

Document 26–IV (Online Companion)

John Snow's account of the investigations he conducted during and after the Broad Street cholera outbreak, as presented to the parish Cholera Inquiry Committee¹

After exhibiting a map of the outbreak area at the 4 December 1854 meeting of the Epidemiological Society, Snow undertook additional inquiries in the former cholera field. A week later, he presented the newly established Cholera Inquiry Committee of the parish of St. James, Westminster a revision of the account he had previously submitted for publication as a second edition of *On the Mode of Communication of Cholera*.

Having been requested by this Committee to draw up a Report on the water used in the locality so severely visited by Cholera, I beg to lay the following statement before you:—

The water supply of the district consists of that of the water companies and that of the street pumps. The subdistrict of Golden Square is supplied by the Grand Junction Company, with water from the Thames, facing Brentford at Kew, which is almost entirely freed from animal and vegetable impurities before it is distributed. The subdistrict of Berwick Street is supplied by the New River Company. The division between the companies [is identical to] that between the two subdistricts of the parish just named. The remaining districts supplied by the Grand Junction Company have been remarkably free from cholera, both during the present year and in 1849. Most of the districts supplied by the New River Company have also been lightly visited by the malady on [9/7/98] both occasions. There is, therefore, in my opinion, no reason to suppose that the water of either of these companies contributed to the late outbreak of cholera. One circumstance which remarkably confirms this view is that the outbreak commenced on the same day, and almost at the same hour, in both subdistricts. If it were possible that any pollution of the water supply of the two companies could have taken place, we cannot suppose that it would have occurred at the same time, at two adjoining spots, and in two systems of pipes in which the supply is derived from such very different sources.

With respect to the pump wells, I found some impurities in the water of each of those which I examined in the first week of September in the Golden Square district, except the one in Vigo Street. The water of the pumps in Broad Street, Warwick Street, and Bridle Lane all contained impurities visible to the naked eye on close inspection in the form of minute,

¹ "Dr. Snow's Report," in Cholera Inquiry Committee [CIC], *Report on the Cholera Outbreak in the Parish of St. James, Westminster, during the Autumn of 1854* (London: Churchill, July 1855), 97–120, in References (Online Companion). Snow dated this account 12 December 1854, when he apparently presented it to the CIC prior to being asked to join it.

whitish, flocculent particles. The water of the pump in Marlborough Street contained a still larger quantity of organic impurities than the others, and most of the people in its neighbourhood avoided using the water and sent [instead] to Broad Street.

In my opinion, mere impurity in the water would not cause cholera unless it were of a special kind—unless, in fact, the impurity had proceeded from a cholera patient. Dr. Lankester has, I believe, particularly examined [98/99] the water of the pump in Broad Street, which is situated in the centre of the area in which the mortality from Cholera occurred. He will, no doubt, inform the Committee of the result of his researches. Dr. Hassall was good enough to examine some of this water, at my request, with the microscope. He informed me that the particles I have mentioned above had no organized structure; he thought they probably resulted from the decomposition of other matter. He found a great number of very minute, oval animalculæ in the water, which are of no importance except as an additional proof that the water contained organic matter on which they lived. I found that the water also contained a large quantity of chlorides—indicating, no doubt, the impure sources from which the spring is supplied. Mr. Eley of 38 Broad Street informed me that he had long noticed that the water became offensive, both to the smell and taste, after it had been kept about two days. A person at 6 Poland Street also informed that he had noticed, for months, that a film formed on the surface of the water after it had been kept a few hours. These are characters of water which is contaminated with sewage.

I inquired of many persons whether they had observed any change in the character of the water about the time of the outbreak of cholera, and was answered in the negative. I afterwards, however, met with the following important information on [99/100] this point:—Mr. Gould, the eminent ornithologist, lives near the pump in Broad Street and was in the habit of drinking the water. He was out of town at the commencement of the outbreak of cholera, but came home on Saturday morning, 2 September, and sent for some of the water almost immediately. He was much surprised to find that it had an offensive smell, although perfectly transparent, and fresh from the pump. He drank scarcely any of it. Mr. Gould's assistant, Mr. Prince, had his attention directed to the water and perceived its offensive smell.

