Introduction

This book has two purposes. It offers an overview of Africa's historical encounters with the seven cholera pandemics from 1817 to the present. Second, it explores the epidemiology of the contemporary African experience during the seventh cholera pandemic, for which evidence is more robust and for which the analysis has immediate policy relevance.

Scientific interest in cholera continues to be significant. Not only did the disease help launch the new field of epidemiology in the late nineteenth century, it also represents a fascinating and complex challenge in the newest research specialties of disease ecology, membrane biology, and trans-membrane signaling. In public health circles, cholera raises questions for global health workers concerned with new and reemerging infectious diseases.

Part One describes the first six cholera pandemics through to 1947, emphasizing how the disease affected Africans. Of course, Africa's experience with cholera cannot be isolated from that of other parts of the globe, especially the Middle East and the Indian Ocean region, long active as favorite routes for cholera's diffusion into the African continent. Nor can the experience of Europe and the Americas be overlooked, especially efforts in the industrializing countries to diagnose and treat this dreaded disease. Chapters 1 and 2 explore cholera's global trajectory and the medical responses the disease provoked. Much of the record of Africa's early experience with cholera has not survived, which may explain why this is the first attempt to produce a study of cholera in Africa. The one major primary source, however, is a remarkable contemporary epidemiological and geographical study by Dr. James Christie, *Cholera Epidemics in*

East Africa, published in 1876.[1] I drew heavily on Christie in Chapter 3, with case studies from Senegambia, Ethiopia, and Zanzibar. Fortunately, cholera features prominently in Nancy Gallagher's path-breaking studies of public health in Tunisia in the nineteenth century and Egypt in the twentieth.[2] Cholera in the Nile Valley and North Africa is the subject of Chapter 4.

Part Two draws more heavily on primary evidence, especially first-hand medical and statistical material. It provides a novel historical and epidemiological portrait of Africans' attempts to deal with cholera outbreaks. No historian is yet to investigate modern cholera in Africa, but two geographers, Robert Stock and Andrew Collins, have provided valuable insights.[3]

After a long period of quiescence, modern cholera science has rapidly evolved since the 1970s. The classic medical work, Robert Pollitzer's monumental *Cholera*, published by the World Health Organization (WHO) in Geneva in 1959, runs over one thousand pages and was meant to be definitive. Two years later, the seventh cholera pandemic emerged out of Indonesia and forced researchers to take a fresh look at this enigmatic and complex disease. The best way to follow research developments after Pollitzer has been to read the research journals as well as a series of edited works compiled by leading cholera researchers.[4] Although historical studies of cholera abound, many of them reflecting outstanding scholarship in English, French, and German, they focus on cholera before 1900, with one important exception.[5] Just before this study was completed, I was

[1] Dr. James Christie, *Cholera Epidemics in East Africa* (London: Macmillan, 1876, reprinted, USA: Kessinger Publishing, 2008). Edna Robertson has recently written an excellent biography, as yet unpublished. See her "Christie of Zanzibar, Medical Pathfinder."

[2] Nancy Gallagher, *Medicine and Power in Tunisia, 1780–1900* (Cambridge: Cambridge University Press, 1983), and *Egypt's Other Wars: Epidemics and the Politics of Public Health* (Syracuse: Syracuse University Press, 1990).

[3] Robert F. Stock, *Cholera in Africa* (London: International African Institute, 1976); and Andrew Collins, *Environment, Health and Population Displacement: Development and Change in Mozambique's Diarroeal Disease Ecology* (Aldershot: Ashgate, 1998).

[4] There have been four compilations. In chronological order, they are: Dhiman Barua and William Burrows, eds., *Cholera* (Philadelphia: W.B. Saunders, 1974); a revised edition by Dhiman Barua and William B. Greenough III, eds., *Cholera* (New York: Plenum, 1992); I. Kaye Wachsmuth, Paul A. Blake, and Orjan Olsvik, eds., *Vibrio Cholerae and Cholera: Molecular to Global Perspectives* (Washington: American society for Microbiology, 1994); and B.S. Drasar and B.D. Forrest, eds., *Cholera and the Ecology of Vibrio Cholerae* (London: Chapman & Hall, 1996). The latest published overview that is of value to researchers and lay readers alike is Paul Shears, "Recent Developments in Cholera," *Current Opinion in Infectious Diseases*, 14 (2001), 553–8.

