

CONTAGIOUS COMMENTS

Department of Epidemiology

Lepers, Lazarettos, and Quarantine: A History of Social Distancing

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I. Introduction

The rapid global spread of COVID-19 since the winter of 2019 into and the spring of 2020 has led to widespread social distancing measures implemented across the United States. City and state-led social distancing in Colorado, as part of an effort to slow the spread of COVID-19, have included closures of dining services, schools, and the encouragement of remote working. This notion of “flattening the curve” to prevent overwhelming the healthcare system has circulated throughout the media as ‘a civic duty’ to protect elderly and vulnerable populations.

The following outlines a history of social distancing and the effectiveness of social distancing techniques used today. Social distancing, however, must be examined alongside two related nonpharmaceutical public health measures: quarantine and isolation. To understand how these measures developed from one another and operate alongside each other, we must first disentangle their meanings. Social distancing is a preventive measure to reduce spread when infected individuals have not yet been identified; such measures prevent nonessential gatherings of individuals in schools, businesses, workplaces, and events. Quarantine (mandated or self-quarantine) is used when there is a suspected infection or possibility of infection, and an individual is kept separate from society as a precautionary measure to prevent spread. Isolation is used when there is a confirmed case in which an individual must be kept separate from others to prevent infection of others.¹

II. Precedent: A Brief History of Quarantine

Historically, isolation techniques were used as early as the fifth century in Europe with the creation of leper colonies, also called *leprosariums*. These *leprosariums* were managed by monastic houses to remove lepers from the public as the disease was considered highly contagious and carried a connotation of moral depravity. This perception endured well into the twentieth century as the disease and its mechanism of spread was still not well understood. In medieval Europe, lepers were given special garments to identify them, and in some communities, wooden claps or bells to signal their movements, so as to allow others to distance themselves as lepers travelled through communities. By the twelfth century, there were over 2,000 *leprosariums* in France alone.^{2,3} The techniques employed

by Christian monastic houses to isolate “undesirable” or “infected” lepers formed the basis of public health protective measures in the medieval and early modern world.

The term “quarantine” (*quarantena* in Venetian dialect, meaning “forty days”) in relation to disease first emerged in twelfth-century Venice in reference to a forty-day period of isolation.⁴ This chosen length of time carried immense symbolism in a Christian Europe in reference to Jesus Christ’s forty days in the desert. Quarantines became more prevalent with the outbreak of the bubonic plague, also known as the Black Death, in 1348. Quarantine hospitals, *lazarettos*, were built next to large shipping ports such as Dubrovnik and Venice. In order to mitigate future disease spread during disease outbreaks, maritime travellers and merchants were forced to quarantine onboard their ships or in the *lazarettos* prior to their admission to the city. Cities across Europe followed Venice’s precedent and built these *lazarettos* (or converted unused *leprosariums*) to quarantine travellers. Eventually, however, the outbreak became so prolific that *lazarettos* were used increasingly as isolation hospitals to house the sick as opposed to quarantine travellers during epidemics.^{5,6}

Though infectious processes were still largely unknown in the early modern period, quarantines and isolation hospitals continued to be the predominant public health measures during major outbreaks. The bubonic plague returned to Europe in multiple waves from the sixteenth through eighteenth centuries, and cities implemented quarantines to isolate the ill from the well. In England, these quarantine hospitals were known as *pesthouses*, and they continued to operate for much of the early modern period.⁷ The yellow fever and smallpox epidemics of the eighteenth century were particularly virulent in the new world where immunity to such diseases had yet to develop.^{8,9} In some of the British Colonies of North America, mandatory home isolation was instituted for all persons with smallpox.⁶ Maritime quarantine measures, including *lazarettos*, continued to operate through the early modern period. Many port cities built *lazarettos* during the cholera outbreak to quarantine sailors and merchants from infected regions. These measures, however, were largely ineffective within the contemporary epidemiological paradigm because the etiology and spread of disease was not yet fully understood.⁶

III. Germ Theory and Vaccination: A Shift in the Epidemiological Theory

The Scientific Revolution of the sixteenth and seventeenth centuries paved the way for new ways of thinking about disease that valued scientific inquiry over religious and moral health. By the early nineteenth century, doctors and scientists relied on a public health paradigm of sanitation that insisted upon public cleanliness and hygiene to dispel *miasma*, or poor air. But in 1840, Jakob Henle first argued for a contagion theory in which small organisms infected individuals.¹⁰ It was not until John Snow’s discovery of cholera’s water-based transmission in 1854 and William Budd’s successful implementation of chlorine to disinfect water systems during typhoid outbreaks that a new understanding of germ theory began to shift the paradigm.¹¹⁻¹³ By the 1880s, the existence of these infectious bacteria were confirmed, including Karl Josef Eberth’s discovery of a bacillus species causing typhoid in 1880 and Robert Koch’s research on mycobacterium as the cause of tuberculosis in 1884.¹⁴⁻¹⁶

The development of vaccines emerged alongside the development of germ theory. Initial efforts towards induced immunity can be seen as early as the fifteenth century in China

with the inoculation and insufflation of infected pus into well individuals as a prophylactic measure.¹⁷ Such practices were also practiced in the Ottoman Empire (modern Turkey) in the eighteenth century as recorded by Europeans such as Lady Mary Montagu¹⁸ and Voltaire¹⁹. Due to Lady Mary Montagu's publicity efforts, variolation (inoculation of smallpox) became more and more widespread in England but it was still considered a dangerous practice due to the disease's virulence. In 1787, the British doctor Edward Jenner developed a vaccine for smallpox by inoculating patients with cowpox, a genetically similar but less virulent disease.^{20,21} By the late nineteenth century, Louis Pasteur furthered the development of vaccines with his work on chicken cholera and anthrax.^{21,22} Both germ theory and vaccines demonstrate the shift into modern epidemiological theory based on a premise of communicable bacterial and viral illnesses that could be spread through various mechanisms of transmission (e.g. water systems, food, interpersonal contact); this would later inform new public health measures towards prevention instead of containment.

