

Document 30-II (Online Companion)

Cholera Inquiry Committee: "Mr. Whitehead's Report of His Special Investigation of Broad Street"¹

I have altered the following transcription to reflect modern rules of capitalization and syntax.

[121] This investigation has been attended with some difficulty for two reasons: 1. Because of the shifting of the population. I have reason to believe that at one time since the pestilence, the street contained one-half, possibly little more than a third, of its usual number of inhabitants. At least, it is certain that only twelve of its families in which deaths from cholera occurred now reside where they did at the beginning of September 1854. No less than seven of the twelve [are] . . . householders or shopkeepers. It is not a little strange that very many who have thus migrated have not deemed it necessary to [leave] the infected district, in some instances selecting for their new abodes houses as severely visited as those whence they [121/122] came.

I find, however, that a feeling of uneasy apprehension respecting the approach of summer is beginning to prevail, even among those who have hitherto stood firm. Whenever the cholera shall reappear in [England], I have no doubt that this neighbourhood will be deserted by all who can conveniently depart unless there shall previously have been given a satisfactory account of the causes of the late calamity and a reasonable prospect held out of comparative immunity for the future. With regard to those who have moved away, I have in many cases traced them out and personally visited them, sometimes following them to a considerable distance.

2. The other difficulty has arisen out of the very nature of the investigation. It has grown upon me as I proceeded. I have often had to return as many as four or five times to the same families to put questions which I did not at first see the necessity of asking. Indeed, throughout the whole street I have gone over the same ground, again and again, in order to bring each portion of the evidence up to the proper standard of accuracy and reliability. [All] statistics which I shall lay before the Committee are the result of personal inquiry. [122/123]

¹ Cholera Inquiry Committee, *Report on the Cholera Outbreak in the Parish of St. James, Westminster, during the Autumn of 1854* (London: Churchill, 1855), 121–69; unedited transcription and PDF of original are available at <<http://johnsnow.matrix.msu.edu/work.php?id=15-78-7D>>.

No. of Houses (exclusive of the Brewery) 49.		
Resident Householders (August 1854) ... 35.		
Floor.	Resident Population. (Aug. 1854.)	Deaths of Residents. (Cholera.)
4th Floor .. (In 2 Houses only)	6	0
3rd ,, (2 Houses have no 3rd)	224	22
2nd ,,	235	18
1st ,,	212	23
Ground (33 occupied as Dwellings) ...	138	17
Kitchens (19 inhabited)	68	6
Cottages (5 in number)	13	4
	896	90
	North South	North South
	470 426	39 51

Besides the 90 deaths here mentioned, there were 28 among persons employed in the factories and workshops of this street, but residing elsewhere. Twelve houses, only, were free from death ([of] residents or non-resident workpeople)—eleven on the north side (in two of which, however, there were recoveries from collapse) and one on the south side. The next table gives the number of fatal cases, with date of attack. [123/124]

Date of Attack.	No. of Fatal Attacks.
August 12th ...	1
„ 28th ...	1
„ 30th ...	1
„ 31st ..	6
September 1st ...	26
„ 2nd ...	24
„ 3rd ...	9
„ 4th ...	8
„ 5th ...	6
„ 6th ...	5
„ 7th ...	0
„ 8th ...	2
„ 9th ...	1
	90

The 28 non-residents were all seized during the first two or three days of the outbreak. The factories and workshops which suffered were all closed for a time after Saturday evening, 2 September.

The committee are well aware that these tables are compiled from papers containing the details of individual cases, which circumstance I only mention for the satisfaction of others into whose hands the report may fall. I am acquainted with the name and have ascertained, as far as possible, the age of each deceased person, together with the alleged precise hour of attack, position of the room occupied, and general sanitary condition of the house.

If I now confine myself mainly to one point, it is because I have been compelled by the evidence to recognise its primary importance. [124/125] Among the questions which the committee decided should be asked throughout the district was one relating to the use of drinking water by the inhabitants. I soon found that the Grand Junction and New River

Companies divide Broad Street, and indeed the whole district, in such a way as utterly to preclude the notion of either of them being at all accountable for the outbreak. It took place simultaneously in both their districts. Moreover, a careful examination has fully satisfied me that, as a matter of fact, they must be held free from suspicion on this particular point.

The only other water used for drinking to any extent by the people of the infected streets was that of the parish pump in Broad Street. I should have much preferred not to anticipate the conclusion to which my evidence points. But for the sake of clearness, I find it necessary to state my conviction, slowly and I may add reluctantly adopted, that the use of this water was connected with the commencement and continuance of the outbreak in a very remarkable way. No one actively engaged on the spot during the pestilence will or can mistake what I mean by the outbreak. There was cholera in the district before it began. There was cholera in the same district after it was over. And yet its limits, both of time and place, are so marked that anyone resolved to carry out an inquiry on strictly inductive principles may feel himself no way perplexed, or even concerned, with [125/126] hypotheses either connecting or disconnecting it with previous cases. If such questions should ultimately come to be discussed by the committee, it must at least be distinctly understood that my investigation has been conducted without any reference to them whatever. In all cases, unless the contrary be expressly stated, it must be borne in mind that the use of cold water is meant. Indeed, it may almost be taken as a rule that the water used for boiling was the company's, or as I shall generally term it, the cistern water.

I shall first deal with the 90, above-mentioned fatal cases. With respect to the first case, which commenced on 12 August and lasted 35 hours, I can learn nothing concerning the use of water. The next (28 August) was the case of an **infant** whose **mother** emphatically denies that it ever tasted of the pump water, assigning as a reason a decided objection to this water on the part of her **husband**, who was himself fatally seized with cholera on 8 September—almost the last person who was attacked, either fatally or not, in this street.² He, of course, was no drinker of the pump water. I may here add that a like positive denial upon this point is given by persons competent to decide both in the other case marked 8 September and in that of 9 September. [126/127] The third fatal attack in Broad Street, that of 30 August, was the case of a lad who went to Bayswater on Saturday 26 August, returning Monday the 28th. The family with whom he resided in Broad Street are positive in their assertion that he never drank of the pump water. The precise hour of his attack was 5 a.m. At noon the same day, he was sent back to Bayswater. It is worthy of notice that his mother and sister (at Bayswater)

infant: Frances Lewis at 40 Broad Street.

mother: Sarah Lewis.

husband: Police Constable Thomas Lewis.

² See Dave Boylan, "Finding Baby Lewis" <http://kora.matrix.msu.edu/files/21/120/15-78-AD-22-johnsnow-a0a1f7-a_11479.pdf>.

were also seized the following evening and died before the end of the week.