[5] At the risk of slighting many fine studies, I note the following exemplary contributions by American, British, French, and German scholars: Olaf Briese, *Angst in den Zeiten*

able to enjoy reading and learning from Christopher Hamlin's excellent overview of cholera, published by Oxford University Press in 2009 as part of the *Biographies of Disease* series, edited by William and Helen Bynum.[6] Besides offering an original and insightful view of classic cholera and its players and problems, Hamlin is the first historian to tackle cholera science through to the present, and to argue convincingly that the revolution in cholera therapeutics and toxicology has rendered many historical assumptions about so-called classic cholera obsolete.[7] One belief, repeated in texts so often it became "fact," is that cholera was "Asian" – different from and more virulent than European forms of acute diarrhea. A second position widely held in scientific circles was that cholera in India was subject to "recrudescence"; that is, cholera's agent lingered in a region, persisting in sporadic and asymptomatic cases among a large host population before bursting out in a new pandemic wave. What triggered these revivals was unclear, as is the prospect, now widely accepted, that cholera's ecological niche was not the human body, but a variety of warm seas that harbored genetically unstable organisms.

Statistics for cholera cases and deaths in the nineteenth century are impressionistic and serve only to provide a qualitative picture. For Part Two, the main source since the Seventh Pandemic that began in 1961 are the data published regularly on cholera outbreaks globally and compiled annually in August or September for the previous year's totals by the WHO in their weekly publication, the *Weekly Epidemiological Record* (*WER*).[8] These aggregate data have been supplied officially by member-states of the WHO since 1968, in keeping with their mandatory obligation under the WHO's International Health Regulations, as revised in 2005. Superior data, which are less constrained by political considerations, have been provided since the mid-1990s by the Program for Monitoring

der Cholera, 4 vols. (Berlin: Akademie Verlag, 2003); François Delaporte, *Disease and Civilization: The Cholera in Paris, 1832*, translated by Arthur Goldhammer (Cambridge: MIT Press, 1986); Richard J. Evans, *Death in Hamburg: Society and Politics in the Cholera Years* (New York and London: Penguin, Second Edition, 2005); Christoph Gradmann, *Laboratory Disease: Robert Koch's Medical Bacteriology*, translated by Elborg Forster (Baltimore: Johns Hopkins University Press, 2009); Charles E. Rosenberg, *The Cholera Years: The United States in 1832, 1849, and 1866* (Chicago: University of Chicago Press, 1962; reprint, with an an afterword, 1987); and Frank M. Snowden, *Naples in the Time of Cholera, 1884–1911* (Cambridge: Cambridge University Press, 1995).

[6] Christopher Hamlin, *Cholera: The Biography* (Oxford: Oxford University Press, 2009).

[7] Hamlin, *Cholera: The Biography*, 269–70.

[8] World Health Organization, "Cholera," *Weekly Epidemiological Record*, yearly since 1970.

Emerging Diseases (ProMED). This program offers a free online forum for microbiologists, infectious disease specialists, public health officials, and the general public, and has been administered since 1999 through the International Society for Infectious Diseases.[9] A full discussion of the strengths and limitations of the data occurs in Chapter 6.

