Cholera and the Pump on Broad Street:
The Life and Legacy of John Snow

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Paper

AFTER ALL, IT REALLY IS ALL OF HUMANITY THAT IS UNDER THREAT DURING A PANDEMIC.

-- Dr. Margaret Chan, Director General of the World Health Organization

There is still a pump in the Golden Square neighborhood on what was once called Broad Street. It does not work, for it is merely a replica of the original, and like the original its handle is missing. It serves as a curiously simple monument to the events that took place over one hundred years ago, when the real pump supplied water to the Broad Street residents. In 1854, hundreds of these hapless locals dropped dead within days of each other as Soho experienced one of the most brutal outbreaks of cholera that London has ever seen.[1] Not even the most eminent physicians could say what caused the disease, or why it came and went as it did.

John Snow's solution to the cholera crisis broke the medical conventions of his era, slowed the progress of a virulent intercontinental disease, and forever changed the way society confronts public health problems.

CHOLERA, THE BLUE DEATH

Cholera plagued civilization for many generations before John Snow's breakthrough. Medical researchers confirm that cholera was present in India in the seventeenth and eighteenth centuries, though records of diseases with cholera-like symptoms extend back as far as the fifth century B.C. The first intercontinental surge, referred to as the First Pandemic, occurred from

[1] John Snow, "On the Mode of Communication of Cholera," 2nd ed., *Snow on Cholera* (New York: Hafner Publishing, 1965): 38.

1817 to 1823.[2] Following waterways, cholera spread from India to Syria, East Africa, and Japan, but did not enter Europe. The Second Pandemic brought cholera to mainland Europe and Britain, then across the Atlantic Ocean to New York and Montreal between 1826 and 1837. Nine years later, the Third Pandemic began, promptly ravaging John Snow's area of southern London.

Microbiology has shown that cholera comes from a bacterium called *Vibrio cholerae* that enters the body through contaminated water or possibly food. The bacteria's interference in the small intestine causes profuse diarrhea and vomiting. The consequent dehydration produces several distinctive symptoms. As the concentration of water in the bloodstream decreases, the blood becomes thick and tarlike. Capillaries rupture, which often turns the skin blue. The heart rate becomes irregular, and dehydrated limbs begin to shrivel. The nervous system, however, remains intact until the end, leaving the victim fully conscious of the pain. Without treatment, death occurs within days - or even hours - of the first symptoms.[3]

Before the days of modern technology, physicians knew little of cholera's origins. Most of them believed that diseases such as cholera were caused by foul odors, or miasmas, in the atmosphere.[4] They also thought that cholera was, given the symptoms, fundamentally a condition of the blood rather than the digestive system.[5] These speculative conclusions led to a diverse spectrum of largely ineffective "remedies." Public anxiety rose in proportion to the death toll. Britain established its first Board of Health, and scientific institutes offered monetary rewards for methods of preventing or curing cholera. For decades, nothing worked.

Enter John Snow.

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[2] G. C. Cook, "The Asiatic Cholera: An Historical Determinant of Human Genomic and Social Structure," *Cholera and the Ecology of* Vibrio cholerae (London: Chapman and Hall, 1996): 20-21.
[3] Irwin Sherman, *Twelve Diseases that Changed Our World* (Washington DC: ASM Press, 2007): 33.
[4] Ralph Frerichs, interview by author, digital recording of telephone conversation, 18 March 2009.
[5] Peter Vinten-Johansen, email to author in response to questions, 25 March 2009.