Whether the impurities of the water were derived from the sewers, the drains, or the cesspools (of which latter there are, I believe, a number in the neighbourhood) I cannot tell. I have been informed by an eminent engineer that whilst a cesspool in a clay soil requires to be emptied every six or eight months, one sunk in the gravel will often go for twenty years without being emptied, owing to the soluble matters passing away into the land springs by percolation.

I requested permission on 5 September to take a list at the General Register Office of the deaths from cholera registered during the week ending 2 September in the subdistricts of Golden Square and Berwick Street, St. James's, and St. Anne's Soho, which was kindly granted. Eighty-nine deaths from cholera were registered during the week in the three subdistricts. Of [100/101] these, only six occurred on the first four days of the week. Four occurred on Thursday, 31 August. The remaining 79 [occurred] on Friday and Saturday. I considered, therefore, that the outbreak commenced on Thursday. I made inquiry in detail respecting the 83 deaths registered as having taken place during the last three days of the week.

On proceeding to the spot, I found that nearly all the deaths had taken place within a short distance of the pump in Broad Street. There were only ten deaths in houses situated decidedly nearer to another street pump. In five of these cases, the families of the deceased persons told me that they always sent to the pump in Broad Street as they preferred the water to that of the pump which was nearer. In three other cases, the deceased were children who went to school near the pump in Broad Street. Two of them were known to have drunk the water, and the parents of the third think it probable that it did [al]so. The other two deaths beyond the district which this pump supplies represent only the amount of mortality from cholera that was occurring before the eruption took place.

With regard to the 73 deaths occurring in the locality belonging as it were to the pump, there were 61 instances in which I was informed that the deceased persons used to drink the water from the pump in Broad Street, either constantly or [101/102] occasionally. In six instances, I could get no information owing to the death or departure of every one connected with the deceased individuals. And in six cases, I was informed that the deceased persons did not drink the pump water before their illness. The result of the inquiry, consequently, was that there had been no particular outbreak or increase of cholera in this part of London except among the persons who were in the habit of drinking the water of the above-mentioned pump well.

I had an interview with the Board of Guardians of St. James's parish on the evening of Thursday, 7 September and represented the above circumstances to them. In consequence of what I said, the handle of the pump was removed on the following day.

Besides the 83 deaths mentioned above occurring on the three last days of the week ending 2 September, and registered during that week in the subdistricts in which the attacks occurred, there was a number of persons who died in the Middlesex and other hospitals, [as well as] a great number of deaths which took place in the locality during the two last days of the week [that] were not registered till the week following. The deaths altogether on 1 and 2 September which have been ascertained to belong to

this outbreak of cholera were 197. Many persons who were attacked about the same time as these [102/103] died afterwards.

I should have been glad to inquire respecting the use of the water from Broad Street pump in all these instances, but I was engaged at the time in an inquiry in the south districts of London. When I began to make fresh inquiries in the neighbourhood of Golden Square after two or three weeks had elapsed, I found that there had been such a distribution of the remaining population that it would be impossible to arrive at a complete account of the circumstances. There is no reason to suppose, however, that a more extended inquiry would have yielded a different result from that which was obtained respecting the 83 deaths which happened to be registered within the district of the outbreak before the end of the week in which it commenced.

The additional facts that I have been able to ascertain, are in accordance with those above related. As regards the small number of those attacked who were believed not to have drunk the water from Broad Street pump, it must be obvious that there are various ways in which the deceased persons may have taken it without the knowledge of their friends. The water was used for mixing with spirits in some of the public houses around. It was used, likewise, at dining rooms and coffee shops. The keeper of a coffee shop which was frequented by mechanics and where the pump water was supplied at dinner time, informed me on 6 September that she was already aware [103/104] of nine of her customers who were dead! The water of this pump was also sold in various little shops with a tea-spoonful of effervescing powder in it under the name of sherbet. And it may have been distributed in various other ways with which I am unacquainted. The pump was frequented much more than is usual, even for a London pump in a populous neighbourhood.

There are certain circumstances bearing on the question which deserve to be mentioned:

(1) The workhouse in Poland Street is more than three-fourths surrounded by houses in which deaths from cholera occurred. Yet out of 535 inmates, only five died of cholera—the other deaths which took place being those of persons admitted after they were attacked. The workhouse has a pump on the premises in addition to the supply from the Grand Junction Water Works and the inmates never sent to Broad Street for water. If the mortality in the workhouse had been equal to that in the streets immediately surrounding it on three sides, upwards of 50 inmates would have died.

