forth in the iniquity of the medical faculty.”

Following Quimby’s death in 1866, Eddy created the belief system that would be known as Christian Science. She drew from Quimby, the early nineteenth century transcendentalists, a host of then-in-vogue spiritualist techniques, and her own unique interpretations of the Bible. Her ideas caught fire with the publication, in 1875, of her manifesto Science and Health.

By the late 1880s Eddy had followers all over the United States as well as in Canada and Europe. Her trained healers promised “all Manner of Diseases Cured — Without Medicine or Ceremony. ‘Disease a Belief, Not a Reality.’ — Remarkable Facts for Metaphysicians — The Science of Medicine Contradicted.”

As her following grew, so did conflict with organized medicine. At the turn of the twentieth century, the Church was tied up in numerous court cases, often initiated by departments of health or physicians groups. In one such case, the New York State Court of Appeal ruled that Christian Scientists were guilty of practicing medicine without a license.

A key 1902 Los Angeles case involved Merrill Reed, a Christian Scientist who denied his ailing daughters diphtheria antitoxin. They died. Reed was charged with manslaughter. In a dubious landmark decision that would stand firm in California law and protect the Church for eight decades, the court ruled in favor of Reed. The reason: diphtheria antitoxin was, Reed’s attorneys argued, an “experimental, unproven therapy.”

The decision wounded the stature of both physicians and public health leaders in California. They had already suffered defeat in 1876 when the legislature voted to give homeopathic treatments equal legal status with allopathic.

The superior status of public health would not be established firmly in California until 1954, when Los Angeleno Cora Sutherland died of tuberculosis. Sutherland, a Christian

Scientist, was a teacher at Van Nuys High School who for years had suffered pneumonic tuberculosis, infecting her students but refusing diagnosis and treatment. After her death, the autopsy revealed that Sutherland's lungs were filled with TB bacteria. The Los Angeles County Department of Health spent considerable time and money tracking all of Sutherland's former students and taking x-rays of their lungs to look for possible infection. Thereafter, all school teachers in Los Angeles were required to undergo TB testing.

Four years later, in 1958, a family in San Mateo, California successfully sued their Christian Scientist neighbors whose untreated consumptive child had passed tuberculosis to their son. Thirty years later, in 1988, the California Supreme Court finally over turned the 1902 Reed decision, finding against Christian Scientist parents who refused medical care for their children who died of meningitis. The Court ruled that parents did not have a legal right to martyr their own children.

Throughout the twentieth century, vaccination was a bone of contention between public health authorities and Christian Scientists. Between 1985 and 1994 four measles epidemics in the United States originated among groups of unvaccinated Christian Scientists.

For these and myriad other remarkable insights regarding the Church, see Fraser, C. God's Perfect Child: Living and Dying in the Christian Science Church. New York: Metropolitan Books, 1999.

127. Waring, a New Yorker, was the loudest anti-contagion-, anti-germ-theory voice in nineteenth century America. A staunch sanitarian booster, Waring told middle class Americans that Louis Pasteur and Robert Koch were crackpots. See Cassedy, J.H. "The flamboyant Colonel Waring." In Leavitt, J.W. and Numbers, R.L., 1985, op. cit.

128. White, R., 1991, op. cit.

129. Ehrenreich, B. and English D., 1973, op. cit.

130. In fairness, nowhere in the United States was there a county-level health department until 1911, but few had as crying a need for one as did Los Angeles.

131. Hiscock, I.V. "A survey of public health activities in Los Angeles County, California." American Public Health Association, 1928.

132. Ibid.

133. For ten years Pomeroy's department tried to fulfill its mandate in the absence of any significant medical facility in Los Angeles County. The developers seemed devoid of concern about infrastructure matters such as water, hospitals, schools, and transportation. They simply continued to lure in masses of people and increase Pomeroy's burden. Los Angeles County would have nearly two million residents in 1925 when its first hospital opened. It was located in

San Fernando, a then fairly remote northern part of the county. The roads had filled with autos, crashes were numerous, and politicians were awaking to the need for an emergency treatment center. In 1924 the County Board of supervisors allocated funds to construct Los Angeles County General Hospital. It would eventually become the largest medical facility in the world and the most vast structure in the United States — exceeding even the square footage of the Pentagon.

But that was still far in the future. Pomeroy's era muddled through with just four small health clinics that were scattered across the county, a TB sanitarium, and a small network of roving public health nurses and food inspectors. Creation of a public health nursing profession was really a Los Angeles idea, born out of necessity. The county couldn't afford an equivalent squad of MDs, and any team of tax-supported doctors would have aroused the wrath of the AMA. For details, see "A new kind of nurse appears." In Rosen, G. A History of Public Health. Baltimore: Johns Hopkins University Press, 1993.

