

## Document 30–IV (Online Companion)

### Cholera Inquiry Committee: “General Report”<sup>1</sup>

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

[ii]

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Description of Map [that is inserted between pages 96 and 97]. This map is the same as that which illustrates the Report of Messrs. Fraser, Ludlow and Hughes on the cholera outbreak in this district.<sup>2</sup> It is founded on the map published in Mr. Cooper’s report to the Commissioners of Sewers; but St. Ann’s Court and the neighbourhood have been added to it, and the fatal attacks which occurred in the district throughout the whole epidemic have been inserted in their respective localities where these could be accurately determined. Further explanations are given on the map. [ii/iii]

#### Introduction.

The cholera inquiry committee appointed by the Vestry of St. James’s, Westminster (upon the motion of Dr. Lankester, seconded by Mr. Joseph Brown) “for the purpose of investigating the causes, arising out of the sanitary condition of the parish, of the late outbreak of cholera in the districts of Golden Square and Berwick Street,” entered upon its duties on 25 November 1854. Having held altogether fourteen meetings, [the committee] completed its labours on 25 July 1855 by adopting the accompanying report.

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<sup>1</sup> Cholera Inquiry Committee, *Report on the Cholera Outbreak in the Parish of St. James, Westminster, during the Autumn of 1854* (London: Churchill, 1855), i-96, 175-76; transcription and PDF of original are available at <http://johnsnow.matrix.msu.edu/work.php?id=15-78-AA>, and a PDF in References of the Online Companion.

<sup>2</sup> The base map is identical. However, the CIC highlighted sewer lines in different colors to distinguish two phases of recent construction and added a circle to depict the cholera field of the outbreak between 31 August and 10 September 1854.

**churchwardens:** Two lay persons appointed by the incumbent (eg., vicar) with responsibility for maintenance of church property and to represent the interests of the laity, usually as volunteers; ex-officio members of parish council, the Vestry.

**Bidgood:** Lace trimming shopkeeper, 6 Vigo Street. Member of sub-committee that wrote this report.

**French:** Surgeon to the parish Workhouse in Poland Street; residence at 41 Great Marlborough Street.

**James:** Surgeon, 49 Princes Street.

**King:** Physician, 17 Saville Row; member of sub-committee that wrote this report.

**Lankester:** Physician, 22 Old Burlington Road; chair of sub-committee that wrote this report.

**Marshall:** 10 George Street, Hanover Square (non-resident member); the recorder who compiled the report in its final form.

**Snow:** 18 Sackville Street.

**Whitehead:** Not a resident of the parish, as required by the Vestry's resolution, but St. Luke's Church was in the parish.

Including certain members added at different times to its original number, the committee finally consisted of the following gentlemen:—

Messrs. [F.] Crane and [T. H.] Rice, the **churchwardens**

\*Rev. T[homas] Beames

Mr. [Henry] **Bidgood**

Mr. [Joseph] Brown

\*Mr. John G.] **French**

Mr. [William] Geesin

Mr. [Charles] Harrison

\*Mr. [John] James

\*Dr. [Richard] **King**

Dr. [Edwin] **Lankester**

\*Mr. [John] **Marshall**

\*Mr. [G. W.] Sanford

\*Dr. [John] **Snow**

Mr. [Thomas] Watkins

\*Rev H[enry] **Whitehead**

[iii/iv] Mr. [Jehoshaphat] York was requested to undertake the duties of Secretary.

For the purposes of this inquiry, the committee availed itself of the following sources of information.

1.—The *Report of the Committee of Health and Sanitary Improvement* appointed by the Vestry of St. James's in 1848.

2.—A *Report* by Mr. E. Cooper to the Metropolitan Commissioners of Sewers on the state of the Drainage in the localities affected by Cholera, containing a map of the Sewers, &c., September 1854.

3.—The Rev. Henry Whitehead's narrative, entitled *The Cholera in Berwick Street*, 1854.

4.—*Report on the Well Waters of the Parish* of St. James, by Dr. Lankester, 1854.

5.—Dr. Sutherland's *Report on Epidemic Cholera in the Metropolis in 1854*, published in January 1855.

6.—Various returns issued under the authority of the Registrar-General.

Besides consulting these published documents, the committee obtained from the office of the Registrar-General a return of the house population in the subdistricts of Golden Square and Berwick Street according to the Census of 1851. [It also obtained] from the local registers [via] Mr.

\*[CIC note;] Subsequently added to the committee as originally appointed. [The others were members of the Vestry.]

Buzzard the Vestry clerk, [iv/v] as well as from various hospitals, documents to aid in forming an estimate of the extent and severity of the epidemic. An early application was also made to Sir B. Hall, the president of the General Board of Health, for such information as might be at his disposal relating to the cholera outbreak in this parish. But principally on the ground that investigations of this kind were more valuable when independent, the president did not comply with this request.

More recently in conjunction with Messrs. Fraser and Ludlow, two of the local inspectors appointed by the Board, a deputation from the committee endeavoured to construct as correct a [map] of the deaths in the affected districts as could be made. By permission of the Board, the committee has been enabled to obtain from the Lithographers some impressions of this map to illustrate the present report.

The first attempt of the committee to collect local information in the cholera districts was by means of a printed Inquiry Return distributed to each house, with a request that it might filled up by the occupier. This measure did not produce the anticipated results.

At the desire of the committee, Dr. Snow [v/vi] on 12 December 1854 laid before it a report containing an account of his researches already made on the supposed influence of the well water from the public pump in Broad Street in producing the cholera outbreak in its neighbourhood. The committee have considered this document sufficiently important to be added at length to its *Report*.

A subsequent attempt to obtain local information by a house-to-house visitation was more successful. By the assistance of a printed form, or "Visitors' Inquiry List," prepared by Drs. King, Lankester, and Snow, the following streets were visited by the under-mentioned members of the committee:—The Rev. Thomas Beames, Mr. James, Dr. King, Dr. Lankester, Mr. Marshall, Mr. Sandford, Dr. Snow, and the Rev. H. Whitehead, viz.:—

Broad Street	Husband Street
Marshall Street	Hopkins Street
Bentinck Street	New Street
part of Berwick Street	Pulteney Court
Kemp's Court,	Cambridge Street
Peter Street	part of Silver Street
Green's Court	

containing in all 316 houses.

This "Visitors' Inquiry List," a copy of which will be found in the Appendix, contained twenty-two heads or subjects of investigation, on each of which exact information [vi/vii] was desired. The lateness of the inqui-

ry—the departure of many families from the neighbourhood—the imperfect recollection of some—the reluctance to reply on the part of others—and the impossibility of underground research—are circumstances which all interfered with the completeness of this local investigation. Its results, which may serve as a guide in any subsequent inspection, have been tabulated by the secretary in a form corresponding with that adopted by the Committee of Health and Sanitary Improvement in 1818.

In the hands of one member of the committee, the Rev. H. Whitehead, whose previous knowledge of the district both before and during the epidemic owing to his position as Curate of St. Luke's, Berwick Street, gave him unusual advantages. [In his hands,] the Visitors' Inquiry elaborated itself into a most minute and painstaking investigation of a principal street situated in the very heart of the locality affected. His special "Report" upon Broad Street the committee have thought it necessary to append at length.

In consequence of facts ascertained by Mr. Whitehead, instructions were given to the Secretary, Mr. York—whose practical experience entitles his evidence to complete [vii/viii] acceptance—to inspect the cesspool and drains of the house [at] 40 Broad Street, close to which the public pump is situated, and also to open and examine the well itself and the soil intervening between it and the drains and cesspool. Mr. York's statement, accompanied by a plan and section, is also annexed to this *Report*.

The analysis of six specimens of surface well water, the composition of which it was desirable to ascertain, was conducted in the Birkbeck Laboratory at University College by Messrs. Powell, Ormsby, Smith, and Worsley at the request of Professor Williamson.

Lastly, many of the facts and statements in the following pages depend on the authority of individual members of the committee.

The drawing up of the "[General] Report" was entrusted to Mr. Marshall. It is arranged under the four following heads:

1. History of the outbreak.
2. Circumstances attending the outbreak.
3. Hypotheses concerning the outbreak.
4. Recommendations of the Committee to the Parochial Authorities.

[viii/9] "General Report"

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The parish of St. James, Westminster, occupies an area of 164 statute acres. At the census of 1831, it contained 37,053 inhabitants; in 1841, 37,457; and in 1851, 36,406. Its population may, therefore, be said to be nearly stationary. The small diminution since 1841 [was] probably owing to public

improvements, especially to those made in connection with the building of the Museum of Economic Geology in Jermyn Street.

For the purposes of registration, the parish is divided into three subdistricts, viz.

St. James's Square subdistrict, occupying 85 acres, with a population of 11,469;

Golden Square subdistrict, extending over 54 acres, and numbering 14,139 inhabitants; and

Berwick Street subdistrict, having an extent of 25 acres, and a population of 10,798.

Since 1841, the population of St. James's Square subdistrict has decreased, whilst that of the other two districts shews a slight increase.

The parish is immediately surrounded by the following registration subdistricts:

Mayfair and Hanover Square in St. George's parish, on the West; All-Souls, Marylebone on the North;

St. [9/10] Anne's, Soho on the East; and

Charing Cross, in St. Martin's-in-the-Fields, on the East and South.

1832. In the first visitation of cholera in 1832, the parish of St. James, then numbering 600 more inhabitants than in 1851, suffered in only a moderate degree in comparison with many others, and on the whole somewhat later in point of time. The earliest deaths in the parish took place in March, and then the epidemic, subsiding until July, reappeared and continued during August, September and October. The total number of deaths occasioned by it cannot now be determined. About 90 cases fell under the observation of the parochial medical officers, of which number half proved fatal. To these would have to be added the deaths occurring in private practice. On the authority of Messrs. Braine and French, who at that time had medical charge of the Cholera Hospital, it may be stated that among the localities attacked were Peter Street, Hopkins Street, Maidenhead Passage, Pulteney Court, Berwick Street, Wardour Street, Broad Street and Carnaby Street, together with the courts and yards leading out of Great Windmill Street, the neighbourhood of St. James's Market, and also Angel Court and Crown Court, Pall Mall. At this period the general sanitary condition of the parish was doubtless defective, for attention was not then so strongly directed to questions concerning the public health.

At the commencement of 1848, the Committee of Health and Sanitary Im-[10/11]provement detected and exposed by their house visitation numerous deficiencies in local cleanliness, especially in the public sewerage. In consequence of these inquiries a decided amelioration of such

defects was accomplished. It was a subject of congratulation amongst those who were interested in the health of the parish that the epidemic of 1848-9 which so speedily followed was even less severely felt by the inhabitants than the visitation of 1832.