The two sections of this book tell very different stories. By the late nineteenth century, especially in industrializing countries of western Europe and North America, but also in Africa, cholera became more sporadic and less destructive of human life. Significant improvements in public health coupled with the burgeoning of scientific medicine created a sense that cholera had been "defeated." The French medical historian Patrice Bourdelais sounded this congratulatory note in the title of his recent book largely devoted to a history of cholera, *Epidemics Laid Low: A History of What Happened in Rich Countries*.[10]

For people who do not live in rich countries, cholera has not been "laid low." It remains a debilitating disease, especially life-threatening to infants and children in parts of Asia, Latin America, and Africa. Indeed, with more than 95 percent of the world's cases since 1995, cholera is now an African disease. Chapter 5 examines the significant medical changes in the etiological understanding and therapy developed to treat modern cholera. Chapter 6 provides an overview of how cholera has reemerged as a global threat to Africa from 1971 to the present. Chapters 7 through 9 deal with case studies of risk factors ranging from the changing global environment to armed conflicts and to public health choices exercised by various African governments. The book concludes with an assessment of cholera today in Chapter 10.

Cholera is not a new disease. Its exact origins are ancient and obscure, but the presence of an acute diarrheal disease in the Ganges Basin of the Indian subcontinent has been endemic from at least the fifth century, when Sanskrit texts described an illness with cholera-like symptoms. Modern cholera dates from 1817, when a vicious intestinal infection caused by the *Vibrio cholerae* bacteria left its long-established Indian reservoir and launched what was later recognized as the world's first cholera pandemic (Figure I.1). As four waves of new pandemics followed in the nineteenth century, cholera's horrendous destruction of human lives earned it a deserved reputation as a global scourge.

[9] Program for Monitoring Emerging Diseases (ProMed), posted by the International Society for Infectious Diseases as *Pro-Medline*, www.promedmail.org

[10] Translated by Bart K. Holland (Baltimore: The Johns Hopkins University Press, 2006).

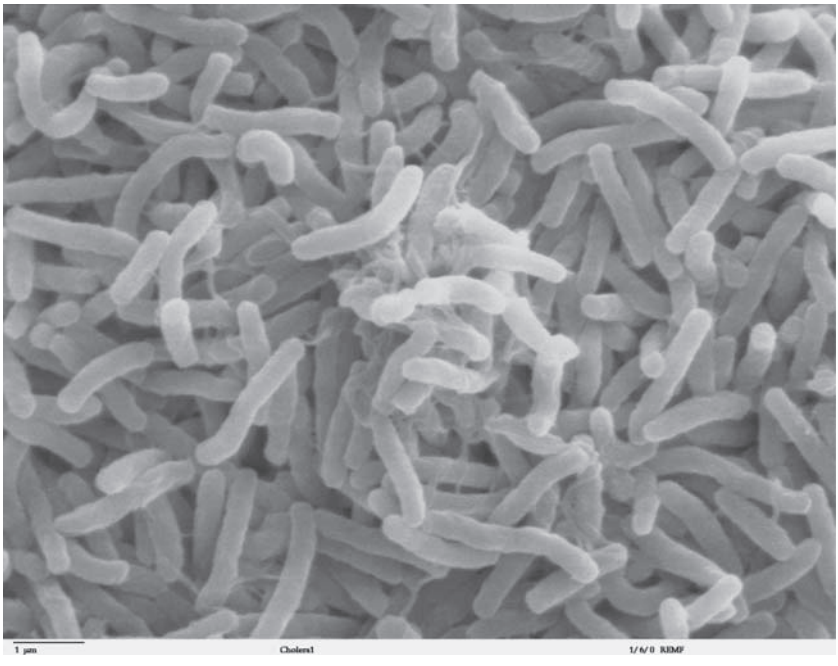

FIGURE I.1. Scanning electron microscope image of *Vibrio cholerae* bacteria (Dartmouth College Electron Microscope Facility).

Two cholera pathogens, the first emerging in the Ganges Delta in 1817 and its descendent launching the Seventh Pandemic from Sulawesi, Indonesia in 1961, have been responsible for at least three of the seven pandemics.[11] Only during the Fifth Pandemic did Robert Koch and his team identify the pathogen as *Vibrio cholerae 01*, which was also responsible for the Sixth Pandemic; the strains that caused the first four pandemics, as well as a cholera-like disease before 1817, have never been determined. The second strain, called *Vibrio cholerae 01* El Tor after the medical inspection and quarantine station port at Sinai on the Red Sea, was first identified there in 1897 by the English bacteriologist Armand Ruffer. How it materialized is not known, but El Tor later appeared in Indonesia in 1937 and caused four major outbreaks through to 1958 while remaining endemic between these episodes.