134. In 1900 some 40 percent of all deaths annually in New York City involved children under five years of age. A 1918 survey by Josephine Baker also found that 21 percent of all New York City school children were malnourished.

135. But first, in 1918, the Church of Christ, Scientist, successfully overturned a compulsory child vaccination law in Seattle. Before a year was out, that city suffered a smallpox epidemic involving 169 cases. In both California and Seattle 30 percent of those who contracted smallpox died of it. See Duffy, J., 1992, op. cit.

136. Writing for the majority, Justice Harlan said: "The liberty secured by the Constitution of the United States to every person within its jurisdiction does not impart an absolute right in each person to be, at all times and in all circumstances, wholly freed from restraint....Real liberty for all could not exist under the operation of the principle which recognizes the right of each individual person to use his own, whether in respect of his person or his property, regardless of the injury that may be done to others."

The case involved an ordinance mandating vaccination of all residents of Cambridge, Massachusetts. Henning Jacobson refused and challenged the ordinance all the way to the Supreme Court. The Court ruled that Cambridge could, indeed, issue such an ordinance. On the other hand, the Court skirted the issue of enforcement. Refusers could be jailed, fined, detained, but not physically forced to accept a vaccine. The case was *Jacobson v Massachusetts*, 197 US 11, 26 (1905). See also Leavitt, J.W. "'Be safe. Be sure': Epidemic smallpox." In Rosner, D., editor, 1995, op. cit.

137. Jordan, P.D., 1953, op. cit.

138. Mankato (Minn.) Daily Review (January 12, 1897).

139. In 1908 Jersey City, New Jersey, was the first place in the world to add chlorine to its

drinking water supplies. Over the next ten years, most major U.S. cities followed the example, further reducing the incidence of water-borne diseases in America.

140. Hookworm disease is caused by any of three parasites indigenous to North America, particularly in sub-tropic ecologies. Hookworm eggs are passed from infected humans in their feces. If the eggs reach moist soil, they become larvae that can infect people by entering cuts on bare feet. Once inside the body, hookworms can have a devastating impact: they devour protein and can cause anemia, weakness, and mental retardation. It was rare, indeed, that anyone died of the disease, but in poor towns in the South hookworm dramatically affected the economies, as entire communities were slowed and dulled by collective infection rates exceeding 50 percent.

In 1906, when the Rockefeller campaign began, experts already recognized that though treatment options were lousy, prevention was fairly simple. Shoes, socks, and long pants were sufficient barrier, in most cases. Hookworm was a disease of extreme poverty.

141. By 1916 there were fewer than five schools of public health in the United States, but there were more than 160 medical schools — demonstrating that curative medicine was already a more attractive pursuit than population-wide disease prevention.

142. Stevens, R. In Sickness and in Wealth: American Hospitals in the Twentieth Century. Baltimore: Johns Hopkins University Press, 1989.

143. Ludmerer, K.M., 1985, op. cit.

144. On the other hand, this professionalization hardened doctor's opposition to all forms of what they saw as meddling in how they practiced medicine. Lawrence D. Weiss neatly summarized this tension: "Physicians, pharmacists, and drug manufacturers viewed public health predominately through entrepreneurial eyes even during the early days of the development of public health institutions and activities. They supported public health as long as it funneled patients and customers into their offices, but the moment they saw public health as competition, they turned their backs."

See: Weiss, L.D. Private Medicine and Public Health: Profit, Politics, and Prejudice in the American Health Care Enterprise. Boulder: Westview Press, 1997.

145. Germany established the world's first national health system in 1883. It was based on creation of sickness funds drawn from tax revenues. The British system went a step further, setting up compulsory health insurance.

146. Numbers, R.L. "The third party: Health insurance in America." In Leavitt, J.W. and Numbers, R.L., 1985, op. cit.

147. Ibid.

148. Ibid, both quotations.

149. Each European country that adopted a universal health plan did so following increases in labor unrest and union efforts. The 1917 revolution in Russia signaled to European leaders that some concessions to organized workers were expeditious. But in the United States organized labor rarely gained such power, particularly in the Far West. In the years preceding their ‘no’ vote, Californians had witnessed the 1910 bombing of the Los Angeles Times building, the bribery conviction of attorney Clarence Darrow (who had defended the alleged socialist bombers of the building), IWW-inspired riots in San Diego and a 1916 bombing of a parade in San Francisco. All of the incidents, supposedly or actually sparked by left wing workers, scared the Los Angeles middle class. Their vote against health insurance was primarily a rejection of socialism and organized labor. Starr, P., 1982, op. cit.

150. A term invented by the American Medical Association but widely popularized by the Church of Christ, Scientist, during the early twentieth century.