1848-49. During the autumn of 1848 only three deaths from cholera occurred in St. James's, viz. one each in Berwick Street, Poland Street, and Rupert Street. In the first four months of 1849, no fatal case occurred in the parish, although from the middle of January to the middle of February, the effects of cholera were plainly manifested all over London. On 26 May, one fatal case happened in Golden Square. In July, five deaths were registered, and the disease, continuing through August and September, proved fatal altogether to 56 persons, viz. 19 belonging to Berwick Street district, 19 to Golden Square district, and 18 to St. James's Square district. Seventeen additional deaths were registered from diarrhoea: Thus the mortality from cholera in the whole parish in 58 weeks of 1848-49 was about 15 in 10,000 persons living, whilst the corresponding rate in all London was 75, and in the immediately surrounding districts about 46.

In St. Anne's, Soho, the relative mor-[11/12]tality was 30 to 10,000 persons living; and of 48 deaths which occurred in that parish to a population of 16,480, only five took place in St. Ann's Court, then containing about 500 inhabitants. This visitation of 1848-49 commenced about the same period in St. James's as in the adjoining parishes, shewing itself earliest in the Golden Square district, next in the Berwick Street, and last in that of St. James's Square, but reaching its height in all three about the same period and causing its greatest mortality in the weeks ending the 1 and 8 September, corresponding in this respect with the general result throughout the metropolis. The streets which suffered most were the following:—In the Berwick Street district, Peter Street (four deaths), Archer Street (two), and Pulteney Place (two); in the Golden Square district, the Workhouse (five inmates), Regent Street (two), South Row (two), and Little Windmill Street (two); in the St. James's Square district, Angel Court (six), Jermyn Street (three), Little St. James's Street (two), Great Windmill Street (two), and Queen's Head Court (two). The rest of the mortality consisted of single deaths in various streets. No fatal case occurred in Broad Street in 1848-49, although a man died of diarrhoea at No. 6.

1850. Four fatal cases of Cholera are recorded during this year in the following localities:—Silver Street, Carnaby Street, Marshall Street, and Oxford Street. [12/13]

1851. In this year one case is registered in Rupert Street.

1852. A single death is returned at 5, Marshall Street.

1853. During the last four months of 1853, when cholera for the third time invaded the metropolis, ultimately to become epidemic, several fatal attacks occurred in St. James's parish, as follows:—In August, one case occurred in Great Windmill Street, and another in Bentinck Street. The next death, on 2 October was in Poland Street. After a short interval, five cases followed in one week, viz. three in the Workhouse on 26 and 30 October and 1 November; two in Marlborough Court, 30 October; one in King Street on 31 October; and one in Great Marlborough Street on 1 November. On 4 November, another fatal attack happened in the Workhouse; and the last death for the year 1853 was in Blenheim Street on 15 November.

It is important to remember these successive visitations of Cholera in St. James's parish, and especially the presence of the disease during the autumn of 1853; for they serve to establish its liability to the inroads of that epidemic, although they entirely failed to prepare its inhabitants for the impending calamity of 1854.

1854. At the commencement of this year, there were but five deaths from cholera registered throughout the whole of the metropolis during [13/14] the month of January; in February, only two, the last being on 4 February. For the eight succeeding weeks, no fatal case was registered in London. During the month of April four deaths occurred. Three weeks passed without a death from cholera, and then four happened in the latter part of May. In the first three weeks of June, three deaths occurred; in the fourth week, no death. In the first week of July, one death was registered, in the second week 5 deaths, in the third 26, in the fourth 133, in the fifth 399. And so the numbers kept increasing weekly up to 2,050 in the week ending 9 September, and then diminished again, as shewn in the subjoined table. The mortality from cholera in all London was reduced to 8 in the week terminating 8 November.

Now, according to the Registrar-General's returns, no death from cholera took place during last year in St. James's parish until the week ending 5 August, when one fatal case was returned. From this date, the cholera mortality in the parish rose and fell as shewn in the annexed table, in which the corresponding mortality in all London, and that in London exclusive of St. James's, is also shewn:

	July 20.	Aug. 5.	Aug. 12.	Aug. 19.	Aug. 26.	Sep. 2.	Sep. 9.	Sep. 16.	Sep. 23.	Sep. 30.	Oct. 7.	Oct. 14.
London . . .	133	309	644	729	847	1287	2050	1549	1284	754	411	249
London, exclud- ing St. James's }	133	308	639	717	841	1209	1763	1482	1265	747	410	249
St. James's . . .	0	1	5	12	6	78	287	67	19	7	1	0

[14/15] Adding to this list one more death which was recorded in the St. James's Square district in the week ending 21 October, the total number of deaths from cholera registered in St. James's in the 17 weeks ending 4 November was 484. But this number gives a very inadequate idea of the entire loss inflicted by the epidemic. Thus, the House List of deaths by cholera furnished to the committee by Mr. Buzzard (the vestry clerk) from the local registers, gives a total of 501 deaths recorded between 1 July and 30 September. Besides these, it is estimated that about 150 of the inhabitants died during the same period in the Middlesex, University College, Royal Free, St. George's, and King's College Hospitals—[that is,] out of the parish, whose deaths would therefore be registered elsewhere. It would appear, indeed, from the investigations of Messrs. Fraser, Hughes, Ludlow and Whitehead, that some deaths must have escaped registration altogether, and that possibly more than 40 non-resident persons who came to work or visit in the parish also died. Hence the fatal attacks in St. James's parish were probably not less than 700.

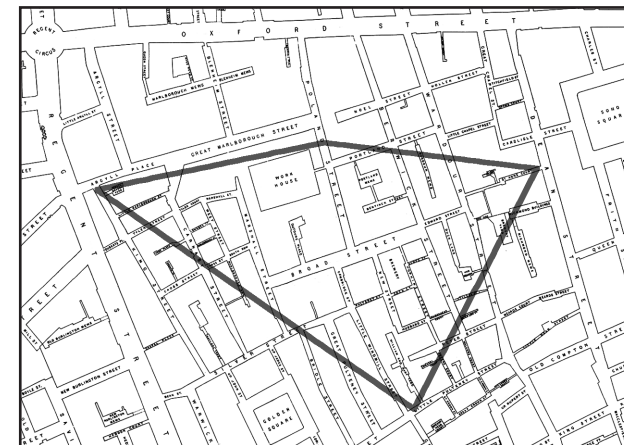
So great a number would imply a relative mortality during the above defined 17 weeks of 220 to every 10,000 persons living in the parish, instead of 152 as estimated upon the data furnished to the Registrar's Office. The highest relative mortality in any metropolitan parish not containing a hospital [15/16] during the same period was in Bermondsey, viz. 158. St. Olave's alone, which includes St. Thomas's Hospital, exceeded it, its ratio being 162. In the adjoining subdistrict of Hanover Square, the ratio was 9; in All-Souls, Marylebone (including a hospital), 28; in St. Anne's, Soho, 37; and in the Charing Cross district of St. Martin's-in-the-Fields (including a hospital) 33. It should also be borne in mind that the mortality from cholera in St. James's parish in 1848-49 was, as already stated, only 15 in 10,000 inhabitants.

It is well known, however, that the epidemic did not act equally within all parts of the parish; the St. James's Square subdistrict experiencing, according to the Registrar, a relative mortality of only 16 to every 10,000 persons living, whilst the ratio in the Berwick Street district was 212, and in the Golden Square district 217.

But, as before stated, the actual rate beyond the registration returns in the two last named districts was considerably greater than this. Moreover, it must now be remembered that it was only in a certain singularly well defined portion of them that the influence of the great outbreak was felt. The cholera area, as it may be called, of St. James's parish may be variously described. Reference to the map prefixed to this report will render the description easily understood. Spreading out from the north-east angle of Golden Square, which is altogether excluded from it, it extends [16/17] westward to King Street, north as far as Great Marlborough Street and Noel Street,

east to the line of Wardour Street, and south to Little Pulteney Street, from the west end of which its limit are expressed by a line crossing over Great Pulteney Street and Bridle Lane, returning to the northeast angle of Golden Square. Beyond Wardour Street to the east lies St. Ann's Court, Soho, with its dependencies, which, though out of St. James's parish, must be included in the cholera area.

It has been shewn by Mr. Whitehead that the limits of the cholera district are also very accurately defined within an irregular four-sided figure, the north and south angles of which are placed respectively near the middle of Poland Street and at the south end of Little Windmill Street, whilst the west and east points are at the northwest corner of King Street and the east end of St. Ann's Court. The included space is rather longer from east to west than from north to south. The centre of this figure falls at the junction of Cambridge Street with Broad Street, and it has been remarked by Mr. Whitehead, as may be shewn with compasses upon the map that a circle, having a radius of 210 yards, struck from the northwest angle of Cambridge Street includes almost the entire area, except St. Anne's Court.—Two notches vacant of mortality require, however, to be taken out of this circle; one corresponding with a part of Great Marlborough Street, the other with one half of Golden Square and the southern part of Bridle Lane.



[Henry Whitehead],  
*Cholera in Berwick Street*  
(October 1854), 2.

As [17/18] thus defined and henceforth in this report intended to be understood, the cholera area, including St. Ann's Court and excluding the vacant spaces just mentioned, covers nearly 30 acres of ground containing, besides streets, courts, and mews, 825 dwellings, St. Luke's Church, Craven Chapel, the Workhouse, a block of model lodging houses (unfinished in 1854), a brewery, and various factories and workshops. In round numbers, its population, in the autumn of 1854, as well as can be estimated, was nearly 14,000 inhabitants (inclusive of 500 in the Workhouse). This would be about 460 persons to an acre. Now the ascertained deaths of residents within this cholera area are 618, being at the rate of 440 to 10,000 persons living. The deaths of non-residents, so far as these are known, viz., 45, are also indicated on the map.

The ascertained deaths and percentage of mortality in the several streets within the cholera area are tabulated in the Appendix, whilst the distribution of the deaths is represented in the map. No street in the cholera

area was without death, but the mortality was greatest towards the centre of the area, and diminished towards its borders. There are exceptions, depending mostly on an extreme mortality in some one house in a small street, as in Cross Street on the west, Bentinck Street on the north, and Peter Street on the southeast. In Hopkins Street, then containing only three houses, the mortality was 18 percent. In [18/19] Broad Street, the very heart of the area, the deaths were rather more than 10 percent, or 1,000 to every 10,000 persons living. In Cambridge Street, Pulteney Court, and Kemp's Court, the population was also decimated. In Marshall Street, South Row, Marlborough Row, Silver Street, Great Pulteney Street, Little Windmill Street, the southern portions of Wardour, Berwick and Poland Streets, the mortality diminished, varying from 8 to 5 per cent; and, taking a still wider sweep from the centre, in the remoter parts of all these longer streets, as a rule, it gradually ceased.