There remain then to be considered the cases of those who were fatally seized on and after Thursday 31 August down to 6 September (inclusive). Of these, there are 15 concerning whom I cannot learn anything bearing upon the point in question, either because the deceased were isolated persons of whose habit in this matter no one can speak with certainty or because surviving friends and relations who might testify are now out of reach. In some few instances, and I am happy to say very few, [I have no information] because those who could settle the point refuse to give any information. Respecting 8 others of the cases now under consideration, the evidence is more or less strong against the probability of the deceased having drunk of the pump water previous to illness. I have marked 6 more as *doubtful* who, according to the testimony of surviving relatives, may or may not have drunk of this water. Next, I have set down 10 cases of persons who, [127/128] there is every reason to believe from all I can gather, did use it; but . . . inasmuch as it is not a matter of absolute certainty, I have distinguished [these 10] from the remaining 45 who I could prove to demonstration did drink of it between the afternoon of Wednesday (30 August) and the hour of attack. For facility of reference, these figures are set side by side in the following table.

Date of Attack.	Whether drank the Pump Water shortly before illness.					Total.
	Decidedly.	Probably.	Not known.	Doubtful.	No.	
Before August 31st .....	...	...	1	...	†2	3
August 31st (Noon) to September 6 (inclusive) }	*45	10	15	6	†8	84
After September 6th .....	...	...	...	...	†3	3

One fact relative to the above details is noticeable, viz.—that of the 56 fatal attacks assigned to the first three days of the outburst (31 August, 1 and 2 September), it is only affirmed respecting two, with any semblance of certainty, that they did not use the pump water. I do not mean that all the other 54 did. But only 2, according to positive testimony, did not.

Of the 28 deaths of non-resident workpeople, 24 were of persons employed at two factories where, as I am informed by the proprietors, the water from the pump was in constant use for [128/129] drinking. All the 24 were seized during the first three days. Concerning three of the other four, I know nothing more than that they were taken ill during the same period.

The other was a young man who drank this water daily. He went home as usual on Friday evening, 1 September, and was attacked the next day. The landlady of the house where he worked affirms that he was the only person in the house who drank this water, and the only one who was at all ill.

Whilst prosecuting these inquiries, I soon perceived the desirableness—indeed the necessity—of closely examining those who had recovered from attacks, whether of cholera or diarrhoea. I shall not pretend to distinguish between cholera and diarrhoea. I can at least assert that the great majority of those to which I shall refer were very serious cases. I find then that of 50 residents who thus recovered:

- 4 are now beyond the reach of inquiry;
- 2 give uncertain accounts of themselves;
- †7 affirm that they did not drink the pump water;
- 2 probably did drink it; and
- *35 certainly did drink it between 30 August and their attack.

—
50

[129/130] In addition to which number, a family of 8 who told me that they habitually used the pump water suffered a good deal of illness. All [were] more or less severely, but in no case fatally, attacked with diarrhoea. Of the 50 persons [listed above], 34 were seized during the first three days of the pestilence. The last attack of these cases apparently connected with the pump was on 6 September. It seems that there was little even of diarrhoea in this street after that date.

In the meantime, I had advanced a step further in my views as to what constituted a proper inquiry into such a subject. I [had] come to the conclusion that I must likewise examine . . . as many, as possible, of those who [resided] in Broad Street at the beginning of September [but who] did not suffer at all either from cholera or diarrhoea. The brief and summary aspect of the following tables will convey but an inadequate idea of the pains taken to elicit and test the information they contain.:—

Residents who did not drink the Pump Water in the last week of August, or the first week of September, and were not ill.	
As affirmed by themselves, or by members of their respective families	243
As affirmed by others who claim to have full knowledge of their habit in this respect.....	36
	279

with impunity: Without an attack of cholera or diarrhoea.

[130/131] I have a record of the names and abodes of all these persons. I also made [a]diligent search for those residents who, at the time alluded to, drank the water **with impunity**. I give the result of this inquiry without attempting, as in several instances I might, to lessen its force by any qualifying statements:—

Drank the Pump Water with impunity.		
Daily.....	According to usual custom	28
From August 30th, noon, to September 2nd, P.M.	} In most cases occasionally	15
September 3rd, A.M., and after .....			} Ditto .....	14
		57

Uncertain and contradictory accounts given by (no illness)	9
Drank it once boiled (no illness)	1
Sometimes used it, but often went weeks without any (no illness)	2
Drank a good deal of it when ill from another cause than cholera	1

I have thus inquired, or at least attempted to inquire, concerning 497 of 896 persons resident in Broad Street at the time of the pestilence. I need scarcely insist upon the peculiarly advantageous circumstances under which the investigation has been conducted. Long before the cholera came upon us, I was well acquainted with the street and its inhabitants. It so happened that during the outburst I was more in this street than any other, visiting very many of the families which suffered. Soon afterwards, I collected of my own accord full statistical information throughout the whole of St. Luke's district parish. When the committee desired me to examine more particularly into Broad Street, I had but to inquire again respecting a matter with which I was already tolerably familiar. The ordinary course of my duties taking me almost daily into the street, I was under no necessity to be either hasty or intrusive. I asked the needful questions just when and where opportunity occurred, making a point of letting scarcely a day pass without acquiring some information and not caring how often I had to verify it in quarters where I could rely upon a willingness to converse upon the subject.

It appears, then, that among the drinkers of the pump water, the ratio of those attacked to those who escaped is at least 80 to 57, whilst the corresponding ratio among non-drinkers of that water is but as 20 to 279. Or, to

state the case in another way, among those attacked the ratio of pump water drinkers to non-drinkers of the same waters is 80 to 20. [132/133] Among those who escaped, the corresponding ratio is but 57 to 279. The latter ratio (57 to 279) is at once apparent to the reader from the two tables immediately preceding. The other (80 to 20) is reckoned from those figures to which * or † were prefixed.

80: *45 + *35.

20: †2 + †8 + †3 + †7

I apprehend that these figures afford a reasonable ground for believing that the pump, in some way or other, was instrumental, to say the very least, in aggravating the disease. The following circumstances strengthen this belief:—

1. On the north side of the street stand two establishments next door to each other, each employing from 30 to 40 persons in workshops at the rear. From the one there were seven deaths by cholera. From the other none. To the former, a supply of water from the pump was fetched daily for such as might desire to drink it. At the latter, no water but the company's was ever drunk. An additional contrast to the rate of mortality at the former is presented by the fact [that] its proprietor, with his family and servants (10 persons in all), entirely escaped the disease though they reside in the house which forms the front of the premises. He assures me that none of the inhabitants of this house used the pump water.

2. On the south side of the street, at no great distance from one another, stand two larger establishments, a factory and a brewery. From the former, where water from the pump, which is close at hand, stood constantly ready for the casual drinking of the workpeople, 18 out of 200 were fatally attacked in rapid succession. Of 70 men employed at the brewery, not one died and only two were at all ill. Not many of these men drink water at all. At least it is certain that they never sent from the brewery to the street pump. Here again, a double contrast may be perceived by comparing the brewery not only with the factory, but with the then unfinished block of model houses now known as Ingestre Buildings. A narrow court separates these buildings from the brewery. Several of the men employed on the buildings were fatally seized in such quick succession that the works had to be stopped. The works having been completed and the men dispersed by the time I was desirous of inquiring more particularly concerning the deceased workmen, I caused a paper of questions to be forwarded to the foreman. [He] sent me word, in writing, that seven of his thirty-five men died from cholera, that the first attacked was [on] 1 September, that the works were discontinued during Monday 4 September, that those who died had drunk of the pump water, and that he had not heard any of the others say whether

or not they drank it with impunity. Ingestre buildings do not belong to Broad Street, and I should not have referred to them but for their proximity to [134/135] the brewery and their marked contrast to it in the matter alluded to.