IV. Modern Outbreaks: The Rise of Social Distancing and Its Effectiveness

While quarantine was used historically to separate the sick from the remainder of the public, social distancing was only introduced in the twentieth century as a preventive, prophylactic measure to prevent further spread of infections among otherwise uninfected individuals. The closure of public venues such as pools, cinemas, and public gatherings during the 1916 poliovirus epidemic is one such example.²³ The 1918 Spanish Flu pandemic, however, initiated more concerted, large-scale efforts towards social distancing, such as school closures.²⁴⁻²⁶ Importantly, the 1918 influenza pandemic was characterized by multiple local epidemic waves, which demonstrate the potential weaknesses of such measures.

Scholars have attempted to uncover the reasons behind these multiple epidemic waves to better understand how to respond effectively to current and future pandemics. A study of the 1918 influenza outbreak in Sydney, Australia attributes the multiple waves to the variable application of social distancing, which led to a 38% reduction of interpersonal contact during government infection control measures. However, as these measures were lifted and individuals stopped social distancing, secondary and tertiary waves ensued.²⁷ A study of the three epidemic waves in England and Wales uses modelling to argue that while the closing and reopening of schools and seasonal temperature did contribute to the waves, behavioral responses, i.e. social distancing, had the largest effect in decreasing infection transmission.^{28,29} Two studies comparing the responses of US cities note that rapid and effective social distancing reduced the infection rate in those cities by about 30-50% whereas cities that intervened too slowly or lifted the interventions too soon were unable to effectively control transmission.^{24,26} These studies all point to the effectiveness of a properly-organized social distancing intervention while underlining its failures when lifted too soon.

V. Current Techniques: The Implementation and Effectiveness of Social Distancing

The H1N1 influenza pandemic (2009) provides more recent comparisons of social distancing responses and effectiveness. A study comparing the non-pharmacological interventions across 13 countries demonstrate that social distancing, along with improved hygiene, were practiced the most.³⁰ Reviews of social distancing techniques in workplaces

and schools in the aftermath of the 2009 pandemic note a paucity of literature directly guiding social distancing interventions in these venues.³¹⁻³³ Modelling of workplace social distancing revealed a median 23% reduction of influenza attacks and demonstrable effect towards flattening the curve of infection. Delayed implementation of social distancing and low compliance of social distancing, however, played a significant role in its ineffectiveness.³¹ Cost analysis of non-pharmaceutical infection control measures reveal that social distancing measures such as school and business closures are not a cost-effective strategy for mild pandemics, however, they do play a role in the optimum strategy for infection containment with more serious pandemics.³⁴

The H1N1 pandemic provided a few major lessons towards the implementation of nonpharmaceutical interventions as outlined by the Center for Disease Control and Prevention (CDC).³⁵⁻³⁷ These include pre-pandemic planning, communication, and collaborative decision-making between the CDC and local governments about the use of personal protective measures, environmental cleaning, and school, workplace, and business closures along with other social distancing measures. These measures are recommended for the specific goal of reducing the number of hospitalizations in order to maintain hospital resources, also known as “flattening the curve”. The rapid change of events with the H1N1 pandemic demonstrated the importance of effectively transmitting updated public health recommendations in concert with local governments.

Mass media played a vital role in the H1N1 pandemic as a tool that promoted government interventions and preventative healthcare measures.³⁸ However, the increased rate of media stories related to the pandemic also contributed to “media fatigue” which resulted in a loosening of preventative measures, thereby causing two peaks of infection.³⁹ The role of social media in particular during this COVID-19 pandemic should not be overlooked as it has played a vital role in circulating information about social distancing and rallying support behind such preventative measures. However, the circulation of false information is also possible, thereby underlining the importance of accurate and collaborative public health recommendations from federal and state governments. The 2009 pandemic also brought to light the importance of international cooperation and preparedness plans in order to mitigate the spread of disease.³⁸ These measures have been implemented to varying degrees globally during the COVID-19 pandemic, but there is still room for improvement towards a swift and unanimous response in the US context.

VI. Conclusion: Major Take-Aways

- 1) Social distancing, along with hygiene, is the most effective non-pharmaceutical preventative measure to reduce infection transmission and mortality rates during major pandemics.
- 2) Local, federal, and international governments must communicate and collaborate effectively towards concerted public health measures in order to mitigate the spread of disease.
- 3) Delayed implementation of social distancing can have serious effects towards infection rates. Likewise, the lifting of social distancing interventions too soon is the primary cause of multiple epidemic waves.
- 4) The media is a vital tool that should be used to educate the public on proper public health measures in concert with state and federal governments.
- 5) “Media fatigue”, however, contributed to a general loosening of social distancing measures, causing secondary epidemic waves, thereby underlining the importance of measured and collaborative communication.

- 6) More studies are needed comparing social distancing techniques in school and workplace to inform concerted responses in an effective and equitable manner.

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