JOHN SNOW, THE TEETOTALER

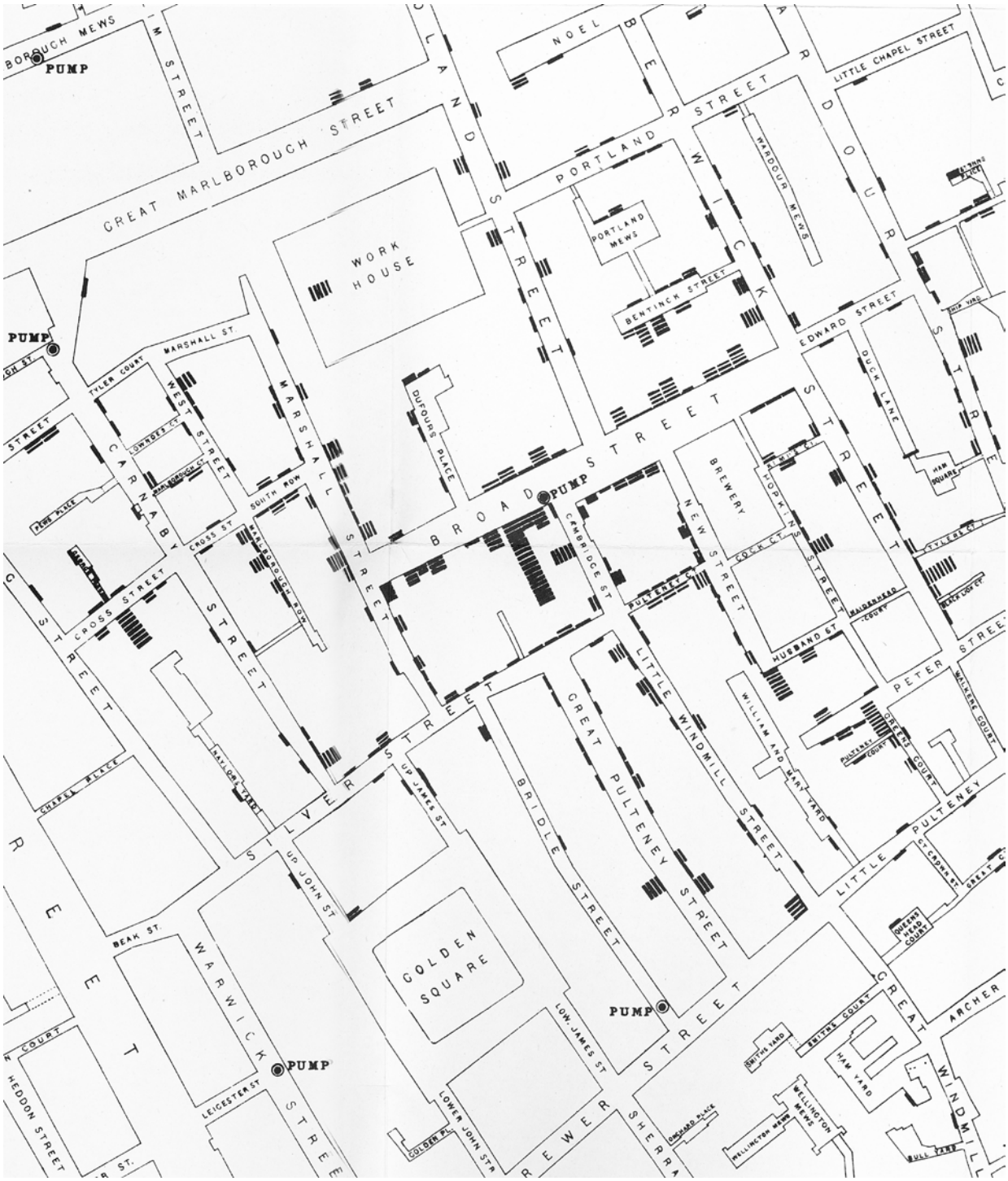
Despite his modest background, John Snow distinguished himself early in life as a bright boy with a special talent for mathematics. At the age of fourteen, he secured a medical apprenticeship with William Hardcastle in Newcastle-upon-Tyne. Snow's tenure with Hardcastle exposed him to cholera patients for the first time during an outbreak in Killingworth in 1832.

