



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



## Explorations

## Alone, together: Social isolation, quarantine, and the coronavirus pandemic



On June 2, 2020, the *New York Times* reported, “Summer is almost here, states are reopening and new coronavirus cases are declining or, at least, holding steady in many parts of the United States. At least 100 scientific teams around the world are racing to develop a vaccine. That’s about it for the good news. The virus has shown no sign of going away: We will be in this pandemic era for the long haul, likely a year or more. The masks, the social distancing, the fretful hand-washing, the aching withdrawal from friends and family – those steps are still the best hope of staying well, and will be for some time to come.”<sup>1,2</sup>

For many Americans, the most demanding of the recommended coronavirus precautions is social isolation – “the aching withdrawal from friends and family.” There are innumerable reports of people choosing to ignore this recommendation. Yet evidence shows, say the experts from the Centers for Disease Control and Prevention (CDC), “Limiting face-to-face contact with others is the best way to reduce the spread of coronavirus disease 2019...”<sup>3</sup>

What does social distancing involve? The CDC says that social distancing, also called physical distancing, means keeping space between yourself and other people outside of your home. To practice social or physical distancing:

- Stay at least 6 feet (about 2 arms’ length) from other people
- Do not gather in groups
- Stay out of crowded places and avoid mass gatherings

## An ancient practise

Social isolation may sound modern, but this is not the case. Isolation during illness is ancient. It eventually became known as the quarantine, a term derived from the 17th-century Italian word *quarantina*, meaning “forty days.” But as Kelly Drews reports in her brilliant 2013 article “A Brief History of Quarantine” in *The Virginia Tech Undergraduate Historical Review*, “Quarantines have been employed for thousands of years as safeguards against the spread of disease. Early in the history of civilizations, isolation and confinement of ill persons were the predecessors of quarantine.”<sup>4</sup> Drews’ astute observations inform much of what follows.

## The discovery of microbes

Microbes were not known by humankind thousands of years ago. What were our ancestors trying to protect against?

Microscopic pathogens were discovered during the period 1665–83 by two Fellows of London’s Royal Society, Robert Hooke and Antoni van Leeuwenhoek. In *Micrographia* (1665), Hooke presented the first published description of a microorganism, the

microfungus *Mucor*. Leeuwenhoek, a few years later, actually observed and described microscopic protozoa and bacteria while employing his improvements on the recently invented microscope.<sup>5</sup>

A key figure in the evolution of our understanding of the spread of infections was Louis Pasteur, whose findings were published in 1861. Fifteen years later, the German physician Robert Koch traced the life history of the microbe responsible for anthrax in cattle and sheep. Six years after that, in 1882, Koch worked out the cause of tuberculosis. It was the first microbial disease in humans for which this had been accomplished.<sup>4</sup> Although a monumental achievement, it was not until the 20th century that germ theory became a standard part of scientific and medical knowledge. Most of Koch’s contemporaries persisted in believing that the major culprits were bad air (miasmas) and undisciplined lifestyles, and had nothing to do with tiny living organisms.<sup>6</sup>

## Quarantine and isolation

The incubation period is the interval from the time the pathogen enters the body until the time it first causes symptoms. Because of the incubation period, an individual may carry a disease-causing pathogen without being symptomatic. When symptoms occur, they may be minimal, such as a low-grade fever, which reflects the body’s attempt to kill or control the spread of the harmful microbe.

“Throughout much of early epidemiological history, isolation, not quarantine, was the primary method of halting the spread of pandemics, because people did not understand the concept of an incubation period,” Drews states.<sup>4</sup> Therefore, before microbes were discovered in the nineteenth century, people understood that social isolation worked but they did not know why. They only understood that sick people should be separated from well individuals.

This type of uncertainty persists in many areas of medical science. We have often known *that* something works before we understand *how* it works. A classic example is general anesthetics, whose effectiveness was unquestioned before we had a clue about the physiological mechanisms that were involved.

