

Historiographical Unpacking—31 August 1854

Thursday, 31 August 1854

A normal day during a cholera epidemic in metropolitan London. Figures from the seventh week of the epidemic, ending the previous Saturday, were available: 847 fatalities from Asiatic cholera in a population greater than two and a quarter million. Worrisome, but not as severe as the number carried off by cholera during the seventh week of the 1849 epidemic. In fact, there were hopeful signs in the current epidemic's weekly progress: just 5 dead during the first week, followed by 26, 133, 399, 644, 729, and 847 in subsequent weeks (*MTG* 1854, 249). Was this visitation on the cusp of peaking?

No such luck. To have the individuals I feature in the historical narratives engage in an exchange of theoretical views after all hell broke loose the following day would have been artificial and stilted. So I chose to begin the story on a day of hope

Farr and Snow at the GRO

Snow (1855) wrote that he and Farr met sometime during the week ending Saturday, 26 August, when Snow presented preliminary results of door-to-door inquiries in two Kennington sub-districts he had begun "about the middle of August" (77). During this meeting Farr offered to have all registrars in South London make inquiries about the water supply at each address where someone

would die from cholera in the current epidemic, beginning 27 August (Snow 1854a). Why, I asked myself, would Farr make such an offer? Had Snow encountered an unexpected difficulty?

A bit of reverse literary-archaeological reasoning about Snow's writing method makes me think something unexpected and catastrophic had occurred, necessitating a change in the scope of the natural experiment. I began with the fact that Victorian publishers often asked writers to submit fair copy on the installment plan to facilitate typesetting of long works, and John Churchill was no exception. He seems to have struck an agreement with Snow early in 1854 for an expanded edition of *MCC* (Snow 1849). Long before the second wave of the 1853-54 epidemic began in July 1854, Snow replicated the structure of argument in the first edition and began submitting installments for *MCC2* (1855) that contained the fruits of additional research on cholera outbreaks he considered suggestive of oral-fecal transmission.

The installment scaffolding is especially evident in the section on point-source cholera outbreaks caused by polluted neighborhood water supplies. Snow essentially copied the *MCC* discussion of Horsleydown and Albion Terrace from 1849, then writes up additional cases as he becomes aware of them via correspondence, personal communication, government reports, medical journals and newspapers. At least I can detect no argumentative reason why, for example, in this section his discussion of cholera at Ilford in 1849

Historiographical Unpacking—31 August 1854

is followed by the 1832 epidemic in Newburn and an 1814 outbreak in India. It appears to me that he sent them seriatim to the publisher for typesetting (32-36).

Whereas an archaeologist exposes successive layers in a midden back in time, I follow Snow's reasoning forward in time by examining installment segments in his published remains. Virtually no significant revision was possible once type had been set; only an infrequent, visibly squeezed footnote was reluctantly permitted. The resulting chronology of creation is often self-evident, sometimes embarrassingly so as in the first line of Snow's (1855) introduction to the Broad Street pump episode:

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 (38).

MCC2 was published in January 1855 whereas the outbreak in Golden Squared happened during the first week of September 1854. "A few weeks ago" suggests that Snow had given John Churchill the initial portion of his discussion of the Broad Street outbreak in late September. The five paragraphs following the introductory paragraph containing the sentence quoted above suggest that what would turn out to be an erroneous chronological reference was an inadvertent outcome of Snow's economical writing method. For he essentially

re-used text from a letter to the editor, published in a medical journal the third week of September, detailing his analysis of 83 deaths during the first week of the epidemic (1854b; see the parallel-column word analysis in Appendix B). Subsequent text about the Broad Street outbreak was written later that autumn, also in installments, as he completed each phase of a more extensive investigation than the limited inquiries conducted in three days during the first week in September.

Impure water and the propagation of cholera in South London

Several weeks into the 1853 cholera epidemic in metropolitan London, William Farr detected a possible pattern in South London. There appeared to be fewer deaths in districts supplied with piped water by the Lambeth Company compared to the same stage during the 1849 epidemic. His own elevation theory could not account for this difference in cholera mortality. Farr wondered if purer water was a significant contributing factor in rendering predisposed individuals less susceptible to cholera. He knew that the Lambeth Company had shut its pumping station on the Thames at Lambeth in January 1852 when new works were completed at Thames Ditton, three miles beyond the tidal reach. But there were two other companies serving South London, which, like other private water companies supplying the metropolis, were forbidden by an 1852 Act of Parliament to draw water anywhere below the Teddington

Historiographical Unpacking—31 August 1854

Lock on the Thames or from any of its tributaries below the highest tidal point after August 1855 (unless special extensions were granted). What progress had they made in making this transition? The Registrar General approved a questionnaire that was sent to ten water company directors in mid-October (UK. GRO 1853, 402).

Farr had answers from eight companies in hand by mid-November, so he prepared a supplement to the *Weekly Return* of 19 November entitled, "Cholera and the London water supply" (UK. GRO 1853, 401-06). The information on company watersheds (areas in which they had laid pipes) showed that the districts supplied by both the Lambeth Company and the Southwark & Vauxhall (S&V) Company had two-thirds of the cholera mortality through week twelve of the epidemic than districts where S&V was the sole provider (406). S&V was still distributing Thames water from its old Battersea works (a half mile above the Vauxhall Bridge), where tidal inflows brought metropolitan sewage released from outlet pipes near London Bridge. In 1849, when the Lambeth Company drew impure Thames water from a pumping station located near the Hungerford Suspension Bridge (closer to the main sewage outlets), cholera mortality in areas served by it had surpassed that in districts only receiving S&V water.

