

# DR JOHN SNOW'S CHOLERA STUDY - TRANSCRIPT

Let's begin by looking at Dr John Snow's Cholera study. John Snow was really interested in public health and did quite a few public health mapping exercises. He's regarded by many as the father of epidemiology, which is the study of diseases. So, we're about to talk about a study from the 1850s. There's four parallels with modern-day GIS that I want you to look out for as we go through this...

- **Parallel 1:** He Geocoded the subjects for his study. In other words, he mapped where people were when they became symptomatic of cholera. Now, this idea of taking a list of people's addresses and putting them on a map is what's called geocoding. We do that all the time in GIS and he was doing that even in the 1850s.
- **Parallel 2:** Importance of field validation to address data quality issues. This is just so important! It becomes really obvious by the end of this talk that a purely GIS technology solution would not have yielded a convincing result for Dr Snow.
- **Parallel 3:** Importance of map quality issues: Maps should not be accepted at face value because they're often incomplete. We're going to see that exact thing in this study. And I think that this issue, these days, of accepting GIS maps at face value is a place where I think a lot of GIS professionals fall over. A lot of them are far too ready to take canned data at face value. And it leads to poor outcomes.
- **Parallel 4:** Dr Snow even did Network analysis. These days Google Maps will allow you to work out an optimal route between two points on a map. He was doing that sort of thing even in the 1850s.

In September 1854 Dr Snow became aware of a cholera outbreak in the Soho district of London. So, what we're talking about is this area here surrounded by the dashed line. Cholera is a highly infectious water borne disease that can kill in hours. People would say goodbye to their loved ones in the morning and would not make it home for dinner at night. It was that vigorous! During this outbreak over five hundred people died in just ten days. He believed that the Broad Street Well [shown here] was the most likely source of the Cholera outbreak. But he needed to prove that, so he created this map showing where each of the 500+ cholera victims were when they became symptomatic of cholera. Now, a couple of things with this...

The first thing is that he just put a dash where the victim was...at the street address. This is that geocoding thing I was talking about before. He actually geocoded these people.

The other thing to be aware of is the address that he elected to geocode them to. It wasn't their home address. It was the address where they became symptomatic. That sort of issue is very important for any of you who are considering study design for a study you might be considering doing.

Dr Snow could see that there were some anomalies in his map. He also did a detailed investigation of 83 deaths that occurred over a 3 day period. So, simplistically, at the end of the study, John Snow was able to convince local officials that the Broad Street pump was the source of the infection. They removed the pump handle and the outbreak ended. He could not have reached this conclusion based on a mapping exercise alone. So let's look at some of the anomalies that he saw in his map. Dr Snow noticed five major anomalies that required explanation if his hypothesis that the Broad Street Well was contaminated with cholera was to be supported. He donned his boots and interviewed local residents. Here's another GIS parallel -

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Thematic maps should not be taken at face-value. They require field validation. Yes, fieldwork is important! And you will really see that by the end of these next few slides.

- **Anomaly #1:** People died here from cholera. Next to a well! Why was that? When he went around and interviewed some of the residents, what he discovered was that locals didn't like the water in that well because it had a bad taste so people from here were travelling all the way to Broad street to collect water from the Broad Street pump because it was known locally as having very pleasant tasting water.
- **Anomaly #2:** The nearby Workhouse had more than five hundred residents, none of whom died of cholera. Through interviews he discovered that the workhouse had a private bore and they weren't using the water from the Broad Street pump. They were using their own water. So, nobody, of course, had died. Lets look at the next one.
- **Anomaly #3:** There were no deaths in this Brewery. Look how close this brewery is to the Broad Street pump. You'd think there would have been quite a few deaths there, but there were none. It turns out that once again, the brewery had a private bore. So everyone there was drinking water from that private bore. But not only that, the brewery also had a free beer policy. The role of beer in public health should not be laughed at. In the day it was often safer to drink beer than water. That's because to make beer you must boil the water and the alcohol in it also has a sterilizing effect. Between this anomaly and the previous one, there's a really important GIS parallel. And that is a data quality one. The two wells that were important to Dr Snow's analysis were not mapped. GIS databases also suffer from such errors (known as errors of omission). So just be sure when you're using GIS maps, for those themes that are really important to your analyses, just double-check that they're complete.
- **Anomaly #4:** There's people who died of cholera near this well here. This well here is at a dead-end and people need to walk a fair way to get to it. So people were travelling to the Broad street well to get their water, rather than to a well that on the map appears to be close, but in actual fact is not. In GIS this would be called Network Analysis.
- **Anomaly #5:** There was a low death rate in this area here. Without fieldwork, he wouldn't have discovered that when the outbreak first occurred, this area here was pretty much evacuated. So there was nobody there to contract the disease. GIS parallel: This is why social researchers should use strict data collection methodologies.

There are many parallels between this study and the way you would repeat it using a GIS. The important thing is that rather than using the map of the cholera outbreak as "gospel" Dr Snow used it to "guide" his investigation. Fieldwork is often an important part of GIS mapping projects, and you should not be afraid to do it.