[11] D. Barua and W.B. Greenough III, eds., *Cholera* (New York: Plenum, 1992); and Reinhard S. Speck, "Cholera," in Kenneth Kiple, ed., *The Cambridge World History of Human Disease* (New York: Cambridge University Press, 1993), 642–9.

Vibrio cholerae 01 El Tor exists in either of two serotypes, Ogawa and Inaba. Less virulent than the original or "classic" *Vibrio cholerae 01*, this new strain led many health authorities to hope that it would not be able to create a pandemic. To the surprise of experts, however, after being confined for twenty-four years, the El Tor strain began a global journey from its starting point on Sulawesi Island, Indonesia in 1961. Once it began dispersing, the El Tor biotype proved to be more widespread than its classic cousin. Its capacity to colonize multiple local ecosystems has produced endemic cholera in Africa and North America, a new phenomenon characteristic of the seventh pandemic.

Indian researchers in Madras discovered the third and newest cholera strain, called *Vibrio cholerae 0139* Bengal, in October 1992. Its emergence is discussed more fully in Chapter 5. By 1996, the WHO observed confidently that because *0139* Bengal had not left the region, it was unlikely to cause a new pandemic.[12]

In theory, cholera should not be a great threat to humans. Not only is susceptibility variable, the bacteria can only be acquired in one way: through the consumption of water or food that has been contaminated either by fecal matter from a person with active cholera, or from free-standing bacteria present in plankton or seafood living in infected brackish water. One authority maintains that cholera causes "only a reversible and easily treated biochemical defect," and claims that cholera requires "a very gross level of contamination, greater than for any other known epidemic disease," to produce illness in normal individuals.[13] This explains why cholera rarely infects medical workers involved in its treatment.

That said, cholera clearly was a grave threat to those who were susceptible. Relatively high gastric acidity in the small intestine can kill the cholera bacteria before they can secrete their toxin. Conversely, low natural acidity coupled with gastrointestinal disturbance arising from purging, alcoholism, or infection with other enteric bacteria can place the human target at high risk of alarming illness. Also, pregnant women are more susceptible to cholera. Unlike the case with smallpox or measles, which confer lifelong protection to survivors, residual immunity to cholera persists only briefly, rarely more than a year or two. Finally, researchers hypothesize that humans with blood type O, for reasons not fully

[12] *WER*, 72 (1997), 235.
[13] Charles C.J. Carpenter, "Treatment of cholera-tradition and authority versus science, reason and humanity," *The Johns Hopkins Medical Journal*, 139 (1976), 157.

understood, are more vulnerable to bacterial infections like cholera, whereas those with other blood types are more susceptible to viral infections such as influenza.[14]

Apart from the many who acquire asymptomatic or mild cases of cholera, cholera's progress is frightening for those who are more susceptible. Incubation precedes symptoms within a range of from fourteen hours to as long as five days. The variation depends on how long it takes for the cholera vibrios to colonize and multiply in the small intestine after they enter the body via the mouth from contaminated water or food. There, the bacteria secrete a powerful toxin that interferes with the absorption of water, salts, and other electrolytes into the large intestine. In the first stage of symptoms, a sudden and explosive watery diarrhea, classically called the "rice water stool," gushes out of the patient, emptying the lower bowel of fecal matter quickly. Dehydration produces acute and agonizing cramps in the muscles of the legs and feet, and sometimes the arms, abdomen, and back. The sense of prostration is extreme, and lasts from two to twelve hours, depending on the severity of the symptoms.