151. California went furthest: physician opposition to competition and middle class abhorrence of “commie medicine” combined in the 1930s when the local AMA chapters denounced Kern County Hospital in Bakersfield. When the Great Depression hit, middle class residents of that county flooded to the public hospital and attendance at private facilities and the offices of private practitioners plummeted. The doctors cried foul, saying the county hospital was an unfair competitor, and local anti-“socialized medicine” forces declared that Kern County had *de facto* created a universal health care system. The case went before California’s supreme court in 1934. Amazingly, it ruled that county hospitals statewide could only render care to impoverished patients. In other words, the court said public hospitals weren’t for the middle class. That ruling went unchallenged for nearly four decades, radically skewing health care in California for the rest of the century. See “The political creation of the voluntary ideal.” In Stevens R., 1989, op. cit.

152. Winslow, C.E.A., 1929, op. cit.

153. Three hundred sixty-one is the number of tenements officially estimated by the city’s government to have existed in 1903.

154. Throughout 1902 two dozen white-uniformed Sanitary Police roamed the streets of New York City in search of health code violators, arresting 304 illegal dumpers, spitters, quarantine violators, and “overcrowders” — landlords who packed too many immigrants into one room — and squads of food inspectors destroyed 8,471,538 pounds of produce and meat.

155. New York City Department of Health. Annual Report of the Board of Health of the Department of Health of the City of New York for the Year Ending December 31, 1902. New York, 1904.

156. NEW YORK CITY MORTALITY PER 100,000: CHILDREN
SELECTED CAUSES, 1900-1950

YEAR	MEASLES (under 5 years)	WHOOPING COUGH (under 5 years)	SCARLET FEVER (under 15 years)	DIPHTHERIA (under 15 years)
1900	187.8	141.7	81.3	413.3
1905	116.2	91.2	39.6	129.1
1910	154.8	58.0	69.4	124.8
1915	116.7	73.5	19.5	85.7
1920	131.2	109.6	13.7	64.9
1925	23.6	55.6	4.5	39.8
1930	28.7	23.3	3.4	11.7
1935	22.8	32.1	4.5	4.0
1940*	6.5	12.0	1.7	1.9
1945*	2.6	7.9	0.5	0.7
1950*	1.4	0.8	—	0.1

* 1940, 1945, 1950 are average annual deaths per 100,000 children for the years 1936-1940, 1941-1945, and 1949-1951, respectively.

Sources: Emerson, H. and Hughes, H.E. Population, Births, Notifiable Diseases, and Deaths, Assembled for New York City, New York, 1866-1938, from Official Records. New York: The DeLamar Institute of Public Health, Columbia University, January, 1941; New York City Department of Health, Annual Reports 1937 and 1959-60.

157. From 1900 through 1902 New York City suffered waves of smallpox, resulting in a total of 1,238 cases in three years, with 410 deaths. The vaccination campaign of 1902 brought the epidemic to a halt, though smallpox continued to rage in nearby Philadelphia, much of New Jersey, and most cities of the Midwest.

158. New York City Department of Health, 1904, op. cit.

159. Soper, G. "Curious career of Typhoid Mary." Bulletin of the New York Academy of Medicine 15 (1939): 704.

160. Mortimer, P.P. "Mr. N. the milker, and Dr. Koch's concept of the healthy carrier." Lancet 353 (1999): 1354-56.

161. In 1910 a definitive demonstration of far longer carrier status was produced by English health officer Dr. Theodore Thomson. From 1896 to 1909 his Folkestone District suffered an epidemic which Thomson eventually traced to a milkman he designated "Mr. N." Though Mr. N. had never suffered typhoid fever, he carried the microbe and passed it to dozens of people with whom he had personal contact or who drank the milk he prepared. See Mortimer, *ibid*.

162. Soper, G.A. "Typhoid Mary." The Military Surgeon 25 (1919): 1-15.

163. *Ibid*.

164. The story of Mary Mallon's case is drawn from Baker, J., 1939, *op. cit.*; Fee, E. and Hammonds, E.M. "Science, politics, and the art of persuasion." In Rosner, D., editor, 1995, *op. cit.*; Leavitt, J.W., 1996, *op. cit.*; Soper, G., 1939, *op. cit.*; and Sufrin, M. "The case of the disappearing cook." American Heritage (August 1970): 37-43.

165. Mallon would, indeed, turn out to be a life-long typhoid carrier, as are, as later studies would reveal, a minority of all people who recover from typhoid fever. Indeed, some people who have never contracted the disease, but were unknowingly infected, can also serve as life-long carriers.