(2) There is a brewery in Broad Street near to the pump. On perceiving that no brewer's men were registered as being dead of cholera, I called on Mr. Huggins, the proprietor. He informed me that there were above 70 workmen employed in the brewery and that none of them had

suffered from cholera, at least in a severe form—only two having been indisposed, and that not seriously—[104/105] at the time the disease prevailed. The men are allowed a certain quantity of malt liquor and Mr. Huggins believes they do not drink water at all. He is quite certain that they never obtained water from the pump in the street. There is a deep well in the brewery in addition to the New River water.

(3) At the wire cartridge and percussion cap manufactory, 38 Broad Street, where I understand about 200 work people were employed, two tubs were kept on the premises, always supplied with water from the pump in the street for those to drink who wished. And 18 of those workpeople died of cholera at their own houses—sixteen women and two men.

(4) Mr. Peter Marshall, surgeon, No. 53 Greek Street, was kind enough to inquire respecting seven workmen who had been employed in the manufacture of dentists' materials at Nos. 8 and 9 Broad Street and died at their own homes. He learned that they were all in the habit of drinking water from the pump, generally drinking about half a pint once or twice a day, while two persons who reside constantly on the premises but do not drink the pump water had only diarrhoea.

(5) Mr. P. Marshall also informed me of the case of an officer in the army who lived at St. John's Wood but came to dine in Wardour Street, where he drank the water from Broad Street pump at dinner. He was attacked with Cholera and died in a few hours. [105/106]

(7) Dr. Fraser of Oakley Square, St. Pancras kindly informed me of the following circumstance:—A gentleman in delicate health was sent for from Brighton to see his brother at 6 Poland Street who was attacked with cholera and died in twelve hours on **1 September**. The gentleman arrived after his brother's death and did not see the body. He only staid about twenty minutes in the house, where he took a hasty and scanty luncheon of rump steak, taking with it a small tumbler of cold brandy and water, the water being from Broad Street pump. He went to Pentonville and was attacked with cholera on the evening of the following day, 2 September, and died the next evening.

(8) The deaths of **Mrs. E**— and her niece, who drank the water from Broad Street at West End, Hampstead, deserve especially to be noticed. I was informed by Mrs. E—'s son that his mother had not been in the neighbourhood of Broad Street for many months. A cart went from Broad Street to West End every day and it was the custom to take out a large bottle of the water from the pump in Broad Street, as she preferred it. The water was taken out on Thursday 31 August. She drank of it in the evening and also on Friday. She was seized with cholera on the evening of the latter day and died on Saturday. A niece who was on a visit to this lady also drank of the water. She returned to her residence, a high [106/107] and

(7): Snow deleted example (6) in the *MCC2* account of the outbreak from his report to the CIC.

(7) . . . **1 September:** This death was not registered in the week ending 2 September (See Document 20). Therefore, it was not on the list Snow copied at the GRO on 5 September.

Mrs. E: Susannah Eley.

*Deaths of the
Hampstead Widow
and her Niece*

(1): Numbers parallel those assigned to similar examples in Document 26-II of the book (extracts from *MCC2*) and Document 26-II (Online Companion).

Why would Snow emphasize that Mrs. E's niece lived in a "high and healthy" district, but died of cholera after drinking water obtained from the Broad Street pump, many miles away?

healthy part of Islington, was attacked with cholera and died also. There was not cholera at the time, either at West End or in the neighbourhood where the niece died. Besides these two persons only one servant partook of the water at West End, Hampstead, and she did not suffer, or, at least, not severely. She had diarrhoea.

There were some persons who drank the water from Broad Street pump about the time of the outbreak without being attacked with Cholera, but this does not diminish the evidence respecting the influence of the water, for various reasons.