## The black death

Drews finds an early form of semi-isolation the Biblical book of Leviticus, the third book of the Jewish Torah, thought to have been written between the fifth and eighth centuries BCE. Instructions occur in the thirteenth chapter for the isolation of those suffering from a skin disease, most likely leprosy.

Nearly a thousand years later in CE 541, the first recorded outbreak of what came to be known as bubonic plague or the Black Death was reported by the Byzantine historian Procopius.<sup>7</sup> This

outbreak was also called the Plague of Justinian or the Justinian Plague, after the Roman emperor. It afflicted the entire Mediterranean Basin, Europe, and the Near East. Constantinople, the seat of the Roman Empire at the time, was severely affected.<sup>8</sup>

The Justinian Plague raged from 541 to CE 549 and destroyed up to an estimated 40 percent of the population in the affected regions. Justinian contracted the plague but did not die from it. He instituted burial customs and control measures. They included efforts to control the movements of people believed responsible for the disease, including Jews, pagans, heretics, and homosexuals.

Drews is unsparing in her criticism of Justinian's response to the plague. She states, "Justinian's discriminatory laws created a sort of quarantine, though he had no knowledge of what caused the disease to spread. People who were considered different from the Christians of Constantinople were accused of causing the terrible outbreak. As a result, Justinian attempted to halt their movement. These minorities were no guiltier in their role as plague carriers than the Christians who had the disease, but racism and aggression against dissident groups of Justinian's reign played a major role in their branding as the source of the epidemic. The quarantine enacted by Justinian proved virtually useless and did nothing to stop the spread of the plague. However, it still qualifies as a quarantine technology, a failed technology, but a technology nonetheless."

In Drews' piquant description, "Originally appearing in the Far East, the disease that would come to be synonymous with plague first emerged in Europe as nothing more than a rumor in 1346. Over the next five to ten years the plague exploded onto the Western world, killing millions and altering the fabric of every society it touched."<sup>4</sup> The use of quarantine expanded during the fourteenth century as the epidemics of Black Death continued.

What did the plague look like? Drews cites the description of the illness recorded by Italian author Boccaccio (1313–1357) in his *Decameron*: "[I]ts earliest symptom, in men and women alike, was the appearance of certain swellings in the groin or armpit, some of which were egg-shaped whilst others were roughly the size of the common apple.... Against these maladies, it seemed that all the advice of physicians and all the power of medicine were profitless and unavailing.... few of those who caught it ever recovered, and in most cases death occurred within three days from the appearance of the symptoms we have described, some people dying more rapidly than others, the majority without any fever or other complications."<sup>9</sup>

## Our coronavirus pandemic

As I write, there are almost 400,000 confirmed deaths worldwide from coronavirus infection (<https://ourworldindata.org/coronavirus-data>). These are tragic numbers, but they are small compared to what our ancestors endured. By the time the Black Death subsided after 1351, "20 million people had died in Europe alone, reducing the population to 80 million people. The epidemic completely halted the rise in human population begun in 5000 BCE; it killed so many people that it would take Europe more than 150 years to return to its former population."<sup>4</sup>

Today people complain about isolation, facemasks, business closures, and restricted movement. Compare these inconveniences with those imposed during fourteenth-century Europe during the plague years. Drews: "By the late fourteenth century, the effects of the plague were so bad that Italian city-states resorted to desperate measures in an attempt to preserve public health. Without definite knowledge of what caused the disease, Italian health commissioners fell back on a common theory that the air itself was infected. In their view, the only way to stop the epidemic was to somehow clean the air.... In their pursuit of corruption-free air, commissioners inspected wine, fish, meat, and water supplies; they worried about sewage; they regulated burials, and decreed the destruction of the clothing of the deceased.... These measures may have saved lives by cutting

down on secondary sources of infection. But besides burning the clothing of the deceased, they did little to curb the rampant spread of the plague.... More extreme measures were taken by Viscount Bernabo of Reggio, who ordered, 'every person with plague be taken out of the city in to the fields, there to die or recover.'"<sup>4,10</sup>