Snow continued his studies in London and became a fully certified physician, receiving invitations to join the Westminster Medical Society (of which he later became president) as well as the Royal College of Physicians and the London Epidemiological Society (of which he was a founding member).[6] He devoted much of his time to the newly-developed field of anesthesiology, designing and constructing inhalers to dispense ether and chloroform more effectively with less risk of overdose. Although the concept of anesthesia originated in Boston, many modern practitioners regard John Snow as the world's first professional anesthetist because he spent his career administering these new anesthetics to the general public.[7] The Royal Medical and Chirurgical Society declared him to be "more extensively conversant with its operation, and more successful in administering it, than any living person."[8] He was even summoned to the palace to give chloroform to Queen Victoria during labor.[9]

John Snow was modest, industrious, and taciturn. He confounded the medical community with his decision to become a vegetarian and abstain from liquor. On occasion, he publicly advocated for temperance.[10] His friend, Benjamin Ward Richardson, wrote that "... he lived on an anchorite's fare, clothed plainly, kept no company, and found every amusement in his science

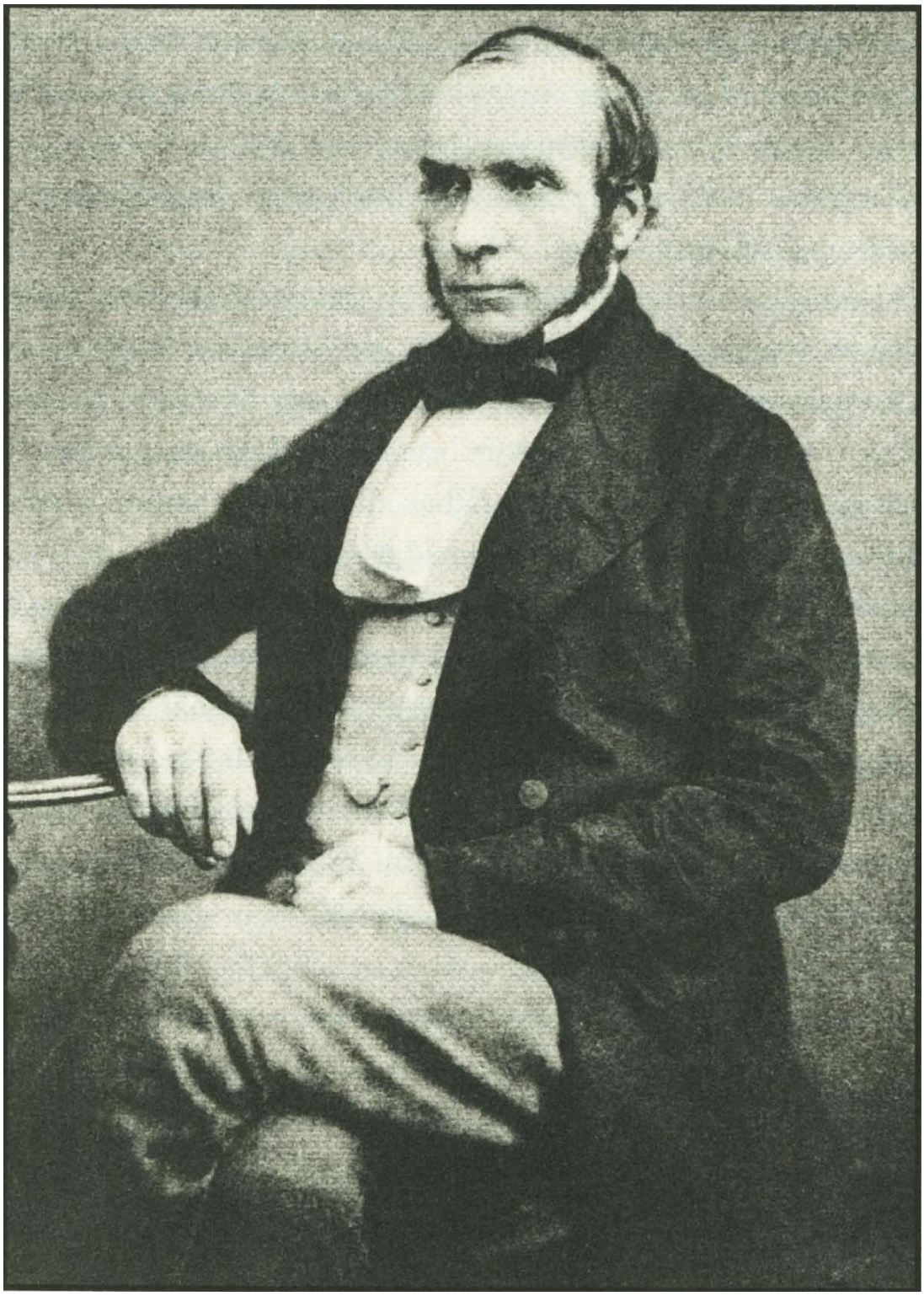
[6] "Epidemiological Society," *The Lancet* 1 (1850): 156.
[7] Rosalind Stanwell-Smith, interview by author, digital recording of telephone conversation, 5 April 2009.
[8] Royal Medical and Chirurgical Society of London, *Proceedings of the Royal Medical and Chirurgical Society of London,* Volume III (1861):47.
[9] John Snow, *The Case Books of Doctor John Snow* (London: Wellcome Institute for the History of Medicine, 1994): 271, 471.
[10] Thomas Snow, "A Doctor's Teetotal Address Delivered in 1893," *British Temperance Advocate*, 1888: 182.