166. Even a century later, many of *Salmonella typhi*'s impressive repertoire of tricks would remain mysterious. The bacteria are capable of infecting crucial cells of the immune system, called macrophages, and residing safely therein protected by vesicle walls. To kill the invaders, the infected cells must deploy lysosomes, or sacks full of toxic protein-eating chemicals, to merge with those vesicles. Once merged, the bacteria are destroyed. But the bacteria are, in some cases, capable of eluding this mechanism and living for years inside human cells. How the bacteria get from cells that have reached the limits of their life expectancy into younger cellular hiding places wasn't known. Nor was it clear how bacteria were shed into the intestinal tract and passed into a carrier's feces without triggering an immune response within the host that would destroy typhoid reservoirs.

In this case, and many others, public health policy has by necessity been based on incomplete science.

For an excellent view of mechanisms used by various *Salmonella* species see Strauss, E. "Anti-immune trick unveiled in *Salmonella*." Science 285 (1999): 306-307.

167. New York City Department of Health. Report of the Board of Health of the Department of Health of the City of New York for the Years 1910 and 1911. New York, 1912.

168. In its 1918 annual report the New York City Department of Health bemoaned that, "it has

been virtually a tradition that the typhoid fever rate remains a reliable index of the attitude of communities toward sanitation and public health. If it were possible to bring home to the citizens of New York City in a clear and intelligible way a realization of how much safer it is to live here as compared with many other cities and as compared with conditions twenty years ago in this City, they might more readily appreciate how their sympathy and support of public health counts, that public health is purchasable, and that within certain reasonable limitations, a community can determine just how safe life can be made for all persons in that community.” The report went on to note that the death rate for typhoid fever in New York City had plummeted from 21 per 100,000 persons in 1902 to just 3 per 100,000 in 1918.

169. Soper, G.A., 1919, op. cit.

170. As quoted in Fee, E. and Hammonds, E.M. “Science, politics, and the art of persuasion.” In Rosner, D., editor, 1995, op. cit.

171. See Duffy’s arguments on this in Duffy, J., 1992, op. cit.

172. Ben-David, J. “Scientific productivity and academic organization in nineteenth century medicine.” American Sociological Review 25 (1960): 830.

173. Rosen, G. “The first neighborhood health center movement: Its rise and fall.” In Leavitt, J.W. and Numbers, R.L., 1985, op. cit.

174. Duffy, J., 1992, op. cit.

175. *Polios* is Latin for gray, *myelas* for spinal chord, and *itis* connotes inflammation.

176. Golub, E.S., 1994, op. cit.

177. Adult cases were rare, presumably because over decades of life older individuals were naturally immunized by sequential exposures. In 1916, of course, all but the wealthiest of adults would have been exposed during childhood, having consumed less than ideally filtered water.

178. Duffy, J., 1992, op. cit.

179. For this section on polio see New York City Department of Health. Annual Report of the Department of Health of the City of New York for the Calendar Year 1917. New York, 1918; Duffy, J., 1968, op. cit.; Golub, E.S., 1994, op. cit.; Kraut, A.M. “Plagues and Prejudice.” In Rosner, D., editor, 1995, op. cit.; and Smith, J.S. Patenting the Sun: Polio and the Salk Vaccine. New York: William Morrow and Company, 1990.

180. In fact, Italian immigration was way down in 1916, with just 33,665 people coming to the United States from that country. That was the smallest number of Italian immigrants to enter the

United States since 1886. The peak of Italian immigration was 1902-1914, during which time 2,799,177 Italians arrived in the United States.

The second largest number of immigrants from a single country in 1916 was 16,063 from Great Britain.

See U.S. Bureau of the Census. Historical Statistics of the United States, Colonial Times to 1970. Bicentennial Edition. 93rd Cong., 1st sess., H. Doc. 93-78 (Part 2), 1976.

181. Rogers, N. "A disease of cleanliness: Polio in New York City, 1900-1909." In Rosner, D., editor, 1995, op. cit.

182. In this case, however, the sanitarians were wrong to boast. Polio probably waned in 1917 because it had saturated the non-immune population, causing disease in the most vulnerable and naturally vaccinating the rest. Over subsequent decades, scientists would offer many explanations for the cyclic nature of polio, generally failing to recognize the salient feature.

183. After the horrible summer of '16, the Franklin Delano Roosevelt family left New York City each summer, hoping to avoid the polio scourge. They spent the lazy months on their vast private estate on cooler, remote Campobello Island, located off the coast of Maine. And there, in August 1921, the future president contracted an unusual case of adult-onset poliomyelitis which left his legs paralyzed for the rest of his life.

184. As quoted in Kyvig, D.E. Repealing National Prohibition. Chicago: Chicago University Press, 1979.

185. Gray, M. Drug Crazy: How We Got into This Mess and How We Can Get Out. New York: Random House, 1998; and Ramirez, J.S. "The tourist trade takes hold." In Beard, R. and Berkowitz, L.C., 1993, op. cit.