The deaths which occurred during the fatal outbreak of Cholera are indicated in the accompanying map, as far as I could ascertain them. There are necessarily some deficiencies. In a few instances [when] persons died in the hospitals after their removal from the neighbourhood of Broad Street, the numbers of the houses from which they had been removed were not registered. The address of those who died after their removal to St. James's Workhouse was not registered. I was only able to obtain it in a part of the cases on application at the Master's office, for many of the persons were too ill when admitted to give any account of themselves. In the case also of some of the workpeople and others who contracted the cholera in this neighbourhood and died in different parts of London, the precise house from which they removed is not [107/108] stated in the return of deaths. I have heard of some persons who died in the country shortly after removing from the neighbourhood of Broad Street, and there must no doubt be several cases of this kind that I have not heard of. The deficiencies I have mentioned, however, do not detract from the correctness of the map as a diagram of the topography of the outbreak; if the locality of the additional cases could be ascertained, they would probably be distributed over the district of the outbreak in the same proportion as the large number which are known.

The outer-dotted line (paratially highlighted in orange) on the map surrounds the subdistricts of Golden Square and Berwick Street, St. James's together with the adjoining portion of the subdistrict of St. Anne's, Soho, extending from Wardour Street to Dean Street, and a small part of the subdistrict of St. James's Square, enclosed by Marylebone Street, Tichborne Street, Great Windmill Street, and Brewer Street. All the deaths from cholera which were registered in the six weeks from 19 August to 30 September within this locality, as well as those of persons removed into Middlesex Hospital, are shewn by black lines in the situation of the houses in which they occurred or in which the fatal attacks were contracted. In addition, the deaths of person removed to University College, St. George's, Charring Cross, other hospitals, and various parts of London are [108/109] indicated in the map where the exact address was given in the *Weekly Return of Deaths*, or when I could learn it by private inquiry.



The pump in Broad Street is indicated on the map, as well as all the surrounding pumps to which the public had access at the time of the outbreak of cholera. It requires to be stated that the water of the pump in Marlborough Street (at the end of Carnaby Street) was so impure that many persons avoided using it. I found that the persons who died near this pump in the beginning of September had water from the Broad Street pump.

The inner-dotted line (paratially highlighted in green) on the map shews the various points which have been found by careful measurement to be at an equal distance by the nearest road from the pump in Broad Street and the surrounding pumps. If allowance [is] made for the circumstance just mentioned respecting the pump in Marlborough Street, it will be observed that the deaths either very much diminish, or cease altogether, at every point

"Topography of the Outbreak"

(CIC Report, after 106; for a larger version without the colored highlights, see 1855-01: John Snow, Map 2, in Supplementary Figures (Online Companion).)

where it becomes decidedly nearer to send to another pump than to the one in Broad Street. At these points I ascertained that the people did generally send to the pump which was nearer. It may be noticed the deaths are most numerous near to the pump in Broad Street where the water could be more readily obtained. The wide open street in which the pump is situated suffered most and next the streets branching from it, especially those parts of them which are nearest to Broad Street. If there [109/110] have been fewer deaths in the south half of Poland Street than in some other streets leading from Broad Street, it is no doubt because this street is less densely inhabited.

I have made a distinct inquiry respecting the greater number of fatal cases of cholera that occurred at the time of the outbreak within the outer boundary marked on the map, but in a situation very decidedly nearer to another public pump than to that in Broad Street. The following are the results:—

{1} On 4 September, a female, aged 42, died at 32 Great Marlborough Street. I learned from the persons with whom she lived that she habitually drank pump water, but did not get it from the pump opposite. She had it principally from Broad Street, but occasionally from Vigo Street.

{2, 3, 4} There were three deaths at 7 Great Marlborough Street on 2, 3, and 5 September. This house is rather nearer to two other pumps than to the one in Broad Street, but water had been fetched from the latter pump and had been drunk at dinner for a fortnight previous to the attacks of cholera.

{5} On 1 September, a **girl** aged 8 years died at **29 Carnaby Street**. On calling a few days afterwards, I was informed by other members of the family that they were in the habit of having water from Broad Street and that the deceased drank of it on the days preceding her illness.

{6} On the same day, [110/111] a **female**, aged 34, died at **31 Carnaby Street**. I was informed on making inquiry that she used to send to Broad Street two or three times a day for water to drink.

{7} On the 1st also, a **female**, aged 35, died at **40 Carnaby Street**. I was informed that she sent nearly always to Broad Street for drinking water.

The houses in which the above three cases occurred are in that part of Carnaby Street which is near to the pump in Marlborough Street. Tyler Street, in which the following cases occurred is also very near to the same pump.