3. The subjoined table may also throw some light upon this question. I have denoted the houses by letters of the alphabet rather than by their respective numbers. Should any one, however, who is scientifically and experimentally interested in the investigation desire to examine into the authenticity and correctness of my statements, I shall be most happy to submit to his inspection all the documents which I have prepared for my own guidance.

Houses in which no one was attacked.				
Houses.	Population.	How many used, or did not use, the Pump Water, August 30th to September 8th.		
		No.	Yes.	Remarks on the Use of the Water.
A ...	11	11		Sept. 4th, for the first time.
B ...	9	4	5	
C ...	10	10		
D ...	13	13		Sept. 2nd and then not much. Cold with Brandy.
E ...	21	19	2	
F ...	5	3	2	
G ...	6	6		
H ...	13	13		Doubtful.
I ...	6	5	1	
J ...	3	3		
10	97	87	10	

In No. F, the landlord and his wife used to draw the water from a **filter**, which would sometimes stand several days without replenishing. Mrs.— tells me they began to have it straight from the pump [135/136] as soon as they perceived the cholera got bad, which, at the earliest, could have been 1 September.

4. One house in which a very remarkable recovery from collapse took place contained at the time but two permanent residents, i.e. two only who slept there throughout the pestilence. They were the two servants of a gentleman who was absent during the greater part of the time. One of these servants was seized badly 1 September [at] 8 A.M. She soon became completely collapsed, but ultimately rallied and passed safely through a most dangerous fever, being carefully nursed throughout by her fellow servant. I visited her daily and can myself testify to the fact which (so far from keeping

in the background) I am anxious to state, plainly and unequivocally, that she drank the pump water incessantly and abundantly during her illness. I could mention many other instances to the same effect. One lad who recovered from a serious attack drank 10 quarts of it on Sunday 3 September, whilst a girl whose recovery from collapse seemed little less than miraculous drank 17 quarts of it the same day, 3 September. I take this opportunity of recording that the pump water was generally, indeed almost universally, administered during the period of illness, both to those who recovered and to those who died. With respect to the servant above-mentioned, it is certain that she was in the habit of drinking a [136/137] great deal of the water every day previous to, and down to the very day of, her being seized. Her fellow servant, who escaped entirely, only commenced to drink it 2 September, and then in no great quantity and with brandy (cold). Their master drank a very little of it 2 September, but says that he thought it very offensive.

5. In another house in which no one died, there were [in] a population of 26 three recoveries from collapse, two being in the same family. This family, seven in the number, used the pump water every day at dinner, three pints to the seven persons, of whom five were not attacked. The two lads attacked were seized, one 31 August [at] 2 P.M., the other 6 September [at] 8 A.M. The third case in this house was a foreigner, seized 1 September [at] 10 A.M., who also was a drinker of the pump water. I made inquiries of the other residents in the house and found only one other person who drank this water, either at that or any other time. He drank it with impunity. I found that 14 of the rest neither used to, nor did at that time, drink it. None of them suffered. Of the remaining three I could learn nothing. Among the 14 was a family, six in number, who a few years back were in the habit of using it. But the father, having once looked down the well when it was opened for some purpose or other, perceived how near the water was to the surface [and] concluded that its sources [137/138] of supply could be none of the purest, and so forbade any further use of it.

I may here mention by way of illustrating the imperative need of care and discrimination in investigations of this kind, that my first inquiries led me to record that the pump water was in general use throughout both these houses. It was only when I had gradually become impressed with the necessity of subjecting both individuals and families to a more particular examination that I elicited the facts as I have now given them. I know that I have used the utmost impartiality in these examinations, sometimes convicting (if I may use the expression) persons of having drunk the pump water with impunity. But I must say that in the very great majority of instances, additional evidence revealed facts tending to implicate the pump. Indeed nothing has more conduced to the decided opinion I now hold upon the

filter: A container used to filter water of impurities.

subject than the gradual disclosure of important testimony, often directly opposed to that which was first given.

Lest, however, [anyone] should imagine that I have from the first been concerned only to establish a preconceived notion, I think it right to make known that when I first heard of the outbreak being attributed to the pump, I stated to a medical friend in a conversation which he well remembers, my belief that a careful investigation would disprove that theory. I based my idea of its in-[138/139] accuracy upon the fact already mentioned, and [so] well known to me, of several recoveries from complete collapse taking place, at least in spite of if not actually by reason of its constant use. Moreover, in a letter to the propounder of this theory acknowledging the receipt of a copy of **his book on cholera**, whilst admitting that his hypothesis afforded an ingenious and plausible explanation of the phenomena, I started an objection to his views on the propagation of the disease so far as they applied to this particular outburst. I shall presently refer to this objection, with intent to invest it with all the force to which it is entitled from the facts which have come under my notice. In the meantime I resume the detail of circumstances which tend to strengthen the suspicion against the pump.

6. A **gentleman**, who with his **two brothers** is brought daily by his business into Broad Street, informs me that **his mother**, who resided at Hampstead (West End), being very partial to this particular water, was in the habit of drinking it daily, having it fetched in a bottle by a cart that went every day from Broad street to Hampstead. She was seized with cholera on Friday (1 September) and died the next day. A lady staying with her at the time also drank of it and died. A servant drank the water and had a slight attack of diarrhoea. The accuracy of this state-[139/140]ment has been called in question. A lady, who having herself drunk the water without ill effect was disposed to doubt its connection with cholera, told me that she had heard that the person whose duty it was to take this daily supply to Hampstead, had in fact been in the habit of fetching it from some locality in Hampstead, in order to save himself trouble. I therefore returned to the son of the deceased lady and stated this to him, reminding him of the extreme importance of accuracy in such a matter. He most positively repeated his assertion that the water was actually taken from this pump. As far as trouble was concerned, it was less trouble to take this water than it would have been to procure any other, as the daily starting-place of the cart is situated not twenty yards from the pump. He further informed me that one of his brothers who was in the habit of drinking this water suffered from diarrhoea, whilst he himself and his other brother did not drink it and were not ill.

7. In a house, where I am well known, circumstances enabled me to

collect together in one room several mothers of families with whom I held conversation, at some length, relative to the habit of the inmates in respect of the water used for drinking. This method possessed the obvious advantage of their assisting and correcting each other's evidence. In this house there were, [in] a population of 32, the three following deaths from cholera. [140/141]

Deceased persons.	Age.	Date of Attack.	Date of Death.
Mr. _____ ...	38	31st Aug., noon	1st Sept., 1 A.M.
Mr. _____ ...	35	2nd Sept., 8 A.M.	15th Sept. (fever).
A boy	8½	2nd Sept., 9 A.M.	3rd Sep., 4.30 A.M.