This data suggested that another natural experiment on the Exeter model was underway, where an improvement in municipal water supply

brought a reduction in cholera mortality. But Farr did not think it qualified as a defining study, an *experimentum crucis*, which would require identical factors except for water quality:

to measure the effect of good or bad water supply, it is requisite to find two classes of inhabitants living on the same level, moving in equal space, enjoying an equal share of the means of subsistence, engaged in the same pursuits, but differing in this respect, —that one drinks water from Battersea, the other from Kew [far from sewage outlets and the Thames' tidal reach].

In his mind, "the circumstances of London" did not present the requisite conditions since "generally . . . the poorest and lowest, if not densest districts, use the worst water," whereas those in more fortunate social and economic circumstances inhabit higher terrain where the water is often the best available in the metropolis (401; *CC&SoM*, 260). John Snow, however, transformed Farr's notion of crucial experiment into a workable concept when he discovered that S&V and Lambeth were still active competitors in sixteen sub-districts of South London.

Snow's installment approach in writing *MCC2* (1855) reveals how this idea came to fruition. The germ was not the paragraph on the ideal *experimentum crucis* mentioned above but a table that appeared in the following number of the *Weekly Return*: specifically, a statement that Lambeth and S&V supplied the same districts in

Historiographical Unpacking—31 August 1854

parts of South London (68-69). Then occurred another example of Snow's phenomenal memory for salient facts: he located verbatim testimony provided by Mr. Joseph Quick, an engineer with S&V, to the Commission that produced the first *Health of Towns Report* (a short-hand title) in 1844, to the effect that some districts in South London had two or three sets of pipes in the same streets (UK. Parliament 1844, 2:133; Snow 1855, 61, 68; Snow 1856a, 241. See also UK. Parliament 1845, 1:192-94).

Quick's testimony made Snow wonder if there was a way to establish a clear demarcation of the intermixed watersheds (which in 1854 had been reduced via amalgamation to two companies, S&V and Lambeth). The second *Health of Towns Report* (UK. Parliament 1845) contained a map depicting the distribution boundaries of all private water companies in the metropolis (facing page 1:137). It seems very likely, given the layout of Map 2 in *MCC2* (Snow 1855, facing page 74) that Snow used the 1845 map, updated to reflect changes in supplied areas reported to the GRO in 1853, as well as reported property rates showing values of pipes owned by the two companies, to determine that there were sixteen intermixed sub-districts (Snow 1855, 72-74). When the Registrar-General's office published a final list of fatalities from the cholera epidemic that extended from August 1853 until January 1854, Snow recalculated these numbers by sub-districts and entered them into a table: there were 60

deaths/100,000 in the intermixed area, compared to 114/100,000 in twelve sub-districts in which S&V was the only supplier and 0/100,000 in three sub-districts where the Lambeth Company had no competition (73). Compelling evidence for the credibility of his theory, but he knew it was insufficient to seal the deal for many of his contemporaries.

One senses Snow's excitement (1855) as he describes the making of a study that would meet Farr's criteria for an *experimentum crucis*:

Although the facts shown in the above table afford very strong evidence of the powerful influence which the drinking of water containing the sewage of a town exerts over the spread of cholera, when that disease is present, yet the question does not end here; for the intermixing of the water supply of the Southwark and Vauxhall Company with that of the Lambeth Company, over an extensive part of London, admitted of the subject being sifted in such a way as to yield the most incontrovertible proof on one side or the other (74).

It was too late in the epidemic and there was too little daylight at that point in the astronomical year to undertake anything systematic, but Snow did make a few inquiries. He was encouraged to find that

in the sub-districts enumerated in the above table as being supplied by both Companies, the mixing of the supply is of the most intimate kind. The pipes of each Company go down all the streets, and into nearly all

Historiographical Unpacking—31 August 1854

the courts and alleys. . . . In many cases a single house has a supply different from that on either side. Each company supplies both rich and poor, both large houses and small; there is no difference either in the condition or occupation of the persons receiving the water of the different Companies (74-75).

Snow realized that this was a natural experiment unlike any he had come across before:

As there is no difference whatever, either in the houses or the people receiving the supply of the two Water Companies, or in any of the physical conditions with which they are surrounded, it is obvious that no experiment could have been devised which would more thoroughly test the effect of water supply on the progress of cholera than this, which circumstances placed ready made before the observer (75).

He had used population data from the 1851 census to calculate cholera fatality ratios for table 6 of *MCC2* (73), according to which 301,149 people were registered in the sixteen intermixed sub-districts. That meant that this

experiment . . . was on the grandest scale. No fewer than three hundred thousand people of both sexes, of every age and occupation, and of every rank and station, from gentlefolks down to the very poor, were divided into two groups without their choice, and, in most cases, without their knowledge; one group being supplied with water containing the sewage of London, and, amongst it, whatever might have come from the cholera patients, the other group having

water quite free from such impurity (75).

If cholera returned to London while S&V still used the pumping station at Battersea to send piped water to its customers, Snow believed the next task was simple enough: "To turn this grand experiment to account, all that was required was to learn the supply of water to each individual house where a fatal attack of cholera might occur" (75).

Note the conditional, "might" in the previous sentence. All three hundred thousand residents would not contract cholera, of course, even fewer would actually die from the disease. Hence, Snow was confident when he wrote this passage that he'd be able to complete such an investigation entirely on his own: "I was desirous of making the investigation myself, in order that I might have the most satisfactory proof of the truth or fallacy of the doctrine which I had been advocating for five years" (76).