{8, 9} Two **widows** who lived in the kitchen at **9 Tyler Street** were attacked with cholera on 2 of September, and were taken to Middlesex Hospital, where they both died. The daughter of one of the deceased women, a girl aged 15, told me that she used to fetch water from the Broad Street pump, as her mother did not like the water in Marlborough Street. Both deceased persons used to drink the water up to the time of their illness. {10}

My informant also drank of it; she had diarrhoea, but was not seriously ill.

{11, 12} On 2 September, a **man** and his wife died of cholera at **8 Tyler Street**. The landlord of the house made an inquiry of the grown-up children of the deceased persons for me, and I learned that they used to have water from the pump in Broad Street, as they considered the water in Marlborough Street not fit to drink.

{13, 14} On 1 September, a **tailor** aged 50 and [111/112] his **son**, aged 12, died of cholera at **10 Cross Street**. Within three days afterwards, [15, 16, 17, 18] four more of his children died, two of them being grown up. This family were great drinkers of pump water and used to send for it every day, but more especially to drink during the night, as they were thirsty in the warm weather, owing to the great number sleeping in one room. The children fetched the water from various pumps, but frequently from Broad Street.

{19} On 2 September, a **boy** aged 7 years died at **4 Cross Street**. This family sent frequently for pump water, both to Broad Street and Warwick Street.

{20} On 2 September, a carpenter aged 30, died at 7 Upper John Street, Golden Square. He was a foreigner and used to drink wine and water to his dinner. The water was procured by the people who kept the house and they got it from Broad Street pump, as they thought the water better than that in Warwick Street which is much nearer. {21,22} Two other persons, who also drank the water, were taken ill at the same time as the deceased, but recovered. One was the servant of the house and the other was a young man in the family. My informants were the widow of the deceased man and the sister of the young man who recovered. It is worthy of notice that the servant had an attack of cholera a fortnight previous to the last one.

{23} A girl aged 5 years died at 42 Ham Yard on 8 September, having been attacked with [112/113] cholera on 2 September. Deceased went to school in Dufour's Place and a brother, a little older than herself, told me in the presence of his mother that he had seen his sister drink the water from the ladle at the pump in Broad Street.

{24} A girl aged 7 years at 3 Angel Court [off] Great Windmill Street was attacked with cholera on 1 September and died on the 8th. She also went to school in Dufour's Place and her parents think it probable that she drank the water of Broad Street pump.

{25} A **boy** aged 9 years died on 2 September at **9 Great Crown Court**. He went to school near the pump in Broad Street and was in the habit of drinking a good deal of the water.

{26} At 13 Wardour Street, near to Oxford Street, the wife of a tradesman died on 2 September. Her husband informed me that they used to have pump water which the deceased used to drink. The boy was always

{11} . . . **man** . . . **8 Tyler Street**: Death of a porter listed in *WR* for week ending 2 September.

{13, 14} . . . **tailor** . . . **son** . . . **10 Cross Street**: Both listed in *WR* for week ending 2 September.

{19} . . . **boy** . . . **4 Cross Street**: Listed in *WR* for week ending 2 September.

{25} . . . **boy** . . . **9 Great Crown Court**: Listed in *WR* for week ending 2 September.

These case descriptions do not appear in the St. James outbreak narrative in *MCC2*, although Snow investigated some of them during the first week of September. Cases listed in the *Weekly Return [WR]* for the week of 2 September (see Document 20 in the book) are bolded in the text and annotated.

In October and November, Snow undertook inquiries into the deaths registered in subsequent weeks (including those not bolded and annotated here).

{5} . . . **girl** . . . **29 Carnaby Street**: Listed in the *WR* for the week of 2 September.

{6} . . . **female** . . . **31 Carnaby Street**: Listed in *WR* for week ending 2 September.

{7} . . . **female** . . . **40 Carnaby Street**: Listed in *WR* for week ending 2 September.

{8} . . . **widow** . . . **9 Tyler Street**: Death of one widow listed in *WR* for week ending 2 September.

directed to fetch it from Broad Street.