It will also be seen, on consulting the map, that in the centre of the cholera area but few houses escaped the invasion of the disease. Of 45 contiguous houses belonging to Pulteney Court, New Street, Husband Street, Hopkins Street, and the south side of Broad Street, only seven escaped without a death; and in 3 of these seven, one a factory, 18 non-residents were fatally seized. In Broad Street, containing 49 houses, only 12 houses escaped without a death. So also the proportion of houses fatally attacked, just as we have seen in regard to the percentage of deaths, became less in passing from the centre of the cholera area. In the whole area, including houses where non-residents were seized, this proportion was 38.8 per cent.

Of the 825 houses in this area, fatal attacks of residents occurred in 313. There were 159 houses having single deaths; 85 with 2 deaths; 34 with 3; 15 with 4; 12 with 5; 3 with 6; 4 with 8; [19/20] and 1 with 12. Five inmates also died in the Workhouse. "There were," says Mr. Whitehead, speaking of only a part of the area, "no less than 21 instances of husband and wife dying within a few days of each other. In one case, besides both parents, 4 children also died. In another both parents, and 3 of their 4 children. In another a widow and 3 of her 4 children. At an average distance of 15 yards from St. Luke's Church stand 4 houses, which collectively lost 33 persons."<sup>3</sup>

Such being the locality of this serious visitation and such its general results, we may in the next place attempt to trace within the limits of the parish its commencement, progress and cessation from day to day, and from place to place. For this purpose it is obvious that, owing to the variable duration of the illness, the death statistics would lead to erroneous conclusions. It is much to be regretted that no complete data can be obtained for fixing the hour of attack. By deducting the period assigned to the duration of the

<sup>3</sup> [Whitehead], *Cholera in Berwick Street*, 6.

disease from the day of death, where such information is recorded either in the registrar's or hospital documents, a rude approximation to the period of attack may be obtained. In regard especially to cholera, this method may give tolerably fair results. But when we remember the difficulty of obtaining correct information and the importance of a few hours more or less, too great reliance must not be placed upon such results nor too great use [20/21] made of them as the foundation of particular views.

In the table placed in the Appendix, 576 fatal cases in St. James's and St. Anne's are arranged to shew the streets in which they took place and days on which the deceased are presumed to have been attacked. This tabular view of daily attacks is of course incomplete and would differ widely from one of daily deaths. It is confessedly a partial view or an imperfect journal of the progress of the epidemic. But in its general aspect it may approach the truth. For convenience of reference, the streets are classified in four zones, or belts, running east and west across the parish, beginning with the northern zone from west to east and then proceeding with the next one to the south, and so on. Only the two middle zones pass through the cholera area.

The earlier deaths from cholera in the metropolis last summer [1854] were scattered very widely about in the extreme south, east, west and north—the central districts escaped for a brief period. The first fatal attack in St. James's parish occurred on 26 July in St. James's Market, Jermyn Street. It terminated fatally on the 29th, by which date 81 deaths had been registered in the south, 48 in the east, 11 in the west, 11 in the north, and 13 in the central metropolitan districts. It may therefore be said that the cholera in the summer of 1854, as well as in 1849, shewed itself in this parish later than in most parts of the metropolis. In reference to the immediately adjoining districts, it must be added that [21/22] St. Martin's-in-the-Fields, St. Anne's Soho, and All-Souls Marylebone were attacked before, and St. George's Hanover Square after, St. James's.

Referring now to the table, it will be seen that shortly after the first case already spoken of as happening on 26 July in the south of the parish, viz. in St. James's Market, two fatal attacks occurred in the west and centre, viz. in South Row on 3 August, and in Silver Street on the 5th. By the time these three attacks had occurred, many more deaths had been recorded in the various districts of the metropolis, as follows:—south districts 371, east 108, west 33, north 23, and central 27. The fourth fatal seizure in St. James's was on the 7th in the south, in Great Windmill Street; the fifth and sixth, both on the 11th, were in the west, viz. in King Street and Marlborough Row. On the following day, three persons were fatally attacked, two in the south and southeast of the parish, viz. in Piccadilly and Great Windmill Street, and one in the very centre of the district to be presently rendered so memorable, viz. in Broad Street, at No. 31.

On 14 [August], one seizure occurred in the west, in Heddon Court; and on the same day, two [occurred] near the centre, viz. in Silver Street and Marshall Street. On the 16th, two persons were attacked in Berwick Street and one in Swallow Street; on the 17th, one in Marlborough Street; on the 18th and 19th, two persons in Marshall Street; on the 18th a man in Piccadilly, and on the 19th a man in Berwick Street. The deaths in Marshall Street were [22/23] in one house (the first being introduced from the Borough), and two of those in Berwick Street were also in one dwelling. During this week diarrhoea was very prevalent all through the Berwick Street district and the adjacent part of the Golden Square district; but in the eleven following days, until the 30th August, diarrhoea had disappeared and very few fatal attacks of cholera occurred. These were either in the south or west, but chiefly towards the centre of the yet future cholera area, viz. in Carnaby Street, Silver Street, Marshall Street and Broad Street.

It appears, therefore, that the disease manifested its fatal effects first on the southeast, west, and east quarters, and afterwards towards the centre of the cholera area. Up to this date (30 August) 38 cases only had occurred throughout the entire parish; but in the afternoon of the 31st August, 31 fatal attacks can be traced. On 1 September, [there were] 131, and on the 2nd, 125. On the 3rd, 4th, and 5th, the numbers are respectively 58, 52, and 26. And on the 6th, 7th, and 8th, 28, 22, and 14 [were attacked]. After that, attacks occurred as follows: 6, 2, 3, 1, 3, 0, 1, 3, 4. Subsequently throughout the rest of September either 1, 2, or 0 per diem. In Dr. Snow's report, the number of daily attacks is also fully and carefully reckoned, as his inquiry took place immediately after the eruption of the disease.

We have here a record of what has so forcibly struck the attention of those who have studied this [23/24] memorable eruption of cholera—the ordinary gradual approach of the disease accompanied by no unusual manifestation of its effects, a lingering about certain localities, a lull in its operation, and then, on a sudden, a terrible outburst overwhelming every one by surprise, outstripping the most prompt and energetic attempts to mitigate its effects, and then quickly declining by well marked though not quite such speedy steps. It is this startling suddenness of the outbreak that has given it a scientific interest, scarcely less momentous than its social importance. As few of us probably will ever witness its like again, it is most desirable that no pains should be spared in its thorough investigation.

On consulting the table in the Appendix, in which the distribution of a great majority of the attacks in the several streets is indicated day by day, it will be seen that the suddenness of the principal outburst, as also its rapid subsidence, is chiefly marked in those streets and courts which are nearest to the centre of the cholera area. In the borders of this space and beyond its limits, there is no such abrupt and extreme rise and fall in the

*Outbreak's Suddenness  
Is of Scientific Interest*

number of the attacks. In Broad Street especially its commencement was sudden and its duration short. The disease continued somewhat later to attack a few persons in other localities.

On the whole, however, the great explosion was almost simultaneous throughout the district. [24/25] Even in the remotest streets, it must be remarked that though the attacks were few, the period of greatest activity corresponded with that of the principal outburst, and indeed with that of highest cholera mortality throughout the rest of London (see table, p. 14). There was, moreover, a small simultaneous outburst in Rotherhithe.

There yet remain several characteristics of this visitation which may here be noticed as tending either to associate it with, or distinguish it from, other less severe and sudden outbreaks of the disease.

In the first place, it may be remarked that in 1854, though the epidemic visited the same streets as in 1832 and 1848–49, it did not limit itself so precisely to its old localities as is often observed. A coincidence in the localities affected is perhaps more marked in regard to the straggling cases on the outskirts of and beyond the cholera area than in the heart of that district. We are informed by Dr. Fraser that in the whole parish, identical houses were visited in only 11 instances out of about a total, as we estimate, of 350 in which fatal attacks occurred. On the contrary, entire streets in the centre of the affected area, [such] as Broad Street, Silver Street, Cambridge Street, Pulteney Court and New Street in which no deaths from cholera occurred in 1848–49, suffered the most severely in 1854.

Certain apparent eccentricities or preferences of localization [which] are very common in cholera visitations displayed themselves here also. For [25/26] example, one side of a street would suffer more than the other. In streets running north and south, the dwelling-houses being about equal on the two sides, the east side sometimes suffered most. In streets running east and west, the south side was generally most affected. Cambridge Street and Little Windmill Street are exceptions to the former, and Silver Street to the latter statement. The order in which houses were attacked followed no definite rule. Some narrow streets and courts suffered severely. Others, however, nearly or quite escaped, such as Tyler's, Great Crown and Walker's Courts. Wide streets, [such] as Broad Street itself, were heavily visited. In St. Ann's Court, the middle houses suffered most. In some culs de sac, [such] as Bentinck Street and Peter Street, those near the dead end.

The southeastern half of the cholera area is a few feet lower than the northwestern half, but the mortality was not attached to any particular level.

A want of cleanliness in streets or houses was by no means a constant accompaniment of the disease. Some houses in the midst of others

*Typical Localization  
Eccentricities  
Sometimes Present,  
Sometimes Not*

*Slight Elevation  
Difference Not a Factor*

*Overall Effects of Localization Much Less Marked than Often Observed*

affected escaped, without [having] any favourable sanitary condition. The map shews that of houses in the cholera area directly opposite untrapped sewer-grates, 40.2 percent had fatal attacks in them, thus barely exceeding the general percentage throughout the area, viz., 38.8. Of two adjacent and equally well ordered factories, one lost seven workmen, the other none. Of nearly 200 workmen and women employed in another large factory, none living in the neighbourhood—the [26/27] females numbering about 160, the males about 30—sixteen of the former and two of the latter were fatally seized. Yet in the workhouse, not 150 yards away, which had at the same time about 500 residents, only five inmates died. Of 35 men working in the open air on the unfinished lodging-houses, seven died.

*Corner Houses*

Corner houses sometimes escaped, such as the 6 on the north side of Broad Street. In one of [them], however, there were 3 severe, though not fatal, attacks. Of corner houses in the cholera area, about 30 per cent had fatal attacks in them. **Public houses**, so often situated at the corners of streets, were singularly lightly visited.