The SoLo denominator problem

Another "might" was sorted when epidemic cholera returned to London in the early July 1854. By the fourth week of the epidemic, it was evident that the 1853 pattern in the South London intermixed sub-districts was re-occurring. But where should Snow begin inquiries? He waited another week. The *Return* for the week ending 12 August, which was publicly available the middle of the following week, showed that cholera mortality

Historiographical Unpacking—31 August 1854

was particularly extensive in the two Kennington sub-districts of Lambeth.

I commenced my inquiry about the middle of August . . . and I found that thirty-eight of the houses in which these deaths occurred were supplied with water by the Southwark and Vauxhall Company, four houses were supplied by the Lambeth Company, and two had pump-wells on the premises and no supply from either of the Companies.

As soon as I had ascertained these particulars I communicated them to Dr. Farr . . . (Snow 1855, 76-77).

The task turned out to be considerably more complicated than he had first imagined. Snow often found it difficult to locate the precise addresses reported to the GRO due to absent or duplicated house numbers. When he did find proper addresses, the residents were frequently unaware which water company supplied their houses. It took some time to devise a near fool-proof chemical test, the outcome of a stroke of luck. During the weeks he undertook inquiries, there was nearly forty times the amount of salt per gallon in water supplied by S&V compared to Lambeth water. Determining correct enumerators for his study “was necessarily attended with a good deal of trouble” (77) and more time-consuming than he had anticipated, but he persevered. If only he had been equally assiduous in locating proper denominators for his study.

An intermixed water supply in similar neighborhoods within sixteen sub-districts was the defining feature in Snow’s South London (SoLo) “grand experiment” (Snow 1855, 75). Within the intermixed area, however, the numbers of houses each company supplied could vary considerably. That meant Snow must calculate very specific exposure ratios — numbers of houses with cholera mortalities in each sub-district (the enumerator) divided by the total number of houses served in that sub-district (the enumerator) — for each company. Otherwise, the results could be badly skewed.

Take the two Kennington sub-districts as an example. During the first five weeks of the 1854 epidemic, Snow found 9.5 times greater cholera mortality in S&V-supplied houses in Kennington than those served by Lambeth; looking good for Snow’s theory, eh? Although the two companies had roughly equal market share at the time in the two sub-districts, what if S&V were sending water to ten times more houses in those two sub-districts than Lambeth was? In that case, the exposure ratios would have been roughly identical.

The manner in which Snow (1854a) described his initial investigation in the two Kennington sub-districts suggests that he initially flirted with exposure ratios based entirely on houses. He showed Farr figures on the number of houses in which a cholera mortality had occurred during the first five weeks of the current epidem-

Historiographical Unpacking—31 August 1854

ic, organized by the source of water consumed in those houses (247). As to denominators, Snow interpreted the information on estimated value of pipes and other materials that S&V and Lambeth had supplied Parliament to suggest that the companies supplied nearly the same numbers of houses in each of these four sub-districts (247). In other words, he arrived at the GRO on or about Thursday, the 24th August 1854, with the results of initial inquiries in the “grand experiment” he had envisioned during the winter of 1853/54:

- A study limited to the 16 sub-districts where S&V and Lambeth had laid pipes in the same streets, alleys, and mews.
- Snow anticipated that he would be able, on his own, to investigate the water supply at every house in this intermixed area where one or more fatal attacks of cholera was recorded for the full duration of the epidemic.
- Exposure ratios calculated for each company as the number of houses with one or more fatalities in each intermixed sub-district / total number of houses supplied in that sub-district.

Farr’s offer to involve GRO registers in Snow’s SoLo study was the first indication that something was awry. There is no need to speculate about when a passage in *MCC2* was com-

posed; we have real-time documentary evidence from Snow (1854a) in the form of a letter to the editor of the *Medical Times and Gazette (MTG)* dated “Aug., 1854”:

Sir,—I have been engaged, during the last ten days, in an inquiry which promises to yield very conclusive evidence respecting the mode of propagation of cholera. . . .

.

I intend to continue the inquiry, extending it to the other sub-districts in which the two water companies are intermixed, and to bring it down to the 26th inst [August]. After this date, I am informed by Mr. Farr that the supply of water at the house in which every fatal attack of cholera may occur, will be returned by the Registrars in all the Districts on the South of the Thames (247).

This letter was published on 2 September and included the results of inquiries Snow (1855) had made in two Waterloo sub-districts; that is, more data than he had shown Farr previously when the offer was actually made (76-77). The passage quoted above shows that within ten days of initiating house-to-house inquiries in Kennington, Snow had abandoned the notion that he, personally, would make inquiries for the duration of the current epidemic at every house in the intermixed area where someone had died of cholera. Few at that time would have known his original intention. The first public disclosure (Snow 1854a) of the SoLo study outlined it as a joint venture: Part 1, the first seven weeks,

Historiographical Unpacking—31 August 1854

with inquiries undertaken by Snow in the inter-mixed sub-districts; part 2, from the eighth week onward, all registrars in South London making inquiries about water sources when assembling their regular weekly reports.

It strikes me as unlikely that Farr would involve all South London registrars in part 2 unless he and Snow had already broached the possibility of expanding part 1 beyond the inter-mixed area mentioned in the letter. The narrative flashback to 24 August suggests that this discussion occurred at the same meeting when Snow presented his Kennington findings. Snow could state, without equivocation, that he would conduct all inquiries about deaths in the intermixed sub-districts during the first seven weeks of the epidemic, and still have known that the absence of data required for calculating exposure ratios for the intermixed area necessitated eventual expansion of part 1. Perhaps, at the time, he hoped Farr was as adept at magic as he was at statistics, and the housing data would be divulged in rapid fashion.