{27} The son of a chemist at 115 Wardour Street, which is about a dozen doors from Oxford Street, was attacked with cholera and went to Willesden, where he died on 2 or 3 September. He dined on the days preceding his attack at some dining-rooms in Wardour Street, where the water from Broad Street pump always stood on the table. He drank malt liquor with his dinner, but frequently took some water with the pastry or sweet pudding with which he concluded it. His father was my informant. [113/114]

{28} The wife of a tailor at 2 Great Chapel Street, Soho, was attacked with cholera on the 4th and died on 8 September. I was informed by the person with whom she lodged that she was a great drinker of pump water and that she used to drink a good deal of cold water at the baths and washhouses in Dufour's Place, where she had been at work on the days preceding her illness. On going to the washhouses, I learned that some persons drank the water of the cistern there and others that of the Broad Street pump.

{29} The child of this woman was attacked on 7 and died on 11 September.

{30, 31, 32} There were three deaths at 14 Noel Street—two on 1 September after a few hours' illness, and one on the 6th after an illness of four days. Pump water was constantly drunk in this house. I saw the boy who fetched it in the presence of the family. He generally got it from Berner's Street or Newman Street, but had occasionally obtained it from Broad Street, [which] had done about two months before my inquiry (which was made at the end of October). But he could not remember the day or week when he last obtained it from Broad Street.

{33} A young woman died at 39 Rupert Street on 5 September, but she was taken ill in St. Ann's Court, where {34, 35, 36} three other members of her family died. She was about to call in Rupert Street, but dropped down at the door. She was carried into the house, where she expired. [114/115]

{37} On 10 September, a girl aged eight years died of cholera after an illness of three days at 7 Naylor's Yard [off] Silver Street. She went to the National School facing the end of Broad Street and used to drink the water.

{38, 39, 40, 41} There were **four fatal attacks** of cholera at **1 Brewer Street** in the beginning of September. One of the deceased persons was the master of the house, who used to send constantly to Broad Street for drinking water. The others who were attacked were also in the habit of drinking it.

{42} A cabinet-maker, who was removed from Philips' Court, Noel Street, to Middlesex Hospital, worked in Broad Street.

{43} A boy also who died in Noel Street went to the National

School at the end of Broad Street, and having to pass the pump probably drank of the water.

{44} A tailor who died at 6 Heddon Court [off] Regent Street, spent most of his time in Broad Street.

{45} A woman removed to the hospital from 10 Heddon Court had been nursing a {46} person who died of cholera in Marshall Street.

There were eight fatal attacks at a considerable distance from the pump in Broad Street, but within the external boundary marked on the map, respecting which I did not, on inquiry, trace any connection with the water of that pump.

Of the above **48 persons**, it will be observed that 28 were ascertained to have drunk the water of Broad Street pump shortly before they were at-[115/116]tacked, whilst there is a greater or less probability that 10 of the others also drank it, and 2 more had been exposed to the malady, by residing in the same room with a patient who died of it. As regards the 8 cases in which I could trace no connection with the water of the pump in Broad Street, it may be observed that they form but a slight mortality for the large area in which they happened—a mortality not greater than was occurring in surrounding parishes, and probably not greater than would have taken place in this district if the great outbreak had not occurred.

I ought to mention, that in all the cases I have alluded to throughout the Report, the water from Broad Street was drunk cold, without having been boiled. It is the custom in this district, as elsewhere, always to use the cistern water for making tea and other purposes where heat is employed, and to send for pump water only for the purpose of drinking it cold.² The following table exhibits the chronological features of this terrible outbreak of Cholera:—[116/117; table 1 is on the next page]

[117/118] The deaths in table [1] are compiled from the sources mentioned in describing the map; but some deaths which were omitted from the map on account of the numbers of the houses not being known are included in the table. As regards the date of attack, I was able to obtain it with great precision through the kindness of Mr. Sibley in upwards of 80 deaths which occurred in Middlesex Hospital. For the hour of admission was entered in the hospital books, as well as the previous duration of the illness. In a few other cases, also, I had exact information of the hour of attack. In the remainder, I have calculated the date of attack by subtracting the

² [Snow's footnote:] I should like to mention here, a fact that I met with in making a part of the house-to-house inquiry, which the Committee undertook in the winter. Out of the 14 houses in Cambridge Street, there were four in which I was distinctly told that none of the inmates ever sent to Broad Street for water, and that they did not do so in August last. There was no case of Cholera in any of these houses. In the other 10 houses, the water from the pump in Broad Street was more or less used by the inmates last August, and there was Cholera in all of them but one, and in that house there was Diarrhea—J. S., June 14, 1855.

