

Efforts, Past and Present, to Stop the Spread of a Disease: A Comparison of Cholera and COVID-19.

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Disease and sickness have always been one of the greatest killers of humans, century after century. Before scientific understanding was realized, the common belief about the causes of sickness were misunderstood and were often attributed to supernatural forces. Thanks to the efforts of doctors in London during the cholera outbreak in 1854, people now have a better understanding of what causes diseases, how they spread, and how that information can be used to save lives. This paper will show how Dr. Jon Snow's contributions to epidemiology are just as relevant today regarding COVID-19 as they were when they were first proposed in 1854 for cholera.

Cholera was first discovered in the Ganges River Delta in India in the nineteenth-century, and rapidly spread across the globe in repeated epidemics.<sup>1</sup> News print in 1831 and 1832 shows that fear of the "Asiatic Cholera" was prevalent.<sup>2</sup> Though, individuals were vehemently claiming in editorials that the disease which was Indian in origin had not reached or infected England, but rather it was a false claim for doctors to increase their wealth.<sup>3</sup> Cholera outbreaks were also common and devastating in America, occurring frequently from the 1830s to 1860s.<sup>4</sup>

Cholera is a diarrhoeal disease which can kill within hours if left untreated.<sup>5</sup> This extremely dangerous illness can cause acute dehydration in severe cases which can lead to death in a very short time.<sup>6</sup> Cholera arrived in England in 1831, when the belief held by doctors at the time was that the many outbreaks of cholera and other diseases were spread through miasmas, or

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<sup>1</sup> "Cholera," Key facts and figures about the history and transmission of Cholera, WHO, June 1, 2021, <https://www.who.int/news-room/fact-sheets/detail/cholera>.

<sup>2</sup> Corrine J. Grimley Evans, "DIVINE PROVIDENCE AND EPIDEMIC CHOLERA: A CONTRIBUTION TO THE STUDY OF SECULARIZATION OF THOUGHT IN NINETEENTH CENTURY ENGLAND," (PhD. Dissertation, Oxford Brookes University, November 1995), 37. <https://library.macewan.ca/full-record/edsble/edsble.294224>

<sup>3</sup> Ibid.

<sup>4</sup> Ibid., 2.

<sup>5</sup> "Cholera" World Health Organization" Information about cholera including symptoms, treatment, and preventative measures. Accessed April 14. <https://www.who.int/news-room/fact-sheets/detail/cholera>

<sup>6</sup> Ibid.

a corruption in the air which carried sickness.<sup>7</sup> Cholera would remain prevalent for decades, until Jon Snow made discoveries about how it was actually spread in 1854.

Starting on the night of August 31, 1854, the district of Soho in London would have well over 600 deaths from cholera in the next thirty days.<sup>8</sup> The actions of Jon Snow in September of 1854 would overturn popular belief about cholera, save countless lives, and provide a foundation for a new field of medicine.

Snow took a different approach to disease management than his peers: he focused on the unique way cholera was transmitted through a community, rather than accepting the theory that it was simply spread in bad air.<sup>9</sup> Snow had a deep understanding of the disease itself, and reasoned that whatever it was, it somehow had to vector between those infected. “The laws of disease communication ... are as ironclad in their generalizability as in any molecular theory of disease pathogenesis,” meaning epidemiology has two areas that have to be dealt with: the micro and the macro.<sup>10</sup>

Snow was the first doctor to realize that the macro level was being ignored by his peers who were focused on the pathogen itself through a micro lens: air transmission. Snow was already a prominent doctor in London when cholera took root, thanks to his work on anesthetics and resuscitation of newborns.<sup>11</sup> He did not discount the micro approach to disease study, but included larger areas of data in his reasoning. His expertise on the properties of inhaled gases gave him the foundation to make assumptions about the disease. The miasmatic cholera theories did not sound right to him, and forced him to search for and ultimately uncover more information.<sup>12</sup>

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<sup>7</sup> Ibid.

<sup>8</sup> Ibid.

<sup>9</sup> Nigel Paneth, “Assessing the Contributions of Jon Snow to Epidemiology: 150 Years After the Removal of the Broad Street Pump Handle,” *Lippincott Williams & Wilkins* vol 15, no. 5 (September 2004): p. 514. <https://www.jstor.org/stable/20485943>

<sup>10</sup> Ibid., p. 514-515.

<sup>11</sup> Robins, “Profiles in Medical Courage,” 87-99.

<sup>12</sup> Paneth, “Assessing the Contributions,” 515.