In the first two of these cases, the drinking of the pump water previous to illness is beyond a doubt. I have set them down rather conspicuously, as I wish to call attention to a circumstance which, whilst it testifies to the reality of my own gradually-formed convictions concerning the pump, adds considerable weight to the reasons upon which they are based. By some mistake, I had at first assigned a wrong date of attack to the two first of these cases, viz.—5 September to the first, and 8 September to the second. The two widows having removed, I was led astray by a miscalculation on the part of a person still in the house. Neither did I detect the error by my own recollection, not having visited the house during the outburst. As my informant seemed positive in asserting that both the deceased were habitual drinkers of the pump water, I made a note (which I can produce) of the second case as being “a difficulty of the pump theory. For why, if, indeed deceased regularly used its water, and was plainly susceptible of cholera, had he not been attacked earlier?” [141/142]

When, however, I came in due course to seek out the widows, I at once discovered my mistake. With reference to the first case, the widow told me that her husband invariably drank the pump water before going to bed, sometimes to the amount of a quart, and that he certainly did drink it Wednesday evening, 30 August. She thinks that she herself did drink a little of it the same day (30 August), but is sure she drank none afterwards. A surviving child of hers, age 11, told me that he drank about half a pint from the ladle (attached to the pump) [on] 31 August [at] 1 P.M. and was none the worse for it. Another boy (the third fatal case above mentioned) is very likely to have done so. She sent her children out of the district [on] 1 September [at] 8 A.M. The other widow used to drink beer for dinner, whereas her husband drank the pump water. Respecting the other inmates of the

his book on cholera: Snow's *MCC2*, published in January 1855 after both had been added to CIC.

gentleman . . . two brothers: The Eley brothers, owners of the percussion cap factory at 38 Broad Street.

his mother: Susannah Eley; the same story was related to the GBoH inspectors (Document 28, p. 204), one of whom, Donald Fraser, informed Snow of this incident (Document 26-II, p. 191).

house, the family of eight to whom I have before alluded were among the number. Of the rest, I ascertained during the above-mentioned conversation that 14 persons who were not attacked never used the pump water. About the four others I know nothing.

8. In another house where I had a similar opportunity of examining the remaining inmates collectively, I found that 20 out of 30 who resided there at the beginning of September never used the pump water. Most of them [gave] their reasons for not doing so. None of these 20 suffered. [142/143] Concerning six others, I could learn nothing as they were gone away. Of the other four, two died of cholera who were plainly shown to have drunk this water shortly previous to being attacked. The remaining two (father and daughter) recovered from diarrhoea. The mother at first told me that none of her family ever had water from the pump. On mentioning my question afterwards to her daughter, the latter recollected that she did drink it and gave a reason for having done so. The father says he did not drink it.

9. There is a family, twelve in number, in this street, of whom two only were attacked,—two boys, who recovered. The parents informed me that they never used the pump water and that they had forbidden their children to drink it from the ladle. On my questioning the children as to their obedience in this matter, it turned out that the two who were ill had drunk it in this way within forty-eight hours of being seized, and that none of the others had. It was fetched for them during their illness, and their mother began drinking it Sunday evening, 3 September, without ill effect.

I have throughout been careful to bear in mind this general use of the pump water during the period of illness, always asking the surviving relatives whether it was not likely that they themselves took this opportunity of drinking it and especially taking pains to distinguish between its [143/144] use by the sufferers before and after the hour of attack.

10. In the next house to that in which this family lived resided a young couple. The husband was seized [on] 1 September [at] 9 A.M. and died the same day at 12 P.M. His wife, though she nursed him, escaped. She at first told me that he never drank water from the pump. Afterwards [she] recollected that, quite contrary to his usual custom, he desired her to fetch some for dinner on Wednesday 30 August 30, of which she was sure that she did not partake. This case is interesting as shewing, if indeed the pump were in fault, that the interval between the drinking of the water and the attack was in one instance about forty-four hours.

11. Just opposite to the pump on the north side of the street lived a family of five persons. Four of [them] (mother, father, and two grown-up

daughters) were, with distressing rapidity, swept away by the pestilence. They were all drinkers of the pump water, including the one survivor, a lad, who certainly drank some (though but a little) [on] 31 August but was away the greater part of the following days.

12. In a family of four, the father was fatally seized [on] 1 September [at] 11 A.M.; a son, not fatally, [on] 2 September [at] 5 A.M.; another son, fatally, [on] 6 September [at] 8 A.M. The mother alone was not attacked. She is sure she never drank the pump water. She is equally sure that her husband and the son who [144/145] was first seized did drink it. She is not so sure about the other son.

13. Two sons from a family of seven are known to have drunk the pump water from the ladle. One was fatally seized the next day with cholera. The other had a not fatal attack of diarrhoea. No other member of the family either drank this water or was ill.

14. In another family, a son, age six, was seized [on] 2 September [at] 6:30 P.M. and died [on] 4 September [at] 11:15 A.M. The father was seized [on] 5 September [at] 7:30 P.M. and died [on] 6 September [at] 10:15 P.M. The mother never drank the pump water. Her husband often did. She knows he did between 1 September and his illness. She thinks it likely the boy did drink it because it was his practice to do so. The girl may, or may not, have drunk it.

15. The last instances of this kind of evidence which I shall adduce are the result of a series of investigations respecting the inmates of a single house. They are especially worthy of notice, not only as adding a striking confirmation of all that has been previously recorded, but as being a fair illustration of the manner in which the whole inquiry has been conducted and as shewing, very remarkably, the utter worthlessness of hastily collected facts.

A father, mother, and grown-up daughter occupied the ground floor. The daughter was [145/146] attacked [on] 2 September and died the same day. The mother assured me that they drank but little water and that from the cistern. I then questioned her more particularly as to what they actually did drink on 1 September. She said that she believed her husband and daughter had some gin and water after she was gone to bed, but added that the water was doubtless from the cistern. The husband was in the room during the conversation but, being very deaf, could not hear it. I raised my voice and asked him whether he remembered having this gin and water? He did. Did he know where the water came from? From the pump. How did

they take the water? He took it hot and his daughter took it cold. Was he ill afterwards? No.

I next went to the top of the house where [there] lived a family consisting of father, mother, a little girl about ten years old, and an infant. They had moved out of the district [on] 4 September 4 but had recently returned. I asked whether any of them had been attacked with cholera or diarrhoea? No. Were they in the habit of using the pump water? Yes. Who fetched it? The little girl. Was she not afraid (I then asked the child) [when] going through the streets to see the shutters all up and so many hearses about? Didn't go through the streets. Why not? Was ill in bed with a cold. I asked the mother whether that was the case. [146/147] She then called to mind that it was so. Who fetched the water when the child was unable to go for it? Why then they got it from the cistern.