186. In New York City, for example, the going bribery rate was \$k400 a week to be divided among a list of officials for protection of a speakeasy and \$40 a week to the local beat cop.

187. Duffy, J., 1974, op. cit.; and New York City Department of Health. Annual Report of the Department of Health of the City of New York for the Calendar Year 1920. New York, 1921.

188. In its 1920 annual report the department also noted that, "With the advent of prohibition, a number of cases of wood alcohol poisoning were discovered," offering a clear rationale for the involvement of medical, versus criminal, authority.

189. For this section, see: Beveridge, W.I.B.. "The chronicle of influenza epidemics." History and Philosophy of Life Sciences 13 (1991): 223-35; U.S. Bureau of the Census. Historical Statistics of the United States, Colonial Times to 1970. Bicentennial Edition. 93rd Cong., 1st sess., H. Doc. 93-78 (Part 1); Centers for Disease Control and Prevention. "Prevention and control of influenza." Morbidity and Mortality Weekly Reports 48 No. RR-4 (1999); Crosby,

A.W. Epidemic and Peace, 1918. London: Greenwood Press: 1976; New York City Department of Health. Annual Report of the Department of Health of the City of New York for the Calendar Year 1918 (see also the years 1919 and 1920). New York: 1919 (1920, 1921); Garrett, L., 1994, op. cit.; Hiscock, I.V., 1928, op. cit.; Hoehling, A.A. The Great Epidemic. Boston: Little, Brown, 1961; and Jordan, P.D., 1953, op. cit.

190. The overall impact on rates of death due to all causes was as follows, according to the U.S. Census Bureau:

AGE-ADJUSTED DEATH RATE (PER 1,000)

Year	Total	White Both Sexes	White Male	White Female	Non-White Both Sexes	Non-White Male	Non-White Female
1916	15.1	14.7	15.8	13.4	22.2	22.6	21.6
1917	15.3	14.7	16.0	13.4	23.4	24.1	22.7
1918	19.0	18.4	20.2	16.6	28.0	28.9	27.1
1919	14	13.4	14.1	12.8	20.5	20.3	20.8
1920	14.2	13.7	14.2	13.1	20.6	20.4	21.0
1921	12.7	12.2	12.7	11.6	18.2	18.0	18.6

191. Because one of the larger early outbreaks surfaced in Spain, the 1918 epidemic was labeled “Spanish Influenza” by all but the Spanish. If a geographic moniker was necessary, “Kansas Flu” might have been more appropriate.

192. After a very brief hiatus out of office, Tammany Hall had again returned to power in New York City, slashed health budgets and, as was their wont, installed cronies in pivotal positions. With a weak slap at Tammany’s control, the health department report mentioned that “the epidemic of influenza and pneumonia came upon us with an overwhelming force, at a time when we were already sorely taxed.”

193. Jordan, P.D., 1953, op. cit.

194. It is not clear why Minnesota suffered so many repeated cycles of the 1918 flu. It is generally accepted that the epidemic was caused by a swine form of influenza, and in frigid Minnesota, Wisconsin, and the Dakotas farmers usually kept their hogs indoors throughout winter in draft-free barns or sties. It is possible the virus cycled repeatedly through the pig

populations, altering just enough year by year to bypass the immune defenses of local farmers.

195. Pomeroy and his health department were still scrambling in 1918-19 to create a reliable vital statistics and disease surveillance system. It is doubtful that even they realized the true toll of their epidemic at the time. The infant mortality data was published a full decade after the epidemic.

196. Eyler, J.M. "The sick poor and the state." In Rosenberg, C.E. and Golden, J., editors. Framing Disease: Studies in Cultural History. New Brunswick: Rutgers University Press, 1992.

197. Smith, D.B. Health Care Divided: Race and Healing a Nation. Ann Arbor: University of Michigan Press, 1999.

198. Dublin, L.I. "The health of the Negro." Annals of the American Academy of Politics and Social Science 140 (1928): 77-85.

199. White, R., 1991, op. cit.

200. U.S. Bureau of the Census, 1976, op. cit.

201. By 1920 public hospitals were the population's major medical providers nationwide, with charitable private hospitals playing a secondary role. In theory, all of these facilities were equally available to everyone. But that was not the case.

In his landmark 1910 report on medical education Abraham Flexner argued:

The medical care of the Negro race will never be wholly left to Negro physicians. Nevertheless, if the Negro can be brought to feel a sharp responsibility for the physical integrity of his people, the outlook for their mental and moral improvement will be distinctly brightened. The practice of the Negro doctor will be limited to his own race, which in turn will be cared for better by good Negro physicians than by poor white ones. But the physical well-being of the Negro is not only of moment to the Negro himself. Ten million of them live in close contact with sixty million whites. Not only does the Negro himself suffer from hookworm and tuberculosis; he communicates them to his white neighbors, precisely as the ignorant and unfortunate white contaminates him. Self-protection not less than humanity offer weighty counsel in this matter; self-interest seconds philanthropy. Smith, D.B., 1999, op. cit.