## Modern quarantine and Isolation

By the mid-1370s, modern quarantine procedures began to take shape in Italy. Drews reports, "In 1374, both Genoa and Venice began determining the ports of origin of incoming ships, and turned away any coming from infected areas.... Ultimately, the Italian city-states extended their quarantine time requirement to forty days. Originally termed *trentino*, the adjustment to forty days of quarantine caused the name to be modified to *quarantino*, a term derived from the Italian word *quaranta*, which means 'forty'. Some suggest this was based on the Hippocratic belief that the 40th day distinguished acute diseases from chronic. Other authors contend that it was changed due to Christian practices, such as the observation of Lent, the length of the great flood of Noah, or the length of Jesus' stay in the wilderness. Regardless of the reason, the increased quarantine time offered an improvement; it better insured that the ships in question did not pose a health risk to the city."<sup>4</sup>

If any deaths occurred or if anyone fell sick during the voyage or during the time the quarantine was being observed, the quarantine would be extended "for 50 or 60 days according to the danger and circumstances," and the goods on board would be "sent to the pest-house" to be "purified."<sup>4</sup>

In addition to establishing a maritime quarantine for incoming ships, Italian health officials began to restrict infected persons and their families and contacts to their homes as a means of preventing further spread of disease. Often the authorities would assign individuals to guard the homes of the quarantined in order to insure they did not escape. Isolation sometimes amounted to captivity and imprisonment. In Milan, where cases of the plague were first discovered, all the occupants of the three houses concerned, dead or alive, sick or well, were walled up inside and left to perish. This extreme action appeared to have worked, as out of all the large Italian city-states, Milan was the least afflicted with the Black Death.<sup>11</sup>

Some forms of isolation and quarantine amounted to banishment. Drews reports that in 2007 archaeologists discovered a mass grave of more than 1500 victims of the bubonic plague while working on the small island of Lazzaretto Vecchio in Italy's Venetian Lagoon. During the plague years, those in Venice who caught the plague were sent to this island. They were treated until they either survived or perished by "physicians brave or foolish enough to tend to the infected," Drews states. Lazzaretto Vecchio may have been the world's first *lazzaret*, or quarantine colony.<sup>4,12</sup>

England's major cities also suffered severely during the plague years. Poor sanitation and massive overcrowding guaranteed a hideous death toll. "The last in a long series of pandemics, the Great Plague of London in 1665, killed between 75,000 and 100,000 of the capital city's citizens. During the summer months the death rates rose, peaking in September" when 7165 Londoners died in one week.<sup>13</sup>

## Quarantines in America

In the United States an epidemic of yellow fever struck Philadelphia, then the nation's capital, in August 1793. The disease killed around 5000 citizens and caused 20,000 to flee the city. In response, the Lazaretto Station was established on the Delaware River in Tini-cum Township in 1799. It was a 10-acre compound consisting of a hospital, offices, and residences that processed ships, cargo, and passengers sailing for the port of Philadelphia. It operated for nearly a century.<sup>14</sup>

In 1832, a cholera epidemic swept over New York City. It was part of a pandemic that began in Asia in 1824, eventually spreading to England and Canada over the next eight years. In 1832, learning that the disease had spread to Quebec and the city of Montreal, New York City Mayor Walter Browne instituted a quarantine in an effort to protect his city. Immigrants continued to enter New York City from England via Canada, however, and the quarantine collapsed. Around 3500 New Yorkers died, while 70,000 fled the city. They carried cholera into America's interior, spreading the disease as far south as New Orleans and Mexico.<sup>15</sup>

## Conclusion

Quarantines and isolation have been used to stem disease for 3000 years. As Drews summarizes, "As human understanding of disease transmission grew, quarantine sophistication and efficacy improved, until it became standard practice in combating epidemics. Though not always successful, quarantines delayed or contained outbreaks by removing all potential pathogen carriers from the populace. At first lightly used against leprosy and plagues of antiquity, quarantine, as a technology, expanded rapidly in the Western world during the Black Death epidemic. Its initial success against the plague established quarantine as a standard procedure to stopping the spread of epidemics and pandemics."<sup>4</sup>

For three millennia our predecessors have struggled to find ways of stemming illness and death from diseases that have been largely defanged by sanitation, vaccines, medications, and the knowledge of the behavior of microbes. Some of the early forms of isolation were draconian as we've seen, such as walling up the sick, confining them to islands, or sending them into fields to get well or die.