The adjoining rooms had been occupied at the time by a young couple with [an] infant child and a female lodger. They were now gone away. But as I knew that one or more of them had been attacked, I went after them. [I] found that the husband and lodger had both had been seriously ill (collapse) but had recovered in different hospitals. The latter was the first attacked, [on] 1 September [at] 1 P.M. The former was seized on the 2nd but not collapsed till the 5th. His brother, who had spent the day (1 September) with him, was taken ill at his own home and died. Had they been in the habit, I asked, of drinking the pump water? No. When the young woman was attacked, what did the doctor recommend? Spring water. Where was it obtained? From the pump. When this water was in the house, did he drink of it? He then remembered that he did. Was it likely that his brother drank it? Very likely. Had the young woman taken any [pump water] previous to her illness? He thought not, but as she was now in a situation in the suburbs, he could not say. I then wrote the question with great distinctness on paper and desired him to put it to her [at] the first opportunity. Some time afterwards, I met him in Broad Street when he told me [that] he had put the question. She [147/148] replied that she did drink it [on] 31 August. I subsequently went again to their present lodgings in order to inquire, particularly of the wife who had escaped entirely, whether she also might not have drunk the water at the same time. She very positively affirmed that neither she nor her child, which likewise escaped, drank any of it. She added that it is, and has long been, her practice to drink no water without first boiling it.

Two women also died in the same house. One was attacked [on] 3 September [at] 9 A.M., the other [on] 6 September [at] 4 P.M. Concerning the former and her habit as to drinking of water, no one could speak. The latter was described to me as a person not likely to have drunk water at all, a description which, however paradoxical it may seem, has in not a few instances supplied the clue which has led to clear discovery of the actual use of

the pump water. I ascertained that she nursed the other woman and washed her things on the day previous to being herself seized.

With respect to the evidence of persons at that time drinking the pump water with impunity, I have already set it forth quite as strongly as I could. I have also mentioned instances of deaths from cholera of persons who did not appear to have drunk this water previous to illness. Among the most noticeable of these is the case of a gentleman who was taken ill [on] 1 September at noon and [148/149] died 17 hours afterwards. His daughter informed me that he never drank the pump water, whilst she herself and the shopman, being the only other inmates of the house, drank it daily. Neither must I omit to state that I have found four families amongst whom the pump water was in constant use, more of whom seem to have taken it with impunity than with ill effect. The proportion in each case [was] 3 to 1, 3 to 1, 5 to 2, and 5 to 1.

I have not met with any family of magnitude worth mentioning who drank it *throughout* without ill effect to one or more of its members. There may be such instances. I only say I have not met with them. I have left nearly 400 of the then inhabitants of Broad Street unaccounted for. Possibly if I could have examined them all I might have discovered some striking exceptions. They may even yet be heard [from]. And I hope they will, if indeed there are such to be found, for there is nothing like sifting a matter of this sort to the very bottom. It is far too important a subject to be sacrificed to the symmetry of a theory.

I know a family of six who all drank it without injury at dinner [on] **3 September [at] 3 P.M.** The lad, a neighbour's son, who fetched it for them was fatally seized that same evening, but he had drunk some the previous day. Another family of five had it for dinner on the 4th and no harm followed. [149/150]

It will probably be expected that I should state something about the sanitary condition of the houses. I feel bound to say that as far as Broad Street is concerned, there is this connection between defected sanitary arrangements and the cholera: A house ill-regulated in other respects is [unlikely] to have its receptacles for the company's water [properly] attended to. Without pointing (as I could) to individuals instances of sad and culpable neglect, I shall content myself with saying that I well know that many of the unfortunate deceased were literally driven to resort to the pump through mistrust of the cistern. A constant supply from the main, with total abolition of cisterns, is an imperative necessity.

Here let me invite attention to the fact, apparent from the statistical table, that the population of the houses which escaped was decidedly below the average house population throughout the street. . . . The houses

3 September [at] 3 P.M.: Snow first tested the pump water several hours later and found it clear of organic impurities.

containing few persons are precisely those which, being for the most part the best regulated in all respects, are consequently the best regulated in respect of the cisterns. There is therefore less, or rather no, need for the inmates to resort elsewhere for water. To which must be added that scantiness of population in particular houses is owing to the absence, often to the absolute exclusion, of children, whom I have found to be the general carriers of the pump [150/151] water wherever it is habitually used. And here I imagine is a reasonable account of the comparative immunity from cholera in [this] neighbourhood of old, infirm and isolated persons—they had no one to send for the pump water.

practical: Those with special experience and training.

The subject of defective drainage ought, perhaps, not to be handled by any but **practical** men. As there is little need, however, of a special or technical education to render one sensible [to] grievously offensive stench, I may at least venture upon the assertion that I have long been aware from painful experience that many of the house drains in Broad Street are in a condition peremptorily demanding the attention of gentlemen professionally acquainted with such matters. Yet there does not seem to be any strong ground for believing that exhalations from house drains had overmuch to do with cholera in Broad Street. I suppose it might reasonably be expected that, if such had been the case, the disease should have found an undue proportion of at least its earliest victims among the inhabitants of kitchens or, as they might truly be termed, cellars. I have already shewn that the kitchen population of Broad Street was not quite decimated, whereas the population of the whole street was just more than decimated. But the manner in which the date of attack in each case bears upon the point in noticeable enough to deserve a full setting forth. [151/152]

It will be observed that three women who died of cholera in kitchens had recently washed cholera linen, a fact to which I merely call attention, leaving it to others to connect it with the attack, or not, as they please.

Kitchen Population 68. Deaths 6.			
	Time of Attack.	Drank the Pump Water.	Remarks.
A Child .	2nd Sept. (slightly)	Doubtful ...	Got worse Sept. 4th.
A Boy ...	4th ,, 9 A.M. ...	Yes.	
Mrs. —	4th ,, 1 P.M. ...	No	} Had recently washed Cholera Linen.
Mrs. —	4th ,, 4 P.M. ...	{ Not ascertainable.	
Mrs. —	6th ,, 4 P.M. ...	No	Ditto.
Mrs. —	9th ,, Noon ...	No	Ditto.

Moreover, a child living in a kitchen was very severely attacked 2 September

[at] 7 A.M., but recovered. It is not certain, though by no means unlikely, that she drank of the pump water. In another kitchen, a father and daughter were simultaneously seized [on] 5 September 5 and recovered. The daughter had used the pump water, the father not. In another, a family who used the pump water suffered a good deal from diarrhoea. I don't know the dates of attack. Thus, it appears that I only know of two attacks in kitchens in Broad Street during the first four days of the outburst, and of not one during the first two days. [152/153]

There are questions relating to the duration of the pestilence and its probable connection with the pump which I must not omit to notice, though I do not find myself in a position to answer them satisfactorily. Upon hypothesis of this connection being made out: How long did the pump water continue to exert a deleterious influence? Had it gradually become thus noxious? Did it gradually cease to be so? I confess to considerable hesitation in attempting to answer these questions. Neither would I venture upon the subject at all but that I feel, if the hypothesis indeed be true, that it is a step in the right direction to make the attempt. I perceive that I am not in possession of sufficient data, which I **regret** . . . Had [I] known from the first the right way to discharge the duty of a collector of facts, these questions might have been well nigh settled.

What does Whitehead **regret**? That he used an inductive method? What was "the right way" in his mind?