In advocating advanced university training for African Americans, Flexner was a progressive individual for his time — in which only seven U.S. universities admitted African Americans. But Flexner never questioned the rationales of the day for racial segregation of health care: in much of the United States in 1920 dark-skinned Americans were not only required to drink from water fountains that were separate from those used by light-skinned Americans,

they were also forbidden access to the same clinics and hospitals, or wards within hospitals.

At the time, Jews and Catholics were also segregated out of the medical system, and few major universities would admit them to advanced degree programs. But long after those walls had fallen, African Americans, Asian Americans, American Indians and Mexican Americans would remain outside the system.

202. Lewis, S. Arrowsmith. New York: Signet Classic Edition, 1961. (Originally published by The Designer Publishing Co., Inc., New York, 1924.) See biographical notes in the editor's afterward.

203. De Kruif, P. Microbe Hunters. New York: Harcourt Brace, 1926.

204. The books of that genre were Microbe Hunters, Hunger Fighters, and Men Against Death.

205. De Kruif, P. Why Keep Them Alive? London: Jonathan Cape, 1936.

206. Ibid.

207. Ibid.

208. Hopkins, H.L. "Hunger is not debatable." New York World Telegram (July 30, 1935).

209. De Kruif, P. The Fight for Life. London: Jonathan Cape, 1938.

210. Ibid.

211. Starr, P., 1982, op. cit.

212. Duffy, J., 1992, op. cit.

213. Eyer, J. and Sterling, P. "Stress-related mortality and social organization." The Review of Radical Political Economics Vol. 9 (1977).

214. See Table: "CHANGES IN U.S. LIFE EXPECTANCY AT BIRTH DURING THE GREAT DEPRESSION."

215. Twenty-two federal hospitals closed (dropping from 310 in 1934 to 288 in 1931); 110 state hospitals were shut down (the total dropping from 632 in 1924 down to 522 in 1937); 153 local government hospitals were closed (from 924 such facilities in 1927 down to 871 in 1937). Charitable private hospitals also suffered, dropping from 1,060 in 1926 to 969 in 1936 (91 closures).

216. Stevens, R., 1989, op. cit.

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217. For these and other Depression-era basic facts, see Badger, A.J. The New Deal: The Depression Years, 1933-1940. New York: Macmillan, 1989; Heckscher, A. When LaGuardia Was Mayor: New York's Legendary Years. New York: W.W. Norton and Company, 1978; and McElvaine, R.S. The Great Depression. New York: Random House, 1984.
218. Carter Family. "No Depression," 1933.
219. Guthrie, W. "Dusty Old Dust," 1940.
220. Guthrie, W. "Do Re Mi," 1938.
221. In 1990s terms, that was hundreds of billions of dollars worth of oil. To put the sum into perspective, total U.S. imports of crude petroleum in 1989 were valued at \$50 billion. White, R., 1991, op. cit.
222. The Hoover Administration supported the deportations and sent federal officials to the West to deport an additional 82,000 men of Mexican heritage between 1929 and 1933. The effort failed, of course, as would all such deportation campaigns: bad as the economy of the West was in the 1930s, Mexico's was worse. And during those years an estimated 500,000 Mexicanos crossed the border to El Norte, settling in California, Arizona, New Mexico, Texas, and Colorado.
- In California, these immigrants crowded in among an estimated 300,000 dust bowl refugees who, despite attempts to block roads and keep them out, made their ways to the Golden State during the Great Depression. Most settled in Los Angeles County or the agricultural San Joaquin and Imperial Valleys. Wherever they settled, the "Okies," as all were called regardless of what dusty part of America they had fled, became targets of discrimination and political strife. Kleppner, P. "Politics without parties: The western states, 1900-1984." In Nash G.D. and Etuliaian, R., editors. The Twentieth Century West. Albuquerque: University of New Mexico Press, 1987.
223. Buck, C.E. Survey of Los Angeles County Health Activity, 1937. Conducted under the auspices of the Public Health Service and the Department of Health, State of California.
224. Pomeroy, J.L. "County health administration in Los Angeles." American Journal of Public Health 11 (1921): 796-800; Rosen, G. "The impact of the hospital on the patient, the physician and the community." Hospital Administration 9 (1964): 15-33; and Rosen, G. "The first neighborhood health center movement." In Leavitt, J.W. and Numbers, R.L., 1985, op. cit.
225. Between 1930 and 1934 in the state of California 894 children died of whooping cough, for example. See Duffy, J., 1992, op. cit.
226. Dunshee, J.D. and Stevens, I.M. "Previous history of poliomyelitis in California." American Journal of Public Health 24 (1934): 1197-1200.