Against this painful historical backdrop, perhaps we might be more tolerant of the preventative precautions issued by contemporary health authorities such as the CDC. Most of our ancestors who faced plague, cholera, and yellow fever would likely trade places with us without hesitation. They would probably look with disbelief on our complaints of being inconvenienced by social isolation, social distancing, and wearing masks and gloves in public. They would probably laugh at the current complaint that individual liberties and freedoms are being sacrificed by the preventative measures aged in our fight against COVID-19, when far more

lethal diseases killed them by millions and depopulated their cities.

Every death from our coronavirus pandemic is tragic. But remembering what our ancestors endured, and their courage as well as mistakes, can perhaps soften the blow.

Larry Dossey, MD  
Executive editor

E-mail address: [larry@dosseydossey.com](mailto:larry@dosseydossey.com)

## References

1. Corum J., Sheikh K., Zimmer C. Different Approaches to a Coronavirus Vaccine. NYTimes.com. <https://www.nytimes.com/interactive/2020/05/20/science/coronavirus-vaccine-development.html>. 20 May 2020. Accessed 2 June 2020.
2. Grady D. We'll Have to Live With This for a Long Time. NYTimes.com. <https://www.nytimes.com/article/coronavirus-facts-history.html>. Accessed 2 June 2020.
3. Social Distancing: Keep Your Distance to Slow the Spread. CDC.gov. <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/social-distancing.html>. Accessed 2 June 2020.
4. Drews, K.A Brief History of Quarantine. *The Virginia Tech Undergraduate Historical Review*. 2013. <https://vtuhr.org/articles/10.21061/vtuhr.v2i0.16/>. Accessed 2 June 2020.
5. Gest H. The discovery of microorganisms by Robert Hooke and Antoni Van Leeuwenhoek (Fellows of the Royal Society.) Notes of the Royal Society. *Notes Rec R Soc Lond*. 2004;58(2):187–201.
6. Watts S. *Epidemics and History: Disease, Power and Imperialism*. Wiltshire, UK: Redwood Books; 1997:xii.
7. Snodgrass ME. *World Epidemics: A Cultural Chronology of Disease from Prehistory to the Era of SARS*. Jefferson, NC: McFarland & Company, Inc.; 2003:20–21.
8. Plague of Justinian. Wikipedia. [https://en.wikipedia.org/wiki/Plague\\_of\\_Justinian](https://en.wikipedia.org/wiki/Plague_of_Justinian). Accessed 4 June 2020.
9. Boccaccio G. *The Decameron*. London, UK: Penguin; 1972:50–51. (G. H. McWilliam, trans). London, UK: Penguin; 1972: 50–51.
10. Sehdev PS. The origin of quarantine. *Clin Infect Dis*. 2002;35(9):1071–1072.
11. Ziegler P. *The Black Death*. Wolfeboro Falls, NH: Alan Sutton Publishing, Inc; 1991:38.
12. Mass Plague Graves Found on Venice "Quarantine" Island. Columbian College of Arts and Sciences: History News Network. The George Washington University. <https://historynewsnetwork.org/article/42384>. Accessed 5 June 2020.
13. The Great Plague of London, 1665. Harvard University Library Open Collections Program: Contagion. <http://ocp.hul.harvard.edu/contagion/plague.html>. Accessed 6 June 2020.
14. Lazaretto Quarantine Station. U. S. History.Org. <https://www.ushistory.org/laz/>. Accessed 6 June 2020.
15. Hays JN. *Epidemics and Pandemics: Their Impacts On Human History*. Santa Barbara, CA: ABC-CLIO; 2005:211–212.