Snow created a geographical map based on findings from interviews he held with infected people, and municipal reports about deaths. His map promoted an interest in cartography as a means to visualize locations hit hardest by a disease, as demonstrated with the interviews conducted around Soho. Snow asked questions about nutrition, contacts, places visited, and other factors that could have played a role in transmission. The conclusion Snow came to was that houses near the Broad Street Pump (BSP) were most affected by cholera. Re-examining Snow's map with modern technology, and cross referencing the results with other sets of data not included in Snow's original map provided confirmation of Snow's claim.<sup>13</sup>

Snow's map was not without its drawbacks. A larger area of focus would help determine if cholera originated from a single source, or if there were possible origins outside the area. Also, while it was excellent at displaying the data gathered, some key epidemiological data was missing, and subsequently affected the predicting power of the map. Two such datasets that were missing were population density during the outbreak, and the age of those affected. Younger people tended to be affected more by cholera.<sup>14</sup>

Information about the deaths from cholera as displayed through cartographical hotspots on Snow's map was accurate and useful in pinpointing the BSP as the primary source for illness and water contamination.<sup>15</sup> Snow learned in his interviews that water-companies distributed water from the BSP to houses throughout the area and outside it as well, which overlapped with findings from interviews.<sup>16</sup> The conclusion Snow drew from this was that water based vectors were the major mode of transmission.

Snow was noted to have a less than pleasant demeanor when dealing with others. Perhaps this is why he was not believed by a single colleague when he "demanded an audience" in a meeting of the St. James Parish Board of Guardians. This district, serviced by the BSP, held a meeting, which Snow was not invited to but attended anyway. He argued that the pump was the

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<sup>13</sup> Narushige Shiode, Shino Shiode, Elodie Rod-Thatcher, Sanjay Rana, and Peter Vinten-Johansen, "The Mortality Rates and the Space-Time Patterns of Jon Snow's Cholera Epidemic Map." *International Journal of Health Geographics* vol 15, no. 21 (2015): 15.

<sup>14</sup> Ibid.

<sup>15</sup> Ibid., p. 15.

<sup>16</sup> Paneth, "Assessing the Contributions," p. 515.

sole source of the disease. Snow trusted his findings, and relentlessly followed up on them. In the process, he made a substantial contribution to medical knowledge through the founding of epidemiology.<sup>17</sup>

Shiode says that Snow stated that cholera is only transmitted through water, but there are other ways that it can be transmitted, such as through contaminated food or close contact with an infected person.<sup>18</sup> However, Snow himself acknowledged that there were possibly other ways cholera could be passed, but that the evidence supported limited instances of something airborne, and furthermore those airborne vectors were still rooted in the fecal-oral route, such as fecal matter drying to dust and blowing in the wind.<sup>19</sup>

In the second week of September, the deaths dropped by 75%, before the handle was removed. The outbreak ended, not because the handle was taken off, but because the “citizenry packed up and left” fearing the increasing number of inexplicable deaths.<sup>20</sup> The most significant number of deaths occurred in the first week of September.<sup>21</sup> Essentially, social distancing was practiced by those who could afford to abandon the diseased area, and the rate of spread declined.

This is not to diminish the actions of Jon Snow, quite the contrary. Snow discovered a key epidemiological principle: the most important information to have about any communicable disease is the mode of transmission.<sup>22</sup> Snow argued that cholera could only be contracted through the “fecal-oral route,” a claim that would challenge popular convention and improve the lives of poor citizens.<sup>23</sup> While Jon Snow did not remove the handle off the BSP himself, his relentless petitioning eventually convinced civic authorities to take the handle off the contaminated pump on September 8, 1854.<sup>24</sup> The efforts of Snow showed that the commonly held beliefs of his peers around transmission of disease were false and disproved with data gathering and scientific study.

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<sup>17</sup> Robins, “Profiles in Medical Courage,” 87-99

<sup>18</sup> Shiode, “The Mortality Rates,” p. 6.

<sup>19</sup> Jon Snow, “On The Mode of Communication of Cholera,” *Edinburgh Medical Journal* vol 1, no. 7 (January, 1856): 668-670. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5307547/>

<sup>20</sup> Paneth, “Assessing the Contributions,” 514.

<sup>21</sup> *Ibid.*

<sup>22</sup> *Ibid.*

<sup>23</sup> *Ibid.*, p. 515.

<sup>24</sup> *Ibid.*, p. 514.

The lesson here is that swift action by scientifically and medically trained individuals can have massive direct implications on the spread of a disease through a population.

In a letter to the Edinburgh Medical Journal, Jon Snow argues about the mechanism in which cholera is transmitted. Snow acknowledges a fellow doctor, William Budd, a proponent of the airborne potentials of cholera, and then puts forward arguments against Budd's claim about how cases spread in a community. The point where the two competing doctors disagree is on the extent to which cholera is transmitted through inhalation, or solely from swallowing. Snow argues it is not through an airborne miasma, as put forward by Budd, but through surfaces contaminated with fecal material which leads to ingestion. This is seen when doctors attending a sick person were fine after washing their hands, but a casual visit from an acquaintance would cause an outbreak. Tracing contacts and outbreaks can provide as much useful information in the physiological construction of a pathogen as hands-on practice.<sup>25</sup>

In his letter, Snow is respectful, and sticks to his points about the pathology of the disease. He recommends reliable solutions to the problem, since it had now been properly identified: "all that would be required to prevent the disease would be such a close attention to cleanliness in cooking and eating, and to drainage and water supply".<sup>26</sup> Effective preventative measures almost always follow after the transmission vector of a disease has been determined.<sup>27</sup>

Scientific study and the practice of medicine in the 1800's was often reserved for the wealthy and the elite. Snow himself, who was born into a modest family, only gained training through the aid of an unknown benefactor, possibly a wealthy uncle.<sup>28</sup> This structural societal circumstance often results in poorer individuals not gaining the knowledge sufficient to improve the standard of living in less affluent districts. Snow emphasised the extent to which poverty enhanced the spread of cholera.<sup>29</sup> Lack of soap and water, lack of training in hygienic behaviour, and other factors play a key role in why impoverished people are ill-equipped to prevent

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<sup>25</sup> Snow, "On the Mode of Communication," 668-670.