Appendix I



Snow's famous map of the Broad Street area. Each black mark represents one death from cholera. From *Snow on Cholera* by John Snow.

Appendix II



Portrait of John Snow. From *The Ghost Map* by Steven Johnson.

APPENDIX III

NINE SURREY DISTRICTS OF LONDON.

Houses supplied by	Estimated Population, 1854.*	DEATHS from CHOLERA.			
		8th July to 5th Aug.	6th Aug. to 26th Aug.	27th Aug. to end of Year.	Total.
(a) Lambeth Company	155,087	14	84	513	611
(b) Southwark Company	240,326	236	977	2,213	3,476
(c) Wells and other sources	106,122	34	119	1,283	1,436
(d) TOTAL	511,435	334	1,180	4,009	5,523

	DEATHS from CHOLERA to 10,000 living.			
	First Stage.	*Second* Stage.	*Third* Stage.	All Stages of Epidemic.
Southwark water, drawn from Battersea and containing London sewage	115	393	888	1,395
Wells and other sources	32	112	1,209	1,353
Purer Lambeth water, drawn from Thames beyond sewage range	9	54	330	393

1854.	ATTACKS.	DEATHS.
August 28, Monday	Child attacked.	
" 29, Tuesday	1	1
" 30, Wednesday	8	2
" 31, Thursday	56	3
September 1, Friday	143	70
" 2, Saturday	116	127
" 3, Sunday	54	76
" 4, Monday	46	71
" 5, Tuesday	36	45
" 6, Wednesday	20	37
" 7, Thursday	28	32
" 8, Friday	12	30

Tables presenting the statistics from Snow's cholera investigations regarding the Lambeth Company versus the Southwark and Vauxhall Company (top) and the outbreak in the Golden Square neighborhood near the Broad Street pump (bottom). From *Report on the Cholera Epidemic of 1866 in England* by the Registrar General.

Appendix IV

The former site of the Broad Street Pump has become a historic site. A replica of the original pump has been erected a few yards away from the spot where the original once stood, and the adjacent pub is now called "the John Snow." This is somewhat ironic given that Snow famously abstained from liquor. Photo courtesy of Mrs. Hannah Reimer.

Annotated Bibliography

Primary Sources:

"Births, Marriages, and Deaths." *The Lancet* (1858): 635.

The Lancet printed a brief obituary that praised Snow's research on anesthetics without mentioning his cholera work. This underscores the idea that much of Snow's acclaim came after his death.

"Epidemiological Society." *The Lancet* (1850): 156-157.

This brief article names John Snow as one of the founding members of the London Epidemiological Society.

General Board of Health. *Report of the Committee of Scientific Inquiries in Relation to the Cholera Epidemic of 1854.* London: Eyre and Spottiswoode, 1855.

Presented to the House of Commons in the year following the outbreak on Broad Street, this report is highly skeptical about John Snow's theory, representing the skepticism of the broader medical community. I quote it in my paper.

General Board of Health. *Appendix to Report of the Committee of Scientific Inquiries in Relation to the Cholera Epidemic of 1854.* London: Eyre and Spottiswoode, 1855.

This was published as a supplement to the above report. Unlike the original report, it does not dismiss Snow's theory completely. I quote it in my paper to demonstrate the gradual change in sentiment.

Local Government Board. *Reports and Papers on Cholera in England in 1893.* London: Eyre and Spottiswoode, 1894.