**Public houses:** Pubs serving beer, ale, etc.

*Cholera Fatalities By Floors and Parts of Houses*

As a general condition, remoteness from the centre of the cholera area seems most to have been associated with exceptional suffering, and proximity to it by exceptional immunity, from the disease.

Towards the centre of the area, in Broad Street, the number of deaths appears to have been nearly equal on each floor, if we reckon the ground floors and kitchens together. In reference to **the population**, however, the ground floors suffered most. Next, in diminishing proportion, [were] the first floors, third floors, kitchens, and . . . second floors. Yet throughout the neighbourhood generally, including Broad Street, [total] deaths on the second floors were the most numerous of all. In the streets furthest removed north and south from the centre, the residents in the upper floors suffered somewhat more in proportion. [27/28] A calculation embracing the principal streets and courts shews that the number of deaths was rather greater in the front than in the back rooms of the houses. The attacks in any given house were seldom quite simultaneous, commonly in quick succession, and more rarely at long intervals.

**the population:** In this context, the average number of inhabitants per floor.

*Cholera Fatalities by Sex*

Tolerably true, on the whole, was this singular malady [cholera] to its ordinary characteristics in the selection of its victims, whether we regard their occupations, general condition in life, sex, or age. Of 636 registered deaths belonging to the parish, 298 were of males, and 338 of females, which is rather more females in proportion than usual. The ages of these deceased persons (with the exception of 6 unknown) were as follows:—

Ages .	0—10.	10—20.	20—30.	30—40.	40—50.	50—60.	60—70.	70—80.	80—90.	0—90.
Males .	79	32	48	50	47	16	19	4	2	297
Females	56	33	40	51	61	51	30	10	1	333
Total .	135	65	88	101	108	67	49	14	3	630

It appears therefore that, as usual with cholera, the smallest number of deaths happened in the second decade of life. The fewest deaths in any one year of age (viz. two,) were between 14 and 15. The inmates dying in the workhouse, were aged persons.

The occupations of 454 persons dying (247 male and 207 female) are indicated in the subjoined table, constructed from the Registrar-General's returns. [28/31]

*Cholera Fatalities by Occupation*

Occupations.	Males.		Females.		Total.
	Aunts.	Sons.	Spinners, Wives, Widows.	Daughters.	
Postmaster (retired), . . . . .	1	..	..	..	1
Government Clerk, . . . . .	1	..	..	..	1
Police, . . . . .	2	..	..	1	3
Fireman, . . . . .	..	..	..	1	1
Chelsea Pensioner, . . . . .	1	..	..	..	1
Solicitor, . . . . .	..	1	1	..	2
Surgeon, . . . . .	1	..	..	..	1
Dentist, . . . . .	1	..	..	..	1
Druggist, . . . . .	..	1	..	..	1
Artist, . . . . .	1	..	1	..	2
Schoolmaster, . . . . .	..	..	1	..	1
Governess, . . . . .	..	..	1	..	1
Lodging House Keeper, . . . . .	..	..	2	..	2
Eating and Coffee House Keeper, . . . . .	1	..	..	1	2
Domestic Servants, . . . . .	2	..	28	2	32
Coachmen, . . . . .	1	1	1	1	4
Charwomen, . . . . .	..	1	4	..	5
Nurse, . . . . .	..	..	1	..	1
Laundress, . . . . .	..	..	1	..	1
Hairdresser, . . . . .	1	1	2	1	5
Hatter, . . . . .	1	..	..	..	1
Tailor, . . . . .	40	12	17	9	78
Shoemaker, . . . . .	28	8	8	3	47
Undertaker, . . . . .	1	1	1	..	3
Dressmakers, including Staymakers and Waistcoat Makers, . . . . .	..	..	15	..	15
Straw Hat Maker, . . . . .	..	..	1	..	1
Commercial Traveller, . . . . .	..	..	1	..	1
Pawnbroker, . . . . .	2	..	..	..	2
Marine Store Dealer, . . . . .	..	..	1	..	1
Livery Stable Keeper, . . . . .	2	..	..	..	2
Carman, . . . . .	2	..	1	..	3
Warehouseman, . . . . .	..	1	..	..	1
Shopman and Shopwoman, . . . . .	1	..	1	..	2
Messengers and Porters, . . . . .	15	6	2	5	28
Errand Boy, . . . . .	..	1	..	..	1
Printer, . . . . .	2	1	..	..	3
Compositor, . . . . .	1	..	..	..	1
Bookbinder, . . . . .	2	..	..	..	2
Stationer, . . . . .	2	..	..	..	2
Piano-forte Maker, . . . . .	3	1	..	1	5
Picture Dealer, . . . . .	..	..	1	..	1
Engravers and Chasers, . . . . .	4	..	1	..	5
Artificial Flower Makers, . . . . .	..	..	2	..	2
Feather Manufacturers, . . . . .	..	..	1	2	3
Dyer, . . . . .	..	..	..	1	1
Draper, . . . . .	..	..	1	..	1
Mattress Maker, . . . . .	..	..	1	2	3
Brush Maker, . . . . .	..	..	1	..	1
Carried forward, . . . . .	119	36	99	30	284

Occupations.	Males.		Females.		Total.
	Adults.	Sons.	Spinsters, Wives, Widows.	Daughters.	
Brought forward, . . . . .	119	36	99	30	284
Carpet Planner, . . . . .	1	..	..	..	1
Coach Trimmers, . . . . .	2	..	..	..	2
Engineer, . . . . .	1	..	1	1	3
Carpenter, . . . . .	4	2	5	2	13
Painter and Plumber, . . . . .	8	1	2	..	11
French Polisher, . . . . .	..	..	3	1	4
Timber Seller, . . . . .	..	1	..	..	1
Cabinet Maker, . . . . .	4	..	3	2	9
Upholsterer, . . . . .	2	..	..	1	3
Japanner, . . . . .	..	..	2	..	2
Curiosity Dealer, . . . . .	..	..	..	1	1
Toy Maker, . . . . .	1	..	..	..	1
Box and Gun Case Maker, . . . . .	3	..	1	..	4
Wine Cooper, . . . . .	..	..	1	..	1
Frame Maker, . . . . .	..	..	1	..	1
Basket Maker, . . . . .	1	..	..	..	1
Glass Cutter, . . . . .	..	..	..	1	1
Jeweller, . . . . .	..	3	..	2	5
Gold Beater, . . . . .	1	..	..	..	1
Gilder, . . . . .	..	..	..	1	1
Smiths,—Copper, Tin, Iron, Gun, Brass, . . . . .	3	5	2	3	13
Steel Manufacturer, . . . . .	..	..	1	..	1
Ironmonger, . . . . .	..	..	3	..	3
Coal Vendor, . . . . .	1	1	..	..	2
Scavenger, . . . . .	1	..	..	..	1
Labourers general, including Bricklayers, Paviers, and Masons, . . . . .	8	5	16	6	35
Milkwoman, . . . . .	..	..	1	..	1
Cheesemonger, . . . . .	3	1	..	..	4
Butcher, . . . . .	6	1	1	..	8
Fishmonger, . . . . .	..	..	..	1	1
Greengrocer, . . . . .	3	..	..	..	3
Baker, . . . . .	5	1	2	2	10
Confectioner, . . . . .	..	..	1	..	1
Publican, . . . . .	1	..	1	..	2
Waiter at Public House, . . . . .	1	2	..	..	3
Wine Merchant, . . . . .	1	..	..	..	1
Grocer, . . . . .	..	..	2	..	2
Tobacconist, . . . . .	..	..	1	..	1
Gentlemen, . . . . .	6	..	1	..	7
Alms (Workhouse), . . . . .	2	..	3	..	5
Totals, . . . . .	188	59	153	54	454
Occupations not Registered, . . . . .	41	10	91	40	182
.General Totals, . . . . .	229	69	244	94	636
	298		338		636
	Males.		Females.		Total.

The total number of persons of any given occupation in the district is not known, so the ratio of mortality in each must remain uncertain. [However,] a few general conclusions are evident. The families of tailors shew the largest number of deaths; next to these, shoemakers; then labourers, including bricklayers, masons, and paviers; then domestic, especially female, servants; next messengers and porters; then dressmakers; next follow mechanics of various kinds, as carpenters, smiths, painters, cabinet makers, and so forth. Of persons dealing in articles of food, bakers suffered most; then butchers; whilst the families of greengrocers, publicans and fishmongers suffered less. General trades and the professions are also represented. It is necessary to observe that tailors and their families undeniably form a very large proportion of the working population of this district. On the whole it would appear that the disease did not limit its attack to any one class, nor yet to the very poor.

It is remarked by Mr. Sibley, the registrar of the Middlesex Hospital, that a large number of the persons brought there for treatment presented a very uncleanly appearance, more so, indeed, than admitted into hospitals for ordinary disease. This may doubtless be explained partly by the circumstances that the patients so admitted were probably the most destitute of those who were attacked, and partly by the fact of their being suddenly seized by the disorder whilst engaged in the usual occupations of their trade.

In this extraordinary outbreak, the symptoms of the disease quite corresponded with those of cholera generally. The common occurrence of the attack within the fore part of the twenty-four hours, the extremely short duration of the early cases and the gradual amelioration observable in the later ones, were all plainly noticeable. Lastly, it is certainly true that in the cases occurring at the commencement of the great outburst, premonitory diarrhoea was of short duration or altogether absent.

It will have been noticed that the preceding estimate of the results of the cholera outbreak in St. James's parish is founded entirely on the death statistics. The number of attacks followed by recovery is unknown. Nor can any certain information be collected as to the relative amount of diarrhoea prevailing.

Circumstances Attending the Outbreak

*Correct Mr. Sibley's Assessment of the "Uncleanly" Admissions to Middlesex Hospital*

*Symptoms during the Outbreak Follow Expected Pattern for Cholera*

*Circumstances Attending the Outbreak*

The sudden, severe, and concentrated character of the particular outburst of cholera which has thus been depicted and which constitutes the most [32/33] remarkable local visitation of that disease hitherto recorded in the metropolis, may at first create a hope that here at least the circumstances

which principally determined the localisation of this singular epidemic would not escape a rigorous investigation. But the disadvantages attending a comparatively late inquiry, and the difficulties encountered in its prosecution were so great, that very decided conclusions must not be expected.