<sup>26</sup> Ibid.

<sup>27</sup> Paneth, "Assessing the Contributions," 514.

<sup>28</sup> Ibid.

<sup>29</sup> Ibid., 515.

contagious spread. Poverty predisposes one to ischemic heart disease, certain cancers, and stroke, making poverty a dangerous condition for people facing another dangerous illness.<sup>30</sup>

A letter to the Editor of The Times newspaper revealed some of the popular sentiment of 1854, beliefs that Snow disputed through his studies. “Talk as we may of Secondary causes, let anyone read the historical account of cholera and then let him doubt if he can that there is an over-ruling Providence, that permits and guides the progress of this disease”.<sup>31</sup> Snow, through his interviews and examinations, discovered that sickness and death were not caused by some mysterious divine will, but rather organisms which were too small to see living in contaminated water. Religious beliefs would again be challenged when the solution to the recurring crises was to promote hygiene, remove waste efficiently, and provide clean water, none of which require devotion to a deity. There was a commonly held belief that the sick peoples of London would be healed if the wealthy citizens came down to their bedsides to exert their Christian faith in an attempt to drive off the illness.<sup>32</sup> The author of the letter to the Editor held beliefs indicative of many in England, beliefs that would come to be challenged in many years of scientific advancement.

Evans argued that providence, or the will of God guiding human situations, was widely held as the cause of events in nineteenth-century England, but the belief declined as outbreaks of cholera spread.<sup>33</sup> The speed at which healthy people would succumb and the horrible method of death ruined the commonly held belief that God was taking a prominent role in human lives. Instead, when counter arguments were introduced that were scientifically based, the Church, a large source of epidemiological misinformation, lost authority on sickness. This contributed to a general increase of secularization going forward, though far from a complete departure from faith.<sup>34</sup> Cholera “became the focal point of a wider and continuing debate about the nature of providence within the context of both questioning and a reformulation of traditional beliefs in the face of rapid social, educational, and economic change”.<sup>35</sup>

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<sup>30</sup> Ibid.

<sup>31</sup> W., “Day of Humiliation In Shoreditch,” *The Times*, Sept. 15, 1849.

<https://link.gale.com/apps/doc/CS84181295/TTDA?u=edmo87290&sid=TTDA&xid=ac2a599a>

<sup>32</sup> Evans, DIVINE PROVIDENCE AND EPIDEMIC CHOLERA, 40.

<sup>33</sup> Ibid., 4.

<sup>34</sup> Ibid.

<sup>35</sup> Ibid., 211.

Awareness and knowledge about communicable disease grew rapidly over a few decades, in part due to the efforts of Jon Snow. Later, an event that came to be known as the “Great Stink” occurred when the sewage waste which was freely dumped in the Thames River produced a putrid stench in the summer of 1858 when a heat wave came over London. The discovery about cholera’s transmission by Snow, and the famous “Great Stink”, heightened public awareness about health issues related to sanitation. Efforts were made to improve the sewage infrastructure in London, with sewage collected and dumped into the Thames Estuary, rather than have it contaminate the water throughout the city. While the issues that were targeted to be fixed reflected the incorrect miasma model of disease, improvements to sewage nonetheless had direct benefits to disease management. It was not until 1867 that germ theory would decisively prove the miasma theory false and revolutionize the understanding and prevention of diseases.<sup>36</sup>

The usefulness and importance of geographic epidemic maps and the careful analytical study of disease can not be overstated in our modern society, which has been in a COVID-19 pandemic for over a year. The efforts made by Snow to better understand cholera as it spread through London are in direct use today, with heat-maps used to determine COVID-19 hot spots and arrange appropriate responses. By interviewing people who were sick, Snow was able to perform an early form of contact tracing, which provided the evidence to support his conclusion about how cholera is transmitted, and to recommend useful measures to combat the spread and intensity of the disease. COVID-19 and cholera clearly have differences in their method of transfer between hosts, one being airborne and the other not, however there are enough similarities between them for a historian to draw useful and relevant pieces of information from their comparison. Misinformation, whether religious or not, and academic pushback to evidence based research, should be resisted with unwavering devotion to the scientific process. Fighting disease in a modern global setting will take tremendous amounts of effort. Individuals must resist the urge to spread discord and fear through misinformation, and instead “we must walk fearlessly into the heart of the epidemic to study it”.<sup>37</sup>

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<sup>36</sup> Herbert Rakatansky, “Miasmas and Other False Beliefs: The Road to Sickness and Death,” *Rhode Island Medical Journal* vol 103, no. 9 (June 2020): 9-11.

<sup>37</sup> Paneth, “Assessing the Contributions,” 516.

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