The letter to the editor Snow (1854a) wrote at the very end of August side-stepped the denominator problem he would describe five weeks later. Although I believe he had just found out the problem existed, I'm not suggesting that Snow misled anyone with preliminary, unadjusted exposure ratios for S&V and Lambeth. District and parish rate books (containing the value of pipes and other property) indicated roughly equal

market share by the two companies in the four sub-districts he had investigated. Consequently, he felt comfortable in drawing preliminary conclusions:

both Companies supply alike all kinds of houses, — those of the rich and the poor indiscriminately. It is evident, therefore, that, in the sub-districts to which the inquiry has extended, the people having the improved water supply enjoy as much immunity from cholera as if they were living at a higher level, on the north side of the Thames (247).

Snow (1854c) wrote the *Medical Times and Gazette* on Monday 2 October that he had just completed inquiries into 642 cholera deaths in the intermixed sub-districts of South London registered during the first seven weeks of the epidemic. Only 93 fatal attacks took place in houses supplied by the Lambeth Company, whereas a whopping 509 instances occurred in houses supplied by S&V; the water source in the remaining 40 cases came from pumps, ditches, directly from the Thames, or could not be determined.

But he could not seal the deal, as Snow (1854c) admitted publicly for the first time, until he knew “the number of houses in each sub-district supplied by each of the Water Companies respectively” (365). That is, gross totals for the intermixed area were only suggestive; they did not show what he believed

Historiographical Unpacking—31 August 1854

a sub-district analysis would — “the effect of the impure water [from S&V] in propagating cholera . . . in a very striking manner, and with great detail” (365). He attached a table depicting what he had discovered about water sources and fatal cholera attacks at the sub-district level, which meant he had the enumerators for calculating detailed exposure ratios for both companies. He only lacked the proper denominator data to complete his part of the “grand experiment,” although he “hope[d] shortly” to receive this information (365). Without it Snow could not complete his analysis of the natural experiment underway in the intermixed area of South London.

Snow then described the back-up plan that had been underway throughout the month of September. “In the mean time” — by which he meant, since shortly after learning that the necessary denominator data was unavailable:

in order to be able to compare the mortality from cholera among the customers of each Company, with the entire number of houses supplied by each of them respectively, I thought it desirable to extend the inquiry to Rotherhithe, Bermondsey, Camberwell, and certain parts of Southwark, which are supplied by the Southwark and Vauxhall Company alone. I was unable by myself to execute this part of the inquiry . . . (365).

The quote doesn’t mention four outlying sub-districts with little cholera supplied only by Lambeth, which Snow had put on his own to-do list

and completed in September. Snow and Farr had decided that the only way to take advantage of the natural experiment currently underway in the sixteen intermixed sub-districts was to extend inquiries into the twelve sub-districts served solely by the S&V water company, as well as the four Lambeth-only sub-districts.

Snow had farmed out inquiries in the twelve S&V-only sub-districts to a newly minted apothecary Licentiate, John Joseph Whiting. Since there was no competition in this area with the Lambeth Company, Whiting’s task was to determine whether S&V ran pipes to houses where someone had died of cholera during the first seven weeks of the epidemic, or the residents fetched water from alternative sources. Unfortunately, Whiting was only able to complete inquiries on cholera fatalities during the first four weeks before he departed the metropolis for a country practice, forcing Snow (1854c) to “calculate” (high-falutin for guess) that the water sources for all cases in these twelve sub-districts for weeks five through seven were “in the same proportions as those occurring previously” (365). Snow’s letter contained a table depicting his and Whiting’s findings by district, with asterisks next to the S&V-only sub-districts that involved estimated results.

Had Snow ended the letter (1854c) at this juncture, he risked giving the impression that the SoLo study was just another, suggestive-at-best, example of comparing cholera fatalities after the

Historiographical Unpacking—31 August 1854

introduction of pure water in some areas to other areas with unchanged supply. He decided to give his audience a prefigurement of the analysis to come when he received the sub-district supply data from S&V and Lambeth that would permit him to plot exposure ratios for the early part of the epidemic within the intermixed area, before normal propagation really set in and skewed the causative effect of impure water. Pending that ideal scenario, he used the only denominator data available to him at the time and calculated exposure ratios during the first seven weeks of the epidemic for each company's entire watershed:

The entire number of houses supplied by the Southwark and Vauxhall Company, according to a return made to the General Board of Health in 1850, was 34,217, and the number supplied by the Lambeth Company, according to the same return, was 23,396. The number of houses supplied by both Companies has increased with the extension of the Metropolis, but it is pretty certain that the proportion continues nearly the same, and for the sake of comparison, the number of houses may be supposed to remain the same also (366).

Snow then divided these figures on the total number of houses each company supplied in South London by the total of actual plus "calculated" cholera fatalities in houses traced to each company, then proposed

that while a death from cholera had oc-

curred in 1 house in every 28 supplied by the Southwark and Vauxhall Company, a fatal attack of cholera had occurred in only 1 out of 251 of the houses supplied by the Lambeth Company. The mortality, in short, to August 26, was just nine times as great in the houses supplied by the former Company as in those supplied by the latter (366).