227. See the following sources for further information on the 1934 outbreak: Aronowitz, R.A. "From myalgic encephalitis to yuppie flu." In Rosenberg, C.E. and Golden, J., editors, 1992, op. cit.; Bower, et al. "Clinical features of poliomyelitis in Los Angeles." American Journal of Public Health 24 (1934): 1210; Dunshee, J.D. and Stevens, I.M., 1934, op. cit.; and Stevens, I.M. "The 1934 epidemic of poliomyelitis in Southern California." American Journal of Public Health 24 (1934): 1213.

228. As far as is known by the author, no one saved a sample of the 1934 virus. Thus, the very unusual symptoms and low mortality rate seen during the Los Angeles epidemic remain mysterious.

229. In 1928 Philip Drinker of Harvard University invented a machine that would be called "the iron lung." It was a six-foot steel tube in which acute polio victims lay. The machine breathed for them, pumping their paralyzed lungs and holding their bodies in an air-tight seal.

The devices hadn't made their way to Los Angeles by 1934, and were too expensive for most of America during the Great Depression. But by 1940 hospitals all over the country would have the Drinker respirators lined up in sad rows, the patients' heads protruding in frightened, and probably bored, bewilderment as nurses tended to the valves and pressure gauges on the iron lungs. The image of large open hospital wards filled with row-upon-row of the coffin-like devices, out of which stuck the angelic faces of paralyzed children, would become a lasting legacy of American polio. See Henig, R.M., 1997, op. cit.; and Golden J. and Rosenberg, C.E., 1991, op. cit.

230. Statewide there were about 2,700 polio cases in 1934; 2,499 of them were treated in that one Los Angeles facility.

231. See Duffy's delineation, "The Great Depression and the war years," in Duffy, J., 1992, op. cit.

232. Furthermore, the Hoover Administration sought to hold down inflation by mandating that some farmers lower their crop production levels. While this held down consumer prices, it was crippling for the affected farmers.

233. By 1930 deaths from that disease were down to 1.2 per 100,000 Minnesotans (compared to 58.9 per 100,000 forty years previously).

Shortly after Chesley took office, Minnesota had its last serious diphtheria epidemic, witnessing 4,269 cases and about 40 deaths. Only smallpox continued to be a major problem in the prairie state, killing 252 Minnesotans in 1924-25, largely because that vaccine was the key target of anti-immunization activists. By 1926, however, Chesley successfully trounced his anti-vaccine foes on the diphtheria front, winning legislative backing for statewide compulsory immunization against that disease. And he whittled away opposition to smallpox vaccination as well.

234. According to Minnesota Department of Health reports for those years, child diarrheal disease deaths fell from 556 statewide in 1920 to just 216 total over the five-year period of 1925 through 1929. Between 1920 and 1929 the state's infant mortality rate fell from 63 per 1,000 live births to 55 per 1,000.

235. As quoted in McElvaine, R.S., 1984, op. cit.

236. Mullan, F., 1989, op. cit.

237. San Francisco had a very sorry track record vis-a-vis the health of its Chinese population. During the 1870s to 1890s, when nearly every other locality in the country saw its death and disease rates go down, San Francisco's rose, primarily due to a sequence of epidemics of smallpox and diphtheria. Part of the problem — perhaps the paramount mistake — was the policy of the city's department of health of blaming Chinese immigrants for every single epidemic.

Chinatown was like a walled-off city within a city, ignored by the department except as a target for vilification. The Chinese, understandably, resented the finger-pointing and grew increasingly hostile towards the department. By 1900, department officials were complaining about hostile Chinese, while Chinatown's elders were instructing their community not to trust the government representatives. This, against the background of often brutal anti-Chinese sentiments that sparked lynchings and other violence against the Asian immigrants. It was a classic paradigm of social bigotry and mistrust serving to promote the spread of disease.

238. However, feral rodents would continue throughout the century to harbor plague-infested fleas. Squirrels, in particular, would periodically in the twentieth century be sources of isolated bubonic plague human illnesses and deaths. Thus, it could be argued that Gage's determined opposition to anti-plague action allowed *Yersinia pestis* to become newly endemic in California rodent populations.

239. Two agencies were created within USPHS: in future years they would transform into the National Institutes of Health and the Centers for Disease Control.

240. See, for example, Institute of Medicine. "The disarray of public health: A threat to the health of the public." The Future of Public Health. Washington, D.C.: National Academy Press, 1988.