From our ignorance of the real or specific cause of cholera, all inquiries like the present are practically limited to a consideration of those conditions which may determine the action of that cause upon and within certain localities. Further, it must be remembered that in this comparatively restricted field of investigation, the want of knowledge just alluded to constitutes a grave difficulty. For if the cause of cholera were itself as well understood as electricity, arsenic, prussic acid, or morphia, means could be found by which to determine its presence, qualities and quantity—and [thereafter] to lay bare, on positive evidence, the conditions which influenced its action, or cessation of action, in given places. But since we do not know the cause of cholera, the questions to be solved concerning its appearance and disappearance, its spreading and concentration, can only receive provisional answers . . . as we have advanced (in the obscurity of our research) towards accuracy of observation, [33/34] correctness of deduction, and freedom from fallacy and error.

In attempting to analyse the circumstances which may be supposed to have had more or less influence in directing the terrible energies of this unknown cause towards a particular portion of the metropolis, we shall first examine the probable effect of those general conditions which must have operated in very much the same manner and degree in every part of it—the rainfall, the temperature and dryness and movement of the air. This will facilitate the subsequent examination of special or local conditions.

#### General or Meteorological Conditions

It has been pointed out by the Registrar-General, speaking of the metropolis generally, that “in the thirty-sixth week of 1854, when cholera raged and the deaths from all causes rose to their maximum (3413), the average daily range of temperature was 30.9°F, considerably the greatest in the fifty-two weeks. The highest temperature of the week was 81.2°F, the lowest was 43.1°F. Therefore, the entire range was 38.1°F. The horizontal movement of the air was only 195 miles, far less than any other week. There was no rain in that or the previous week, and the mean temperature of the previous week had risen to 65.1°F, the highest mean weekly temperature in [34/35] the year.”<sup>4</sup>

This brief summary does not exhaust the interest attached to the general meteorological conditions prevailing in the metropolis during last summer and autumn, as especially applicable to our present inquiry.

*Rain.*—From 6 August, when cholera had fairly established itself in London, to 11 September, when it had begun to decline (i.e., for a period of 37 days), there were only 7 days on which rain fell. The total quantity during that time [was] under three-tenths of an inch, one-third of which (i.e., one-tenth of an inch) fell in one day, 15 August. From 25 August to 11 September (18 days), there was no rain at all and it was within that period that cholera manifested its greatest virulence.

*Temperature of air.*—From the middle to the end of July, the temperature was excessive. From thence to the end of September, it was also decidedly above the average for that season of the year. Its maximum and mean daily value, and its daily range, stood very high on 27, 28, 29 and 30 August and on 3, 4, and 12 September. The maximum temperature fluctuated from 80°F to 85°F degrees in the shade, and from 99°F to 114°F degrees in the sun. The three hottest days [were] 27, 28, and 30 August. On 2, 5, 6 and 7 Sep-[35/36]tember, the temperature, though not so high, was from ½° to 4° above the average calculated for 38 previous years. On 1 September, the temperature fell slightly (6/10 of a degree below the average for that day,) still however reaching to 72°F in the shade and 94°F in the sun. On 27, 28, and 29 August, there was more or less cloud and haze. But from 30 August to 6 September, the sky was almost continually cloudless.

*Temperature of water in the Thames.*—During the months of July and August, the mean temperature of the water at Greenwich was 64°F; in September 63°F. In the two weeks ending 2 September, it ranged from 60°F to 68°F.

*Hygrometric state of the air.*—As tested by the dew point, the air was drier than usual in the months of August and September. Compared week by week, its mean dryness increased and diminished somewhat like the mortality from cholera. But examined daily during the latter part of August and the beginning of September, extreme variations are recorded at Greenwich on any one day. From 30 August to 6 September, the lower atmosphere was not far from complete saturation at some period of each twenty-four hours.

*Wind.*—On 26 August, the wind which for four weeks had been from S.W., W., or S., changed to N.W. On the next three days, there was only occasionally a very gentle movement from the N. On the 30th, what wind there was, was N., and [36/37] then S.W. and W.S.W. On the 31st, S.W., and then N.E.; on 1 September, N.; on the 2nd, S.E. and E. From 3 to 12 September, N.E.; and after that, S.W. again.

*Horizontal movement of the air.*—The stillness of the air during the two weeks ending 2 September and 9 September, in which the mortality from cholera rose to its height, was very remarkable. The total horizontal movement for those weeks [was] not more than 245 and 195 miles. During the ten years from 1845 to 1854, the average weekly movement was 783

<sup>4</sup> [CIC note:] *Summary of Births, Deaths, etc., in London, for fifteen years, 1850–1854.*

miles and the average for the year 1854 [was] 687. Instead, however, of 100 miles a day, the average daily rate in the two cholera weeks, as they might be called, was but little more than 30 miles. But even this is not an adequate account of the unusual stillness of the air. During the 10 previous years, not 10 single weeks can be found in which the movement was less than 195 miles. During the two weeks just indicated, even the slight movement which did occur was not continuous, but interrupted by long intervals of calm. Thus, out of 16 days, from 27 August to 11 September, there were 11 days more or less calm. Seven of these (27, 28 and 29 August, and 1, 4, 10 and 11 September) were calm throughout. Four (30 August, and 2, 7, and 9 September) were calm during one-half of the 24 hours. [37/38]

*Barometer.*—Coinciding with this dry, hot, and quiet state of the atmosphere, the barometric range was continuously high, as would be expected.

*Electricity and ozone.*—The electricity, when observed, was positive and of moderate tension. The ozone action was defective or not manifested at all, a fact probably of serious import.

*General conclusions.*—From the preceding account, it is plain that the period of greatest mortality from cholera in the metropolis last autumn was characterised by a previous, long-continued absence of rain and by a high state of the temperature, both of the air and of the Thames—conditions which would render the waters of that river more concentrated as to impurity, favour periodical evaporation from its surface, and explain the alternating (diurnal and nocturnal?) extremes of dryness and saturation of the air. There was also an unusual stagnation of the lower strata of the atmosphere, [which is] highly favourable to its acquisition of impurity, the operation of those partial currents which are caused by local variations of temperature, and the more subtle movements dependent on the law of diffusion. Moreover, at the rise of the epidemic in London after the middle of July, it will also be found that somewhat similar conditions prevailed for many days. At its decline, they were all more or less changed. It is impossible to assert that the relations here pointed out were uniformly exact, or to fix the precise share which [38/39] each of the conditions enumerated might separately have in favouring the spread of cholera. {However,} the whole history of that malady, as well as of the epidemic of 1854, and indeed of the plagues of past epochs, justifies the supposition that their combined operation, either by favouring a general impurity in the air or in some other way, concurred in a decided manner during last summer and autumn to give temporary activity to the special cause of that disease.

If this supposition be correct, it is obvious that the same general meteorological conditions would operate simultaneously in the limited locality to which the present inquiry is directed; and here too we have found

that the cholera outbreak suddenly declared itself after the four hottest and calmest days of August, viz. the 27th, 28th, 29th and 30th. But, as previously shown in the history of this local outbreak, the resulting mortality was so disproportional to that in the rest of the metropolis, and more particularly to that in the immediately surrounding districts, that we must seek more narrowly and locally for some peculiar conditions which may help to explain this serious visitation.

#### Special or Local Conditions

The considerations involved in this part of the inquiry may be discussed under the following heads:—Elevation of site; soil and subsoil; surface and ground plan; streets and courts; density of the [39/40] population; character of the population; internal economy of dwelling-houses as regards light, ventilation, and general cleanliness; cesspools, closets, and house-drains; sewerage; and water supply.

*Elevation of site.*—As shown in the table at page 55, the mean elevation of St. James's parish above the Thames high water mark is 58 feet, whilst that of the Berwick Street and Golden Square subdistricts, respectively, is 65 and 68 feet. The highest point in the parish, about 75 feet, is near the junction of South Row with Marshall Street, situated in the last named subdistrict. . . . The unusual mortality from cholera in those districts in 1854 . . . stands as the most remarkable exception to that very interesting general relation . . . shewn by Mr. Farr to prevail throughout the metropolis between lowness of level and a high mortality from cholera.

According to the prevalent rule, the annual mortality from that disease in St. James's parish would not be above 40 in 10,000 persons living, whereas in seventeen weeks of 1854, it reached a registered ratio of 152. Even by taking the mean of the low rate of 1849 and the higher rate of 1854,—a proceeding which, though it serves to equalize the mortality numerically, in no way diminishes or explains the exceptional character of that of 1854,—the ratio is still 84 to the 10,000 living persons. Indeed, as is clearly shewn in the table, the actual mortality was greatest in the [40/41] highest quarter of the parish, largely exceeding that of immediately adjacent subdistricts (which have a nearly corresponding elevation) and reducing the cholera area of St. James's to a level with Bermondsey, which has a mean elevation corresponding with the high water mark. (Compare the table, p. 55.) In the epidemic of 1849, similar exceptions to the general rule were instanced in St. Giles's (Holborn) and in Bethnal Green, but none of so extraordinary a character as that now under consideration. Full allowance being made for the acknowledged irregularities in the local distribution of successive visitations of cholera, this fact alone would suggest the existence of some special localizing condition.

*Special  
or  
Local  
Conditions*

*Exception to Farr's Law  
of Elevation Suggests  
a Special Localizing  
Condition*

*Soil and subsoil.*—The artificial, or made, soil of from 8 to 12 feet thick, which, as is usual in districts long covered with houses, is composed principally of accumulated rubbish charged with various débris. {Beneath,] the natural subsoil of the entire parish is gravel, forming part of the gravel bed which extends in a westward direction through Hyde Park. Towards and at the bottom of the gravel, which varies from 20 to 30 feet in depth, are veins or layers of sand resting upon the London clay and abundantly charged with water. This gravelly substratum insures a good natural drainage of the surface soil and of the basements of houses, and is, of course, favourable to the salubrity of the district.