The possible effects of pure and impure water on cholera mortality were even more striking in the first four weeks, when other forms of propagation weren't as pronounced:

During the first four weeks of the present epidemic, 563 persons died of cholera in London. Of these it has been ascertained, by a personal inquiry at every one of the houses in which the attack took place, that no less than 268 of the fatal attacks took place in houses supplied with water by the Southwark and Vauxhall Company. . . . During these four weeks there were but ten deaths from cholera in houses supplied with water by the Lambeth Water Company; although it has been shown above that they supply fully two-thirds as many houses as the other Company. The cholera was consequently eighteen times as fatal among the population supplied with the water from Battersea Fields as among that with the purer water from Thames Ditton, during these four weeks, although this latter population is intimately mixed with the former.

A lot of guesswork, two dodgey numbers, and a slight over-reach in the last sentence; only 62% of the population in the combined watersheds had an intermixed supply (Snow 1855, 84). But it was

Historiographical Unpacking—31 August 1854

the best he could do with the information available.

However, it was not the analysis of the “grand experiment” Snow had already described for the forthcoming publication of *MCC2*.

Snow’s SoLo analysis in *MCC2*

October ended without Farr receiving the desired denominator data. Snow had a deadline to submit the remaining sections of *MCC2*. He had delayed writing up the South London study as long as he could.

We can imagine Snow’s chagrin. He had in hand enumerator data on cholera fatalities in the intermixed sub-districts during the first seven weeks of the epidemic. He had personally collected it, as promised in the letter to *MTG* published on 2 September. Granted, his findings did not cover the entire epidemic, but they contained neither guesswork nor “calculations.” Part of the planned “grand experiment” was ready for analysis. But he could proceed no further without sub-district level information on how many houses each of the private water companies supplied in the intermixed area. What was to be done?

Snow really had no option except to revise and expand the two letters he had sent to *MTG*, an approach he had already used for the opening sections of *MCC2* with the eponymous 1849 pamphlet (the title page states, “Second Edition, much Enlarged”). The South London portion of *MCC2* runs just over sixteen pages of text

and tables (1855, 76-92). Snow transformed the letter published in September (1854a) into a brief discussion of his initial inquiries in Kennington, Farr’s offer to involve GRO registrars beginning 27 August, and Snow’s “resolve” to investigate cholera fatalities in the entire intermixed area until the 26th on his own (76-77). The October letter to *MTG* (1854c) contained a long description of difficulties he encountered when he asked residents which company supplied their houses; “It would, therefore, have been impossible for me to complete the inquiry if I had not found that I could distinguish the water of the two Companies with perfect certainty by a chemical test” (365). Snow reduced the entire passage in *MTG* when writing *MCC2*, but some wording is nearly verbatim: “It would, indeed, have been almost impossible for me to complete the inquiry, if I had not found that I could distinguish the water of the two companies with perfect certainty by a chemical test” (77-78).

The structure of Snow’s argument in *MCC2* often differs from that in the second letter to *MTG*, but snippets of varying length frequently reappear. He condensed a long paragraph on the absence of sub-district housing supply and hiring Whiting, deleting the phrase, “I hope shortly to learn . . .” but recopying verbatim that “I was fortunate enough to obtain the assistance of a medical man,” and additional phrases about Whiting’s inquiries on fatalities during the first four weeks of the epidemic in S&V’s unmixed watershed

Historiographical Unpacking—31 August 1854

(1855, 78-79). An entire paragraph in *MCC2*, with the exception of one word, comes from the *MTG* letter (1854c):

It may, indeed, be confidently asserted, that if the Southwark and Vauxhall Water Company had been able to use the same expedition as the Lambeth Company in completing their new works, and obtaining water free from sewage, the present epidemic of cholera would have been confined in a great measure to persons employed among the shipping, and to poor people, who get water by pailsful direct from the Thames or tidal ditches (366).

Snow changed “present” to “late” since the cholera epidemic had ended when he wrote this passage (1855, 81). There are many other incidents where he re-used, with minimal alteration, parts of sentences from *MTG* when writing parallel sections in *MCC2*.

Perhaps the most notable differences between the October letter to *MTG* and *MCC2* are corrections Snow made to his discussion of the number of fatal attacks he and Whiting had investigated and an accompanying table; a change in the data he used to calculate tentative exposure ratios; and addition of data gathered by GRO registrars from 27 August through 14 October. For the intermixed area during the first seven weeks, Snow changed the numbers for S&V from 509 to 525, Lambeth less drastically from 93 to 94 (1854c, 365 and 1855, 85). For entire watersheds during the first four weeks, 268 deaths in

S&V-supplied houses became 286 and Lambeth went from 10 to 14 (1854c, 366 and 1855, 79); the likelihood that the early S&V number was a typographical error at the press is lessened by the fact that Snow changed the fatality proportion between the two companies from 18:1 to 14:1 in *MCC2*. He also corrected figures in the single *MTG* table for the first seven weeks, added a new table covering the first four weeks, and organized both tables to show sub-district fatalities in three categories: solely S&V, intermixed, and solely Lambeth (1855, 84-85). Denominator data in *MTG* is from 1850, whereas in *MCC2* it's from 1853 (1855, 80); accordingly, the figures Snow used for Lambeth's percentage of market share compared to S&V dropped from 68% to 65%. Snow used total watershed housing figures and population data to discuss fatalities in South London for the fourteen weeks of the full 1854 epidemic (1855, 86-91). In addition, in *MCC2* Snow toned down his criticism of “ill-directed efforts of benevolent individuals among the non-medical part of the community” that he believed had caused the sewage concentration of the Thames to increase since the 1830s (1854c, 366).