Some facts, however, may be stated. The pump handle was taken off on Friday 8 September. But by that time, the epidemic had evidently subsided. Neither, as I have already stated, have I been able to trace any connection between the pump and the few attacks subsequent to Wednesday 6 September, 8 A.M. It is rather strange that I have had to record that same date and hour of attack, both in the last fatal case and also the last non-fatal case in which such connection is made out. There were but five fatal attacks in Broad [153/154] Street after that hour. I know of only two attacks not fatal in this street after that same hour. But as I have unavoidably left nearly 400 of the then inhabitants of the street unexamined, I . . . admit that my records of diarrhoea (not fatal) must be incomplete, as [well as] the records of the use of pump water with impunity.

Had the pump water become innocuous? Or had it already swept off the majority of its drinkers, leaving unscathed just those of them who were not susceptible [to] its evil influence?

I must here, for once, transgress the rule I have observed of confining myself to Broad Street and avail myself of a table relating to duration of illness during the first five days. I constructed [it] several months ago from the Registrar-[General]'s returns for the account which I then wrote of the 376 deaths from cholera which took place throughout St. Luke's district parish. This table, however, is not complete. The duration of illness [was] in

some cases omitted in the returns. And no returns for the first nine days of September [appeared] from one, at least, of the hospitals to which several of the patients were conveyed. The amount of incompleteness may be reckoned if I state that during the first five days of September the number of deaths in that district—a number, however, itself incomplete—were 42 on 1 September, 63 [on] 2 September, 41 [on] 3 Sep-[154/155]tember, 43 [on] 4 September 43, [and] 23 [on] 5 September. It must be noticed that the dates given below are of *deaths*, not *attacks*.

TABLE OF DURATION OF ILLNESS.														
Hours.	SEPT. 1st.	Deaths.	Hours.	SEPT. 2nd.	Deaths.	Hours.	SEPT. 3rd.	Deaths.	Hours.	SEPT. 4th.	Deaths.	Hours.	SEPT. 5th.	Deaths.
10&under.	10		10&under.	9		10&under.	1		10&under.	2		10&under.	4	
10 to 20	23		10 to 20	23		10 to 20	14		10 to 20	11		10 to 20	8	
20 to 24	3		20 to 30	6		20 to 30	8		20 to 30	4		20 to 30	2	
Over 24	1		30 to 40	2		30 to 40	1		30 to 40	2		30 to 40	0	
			40 to 48	7		40 to 50	4		40 to 50	3		40 to 50	1	
						50 to 80	3		50 to 80	3		50 to 80	2	
									80 to 100			80 to 100	1	

... Supposing the number of rapid cases assigned to each day may be taken as an index to the malignancy of the cause (whatever that cause may have been), there was then a very perceptible decrease of malignancy after the cause had been in operation somewhat over forty-eight hours. However, [there was] no corresponding rate of diminution ... in the two last days here mentioned. Reference to **the table** in which I gave the dates of fatal attacks in Broad Street points to a similar conclusion. ... The mortality and even the illness in this street had subsided, almost to total disappearance, decidedly previous to the locking up of the pump. The second, unmistakable decrease of cholera and diarrhoea in Broad Street dates from Wednesday 6 September, after 8 A.M.

Respecting the commencement of the outburst, [155/156] there is, of course, somewhat less uncertainty in this matter. There was the case, already mentioned, of a man drinking the pump water only on Wednesday 30 August [at] 1 P.M.; although six persons were fatally seized on Thursday 31 August, [he] was not attacked till Friday 1 September [at] 9 A.M. Thus we have, in one instance, an interval of 44 hours between the drinking of the water and the attack. I have reason to believe that this interval varied considerably in different cases. It is obvious that this varying interval renders it exceedingly difficult, if not impossible, to calculate either the time or the rate at which the water became free from pollution. The day of greatest pollution must have been 31 August.

I cannot help thinking that the decided diminution of fatal attacks

on Sunday must have been owing to a partial purification (however effected) of the water on Saturday. Whether we are to infer from the above facts a returning impurity of the water acting on a diminished number of drinkers must remain an open question. I trust that no one will be for settling these questions by single instances. I myself drank a little of the pump water, with brandy (cold), with impunity on Sunday evening at eleven o'clock. Whatever may have been the cause of the outburst, it will certainly be found that some, if not many, who were exposed to it did not suffer. If, for instance, it were atmospheric, it cannot be denied that we all breathed the air. [156/157]

What, then, was the matter with the pump? I did not consider that, so long as I was merely engaged in collecting facts, it was any business of mine to hazard even a conjecture upon this subject. But when the fact of a connection between the pump and the pestilence did appear to be established, I then thought it my duty no longer to keep that point in abeyance. The possibility of the water having been contaminated by matter thrown off from a cholera patient who might, so to speak, have imported the disease from another locality, had often been discussed in committee. It had been agreed that, as yet, no evidence had been discovered which would support such a supposition.

There were, indeed, cases of cholera towards the latter end of August in the upper part of Marshall Street, the sewer from which runs close by the pump well. But as it is a new sewer, built so recently as 1851, it was deemed very unlikely that it should be found to leak. Moreover, even if it did leak and if one or two isolated cases had in this way polluted the pump water, why should the epidemic have so rapidly subsided when scores of subsequent cases on the same line of sewer must have added intensity to its cause? This was the objection which I had myself urged against such [an] hypothesis. Neither was it thought at all probable, or possible, inasmuch as the house in Marshall Street is situated about fifty [157/158] yards from the pump, that percolation from a cesspool at such a distance would have taken place through the intervening ground without all noxious particles being eliminated in the process of filtration. Similar objections held against the likelihood of contamination of the pump well from the first case in Broad Street. The house where it occurred [is] nearly thirty yards from the pump.

As I could ascertain little about this case, I took extra pains to inquire into what I then supposed to have been the only other case in the street previous to the great outburst. It was the one dated in the **second table** as commencing on Monday 28 August [at] 5 A.M. ... The patient came from Bayswater on Wednesday 30 August 30 and so may have brought the disease with him. He was sent back to Bayswater seven hours after he was attacked. Having already calculated that the probable time when the

the table: On page 128.

second table: See page 124.

pump water became sufficiently injurious to produce fatal effects was early in the afternoon of Wednesday, I examined into this case with considerable interest. I could elicit nothing, however, to distinguish it from the other early cases upon the point immediately in question. The house in which it occurred is more than thirty yards distant from the pump.

At this time, I supposed myself to know for certain that, throughout the whole street, there had been no other case before twelve o'clock on Thursday 31 August. One of the earliest [158/159] cases on that day did, indeed, occur in the house which is the very closest of all to the pump, but it was not actually the earliest. The three first cases in Broad Street on that day were so nearly simultaneous as to preclude [any possibility except] . . . a common origin. One day last week, however, I happened to be studying the registrar's returns for a purpose unconnected with this matter, when my eye suddenly fell upon the following entry [on] page 340:

“At 40, Broad Street, 2nd September, a daughter, aged five months, exhaustion, after an attack of diarrhoea four days previous to death.”