This document, regarding later outbreaks of cholera in England, was presented to the House of Commons many years after Snow's death. By 1894, Snow's ideas were entirely accepted, and the report is highly complimentary. This further demonstrated the medical community's eventual embrace of Snow and his ideas.

Local Government Board. *Fifteenth Annual Report of the Local Government Board, Supplement Containing Reports and Papers on Cholera.* London: Eyre and Spottiswoode, 1886.

Two decades after the Broad Street outbreak, Snow's ideas had gained much greater favor. This report, presented to the House of Commons, praises Snow and his theory at great length. I quote it in my paper.

Registrar General. *Report on the Cholera Epidemic of 1866 in England.* London: Eyre and Spottiswoode, 1868.

Like the preceding four documents, this report analyzing previous cholera outbreaks was presented to the House of Commons. It contains the reproductions of Snow's data that I use in appendix III.

Richardson, Benjamin Ward. "John Snow, M.D., A Representative of the Medical Science and Art of the Victorian Era." *The Asclepiad*, 1887, Vol. 4, pp 274-300.

Benjamin Richardson was a colleague and intimate friend of John Snow. His relatively short biographical article published following Snow's death provided unique insights into Snow's thoughts, habits, and idiosyncrasies.

Royal Medical and Chirurgical Society of London. *Proceedings of the Royal Medical and Chirurgical Society of London,* Volume III (1861).

Shortly after Snow's death, the society praised Snow, particularly stressing the importance of his work with anesthetics. This is important because most people see his

work on cholera as being his principal concern and his most successful endeavor. I quote this document in my paper.

Snow, John. "Cholera and the Water Supply" (Letter to the Editor). *The Times* 26 June 1856: 12, column B.

Snow's letter to the editor provides the statistic that roughly six cholera deaths occurred among individuals consuming Southwark and Vauxhall water for every one cholera death among consumers of Lambeth water. I use this statistic when describing the outbreak.

_____. *The Case Books of Doctor John Snow*. London: Wellcome Institute for the History of Medicine, 1994.

Although cholera research was the field that would earn Snow a place in history, the vast majority of his work with patients involved administering anesthetics. His case books demonstrate the importance he placed on this second pursuit and the diligence with which he worked.

_____. "On the Mode of Communication of Cholera." London: Wilson and Ogilvy, 1849. *The John Snow Archive and Research Companion*. Vinten-Johansen, Peter. Michigan State University, East Lansing, MI. <http://matrix.msu.edu/~johnsnow/index.php>. 18 April 2009.

This is the first edition of Snow's most famous work. It is speculative and fairly short, published before both of his research experiments were conducted. His words demonstrate his awareness that the ideas he proposes are shockingly controversial. I quote this in my paper.

_____. *Snow on Cholera*. New York: Hafner Publishing, 1965.

This book is a reprint of two of Snow's most famous papers on cholera, including the second edition of *On the Mode of Communication of Cholera*. I quote in several places from his explanation of his studies.

Snow, Thomas. "A Doctor's Teetotal Address Delivered in 1836." *British Temperance Advocate*, November 1888: 182.

Thomas Snow presents his brother's arguments on behalf of temperance. This illustrates that Snow's personal lifestyle, not just his views on cholera, differed markedly from the Victorian era medical community – most doctors did not endorse the temperance movement.

_____. "Dr. Snow on the Communication of Cholera" (Letter to the Editor). *The Times*, 20 November 1885: 4, column F.

Snow's brother describes how physicians in London used Snow's research to successfully manage a cholera outbreak in 1866. This is a concrete example of Snow's impact on public health policy.

Whitehead, Henry. *Report for the St. James Parish Cholera Inquiry Committee*. London: J. Churchill, 1855. *The John Snow Archive and Research Companion*. Vinten-Johansen, Peter. Michigan State University, East Lansing, MI. <http://matrix.msu.edu/~johnsnow/index.php>. 18 April 2009.

Henry Whitehead presents a letter from the doctor who treated Sarah Lewis's infant, substantiating the claim that the infant could have been the cause of the outbreak.

Personal Communications:

Frerichs, Ralph. Telephone Interview. 18 March 2009.