I've carried the discussion of *MCC2* well beyond what transpires in the 31 August 1854 narrative because of a common misperception that it contains Snow's analysis of the “grand experiment” during the 1854 cholera epidemic where the watersheds of the Lambeth and S&V companies

Historiographical Unpacking—31 August 1854

intermixed in South London. The revised *Lancet* obituary (2013) during the 200th anniversary year of Snow's birth is an example:

It was his "Grand Experiment" that same year [1854] that secured his huge reputation in epidemiology. . . . During 1848–49, the death rates for the two companies were the same, but by 1854, after Lambeth's move, Southwark and Vauxhall's rate was between eight and nine times higher, and in the first 4 weeks of the epidemic, Southwark and Vauxhall customers had a 14-fold higher risk. In 1855, Snow published a much-expanded second edition of *On the Mode of Communication of Cholera* that included these results.

The 14:1 risk disparity (60% of S&V inquiries during this period were conducted by Whiting) refers to what Snow described in *MCC2* (1855, 80) as total cholera fatalities during those weeks in the entire watersheds of the two companies, not the intermixed area that constituted Snow's intended "grand experiment." He was not able to undertake those calculations until most of the sub-district level housing data he required was published in a retrospective study lead by John Simon (1856).

In short, *MCC2* does comprise a description of why Snow believed this natural experiment (in which happenstance determined if one's house received impure or purer Thames water) had the makings of an *experimentum crucis*. *MCC2* does describe what had to be

done to try and determine the water supply at each house where someone had contracted a fatal case of cholera, why it was necessary to farm out some investigations, and the totals he, Whiting, and the registrars were able to amass in their respective assignments. *MCC2* does contain Snow's risk-exposure calculations per company for their entire watersheds during various phases of the epidemic. But one must consult Snow's article (1856a) for his analysis of the "grand experiment," despite Wade Hampton Frost's dismissal of it as "not altogether essential to Snow's original argument, which was already well established . . ." (1965, xvi) — yep, you guessed it, in *MCC2* reprinted after Frost's introduction.

Historical continuity vs. historical change

One of my goals when teaching historiography has always been to make transparent the tacit knowledge of a professional historian. This often necessitated a my-way-or-take-another-class approach to counter default notions of doing history. I gave students worksheets containing intellectual rubrics they must follow when researching and writing until they mastered my methodology. Appendix A is an example where I asked them to decide, before drafting a thesis statement, if their interpretations involved historical continuity or historical change.

Nightingale's sojourn on a Middlesex Hospital ward was an example of historical con-

Historiographical Unpacking—31 August 1854

tinuity. It was the actualization of a decision she had already made to leave the Gentlewoman's Establishment for something else, some new post or experience yet to be determined. Hence, my thesis statement for the opening narratives in which she is featured reflected basic elements of historical continuity: what she did, when she did it, and how/why it came about.

My interpretation that a circumstance beyond John Snow's control forced him to alter his intended focus on just the intermixed watersheds in South London is an example of historical change. It requires a different thesis statement, historiographically, than the one that underpins the opening narratives featuring Florence Nightingale, a thesis statement based on a diagram similar to what I would assign students to construct with the following four **c**-words in mind:

First, depict a change in **chronology** as "From > To"; for example, from Snow's initial vision of the SoLo project as limited to intermixed watersheds > to the expansion to include all sub-districts where either S&V or Lambeth was the sole provider of piped water.

Second, propose a **causal** explanation for this change, such as the denominator problem Snow encountered — the unavailability of data on the exact numbers of houses the two water companies served in each of the inter-mixed sub-districts.

Third, present evidence of a **contingent** event or factor that substantiates the proposed

"From > To" chronology and the hypothesized causal explanation. The contingent event for Snow in the 31 August narrative occurs when his anticipated SoLo project changed on a dime: a documented meeting in August 1854 where Snow (1854a) showed Farr preliminary findings from two inter-mixed sub-districts and Farr's response was to offer the services of his registrars. This meeting has the characteristic feature of a contingent historical event as set forth by Stephen Jay Gould (1989, 283). The causal explanation and/or contingent event constitute the "Because" component in the thesis statement.

Fourth, identify the **context** necessary for a reader to understand your narration of this historical change. For the 31 August narrative, I chose to summarize Snow and Farr's respective cholera theories and the serendipitous appearance of a natural experiment during the London cholera epidemic of 1854.

My **thesis statement** for Snow and Farr at the GRO is an example of historical change: The absence of denominator data essential to analyzing just the intermixed Lambeth/S&V watersheds forced Snow to suspend his "grand experiment," then expand and share inquiries into fatal cholera attacks occurring in every South London district served by the two companies. This unexpected change in plans affected everything he did during the 1854 epidemic, including his approach to investigating the local outbreak in Golden Square.

Historiographical Unpacking—31 August 1854

The narrative form

Farr and Snow's ideas and actions are developed in a series of dated flashback-narratives, some containing sub-titled explanatory sections, as well as a final narrative on Thursday 31 August.

Although I have found no documentary evidence that Snow and William Farr actually met at the GRO on that day, it is very possible that they did so. It was the eighth week of the London cholera epidemic. The *Weekly Return* no longer contained details of each death; the numbers were too enormous. So Snow would have had to visit the GRO to secure a list of everyone who had died of cholera during the week ending 26 August in the South London sub-districts covered by the natural experiment.