The second stage, often reached in a day or two, is marked by extreme collapse and continued purging and vomiting. Rapid dehydration and ruptured capillaries produce a grizzly effect in the patient's appearance. The skin becomes black and blue, wrinkled, cold, and clammy to the touch; the eyes become sunken, the cheeks hollow, the voice husky, and the expression apathetic. Blood pressure falls, a pulse cannot be felt at the wrist, and urine is suppressed. Violent convulsions of the leg and stomach muscles can cause terrible pain. Loss of liquid is often so great that blood can run as thickly as tar, and the opening of a vein produces no results. Meanwhile, the patient suffers from the horror of full awareness of her or his plight. By this time the patient may have lost most body fluids. Without fluid replacement, death can occur from circulatory or kidney failure. In the worst cases, a healthy person can be dead in hours.

Feces from acutely infected patients are the main source for spreading the cholera outbreak. In a single day, an individual patient can produce up to twenty liters of stool containing as many as ten million vibrios per milliliter. This frequent and painless diarrhea is accompanied by vomitus of the same whitish appearance, which may contain cholera bacteria; and there is extensive retching and hiccups. The massive loss of water

[14] D.L. Swerdlow et al., "Severe life-threatening cholera associated with blood group O in Peru: Implications for the Latin American epidemic," *Journal of Infectious Disease*, 170 (1994), 468–72.

and electrolytes can amount to 8 percent loss of normal body weight. A third stage, for those who survive this critical attack, brings a cessation of vomiting and diarrhea. If the second stage lasts only a few hours, then circulation and blood pressure are restored and the flow of urine resumes. Though recovery seems assured, death can still occur within four or five days should impaired kidney function develop.

Given the truly horrible suffering it has inflicted on patients, it is no wonder that cholera has remained a frightening disease. Deeply embedded in the collective memory of many cultures globally, its association with violent purging of both vomit and feces evokes natural revulsion and shame in both patients and caregivers. The inability to control the bladder and bowels in the process of bodily elimination of waste is a mark of infancy, but its manifestation in adults suffering from cholera is a humiliating sign of dependency, and, among the elderly, a sign of senility.

Attitudes toward feces and their elimination have varied greatly over time, within and across cultures. European aristocracy developed "chamber pots," and monarchs such as Elizabeth I or Louis XIV thought it acceptable to relieve themselves while holding court. By the nineteenth century, however, elimination of body waste became a private act, one that distinguished the proper manners of genteel society from the barbarous public practice of the lower classes and the "other" – often foreigners. The sanitarian movement reinforced this loathing of feces, and germ theory later in the century was able to demonstrate the threat to health that fecal matter could represent. The literature on "dirt and disgust" has been linked to specific theologies such as Unitarianism and belief in a universally benevolent God. A recent study in literary criticism has argued that cholera was a vehicle for the creation of Victorian notions of the social body operating in the nation-state.[15]

On the Continent, a similar horror of feces and filth was also developing. Alfred Le Petit's grotesque caricature purporting that cholera was not contagious and entitled "Un docteur épatant" (an amazed doctor) appeared in *Le Grelot*, a popular Paris magazine, on November 23, 1884. Difficult for readers today to tolerate, the drawing portrays a man placing fecal matter in his mouth while releasing a bouquet of violets from

[15] For the theological dimension, Michael Brown, "From foetid air to filth: The cultural transformation of British epidemiological thought, ca. 1780–1848," *Bulletin of the History of Medicine*, 82 (2008), 515–44; for literary criticism and cholera, Pamela K. Gilbert, *Cholera and Nation: Doctoring the Social Body in Victorian England* (Albany: State University of New York Press, 2008).

his anus. A blue hue of violets symbolized the common association of cholera victims with blue skin color. The caption reads, "[T]o prove cholera is not contagious, Dr. N. consumes a cholera-ridden feces orally; five minutes later, he produces a bouquet of violets … 'at the other end.'"[16]

Cholera became the quintessential disease of filth, and this association, more than its potential and real lethality, helps explain why it triggers such powerful popular reactions. The symptoms of a cholera attack invoked bodily functions that were hidden from public view in respectable Western society by as early as the late eighteenth century. Those who flaunted such practices as bodily elimination were degraded marginals, vagrants, drunkards, or the mentally ill. Their very behavior was an indicator of their disqualification from civilized society.