I knew the case and had recorded the date of death. Somehow [I] had **neglected to inquire about the date of attack**, having passed it by lightly, I suppose, because it was the case of an infant. [Nor] had it occurred to me that the child might have been ill all the week. I immediately went to the house and ascertained from the mother, who occupied the back parlour, that the child was attacked on Monday 28 August. The dejections at first were abundant but ceased on Wednesday 30 August. In answer to further questions, she told me that the dejections were collected in napkins which . . . were immediately steeped in pails, the water from which was poured partly into a sink in the back yard and partly into a cesspool in the front area.

3 April.

[159/160] Being struck with the dangerous proximity of the cesspool to the pump well, I lost no time in communicating the facts to the committee,³ who ordered an investigation to be made forthwith. This investigation, carried out by our Secretary and Surveyor, is described elsewhere. It clearly established the general fact of percolation of fluid from the cesspool into the well. I do not pretend to any practical knowledge of such matters. But having been down the well and examined the places where the steining was removed for the purpose of inspection, I can at least say that I saw enough to convince me on this point. The importance of this investigation, even apart from any consideration of cholera, cannot be overrated. The sooner all shallow pump wells are filled up and all house drains vigorously examined, the better. As to whether any light be here thrown upon the propagation of

³[Whitehead's note:] This was done on 3 April, on which day also the substance of the preceding portion of this report was for the first time laid before the committee.

neglected to inquire about the date of attack: Actually, Whitehead noted the date of attack earlier in his report; see page 126.

cholera, let every one form his own opinion.

In the same house where the above-mentioned infant died, there were several cases of cholera. For the convenience of the reader, I have fully recorded all the deaths which happened in this house in the following table. [160/161]

No. 40, BROAD STREET.						Whether or no drank the Pump Water previous to illness.
Floor.	Age.		Date of Attack.	Date of Death.		
Back Parlour	6 mths	L. ...	28 Aug. 6 A.M.	2 Sep.		No.
1st Back ...	25 years	Mr. G.	31 Aug. 1 P.M.	2 Sep. 1 P.M.		Yes.
3rd Back ...	25 do.	Mr. R.	1 Sep. 9 A.M.	18 Sep. in hospital		Yes.
Ditto ...	36 do.	Mrs. G.	4 Sep. 6 A.M.	5 Sep. 10 A.M.		Yes.
Back Parlour	49 do.	Mr. L.	8 Sep.	19 Sep.		No.

The last and first cases are of father and child. It will be observed that whereas the child was attacked 78 hours before the commencement of the general outburst, the father was not attacked till the day the pump was locked up. Nothing has been elicited to throw light upon the cause of attack in either case.

What is more important, however, in reference to our present inquiry [are the following questions]: If matter thrown off from the child and poured into the cesspool in the front area during the early days of the week percolated [into] the ground and contaminated the well, why did the number of attacks so sensibly and rapidly diminish on Sunday 3 September, when matter from two adult cholera patients had been poured down **the same place** during the later days of the week? Why, moreover, did the epidemic so nearly disappear from Broad Street on or after 6 September when another person was attacked in the same house [on] 4 September?

I have already said enough to shew that I am not in a position to answer these [161/162] questions. [However,] I might make some plausible suggestions. For instance, the drinkers of the pump water were not so numerous when so many who habitually used it were already dead—an allowable supposition, seeing that several hundreds were attacked in the first three days within 210 yards of the pump and I have shewn how few habitual drinkers of its water among the inhabitants of Broad Street escaped. Again, on and after 4 September, the residents were quitting the street in great numbers. Or, it might be [argued] that the unusual drain upon the well caused by the intense thirst of the sufferers (who, as I have said, were generally supplied with the pump water) might in some measure account for the rapid change in its quality. But as these suggestions are not conclusive to

the same place: See page 166, where subsequent inquiries showed that few, if any, dejections from the two patients on the third floor entered the cesspool.

myself, I do not desire they should be so to any one else. For my own part, I cannot state from the facts before me whether the water did actually get continually purer, or whether it first became purer and then got worse again. Of one thing I am certain. The case against the pump is strong enough to render wholly unnecessary . . . any impatience at objections, however formidable they may appear. I cannot but feel that, whatever uncertainty there may be about the nature of infantile diarrhoea, the plain fact of this child's dejections being poured into a cesspool (the connection between which and the pump well has been clearly established) for a period of three days immediately preceding a great outburst, the phenomena of which point so decidedly to the pump as its origin, is indeed a very remarkable coincidence.

8 May.

* * *

Since the above has been written, I have called on Dr. Rogers . . . , who attended the infant in 40 Broad Street during [her] illness. He has very kindly furnished me with the following particulars respecting the case:

56 Berners Street
30 May 1855.

Sir,

Anxious to comply with your request to give all the particulars I could remember of the illness of which Mrs. [Lewis]'s female infant died last September [but] not having kept any notes of the case, I deemed it advisable . . . [first] to see the mother and clear up some points of which my memory retained but an uncertain recollection.

The infant, the subject of your inquiry, was brought up by hand, or bottle. [Her] mother, from ill health and want of milk, [was] not able to suckle [her]. [She] appeared to thrive better on its food (principally boiled ground rice and milk) than [her] brother, who died two or three years ago and whose history I will subsequently briefly refer to. [She] was born, I believe, in April 1854 and was attacked with a diarrhoea the following June. [Her] evacuations were pale and slimy, sour and offensive. [She] was under treatment for about five days. [Thereafter, her health] continued pretty well till 14 August, when [she] had a similar attack which, however, gave way to treatment in two or three days.

On the morning of Monday 28 August, I was sent for to see the infant. [I] and found [her] again [163/164] suffering from another attack of diarrhoea, but now accompanied with sickness so that little medicine or food could be retained. [Her] dejections were pale, slimy, and watery, [and]

smelt very offensive. The mother tells me they were now and then of a mixed greenish and cream colour. This state of purging and sickness continued till Wednesday (the 30th). I never saw, that I can remember, what might be taken for cholera stools. She never looked bluish, had no cramps, there was no cold stage or collapse nor subsequent fever. She always passed her urine which stained the napkins. From Wednesday (the 30th) till Saturday (2 [September]) there was no purging or sickness. She could take little food, appeared quite exhausted, and died very quietly on Saturday at 11 a.m., aged 5 months. The mother now tells me that the sickness was the only difference she observed between the last and former illnesses.

Mrs. [Lewis], whose health was so bad while pregnant with this child, had equally bad health previous to the birth of a male infant, born about three years ago. [He] was likewise brought up by bottle. [He] lived only ten months. [His] lungs and mesentery were diseased. [He] had cough. Recurring attacks of diarrhoea finally carried him off . . . [like his sister], for I cannot separate these two children's cases. They exhibit a close relationship to my mind, for we well know that many children are continually carried off when brought up by hand by similar disorders.

I have been informed by Mrs. [Lewis] that [she] and niece were both attacked with severe diarrhoea the week preceding the infant's last illness. They both recovered without having taken any medicine, though this disease and cholera was spreading and had already become fatal in their neighbourhood. During my attendance on the infant, Mrs. [Lewis] had a relapse, with spasms and cramps, and was then treated by me with immediate success. I learn from the mother that the infant's napkins were first soaked in cold water, which was thrown down the sink or privy. The napkins were then properly washed.