Farr had already instructed GRO staff to provide Snow (1854a) each week with mortality lists containing information not available in daily newspapers or printed *Weekly Returns*. Sub-district registrars were supposed to complete returns of births and deaths each Sunday and pass them on to their district registrar for review. District registrars then forwarded their reports to the head GRO office in Somerset House, where Farr's team attempted to prepare complete copy for each return by Monday evening for type-setting into pamphlet form; copy was also sent to major newspapers. When all went smoothly, *Weekly Returns* were available at District Registrars' offices

on Wednesday and extracts from it appeared in Wednesday editions of the dailies; the *Times*, for example, published overviews, tables, and meteorological summations for the week ending 19 August 1854 on Wednesday the 23rd ("The Health of London," 8c-d), and on Wednesday 30 August for the week ending the 26th ("The Public Health," 9c-d).

Snow could have found the gist of recent cholera mortality in the metropolis from reading extracts in the *Times* or procuring a complete copy of the return; but to suss out specifics, he had to walk to Somerset House. He had no anesthetic administrations scheduled between 25 August and 1 September, so he could have made the visit on Wednesday or Thursday. Absent evidence to the contrary, I chose Thursday. Whichever day he did visit the GRO that week, it is very likely that he would have popped into Farr's office for a chat and to give him an update on the progress of the South London investigation. This was sufficient probability for me to compose an historical narrative with a setting at the GRO on the same day that Florence Nightingale began her sojourn at the Middlesex Hospital.

As in the Nightingale episode at the institute on Upper Harley Street, the narrative style I employ for meetings between Farr and Snow is predominantly free indirect speech. When the narrative contains conversational speech, it is always in free indirect style, not quoted speech, since the latter in an historical work denotes

Historiographical Unpacking—31 August 1854

quotations from documentary evidence. Take the opening lines of the 24 August flashback as an example:

So far, the *experimentum crucis* is yielding anticipated results!

Farr looked perplexed. What was Snow talking about?

This is free indirect style — Snow’s spoken statement (without attribution) and Farr’s reaction (his internal speech) as free of authorial flags (in this instance, an historian’s seeming omniscient knowledge) as I could make it. Had I used reported or simple indirect speech in this instance, I would have added, “said Snow” to the first sentence and “thought Farr” to the third. My authorial presence is limited to providing context: how Farr looked.

Left-justified dates in bold font designate encounters between Snow and Farr, beginning with the flashback to 24 August 1854. This narrative is interrupted by explanatory sections (set off by centered and bolded sub-titles in a smaller font) that provide historical context and Snow’s doings during the early stages of the SoLo investigation (also designated by left-justified dates in bold font), before resuming at the point where Snow shows Farr the results of preliminary inquiries in the Kennington sub-districts. When narrating Snow’s activities in the run-up to the SoLo project and the initial inquiries in Kennington, I often employ indirect speech. That is, I explicitly

report what I believe Snow was thinking and doing.

In my view, Snow became aware of the denominator problem and decided to expand the SoLo study during the same (documented) meeting — which in this narrative occurs on the 24th — at which Farr offered to have sub-district registrars begin collecting data on water sources starting 27 August. The Snow/Farr section ends on 31 August, the narrative present so to speak, with an hypothesized meeting that updates Snow’s findings with two Waterloo sub-districts and shows his resolve to begin inquiries in the other sixteen sub-districts on his expanded to-do list in South London. Narratives about Snow’s hypothesized meetings with Farr on 24 and 31 August are based on Snow (1855, 76-79; 1856a, 242-43; and 1854a).

Additional documentation & unpacking

The page preceding the Farr-Snow scenario contains four figures scanned from the 19 November *Weekly Return* (UK. GRO 1853, 389 [title page]; 391 [sample of individual deaths]; 401 [supplement title and extract, marginal check marks mine]).

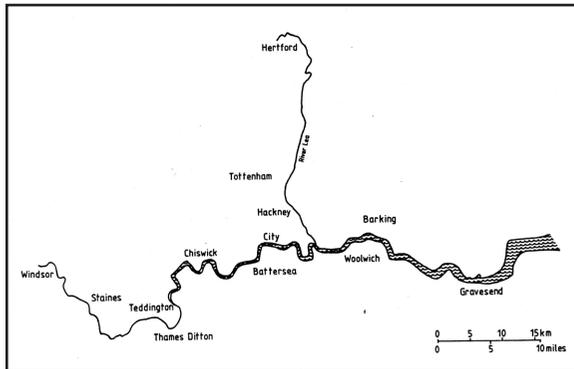
Three figures on the opening page of the Farr-Snow scenario:

- Detail from Map 2, “Water supply to Registrar-General’s districts for South London” (Snow 1855, after 74) <<http://johnsnow.matrix.msu.edu/work.php?id=15-78-52>>.

Historiographical Unpacking—31 August 1854

- Detail from portrait of John Snow, painted by Thomas Jones Barker in 1847. Photo by David Zuck of the original owned by Geoffrey Snow.
- Detail from a photograph of William Farr, circa 1870, courtesy of Ralph Frerichs <http://www.ph.ucla.edu/epi/snow/farr/farr_fig1.html>.

The figure on the tidal reach of the Thames and Lea rivers is an amended version of a map in Luckin (1986 frontispiece). I scanned

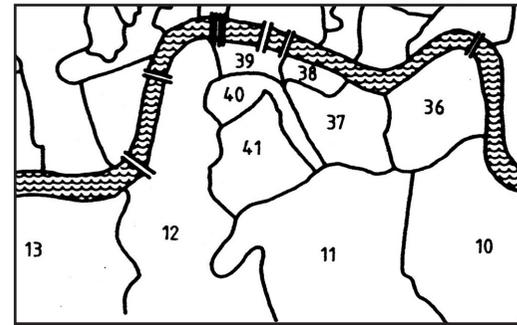


Luckin's map into Photoshop, erased everything but the two rivers and the distance marker, and used the Horizontal Type Tool to add place names mentioned in the Snow-Farr narrative.