Some cultures have used metaphor to express loathing for cholera and its association with filth. In Brazil, it is a matter of deep shame to be considered *imunda*, "filthy," or deficient in personal hygiene. The colloquial expression for cholera was *doença de cachorro*, "a dog's disease," similar to the English phrase "sick as a dog," and was used euphemistically to describe bouts of vomiting and diarrhea.[17]

Modern day sensibility has continued, and with it, deeply ingrained psychological attitudes. Euphemistic language is one indication, and examples include such terms as "night soil" for human feces used as fertilizer, a common practice in parts of Asia but avoided elsewhere. Similarly, having a "bowel movement" is the polite discourse used even between doctors and patients, as opposed to a wide variety of countercultural expressions used by the young, the rebellious, or the uncouth. Another euphemism is the practice of "toilet training," so fundamental to early childhood.

Yet waste elimination is a natural function, and not every culture has considered it abhorrent. Many Africans and Indians use empty areas of public or even private space as makeshift latrines. One of the most difficult adaptations for cultural outsiders is to engage in greetings and conversations with individuals who are in the act of defecating. While fecal elimination as a casual and natural act may be culturally acceptable in some societies, makeshift latrines do represent a public health hazard, and persuading people of the cholera risks involved can pose a challenge to public health authorities.

[16] In Patrice Bourdelais and André Dodin, *Visages du choléra* (Paris: Belin, 1987), 75.
[17] Marilyn K. Nations and Cristina M.G. Monte, "'I'm not dog, no!': Cries of resistance against cholera control campaigns," *Social Science and Medicine*, 43 (1996), 1007–24.

For most of the nineteenth century, medical remedies for cholera remained as varied – and often as downright harmful – as they were ineffective. Misunderstanding of cholera's mode of attack on the human body often produced "benevolent homicide," to use Norman Howard-Jones's appropriate phrase.[18] Instead of replenishing fluids and electrolytes, misguided treatments could often involve accelerated loss through purging, the administration of alcohol or morphine, and other undesirable practices. Two such painful attempts at therapy in the nineteenth century were the application by Parisian physicians of a red-hot iron to the spine or the heel. Second, hot and cold water orally or via the rectum was sometimes attempted, as were baths. Although they diverged as the nineteenth century progressed, Western and Indian medical therapies shared a series of assumptions and practices regarding cholera. Western humoral tradition classified cholera initially as a disease of bile because of the patient's thirst and the yellowish tinge to the eyes. In 1817, British physicians sitting on the Bengal Medical Board recommended treatment in four stages, borrowing partly from Ayurvedic Indian practice. First came the Western prescription of liquor to revive strength; second, laudanum (tincture of opium) to calm the stomach and bowels; third, purgatives like calomel, epsom salts, and senna to expel any remaining "morbid secretions"; finally, tonics and a plain diet to restore health to the stomach.[19]

The use of strong spirits aside, this was much like the treatments used by Indian healers. They recommended medicines made up of black pepper, borax, asafetida, aniseed, ginger, and cloves; sometimes opium or hemp was offered to dull pain and relax the body.

Both British and Indian pharmaceutical schools were convinced their treatments were preferable, but neither side showed great enthusiasm for the available medicines, possibly because none really had significant therapeutic value. In the 1840s, Dr. William Scot of the Madras Medical Board spoke for many when he lamented the failures of treatments: "In no disease has the sovereign efficacy of numberless specifics been more vaunted, and in none have the utmost efforts of the medical art been more frequently insufficient, than in cholera."[20] A century and a half

[18] Norman Howard-Jones, "Cholera therapy in the nineteenth century," *Journal of the History of Medicine and Allied Sciences*, 27 (1972), 373.

[19] Ira Klein, "Cholera: theory and treatment in nineteenth century India," *Journal of Indian History*, 58 (1980), 35–51.

[20] In David Arnold, *Colonizing the Body: State Medicine and Epidemic Disease in Nineteenth-Century India* (Berkeley: University of California Press, 1993), 183.