Debunk Myths of John Snow

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In his famous novel Oliver Twist, Charles Dickens described London's infamous slums in evocative terms: "rooms were so small, so filthy, so confined, that the air would seem to be so tainted even for the dirt and squalor which they shelter" (Dickens). Victorian London was the largest city in the world and was the first to reach a population of one million. The price of this explosive growth was overcrowding, squalor, and filth. Under these circumstances, infectious diseases were rampant. Among all disease outbreaks, the 1854 cholera outbreak in London's Soho district was one of the greatest. People could die within a few days if they developed severe watery diarrhoea and vomiting after exposure to cholera bacterium (What is cholera?).

The cause of cholera and its mode of transmission remained unknown before the 1854 cholera epidemic. Due to city's filthy environment, it was reasonable that most people in London at that time believed in the miasma theory, which linked foul air to the spread of diseases, including cholera (Halliday). Nevertheless, as an excellent physician, John Snow argued that cholera could not be transmitted through air. Based on his observation, the disease agent should enter a person's gut through mouth since symptoms of cholera were entirely the result of fluid loss but not inhaling problems (Brody). To confirm his theory, John Snow conducted what he called the Great Experiment in 1854 to investigate relationship between cholera mortality and water source distribution through statistical mapping. The Great Experiment enabled John Snow to identify the Broad Street water pump as the source of epidemic and remove its handle to prevent further transmission. Like many traditional memoirs of John Snow, the book *"The People's Health"* written by Robin Henig portrays Snow as a hero who ended the outbreak on his own by removing the handle of the source pump after drawing the cholera death map (Henig). Even though Snow has been considered as one of the most important pioneers in epidemiology, he was not as omnipotent as portrayed in the simplified description in Henig's book since his removal of the pump handle did not cause the outbreak to end, he did not scientifically prove his theory, and he was not a lonely hero without others' support during his experiment.

The first myth to be debunked is that the removal of Broad Street pump handle did not stop the 1854 cholera epidemic. In 1840s, water was not as adequate and clean in southern parts of Britain. However, cholera outbreak in southern areas was not as abrupt and serious as that in London because people in southern Britain had developed immunity through generations of coexistence with cholera (Stanwell-Smith). On the contrary, people in London at that time were experiencing a transformation of living environment. Before the 1854 cholera epidemic, land owners could make profit by collecting and selling human waste for fertilizer (Stanwell-Smith). After a new kind of fertilizer bird guano was introduced to daily use, collecting human waste was no longer profitable so most landowners left waste collection to family inside crowded buildings (Gill). Families' waste was at best dumped into the Thames, or at worst just shoveled into the street (Gill). People in London were more susceptible to cholera since most people were not infected before, and hundreds died during initial weeks of outbreak. However, the death rate gradually reduced as people acquired basic immunity (Stanwell-Smith). Like other infectious diseases such as malaria and ebola, cholera bacteria had its own life cycle (Clemens). As shown in Snow's own tabulations of the deaths during the Great Experiment, the cholera death rate dropped precipitously after the peak day and the outbreak was already subsiding before the handle was removed (Goodman). In addition, scholars at that time had already realized the importance of hygiene to promote people's living conditions. Before John Snow's experiment, Edwin Chadwick, a leading social reformer at that time had proposed a Public Health Act to improve the disorganized sewage system. Even though the removal of Broad Street pump's handle prevented Soho district's citizens from drinking water with cholera, it did not prevent disease transmission through other water sources. Morality had not fallen dramatically until the new sewage system was built as a result of the Public Health Act in 1865 (Gill). Therefore, the reduction of cholera morality was contributed mostly by the disease's own life cycle and the 1865 sewage system reform, but not John's iconic removal of the pump handle.