**pest field:** Burial ground. Pest is shorthand for pestilence.

It should here be mentioned that the ancient [41/42] **pest field** used by the neighbouring parishes in the time of the Great Plague had its locality east of Regent Street and north of Golden Square. As considerable doubt and error still prevail in regard to the site of this field, a slight digression may be permitted in order to settle a subject both of medical and topographical interest.<sup>5</sup>

The history of this pest-field is associated with the name of William, the renowned Earl of Craven. [He] fought under Gustavus Adolphus [and] was married, it is said, to Elizabeth, daughter of James I and Queen of Bohemia. Having lived through troublous times, [he] reluctantly surrendered, at the head of the Coldstream regiment, the protection of St. James's Palace to the Dutch Guards of the Prince of Orange. This remarkable man, who died in 1697 at the great age of 88, continued to reside at Craven House, Drury Lane throughout the whole time of the plague in 1665–66. He first hired, and then purchased, a field on which pest houses (said to be 36 in number) were built by him for persons afflicted with that disease and in which a common burial ground was made for thousands who died of it. In 1687, the Earl gave this field and its houses in trust for the poor of St. Clement's Danes, St. Martin's-in-the-Fields, St. James's West-[42/43] minster, and St. Paul's Covent Garden to be used only in case of the plague reappearing. The place came to be known as the Earl of Craven's Pest Field, the Pest Field, the Pesthouse Field, or Craven Field. In 1734, the surrounding district having become covered with houses and streets, a private Act (7 George II., c. 11) discharged this pesthouse field from its charitable trusts, transferring them without alteration to other land and **messuages** at and near Byard's Watering Place, (Bayswater) Paddington, now called Craven Hill. This Act refers to the original **conveyance** for a description of the abutments and boundaries of the field, states that it contains three acres, more or less, and mentions as belonging to it, "one way or passage of six-

**messuage:** "A dwelling-house with its outbuildings ... and the adjacent land assigned to its use" (*OED*).

**conveyance:** "Written instrument or document" indicating transference of property (*OED*).

<sup>5</sup> [CIC note:] The acknowledgments of the committee are due to Mr. Wickens, solicitor to the Craven estate, Mr. Goodwyn, Mr. Crace, and Mr. Farrant for their assistance in regard to this matter.

teene ffoot wide . . . to and from the premises by the Slaughter-house there leading into Eyre Street."

The original extent of the Craven Estate, so far as it corresponded with the site of the pest field, is correctly shewn in the map prefixed to this report. Some additional property lying between West Street and Carnaby Street, purchased by Lord Craven in 1774, has nothing whatever to do with the ancient pest field. Moreover a small portion of the northeast part of the field itself no longer belongs to the estate, having been first rented and subsequently purchased by St. James's parish as a burial ground. The present public baths and washhouses are built over the greater part of this portion. The width [43/44] of the pest field, from the middle line of Marlborough Row and West Street to the west side of Dufour's Place, is about four **chains** [244 feet]. Its length, from the top of Brown's Court at the back of the premises in part of Great Marlborough Street to the set-off against 4 Marshall Street, is rather less than eight chains [488 feet].

**chain:** As a unit of length, 66 feet.

Including the part sold to the parish, it contains three acres and a fraction, forming a tolerably exact parallelogram twice as long as it is wide. The short, narrow piece of Marshall Street next to Silver Street (although now 18 feet wide) undoubtedly corresponds with the way or passage mentioned in the Act. For in what appears to be the original trust deed now existing in the Craven office, this way is described as **excepted out** of the premises abutting the pest field on the south. The "Eyre Street" mentioned was probably an extension of Air Street running northwards to join Silver Street near the point in question before Golden Square was built. In an early and perhaps unique impression of Blome's Map of St. James's parish (one of the series to illustrate Strype's edition of Stowe) which is now in the possession of Mr. Crace, the pest field is shewn with a passage leading to it on the south from Silver Street, Golden Square being also laid down. The date of this map is probably 1680–90. The field itself is represented as if covered with grass, excepting a roadway which extends from the entrance passage nearly to its northern boundary. On the east of [44/45] this roadway, about two-thirds of the distance up, the pest houses are shewn, probably in a conventional manner, as a single block of buildings. In a later impression of this map printed in 1720, the houses, grass, and roadway are all scraped out.

**excepted out:** Excluded.

From this description and the plan [map] it will be seen that, at the present moment, nearly the whole of Marshall Street, South Row and a part of Broad Street traverse the old pest field; West Street and Marlborough Row occupy a strip of its western edge. Considerable doubt exists as to the precise part or parts of the field in which the burial pit or pits were dug. In quite recent times, evidence has been met with in two spots: one, the site of Craven Chapel; the other, in the right-hand, lower corner of the former field, which would seem to indicate at least two places of burial. The

latter position corresponds with Maitland's statement that "at the lower end of Marshall Street, contiguous to Silver Street, was a common cemetery, in which thousands of corpses were buried in the time of the plague. Craven Chapel stands on part of the open ground of the old Carnaby Market, a space which for some reason was long unoccupied by any building, though houses had been built on other portions of the field. Open ground was styled the Pest Field up to the time of Craven Chapel [was] built.

It has been often alleged that, in some way or other, the remains of decomposing animal matter [45/46] or plague matter itself, lying in the soil of this district, are chargeable with the great mortality from cholera near it. Popular opinion has even gone so far as to maintain that the disease of last autumn was not cholera, but a direful kind of black fever. But it is scarcely conceivable that any specific poisonous agent should remain un-decomposed in the ground for 200 years. It is improbable that animal matters, generally, enclosed for so long a period in a gravelly soil should retain noxious qualities of any kind. Yet the possibility of this latter contingency cannot be absolutely denied. Supposing it to be so, such substances could only act by tainting the air directly in consequence of the disturbance of the soil, or indirectly through the leakage of gases or fluids into the sewers. Or, they might otherwise act by contaminating the well-waters of the neighbourhood.

Deep cuttings made in laying down new sewers were carried through one part of the old pest field in 1851 (as shown by the blue colour), and through other parts (as indicated by pink colour) in the winter of 1853–54, the last-named works being completed in February 1854. But no evidence exists of either line having passed directly through an ancient plague pit. No serious nuisance occurred at the time the ground was opened. And no immediate ill consequences ensued to the health of the surrounding inhabitants. It is well known that the whole of the pest field was not used as a burial place. As [46/47] it happened, the cuttings for the new sewers passed through a fine, gravelly soil. Moreover, an interval of at least seven months occurred between the period at which the earth was broken up and the outbreak of cholera which was imagined to have been thus produced. It may be added [that] the site of the pest field comprises but a small part of the "cholera area" and was not more severely visited than other quite distant parts of it.

In reference to the opinion that the sewers themselves may have become channels of contamination by the passage into them of gases or fluids from the pest field soil, it must be remarked that percolation of any kind would be very unlikely through sewers so newly constructed. At all events, this would have taken place much more easily through the older and more decayed ones. But in 1832 and 1849, although cholera penetrated the district, no unusual outburst took place. Moreover, as will be subsequently

explained, the drainage from the pest field flows in two definite directions, whilst the aggravated effects of cholera were equally felt along other lines of sewers.

As regards the possible contamination of the well water by the fluids of the pest field, it must be remembered that in the numerous excavations which have been made in its soil, from time to time, for the foundations of houses, in sinking wells, and in cuttings for sewers, drains, gas and water pipes, . . . much of the actual plague deposit [47/48] have been removed. [Moreover, ] the soil has been so perforated and channeled that, for many generations past, in addition to the natural drainage which is very perfect, it has been draining itself continually in these artificial ways and so ridding itself of its noxious contents. Hence, the chances of the contamination of the well water by the pest-field fluids would become less and less every year, and would certainly be greater in 1832 and 1849 than in 1854. Even the older sewers have been known to rob the water supply from certain wells. The new cuttings, being of greater depth, must act still more efficiently to relieve the soil of any impure fluids with which it may be charged.

On the whole, the supposition of the injurious influence of the pest field as a special cause of the cholera outbreak in St. James's is not supported by any important facts.

*Surface and Ground Plan.*—With the exception of St. James's and Golden Squares, Burlington Gardens, part of the Church Yard and the Workhouse Green, every spot in St. James's Parish is either covered by buildings or, more or less, perfectly paved. It is hardly necessary to add that there are no open ditches, ponds, or stagnant waters; [there are] no pieces of habitually damp ground. The surface is least occupied by houses in the St. James's Square subdistrict; more so in the Golden Square [subdistrict]; most of all in the Berwick Street subdistrict.

*Streets and Courts.*—In the St. James's Square [48/49] and Golden Square subdistricts, there are many long, direct and wide streets. But in the Berwick Street subdistrict and contiguous parts of the Golden Square subdistrict, most of the streets and courts are comparatively narrow, short and exceedingly intricate in their arrangement. Some of the streets even have a dead wall across one end. Of the greater number of those which have a thoroughfare both ways, the junctions with each other are at such irregular intervals that they appear to be obstructed, the view either way is exceedingly limited, and the neighbourhood is very perplexing to a stranger. Even so considerable a street as Broad Street presents no direct outlet at either end. Out-of-door ventilation along the streets is seriously impeded in such a neighbourhood. The heart of the district is much protected, both on the east and on the west—the quarters from which the prevalent winds of this coun-

try blow. In calm weather, the stagnation of the street atmosphere must be almost complete. Indeed, during the hot, still days at the end of last August, this was painfully felt and noted by many of the inhabitants. As a special instance, it may be mentioned that the persons residing in Pulteney Court and New Street complained of feeling suffocated by the temporary closing of Cock Court during the erection of the model lodging houses named Ingestre Buildings.

Lastly, it must be noted as touching this question of out-of-door ventilation, that in the district now under consideration, the yards to the houses are [49/50] generally very small. All available spaces behind the dwellings are covered with factories, workshops or small tenements or cottages—all offering further impediments to a proper circulation of air outside the houses.

*Density of Population.*—From the close covering up of the surface which has just been described, it might be expected that this part of St. James's would be very densely peopled. The fact is so, to a startling degree. The entire parish in 1851 had a population of 222 persons to an acre, standing in this respect within three of the top in the list of the 36 registration districts in the metropolis. The subdistrict of St. James's Square had a density of 134 per acre; that of Golden Square [subdistrict,] 262; whilst the Berwick Street subdistrict had a population of 432 persons to an acre—the most densely crowded of the 135 sub-districts into which London and its suburbs are divided.<sup>6</sup> The removal of the block of houses between Hopkins' Street and New Street for the erection of Ingestre Buildings, which were incomplete at the time of the cholera outbreak, would somewhat reduce the population [50/51] in the Berwick Street subdistrict in 1854. The relatively smaller population in the Golden Square subdistrict is accounted for by its including Golden Square, the whole width of Regent Street, Great Marlboro Street, the Earl of Aberdeen's, the Pantheon, and the Workhouse Yards. But there are parts of it contiguous to the Berwick Street subdistrict and comprised within the cholera area which are quite as densely crowded as the latter. Since all parts are not equally overcrowded in either [subdistrict], the high rate of the population per acre implies a much greater concentration of the evil in special localities.