The figure of the first published data documenting a reverse in cholera mortality in districts served by Lambeth and S&V between the 1853 and 1849 London epidemics is an extract from the 19 November *Weekly Return* (UK. GRO 1853, 406). This *Return* suggested that the 1853 London cholera epidemic contained the makings

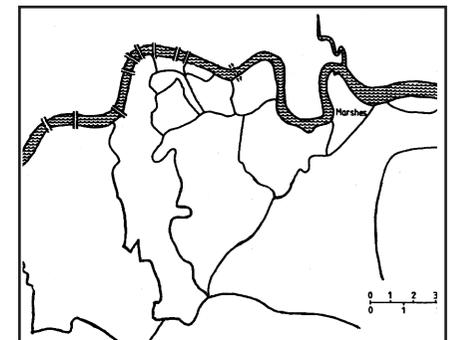
of before-and-after natural experiment like those occurring in previous epidemics in Exeter and Hull.

The 26 November *Return* contained the game-changing evidence that there were still intermixed watersheds in South London (UK. GRO 1853, 409).

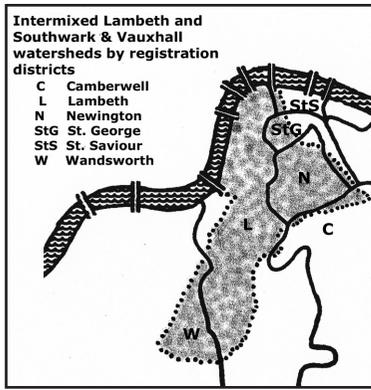


Luckin (1986) also has an illustration of London registration districts as of 1850 (71). I imported it into Photoshop and cropped the section containing the South London districts served by the Lambeth and S&V water companies. Then I erased Luckin's

registration district numbers, altered the bridges to comply with the detail covered in the narration, and filled in the missing district boundaries on a printed copy. I used this enhanced



Historiographical Unpacking—31 August 1854



printed copy as a base, along with the Brush and Horizontal Type Tools in Photoshop, to create the figure of the intermixed sub-districts, as well as the subsequent three figures depicting aspects of the SoLo natural

experiment. An experienced graphic designer would, of course, produce more professional figures that I can manage. But one purpose of my narrative is to show what anyone with an elementary facility in editing images might have done.

Shortly after the first of the SoLo figures comes the prepared-mind reference to cholera in the Baltic Sea. The narrative is based on Snow's letter to the editor of *MTG* (Snow 1854). The PDF at <http://johnsnow.matrix.msu.edu/work.php?id=15-78-41> includes the notice, "Health in the Baltic Fleet," that spurred him to write.

The individual cholera deaths in the South Districts for the week ending 5 August 1854 (UK. GRO 1854, 249-58) would have been available to Snow on Wednesday 9 August. The *Times* did not print the entire mortality list.

The article that Snow skimmed at breakfast on 17 August 1854 would have been "Health of London" (*Times* [London, England], 17 August

1854: 9) <*Times Digital Archive*>.

- The figure depicting the Teddington Lock is a detail scanned from "Teddington Lock, 1894" (Godfrey, London sheet 132).

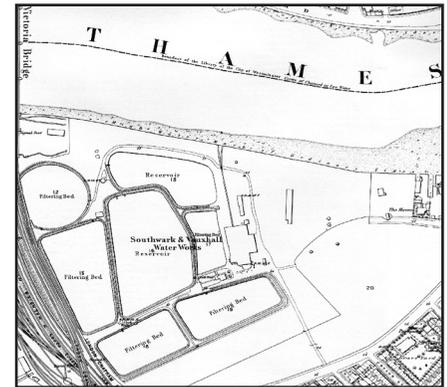
- The figure depicting the S&V works at Battersea is a detail scanned from "Pimlico, Sloane Square & Nine Elms, 1869" (Godfrey, London sheet 88). Unlike the previous figure, in

which any changes at the lock that occurred during the forty years since 1854 are immaterial to the narrative, the 1869 map depicts a functioning railroad bridge, rails for four different

railways, and the Battersea Park Station — none of which appear on Map 2 of Snow (1855, after 74). Consequently, I used Photoshop to modify details in the 1869 Ordnance map so that I could approximate the likely situation in 1854.

Information about Snow's chloroform administrations on Thursday, 17 August, 1854 is taken from Snow (1858, 341; see Appendix C).

The table showing cholera mortality in the two Kennington sub-districts through 12 August is adapted from the letter to the editor of *MTG* Snow submitted for publication the following week (1854a, 247). After meeting with Farr



Historiographical Unpacking—31 August 1854

during the fourth week of the month, Snow was able to complete inquiries in the Waterloo Road sub-districts on deaths registered through 19 August, which are also included in the *MTG* letter. He did not update the Kennington sub-districts beyond what he had already shown Farr for this letter.

Bibliography

Since this document contains excerpts from “Cholera in St. James,” my online experiments in historiography, the references are accessible by clicking on [Bibliography](#) on the right side of that home page:

<http://johnsnow.matrix.msu.edu/broadstpump/>

or, if this link is dodgy, I’ve created a separate record as Document 14–IV (c) in the Online Companion.