Moreover, since the germ theory had not been developed yet, John Snow knew nothing about cholera bacteria and were not able to prove his theory. Before conducting his experiment, Snow already believed that cholera was a water-borne disease. In an article published on Medical Times and Gazette during the cholera outbreak, Snow claimed that "as soon as [he] became acquainted with the situation, [he] suspected some contamination of the water on Broad Street" (Snow). It was clear that Snow was not meticulously tracking down cholera cases to get a eureka moment of the cause. He used deductive reasoning which moved from generalized principle to draw specific conclusion but not inductive reasoning which moved from specific instances to a generalized conclusion. The Great Experiment should be considered more as a survey which helped Snow to confirm his theory rather than a new discovery. There were other physicians at that time who drew even "more detailed and accurate maps than Snow's", yet came to a completely opposite conclusion that miasma was the real cause (Brody). Correlation did not mean causation because correlation could be dangerously misleading when people over extrapolated information with biased minds. Although microscope was invented centuries earlier around 1590, the germ theory was not developed until ten years later by Louis Pasteur and Robert Koch (Sen). During the epidemic, people still did not know bacteria was the agent of disease transmission, including John Snow. Snow devoted his rest of life trying to figure out why the Broad Street pump was contaminated. Ironically, the cholera bacteria was discovered by Filippo Pacini in 1854, the same year as the Broad Street cholera outbreak (UCLA). The knowledge of the cholera bacteria transmission would not become widespread until almost thirty years later. Even the great figure Florence Nightingale who was considered as the founder of modern nursing and made great contributions in the Crimean War did not believe in the germ theory before 1910 (Stanwell-Smith). Without knowledge of germs, Snow was not able to concretely prove that it was water that transmitted cholera bacteria. As a result, the miasma theory could still be defended by others.

Finally, John Snow was not fighting for truth on his own. Snow had already been a well established physician in Britain before the outbreak due to his ground-breaking use of chloroform to Queen Victoria when she gave birth to two of her children (Goodman). In a moderate cholera epidemic in 1852, British government commissioned William Farr as the officer of General Register Office to implement the Public Health Act. Even though Farr was a supporter of miasma theory, he still provided Snow valuable death information to enable Snow conduct his experiment and draw his map (Bynum). In the more serious 1854 outbreak, Snow was supported by Henry Whitehead, a local curate who also supported miasma theory. After reading Snow's publication in 1852, Whitehead wanted to reveal "the falsity of the Snow's hypothesis regarding the Broad Street pump" (UCLA). Since Whitehead knew local citizens quite well, he was the actual person who did the door to door investigation of disease (UCLA). To his surprise, he found out Snow's theory matched the real situation and later started to promote Snow's water-borne theory. In the Cholera Inquiry Committee's final report published in 1855, the committee unanimously admitted that the "striking disproportionate mortality in Soho district was in some manner attributable to the use of the impure water of the well in Broad Street" (The Cholera Enquiry Committee). While this report did leave possibility of miasma as a factor, it was clear that the public health community was in support of Snow's theory. William Farr, Henry Whitehead, members in Cholera Inquiry Committee, and many other unknown people actually supported Snow during his investigation to enable him find out the truth.

John Snow was no doubt a remarkable contributor for modern epidemiology. However, people's recognitions of Snow's great work were mostly retrospective. Since there were not many icons in the field of public health, people tended to contribute more achievements to Snow than what he deserved. Everyone has limitations and nobody can solve a serious problem completely without support from others. Snow did not magically end the outbreak, concretely prove his theory, or investigate the cause without any support. In the course of scientific discovery, countless people

have been working diligently to find out the truth. John Snow was a wise but also lucky man. Without his acute intuition, right outbreak opportunities, and others' support, Snow could not make such outstanding achievements in the history of public health.

Work Cited:

Brody, Howard, et al. "Map-Making and Myth-Making in Broad Street: The London Cholera Epidemic, 1854." *The Lancet*, vol. 356, no. 9223, 2000, pp. 64-8. elibrary, https://explore.proquest.com/elibrary/document/199011903?accountid=16844, doi:http://dx.doi.org/10.1016/S0140-6736(00)02442-9.

Bynum, W. F. "IN RETROSPECT: On the Mode of Communication of Cholera." Nature, vol. 495, no. 7440, 2013, pp. 169-170. elibrary, https://explore.proquest.com/elibrary/document/1330861152?accountid=168443.