*Character of the Population.*—Confining our attention now to the district particularly affected by the cholera, it may be stated in general terms that the great mass of the persons inhabiting the densely, crowded parts is composed of the families of labourers, mechanics and journeymen (many of

<sup>6</sup> [CIC note:] See table, p. 55. We may here point out an accidental but important error in the Registrar-General's *Weekly Returns*, commencing 30 September 1854, by which the respective areas of St. James's Square and Golden Square subdistricts (85 and 54 acres) are reversed. This has further vitiated the estimated population per acre in those subdistricts in the table given in the *Weekly Return* for 30 December, p. 547, where the population is said to be 212 in St. James's Square, and 166 in Golden Square, instead of 134 and 262 respectively.

them tailors)—of persons, in short, employed at fair wages and manifesting no peculiarity in moral characters, habits or occupation beyond those usual to their class.<sup>7</sup> The number of those who live other-[51/52]wise than by industry is certainly small. Besides the residents in this crowded district, there is a daily influx and efflux of probably 2000 persons engaged within it in various workshops and factories, in none of which, however, are any specially injurious processes carried on. The larger and less crowded streets are occupied by tradespeople and the professional classes, in every way corresponding with those of similar neighbourhoods.

*Dwelling Houses.*—*internal economy as to space, light, ventilation, and general cleanliness*—For the most part, the houses in this district are old, having been built about the years 1700 to 1740. As already stated, the yards are very small and much covered, but there are no houses built back-to-back. In some streets, the houses are what are termed 3rd class houses, containing from 10 to 15 rooms. In the smaller streets, they are 4th class houses. The rooms, of course, vary in size and height. As usual in dwellings constructed 150 years back, [they] are not objectionable unless over-filled with inhabitants. Cellars and vaults are common. The front areas are narrow and much covered in. Of light there is, generally speaking, an abundance, as the numerous windows, constructed before the adoption of a **window duty**, have been re-opened since its abolition. The indoor ventilation is, on the whole, defective. The staircases and passages [are] [52/53] narrow. The **sashes**, with some exceptions, [are] single-hung so as to open only at the bottom, a serious defect which cannot be too strongly condemned. Probably not more than a dozen houses in the affected district are occupied by a single family; the sub-division of one dwelling among many families [is] the rule. The competition for rooms has been so great that a respectable workman can often only afford to have one for his whole family. The underground rooms or kitchens are frequently inhabited; in Broad Street, for example, nearly two out of five houses [are so]. In many of the smaller streets, half of the kitchens are occupied as dwelling and sleeping rooms, sometimes by a numerous family. More commonly, the number of persons in each kitchen is small.

The ground floors of more than half the houses are occupied as shops. The population, taken generally throughout the district, is accumulated rather in the 1st, 2nd and 3rd **floors**. The 2nd floor [was] usually the

<sup>7</sup> [CIC note:] It was found in the epidemic of 1849 that, through[out] London generally, there were fewer deaths from cholera on Wednesdays, Thursdays, and Fridays than on the other days of the week—the fewest of all being on Fridays. The highest mortality took place on Mondays and Tuesdays. This difference was attributed, in part, to the indulgences often practised at the beginning and end of each week. In St. James's, however, the greatest number of attacks was on Friday, and the daily range of mortality does not justify any general inference unfavourable to the habits of those who were [51/52] seized—a conclusion entirely in accordance with their varied position in society, and also with the assertions of those who know the district.

**window duty:** A property tax based on the number of windows; repealed in 1851.

**sashe:** The moveable part of a window.

**floors:** British ground floor = US 1st floor, British 1st floor = US 2nd floor, etc.

most densely peopled. In Broad Street, the average number of persons to a house is about 18 and to each floor, 5½. But great differences prevail. Even in Broad Street there are instances of 30 persons living in one house. In one of the smaller streets, 54 persons were crowded into one dwelling. The unusual overcrowding of certain houses follows from the general statistics already detailed. In the cholera area, the ratio is between 17 and 18 persons to each house.

In the close and complicated streets in the [53/54] densely packed dwellings—the climax of overcrowding as compared with all London,— [there exist] in the character and occupations of the people, [as well as] the general economy of the houses, conditions . . . which, [along] with other necessarily attendant evils, might be supposed to neutralize the advantages arising from the nature and elevation of the soil. Such an explanation indeed has already been offered by Dr. Baly in regard to the comparatively high rates of mortality from cholera observed in Bethnal Green and in St. Giles', Holborn. Within very straitened limits and with unfavourable external conditions, there is certainly to be found in the cholera area of St. James's a large number of that very class of persons—labourers, mechanics, artisans, journeymen, and tradespeople—who usually supply the most victims to the disease.

But that this circumstance, combined even with defective domestic arrangements, is adequate to explain the actual outbreak appears doubtful. [If so,] why was not the presence of the cholera agent in this same district in 1832 and 1849, although then equally overcrowded, attended by the same lamentable consequences? Why did not cholera, which was present at the same time, under the same meteorological conditions, and with closely corresponding local circumstances in the adjoining districts, ravage them to the same extent? In All Souls, Marylebone, in St. Anne's, Soho (excluding St. Ann's Court), in St. Giles's, and in parts of St. Martin's-in-the-Fields, nearly similar spots could be pointed out. Yet, as [54/55] shewn by the annexed table, the mortality in each was, compared with that of St. James's, very low.

Table shewing the Mortality from Cholera in various parts of the Metropolis, with the elevation, density of population, and general Mortality of the same :—

Localities.	Hospital or Workhouse.	Deaths from Cholera to 10,000 Persons living. 1849.	Deaths from Cholera in 17 weeks to 10,000 Persons living. 1854.	Elevation, or Feet above Trinity High Water.	Persons per Acre. Census 1851.	Annual Deaths from all Causes to 10,000 Persons living. 1841—1850.	
London, . . . . .	..	60	45	39	30	246	
Districts.	Bermondsey, . . . . .	W.	161	158	0	70	268
	Holborn, . . . . .	W.	35	5	53	233	246
	St. James's, . . . . .	W.	16	152*	58	222	206
Sub-District of	St. Giles, South, . . . . .	W.	97	32	64	317	363
Sub-Districts surrounding St. James's.	Mayfair, . . . . .	W.	15	23	56	95	181
	Hanover Square, . . . . .	..	4	9	64	45	163
	All Souls, (Marylebone) . . . . .	H.	25	28*	76	258	290
	St. Anne's, Soho, . . . . .	..	27	37	64	327	203
	Charing Cross, in St. Martin's . . . . .	H. } W. }	48	33	17	48	284
Sub-Districts, St. James's.	St. James's Square, . . . . .	..	13	16	40	134	133
	Berwick Street, . . . . .	..	18	212*	65	432	224
	Golden Square . . . . .	W.	16	217*	68	262	237
Cholera Area of St. James's, . . . . .	W.	17.5	440	66	460	(?)	

\* Corrected by transferring certain Deaths from All Souls, Marylebone, in which Middlesex Hospital is situated, to the localities in which the fatal attacks occurred.— (See Registrar-General's Returns).

St. James Outbreak Compared with Cholera Mortality Elsewhere in Metropolitan London

[55/56] In certain instances within the cholera area, the mortality bore a direct relation to the density of the population. This is true chiefly of streets in the centre of the district. Towards its borders, an overcrowded people with defective external and internal ventilation, and a large amount

of general uncleanliness, did not suffer in the same degree as in the lower part of Wardour Street, in Peter Street from No. 20 to 32, in Walker's Court and in Little Pulteney Street. Individual instances of extreme uncleanliness in both streets and houses (as 7 Husband Street) were sometimes associated with comparative immunity from the disease; whilst some of the wider streets and well-ordered and scantily filled residences were visited severely. It has already been mentioned that 7 workmen, engaged in the open air in the erection of Ingestre Buildings, died. At least 30 other non-residents, visitors or workmen, besides about a dozen others who merely came to dine at chop or coffee-houses in the district, also died. None of these persons slept in it or could have been much influenced by its permanent conditions. Lastly, as bearing on this subject, it must be noted that the average annual mortality of the Berwick Street and Golden Square subdistricts from all causes of death is by no means high (see previous table), shewing that no serious results ordinarily ensue from the acknowledged sanitary defects just described. The elevation is probably the chief cause of this general healthiness.

[In short,] the evils necessarily attending [56/57] the most densely crowded population within the circle of metropolitan registration do not offer a clear and decided explanation of the aggravated results of cholera in this parish. We pass to such other local sanitary disadvantages as might or might not accompany this overcrowding and so be obnoxious or otherwise to health, viz. the state of the cesspools, house-drains, sewers, and water supply.

*Dust-bins and accumulations in yards, cellars and areas.*—At the time of the visitors' inquiry, very careless arrangements were still found to exist in regard to these points. At the period of the cholera visitation, there were undoubtedly many nuisances of the kind. But on the best authority, it may be stated that cholera was most impartially distributed between the comparatively dirty and comparatively cleaner spots.

*Cesspools, closets and house-drains.*—The visitors' inquiry lists sufficiently prove the insuperable difficulty of arriving at true results as to the existence or absence of cesspools. There is every reason to believe that they exist in large numbers. Originally, such receptacles would be sure to be provided. As an illustration of the abundance of these obnoxious pits in certain parts of the parish, it may be mentioned, on the authority of the late Sir H. de la Beche, that when Derby Court, Piccadilly, was pulled down to clear a site for the Museum of Economic Geology, no less than thirty-two cesspools had to be excavated.

Such cesspools are frequently situated in the [57/58] narrow front areas, kitchens or vaults, there being generally no space available for such conveniences in the backyards. In the event of any obstruction or overflow, the entire basement must therefore be filled with deleterious substances or

gases. These cesspools are generally connected with the sewers by means of flat-bottomed brick drains, having, in some cases, the advantage of a bricklayer's water trap in the area or vault. Of the faulty construction of these drains and traps, and of the defective state of repair and blocked-up condition of many of the cesspools, little doubt can exist after the discovery of all those defects in the inquiry conducted by Mr. York at 40 Broad Street. The house drains themselves are also of considerable age and are probably in many cases in the decayed condition detected on the same premises.

Equally impossible is it to ascertain, without additional powers of search, the mode in which these house drains are connected with the sewers. But it may safely be stated that, for the most part, it is by a simple outlet or drain mouth, without other trapping than the water trap in the area. Frequently, when the original sewers are replaced by new ones situated at a greater depth, this opening is made near the top of the sewer arch instead of towards the bottom. In some houses, but certainly in the minority, water closets with pipe drains and leaden, airtight flaps are substituted for the older arrangements.