241. Furman, B. Profile of the United States Public Health Service, 1798-1948. Washington, D.C.: Government Printing Office, 1973.

242. Mullan, F., 1989, op. cit. Congress continued debating and creating yet more agencies until 1930. Every time a powerful member of Congress got riled up about a health-related issue, bingo! a new agency was born. In 1929, just weeks before the Crash, for example, Congress

created a Federal Bureau of Narcotics to deal with increasing drug addiction problems. It would eventually become the Drug Enforcement Administration and take a staunch criminalization approach to the issue of drug use.

243. In 1930 there were seven federal prisons housing 12,000 inmates. By 1988 there would be fifty-five federal prisons holding 50,000 inmates. And by 1997 there would be 1.2 million state and federal prison inmates in the United States. Eighty percent of the federal prisoners would be serving time on drug charges. See Cillard, D.K. and Beck, A.J. Prison and Jail Inmates at Midyear 1997. Washington, D.C.: Bureau of Justice Statistics, U.S. Department of Justice, 1998.

244. Badger tells us that “between 1933 and 1937 the American economy grew at an annual rate of 10 percent, but output had fallen so low after 1929 that even this growth left 14 percent of the workforce unemployed. A recession in 1937 quickly shot the unemployment rate back up to 19 percent. Well into 1941 unemployment remained at over 10 percent.” Badger, A.J., 1989, op. cit.

245. Among the many New Deal initiatives that affected health programs were: Aid to Dependent Children (1933); the Civil Works Administration (1933); the federal Emergency Relief Administration (1933); the National Recovery Administration (1933); the Public Works Administration (1933); the Tennessee valley Authority (1933); the Rural Electrification Administration (1935); the Works Progress Administration (1935); and the Social Security Act (1935). In the same period Congress passed a series of federal initiatives specific to health. They included: the Venereal Diseases Act (1935); the National Cancer Act (1937); and the Venereal Diseases Control Act (1938).

246. The author’s favorite being: “I think the reporter should get his facts straight before he distorts them.”

247. For details on the LaGuardia administration see Heckscher, A., 1978, op. cit.

248. In 1928 the predecessor of what would eventually be called the Health and Hospitals Corporation (HHC) was created, a city agency that thereafter ran Harlem Hospital, Bellevue, and a host of other public hospitals and clinics in the five boroughs.

249. For details see Duffy, J., 1968, op. cit.

250. And department revenues were way down. In part, this was because of the formation of HHC and moving the hospital funds out of the department’s budget. But beyond that, the budget continued to fall. In 1927 its budget was \$6,119,244. By 1933 it was just \$4,600,000 — a 25 percent drop. As politicians no longer felt public pressure in support of the department, it was

easy to hack away at is paltry budget.

251. Heckscher A., 1978, op. cit.

252. As quoted in Duffy J., 1968, op. cit.

253. While Rice was busy rebuilding the health department, Dr. Sigismund Goldwater was building up the city's hospital system — thanks again to New Deal Money. In two years he constructed three new hospitals and upgraded facilities in several older ones.

254. Quoted in LaGuardia, F.H. and Rice, J.L. Twelve Months of Health Defense. New York: Department of Health, 1941.

255. Ibid. Robert McElvaine argues that, in general, the New Deal was a boon for the health of African Americans. He notes that during the 1930s their life expectancies improved and illiteracy rates among them fell from 16.4 percent to 11.5 percent. (McElvaine, R.S., 1984, op. cit.) The problem with that argument is that white life expectancies also improved between 1929 and 1940, and by the end of the Great Depression the gap between the races remained wide. In 1929 life expectancy at birth (genders combined) for whites was 58.6 years; for blacks it was 46.7 years. Thus, on average whites were living 11.9 years longer than African Americans.

In 1940 white life expectancy was 64.2 years; for blacks it was 53.1 years. So whites were living 11.1 years longer than blacks. The gap had therefore been closed by barely 1 percent. (Based on data from the U.S. Census Bureau. I am forced to surmise black life expectancies, though the Bureau listed them in a category entitled “Negro and Other.”)

256. Duffy, J., 1968, op. cit.; and LaGuardia, F.H. and Rice, J.L., 1941, op. cit.

257. Heckscher, A., 1978, op. cit.

258. New York City Department of Health. Annual Report of the Board of Health of the City of New York. New York, 1938.

259. Badger A.J., 1989, op. cit.

260. As quoted in McElvaine, R.S., 1984, op. cit.

261. Ibid.

262. Badger, A.J., 1989, op. cit.; de Kruif, P., 1938, op. cit.; McElvaine, R.S., 1984, op. cit.; and Starr, P., 1982, op. cit.

263. As quoted in Badger, A.J., 1989, op. cit.

264. De Kruif, P., 1938, op. cit.