Having been asked the history of the one infant's illness, I felt I was called on to allude to the [164/165] death of the previous one and to make known the attack which the mother and niece had suffered from before the infant's illness. . . . The fatal cases of cholera which subsequently occurred in the house, one of which was the father of the infant, will be given and reported on by others. I will not, therefore, further refer to them. Having given the information you required of me,

I remain, Sir,

Yours, &c.

W. R. Rogers.

It is not for me to discuss the probable difference of opinion which may arise among medical men as to the nature of this child's illness. Whether or not they may choose to decide that "the accompaniment of sickness" in its third attack (28 August) and "the relapse of [the] mother, with spasms

and cramps” on that occasion indicate the presence of choleraic symptoms, it is for me only to call attention to the coincidence. . . . I am aware of two or three pump water drinkers in Broad Street who were attacked rather sharply with diarrhoea about a fortnight before the outburst, one of whom afterwards died of cholera and another recovered from cholera during the great outburst. And . . . I have long since made mention in print [that] “one night in August, when the inhabitants of certain contiguous streets and courts (the very same which have just suffered so severely) were very generally attacked with diarrhoea.” [Nonetheless, I cannot] speak [165/166] with sufficient positiveness to connect these attacks in point of time with “the previous illness of the infant on 14 August.” Even if it should be that we really are on the right track, I know that at this late period it is impossible to unravel the matter in such a way as to meet all objections. I suppose that another epidemic—if unfortunately we should have one—will set all these points at rest. Meanwhile, we must be content with securing a prospect of ready attention to one important subject of investigation.

third floor of No. 40:
See table on page 161.

It is worthwhile, however, to state that by recent inquiry, I have ascertained that the dejections of the patients in the **third floor of No. 40**, owing to great hurry and confusion, were so disposed of that but little could have found its way into the cesspool at all. My attention has also recently been called to the cross drain from the bottom of the stack pipe of No. 39 (see Mr. York’s diagram). There were three deaths from cholera in No. 39, the attacks being on 1, 2 and 4 September. Two [were] of 12 hours duration, one of 24 hours. The point of junction of the two drains will be apparent from the surveyor’s diagram. Whether this fact be considered to increase the difficulty which I have raised will depend upon the precise place and manner of the supposed fatal communication. This is not easy to determine. Even if it could have been ascertained by scientific experiments at [166/167] the time of the excavation, [it] cannot now be discovered owing to the altered state of the drain.

Henry Whitehead, M.A.

5 June 1855.

* * *

I had fully intended to avoid making any mention whatever of other streets, being apprehensive from my Broad Street experience, of being gradually drawn into an intricacy of investigation, to the complete statistical unravelling of which I should certainly have found myself unequal. Yet I feel it necessary to record my opinion, founded upon continuous inquiry, that a like investigation of any other street in the cholera area would have elicited similar, and even more striking, evidence in favour of the pump hypoth-

esis— more striking because abounding in more marked contrasts than were likely to be met with in the immediate vicinity of the pump.

Having already taken up so much space, I must omit the streets and courts intervening between the centre and the outskirts of this area and briefly allude only to the outskirts. Four deaths occurred in the corner house of Brewer Street and Little Windmill Street, and four more in a house towards the north of Poland Street. In each of these houses, the use of Broad Street water in August and September (1854) is beyond a doubt. Three deaths also occurred in a house close to the dead wall in Noel Street, where the use of this water at that time is more than probable. These facts, as well as the following, are interesting as tending to disprove the reiterated assertion that the outbreak extended beyond the reach of the pump.

St. Ann’s Court (Soho), although the most remote spot of the infected district from the centre of the area, is yet by actual measurement throughout its whole length nearer to the Broad [167/168] Street pump than to any other. Not having any knowledge of its inhabitants, I did not venture to examine them. But the person (himself residing there and by his position well acquainted with the people) who kindly furnished me with its statistics of cholera, informed me that the Broad Street water was much used there. The distance from the centre of this court to the Broad Street pump is almost 240 yards.

On the other hand, Cross Street, though actually nearer to another pump, is not so remote as St. Ann’s Court from that in Broad Street. As a matter of fact, the inhabitants of Cross Street did resort in August and September (1854) to the Broad Street pump, having (whether with or without reason) conceived a dislike to the water from Little Marlborough Street. A friend of my own, having more than once urged Cross Street as [an] obvious objection to the water theory, went and made some inquiries in it. When I next saw him he begged to withdraw his objection.

Peter Street affords, perhaps, as singular an instance as could be found of what has often been termed the capriciousness or eccentricity of cholera. In the smaller portion of it, extending from Green’s Court westward to the dead wall, there occurred 19 deaths. In its larger portion, extending from Green’s Court eastward to Wardour Street, there was only one death. Now, as a matter of fact, the whole of Peter Street lies, if you measure along the thoroughfare, nearer to the Rupert Street than to the Broad Street pump. But as you approach the dead wall, it would take a good judge of distance to decide the point without actual measurement. The house at the corner of Peter Street and Hopkins Street is only four yards nearer to the former than to the latter pump. Consequently its opposite neighbour, No. 23 where 12 deaths occurred, is just so much the nearer still, as the width of a narrow street may render it, to the former. Under these circumstances,

especially taking into consideration the circuitous route to Rupert Street, it need not be thought strange if the western population of Peter Street sent to the Broad Street pump. In No. 23, two families supplied nine out of the twelve victims to the disease. A sur-[168/169]viving member (the mother) of one of these families informed me that they had water from Broad Street at dinner the day (31 August) before her three deceased relatives were seized. In our parish school on Wandsworth Common, I recently encountered by accident a girl belonging to the other family. Father, mother, and four brothers or sisters were all swept away by cholera. She told me that they were in the habit of using the Broad Street water. As you go eastward from this house, of course, the uncertainty as to the relative distances of the two pumps becomes less and less. Having occasion one day for some other purpose to visit a house only three doors to the east of No. 23, I took the opportunity of questioning a very intelligent man on the point. He said that being of opinion that the Rupert Street pump was the nearest, he always sent to it when he did not use the cistern water. There was, as I have said, only one death in Peter Street east of No. 23. Upon inquiry, I found that it was in a family among the members of which, four nearly simultaneous attacks, three not proving fatal, took place on Sunday morning, 3 September. They had not habitually used the Broad Street water. But it so happened that on Saturday afternoon, 2 September, the deceased (a lad) fetched a large can of it and began drinking it freely. The father remarked that he would be ill if he drank so much, but the mother said it would do him no harm as it was spring water from Broad Street. . . . They all commenced drinking it, with what result has been mentioned.

The solitary death from Walker's Court was that of a person who was known often to drink the water [in the] evening. She died in the country, having gone away to escape the pestilence. I shall only add that Mr. Harrison, Surgeon, of Berwick Street was an habitual drinker of this water and, in fact, did drink it as usual for dinner the day before he was fatally seized. Mrs. Harrison, on whose authority I state this, also drank it and was none the worse for it.

H. W.

5 June 1855.