48 persons: I count 46, including those who recovered from attacks of cholera and diarrhoea. Eleven of them appeared in the *Weekly Return* for the week ending 2 September, which meant they were on the list Snow copied at the GRO and investigated prior to meeting with the Sanitary Committee on 7 September.

{38, 39} . . . four fatal attacks . . . 1 Brewer Street: Two deaths at this address, a cheesemonger and a servant, are listed in *WR* for week ending 2 September.

duration of the illness from the date of death. There are 45 cases in which the duration of the illness was not certified to the registrars and where I had no means of ascertaining it. The time of the attack in these cases is consequently unknown. These persons nearly all died on the first days of September, in the height of the calamity. It is almost certain that they were cut off very quickly, like the others who died at this time.

TABLE I.

Date.	No. of Fatal Attacks.	Deaths.
August 19	1	1
" 20	1	0
" 21	1	2
" 22	0	0
" 23	1	0
" 24	1	2
" 25	0	0
" 26	1	0
" 27	1	1
" 28	1	0
" 29	1	1
" 30	8	2
" 31	56	3
September 1	143	70
" 2	116	127
" 3	54	76
" 4	46	71
" 5	36	45
" 6	20	37
" 7	28	32
" 8	12	30
" 9	11	24
" 10	5	18
" 11	5	15
" 12	1	6
" 13	3	13
" 14	0	6
" 15	1	8
" 16	4	6
" 17	2	5
" 18	3	2
" 19	0	3
" 20	0	0
" 21	2	0
" 22	1	2
" 23	1	3
" 24	1	0
" 25	1	0
" 26	1	2
" 27	1	0
" 28	0	2
" 29	0	1
" 30	0	0
Date unknown	45	0
Total	616	616

It will be observed that the daily number of fatal attacks was already much diminished by 8 September, the day when the handle of the pump in Broad Street was removed. It is not improbable that the water had, from some cause or other, ceased to contain the cholera poison. At all events, the few attacks which took place after [118/119] 10 or 12 September must have been occasioned in the usual manner and not through the medium of the water.

I wish it to be understood that I do not attribute every case of cholera to the use of polluted water. It is my opinion that every case is caused by swallowing the peculiar poison or morbid matter of cholera, which has proceeded from a previous patient sick of the same malady. But this morbid matter need not be in water, and there are facilities for its being accidentally swallowed and propagating the disease without the aid of water. This is more especially the case in the crowded dwellings of the poor, where a number of persons live, sleep, cook, and eat in one room. I do not, therefore, attribute every case of cholera in the parish to the water of the pump well in Broad Street. But certainly, those which constitute the great outbreak which took place at the end of August [were], suddenly rais[ing] the mortality of this disease from about five in a week to nearly 500.

The reason why the water of this pump produced the great outbreak is, I feel confident, that the evacuations of one or more cholera patients found their way, by some means, into the well. There were fatal cases of cholera a few days before the great outbreak not far from the well, and there may have been other cases, not fatal, which are not recorded.

I published several instances in 1849 of sudden [119/120] and severe outbreaks of cholera arising from the pollution of tanks, wells, and other local supplies of water by the contents of cesspools and house drains.

In the outbreak at Albion Terrace, Wandsworth Road in that year, the night soil was from six to nine inches deep at the bottom of the tanks that were examined. In some instances in Horsleydown and Rotherhithe, the contamination of the water was equally well proved. In these instances, the dejections of a patient ill of cholera entered the water before the great outbreak.

I have been making inquiries during the autumn just passed in the South districts of London, which shew that the dejections of cholera can reproduce the disease after passing down the sewers into the Thames, being afterwards distributed through some miles of the pipes of a water company. Under these circumstances, the cases of cholera are scattered over the whole of the districts supplied by the company. [They] become gradually more numerous as each set of cases, the dejections of which pass into the river, produces new ones. In the instances, on the other hand, in which a pump well or some other local supply of water is thus contaminated, the outbreak is always sudden and violent.

12 December 1854.

John Snow, M.D.