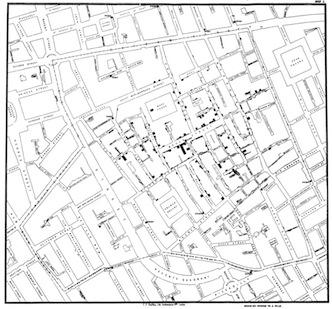
**Shifting From Shaman To Sherpa : John Snow**

The story of John Snow’s one man crusade to combat the cholera epidemic of 1849 has attained nigh legendary status, and he is often credited as being the father of modern epidemiology—the branch of medicine that deals with the incidence, distribution, and control of diseases. As devastating as our modern data security breaches and distributed denial of service attacks may be, they pale in comparison to what the cholera bacteria does to the human body. The outbreak in London was especially brutal:

*The most terrible outbreak of cholera which ever occurred in this kingdom, is probably that which took place in Broad Street, Golden Square, and the adjoining streets, a few weeks ago. Within two hundred and fifty yards of the spot where Cambridge Street joins Broad Street, there were upwards of five hundred fatal attacks of cholera in ten days. The mortality in this limited area probably equals any that was ever caused in this country, even by the plague; and it was much more sudden, as the greater number of cases terminated in a few hours.*

*As soon as I became acquainted with the situation and extent of this irruption of cholera, I suspected some contamination of the water of the much-frequented street-pump in Broad Street, near the end of Cambridge Street…[[1]](#footnote-0)*



The most famous artifact of Snow’s work may be his “cholera map” (Figure #) which he produced to visually communicate the proximity of deaths to the Broad street water pump. Most accounts point to the map itself as the quintessential piece of evidence that led to the closure of Broad Street pump. However, Snow developed and tested his divergent hypothesis—that cholera was a localized “disease of the gut,” and that its symptoms were entirely the result of fluid loss—well before he drew his map[[2]](#footnote-1).

Snow’s greatest detractor, William Farr, was chief among a vast number of physicians at that time who were convinced that cholera was miasmatic in nature (spread through the foul emissions in the “ether”). Farr, himself was a pioneer of the use of statistics in the nascent field of epidemiology at that time and had compiled a table of deaths from the 1849 London epidemic—by district—together with eight possible explanatory variables[[3]](#footnote-2). He used this data to “conclusively” show that the areas most affected were lower in elevation which obviously meant that the concentration of foul ether was higher and led to more cholera cases and fatalities. If we look at the data Farr collected, we can see a definite bias in the factors, and the application of more modern statistical methods[[4]](#footnote-3) have invalidated Farr’s original, definitive claims.

**Table #: Variables Collected by William Farr**

|  |
| --- |
| District  Deaths from cholera in 1849 per 10,000 inhabitants  Elevation above high water  Annual deaths from all causes per 1838 – 1844 10,000 inhabitants  Persons per acre  Persons per inhabited house  Average annual value of house  Annual value of house per person  Poor rate precept supplya per house value  Water supply (major water source, not related to pump stations) |

While the lens of history validates Snow’s conclusions, it’s important to understand what made his efforts, analyses and conclusions more valid than Farr’s if we are to move our own discipline forward:

**First and foremost we should always be looking at what we know with a critical eye and be willing to investigate even small pieces that don’t quite fit within our well-established frameworks**. Snow started poking more at cholera well before the 1854 epidemic. As he studied earlier cases, he noted facts such as massive host dehydration and visible water contamination Despite no knowledge of what we now call bacteria, Snow posited the causal agent must enter via the mouth, multiply in the stomach and spread to others via a faecal-oral mechanism (e.g. handling of soiled, contaminated linens/clothing). He further deduced that the transmission of the disease across greater distances was due to drinking water contaminated with raw sewage containing the specific cholera poison. This was definitely “out of the box” thinking.

**As we pursue our analyses to their conclusions, we should strive to eliminate bias wherever possible.** Humans are naturally drawn to the familiar, even those in pioneering fields. While Farr took a data-centric approach to his choleric conclusions his parameters almost guaranteed his conclusions would remain in his comfort zone. Snow (and others at that time) went door-to-door, recorded scads of variables, got his hands dirty (literally) and challenged himself often since he knew he would be challenged—and vigorously—by others. Both men truly wanted to put a stop to this disease, but one was determined to look to all the possible facts, not just the past, for explanation.

**We need to realize numbers do not tell the whole story**. Officials made lists upon lists of cholera victims. While this provided a great reference for genealogists, it did little to aid serious analysis let alone innovative exploration. The idea to look at the problem geographically fueled Snow’s research months before he put pen to parchment. Yet, his simple dot map—of which there were at least four iterations, with some employing Voroni diagramming techniques[[5]](#footnote-4) (<http://johnsnow.matrix.msu.edu/images/online_companion/chapter_images/fig12-6.jpg>)—revolutionized how analyses are conducted and visuliazed in epidemilogy.

**Always tell the truth, the whole truth, and nothing but the truth.** Snow was careful to note both the sources of his data along with a detailed list of known and possible data recording deficiencies. Many modern reproductions of his maps and tables do not include these caveats, but they were essential in validating his arguments and methodology at that time. Snow also had to deal with anomalies that were made even more anomalous on his map such as the fact that the local brewery employees seem to have been unaffected (yet were in proximity to the pump) and the fact that there were a fair number of cholera cases far from the Broad Street pump (each having a more convenient pump nearby).

Snow’s passion and relentless, innovative pursuit of the truth helped he and, eventually, his peers move from epidemiological shamans to sherpas.

1. *On the Mode of Communication of Cholera* by John Snow, M.D. ; London: John Churchill, New Burlington Street, England, 1855 [↑](#footnote-ref-0)
2. *Map-making and myth-making in Broad Street: the London cholera epidemic, 1854;* Brody, Rip, Vinten-Johansen, Paneth, Rachman ; THE LANCET • Vol 356 • July 1, 2000 [↑](#footnote-ref-1)
3. *Weekly return of the Registrar-General of births and deaths in London*.; Farr, W. ;1853;14:429—32. [↑](#footnote-ref-2)
4. *John Snow, William Farr and the 1849 outbreak of cholera that affected London: a reworking of the data highlights the importance of the water supply*; P. Binghama, N.Q. Verlanderb, M.J. Cheala; Public Health (2004) 118, 387–394 [↑](#footnote-ref-3)
5. Voroni diagram definition and example from Wolfram Alpha : http://mathworld.wolfram.com/VoronoiDiagram.html [↑](#footnote-ref-4)