Clemens, John D., et al. "Cholera." *The Lancet*, vol. 390, no. 10101, 2017, pp. 1539-1549. elibrary, https://explore.proquest.com/elibrary/document/1945865406?accountid=168443, doi:http://dx.doi.org/10.1016/S0140-6736(17)30559-7.

Dickens, Charles. *Oliver Twist*. Baronet Books, 2008.

Gill, Geoff. "Cholera and the Fight for Public Health Reform in Mid-Victorian England." Historian, no. 66 2000, pp. 10. elibrary, https://explore.proquest.com/elibrary/document/274942422?accountid=168443.

Goodman, Alyssa. "The Details of John Snow's Investigation." *edX*. PredictionX: John Snow and the Cholera Outbreak of 1854. MOOC offered by Harvard University. Web. Accessed on June 10th, 2019.

Goodman, Alyssa. "John Snow: Myths" *edX*. PredictionX: John Snow and the Cholera Outbreak of 1854. MOOC offered by Harvard University. Web. Accessed on June 10th, 2019. https://courses.edx.org/courses/course-v1:HarvardX+SOC1.jsx+2016/courseware/4a33cf558be349d7baa804e0abc59200/bc1a0c39ef8b4730ba2cef87a64f5566/?child=last

Halliday, S. "Death and miasma in Victorian London: an obstinate belief." *BMJ (Clinical research ed.)* vol. 323,7327 (2001): 1469-71. doi:10.1136/bmj.323.7327.1469

Henig, RM. "A memoir of public health and its evolution at Harvard". *The People's Health*. Washington, DC: Joseph Henry Press, 1997.

"Report on the Cholera Outbreak in the Parish of St. James, Westminster, during the Autumn of 1854." The Cholera Enquiry Committee. *The John Snow Archive and Research Companion*. Taubman Medical Library, University of Michigan. July 1855. Web. Accessed on June 13th, 2019. http://johnsnow.matrix.msu.edu/work.php?id=15-78-AA

"Reverend Henry Whitehead" *UCLA Department of Epidemiology Fielding School of Public Health*, https://www.ph.ucla.edu/epi/snow/whitehead.html

Sen, Srabani. "Communicable Diseases and Germ Theory in Colonial India - An Assessment." I*ndian Journal of History of Science*. Web. Accessed on June 10th, 2019. https://pdfs.semanticscholar.org/514d/e7673635410cb30bbb26b0bf7d6b85d112b9.pdf

Snow, John. "The cholera near Golden-square, and at Deptford." Medical Times and Gazette. *The John Snow Archive and Research Companion*. Taubman Medical Library, University of Michigan. (23 September 1854): 321-22. Web. Accessed on June 10th, 2019. http://johnsnow.matrix.msu.edu/work.php?id=15-78-45

Stanwell-Smith, Rosalind. Interview by Alyssa Goodman. “John Snow Society and the impact of John Snow's "original mind" on the science of epidemiology.” *edX*. PredictionX: John Snow and the Cholera Outbreak of 1854. MOOC offered by Harvard University. Web. Accessed on June 13th, 2019. https://courses.edx.org/courses/course-v1:HarvardX+SOC1.jsx+2016/courseware/9a3d7690192d42e48c3b90da772eae73/fa7ff6777e554d258ea6bf42ee332f2d/?child=first.

Tuthill, Kathleen. “John Snow and the Broad Street Pump: On the Trail of an Epidemic.” *UCLA Department of Epidemiology Fielding School of Public Health*, 2003, www.ph.ucla.edu/epi/snow/snowcricketarticle.html.

“What is cholera?” *World Health Organization*. Web. Accessed on June 9th, 2019. https://www.who.int/topics/cholera/faq/en

“Who First Discovered Vibrio Cholera?” *UCLA Department of Epidemiology Fielding School of Public Health*, https://www.ph.ucla.edu/epi/snow/firstdiscoveredcholera.html