*Sewers.*—Owing to successive alterations and ad-[58/59]ditions, the sewerage of the district affected by the cholera is arranged in a rather complicated manner. Its plan, as it existed in the autumn of 1854, is laid down in the map prefixed to this report, constructed on the authority of the one published in Mr. Cooper's Report to the Metropolitan Commissioners of Sewers. The older sewers, some of which were built as late as 1823, are left uncoloured. A new sewer constructed in 1851 is shaded blue. The late, extensive additions made in the winter of 1853–54 are tinted pink. The several systems appear to work as follows:—

*a. Waterflow.*—

1. Starting from the high ground near the junction of South Row with Marshall Street, there is a fall in the sewers in two directions. The drainage from the upper part of Marshall Street, South Row and all the intermediate courts and streets to Carnaby Street flows westward through Tyler Street and Foubert's Place into the Regent Street sewer.

2. On the other hand, the middle third of Marshall Street, from South Row to Broad Street, Broad Street itself (including Dufour's Place) as far as Cambridge Street, Cambridge Street and the two Windmill Streets, form another line of flow, running south, east, and then south again.

3. The eastern half of Broad Street, Poland Street, Berwick Street and its dependencies, Pulteney Court, and all the small streets and courts east and south as far as Wardour Street and Little Pulteney Street, ultimately run into the Wardour Street [59/60] sewer.

4. The short piece of sewer in the lower part of Marshall Street, south of Broad Street, ends in a transverse [sewer] line which follows Silver

Street and, from a point opposite to Bridle Lane, falls in two directions—westward to join the Golden Square sewers through Upper James Street, and eastward by a pipe drain to end in the Cambridge Street line already mentioned.

5. Great Pulteney Street has a sewer to itself, running south into a second transverse [sewer] line which occupies Brewer Street and Little Pulteney Street; crossing above the Windmill Street line, [it] falls both ways from that point—westward into the Golden Square system, and eastward into the Wardour Street sewer.

*b. Atmospheric connection.*—Of the five systems of sewers just described, the first (pink) has atmospheric connection with the second (blue) at the high level in Marshall Street near the end of South Row. The first and third appear to be connected atmospherically by the Great Marlborough Street line. The fourth (Silver Street) is connected with the second at the junction of Cambridge and Little Windmill Streets, and with the fifth (Brewer Street) through the Golden Square sewers. The fifth is further connected with the third (Wardour Street) at the end of Little Pulteney Street. Lastly, the second and third, occupying respectively the two halves of Broad Street, have only an indirect and circuitous atmospheric connection.

At the period of the cholera outbreak, it was [60/61] very generally believed that the unusual mortality was, in some way or other, chiefly attributable to the sewers themselves or to their alteration and extension in certain parts of the district in 1851 and in the winter of 1853–54 [due to]:

- (1) disturbance of the ground of the old pest-field already alluded to;
- (2) general disturbance of the artificial soil, the removal of good gravel and the subsequent filling in with rubbish;
- (3) on account of sundry diversions or changes in the previous current of the drainage;
- (4) the foul and loaded condition of the sewers, and the escape of noxious air from the numerous ventilators and untrapped gullies.

It is not easy to connect the general disturbance of the soil in 1851 and in the winter of 1853–54 with an outbreak of cholera in the autumn of 1854. Even in the case of the old pest field, such connection is difficult to be conceived for the reasons which have already been detailed at length. The opening of old ground for the purpose of building new street sewers should be carefully timed and properly conducted. But the vague apprehension that this is necessarily attended with risk to public health may be quieted by the fact that such works were proceeding at the cholera period in various parts of the metropolis without appreciable evil results.

Before 1851, Marshall Street drained into Silver Street, and the

whole of Broad Street, including [61/62] Dufour's Place, drained into the Wardour Street sewer. At present, the drainage of [Marshall] Street flows three ways—its upper part, westward through Tyler Street; its middle part, eastward along Broad Street to Cambridge Street; and its lower part, only into Silver Street. Only the eastern half of Broad Street now drains into Wardour Street. Moreover, the sewers in the two halves of Broad Street are not directly connected. Hence, as Mr. Cooper has remarked, the diversion of the sewerage cannot have had much to do in itself with the increased mortality. The deaths [were] distributed pretty equally over the two districts east and west of Cambridge Street, and even over the two halves of Broad Street separated at the point where the new and old sewers approach without joining. But whether incidentally this diversion of the drainage could have had any injurious effect is a point for further examination.

Of the escape of foul, nauseating and noxious vapours from the untrapped gully holes and ventilators throughout the district, there can be no doubt. Particular evidence of this fact as regards 30 and 31 August could easily be brought forward. Owing indeed to the previous, long-continued absence of rain and the great heat of the four previous days, this was the case all through the metropolis, even in parts lightly visited by cholera, as in Regent Street, in St. Giles' Holborn, and in the northern parts of London. One cannot [62/63] suppose, then, that the general condition of the sewers in this district was different from that in others where cholera was scarcely felt. But it remains to be asked, were there any special circumstances or peculiarities in the sewerage of the affected districts?

The improbability of the pest field soil contaminating the sewers has already been discussed. From the baths and washhouses, the brewery and certain factories, a considerable quantity of hot water continually passes down through these sewers. It is quite certain that this might locally aggravate the smells from the sewer atmosphere by increasing its temperature and moisture. So, also, the acid fluids passing from time to time along them from factories in the neighbourhood might, by meeting with sulphide of ammonium, set free sulphuretted hydrogen and thus add materially to the noxiousness of the escaping effluvia. But the detergent effect of a large quantity of hot alkaline and other waters, unmixed with solid matter, continually flushing the sewers must, of necessity, be a benefit. In particular, it must be added that there is no evidence whatever of baths and washhouses, either here or elsewhere, being in any way specially concerned in increasing the intensity of cholera.

Of cowsheds, grease boiling houses, marine stores and slaughterhouses, there are many, especially along the southern half of the cholera area. Their drainage must pass, some of it into the [63/64] Wardour Street system and the rest into the Golden Square system of sewers. One large

establishment drains into the short piece of sewer at the lower end of Marshall Street, near Silver Street. There is no surface drainage above and the house drainage must be insufficient to keep the sewer clear from obstruction. Direct evidence is on record of the accumulation during last August of the blood, offal and ordure of animals in the short piece of this sewer, as far as its entrance into the Silver Street sewer and even beyond this point. The presence of such accumulations must hold up the house drainage as far as the corner of Broad Street. There is no gully hole along this part of the sewer and no ventilator at the top.

It forms, therefore, a closed and underground retort, 200 feet long, its inclined floor being partly choked with animal matter and refuse (the most prone of all to dangerous putridity), partly covered with the closet drainage from occupied houses and empty only at its upper end. Its beak dips down into Silver Street, into which the products of its distillation must slowly fall. Spreading eastward and westward along Silver Street—escaping partly at its gully holes so offensively that sacks were frequently put over them by the inhabitants near whose doors they opened—the products would either be drawn along in the direction of the air draught in the sewers which, contrary to the water flow, tends towards the higher levels. Or, by aid of gravi-[64/65]tation or [various] currents in the sewers, they might pass in opposite directions before escaping into the streets. In this way, the local atmosphere during the cholera outbreak might be seriously tainted, or molecular decomposition, fermentation or organic growth might extend itself along the contents of the loaded sewers of this overcrowded district wherever atmospheric connection existed. It is impossible to say that this sewer retort would generate any peculiar products. But it would certainly generate more products, and those more quietly than any ordinary sewer. Thus, it might aggravate the mischiefs common to all sewerage and might even constitute a focus of molecular or organic change, by which adjacent accumulations of filth might be more rapidly excited to active decomposition.

Without doubt, the general taint of the atmosphere in the southern half of the cholera district may thus have been specially increased. It is important, further, to bear in mind that probably no such other example exists throughout the metropolis of large slaughtering premises draining into so short a closed sewer, with insufficient head-water to carry away the filth. It must also be remembered that, in 1849, this arrangement did not exist. The surface water and house drainage from a considerable district, including three-fourths of the sewerage from the workhouse, then operated to wash away the refuse from the slaughteryard in question. [65/66]

On general grounds, therefore, it would seem as if here was one local condition probably most favourable to the intensity of a cholera out-

break and special, perhaps, when considered both as to time and place. But there are difficulties in the way of viewing it as a satisfactory explanation of the outbreak itself. No direct underground atmospheric connection can be traced between the Silver Street sewer and the old sewer in the eastern half of Broad Street. The communication between them, through the trunk lines of Wardour Street and Berwick Street, is somewhat circuitous, although not many hundred yards [in total length]. Nevertheless, when the excessively calm and sultry character of the days immediately preceding the outbreak is remembered, an above ground diffusion of the impure air might be supposed to have been concerned in aiding the spread of the disease, either directly or indirectly, by inoculating other seats of mischief, such as over-flowing cesspools existing in that quarter. It has been alleged in the public journals [newspapers] that the deaths generally took place in houses opposite to gully holes and ventilators. But, as stated in our previous remarks upon the map, this was the exception and not the rule.

As to the probable entrance of the sewer air into some houses rather than into others, little certain is known. As already stated, trustworthy evidence can be obtained only in a few cases as to the absence or presence of traps, or their efficiency [66/67] or non-efficiency where they [do] exist. In such important particulars, it is a matter of regret that the present report must remain defective. In the case of 40 Broad Street, it is evident from Mr. York's account that the vertical stone in the water trap, being erroneously placed, could not defend the interior of the house from the gases of the sewer. This may be an example of a very general rule. It is known, also, that when the main sewer was sunk, many house-drains, instead of being lowered, were simply connected by an invert pipe entering too near to the top of the new sewer arch. It has been asserted that where houses had leaden flap traps to the drains, no deaths from cholera took place, and vice versa. In the upper part of Marshall Street, 6 houses are known to have had these flap traps inserted, and in 4, the drains were properly lowered. In these no deaths took place.

But opposite facts are to be met with. In two factories in Broad Street, the closet accommodation, water supply, and traps are equally complete. Yet in one, 7 deaths out of 42 persons employed, took place; in the other, out of 30, none. In a large factory employing 200 people of whom 18 died, the closets are well arranged and attended to daily. It is, moreover, shewn by Mr. Whitehead that in Broad Street, the kitchen population did not suffer so much nor yet so early [in the epidemic] as persons living on some other floors. The percentage of mortality diminished from the ground-floor upwards, with the exception of a slight increase on the third [67/68] floor over the second. Of the 26 deaths in Little Windmill Street, the kitchens, with inmates relatively as numerous and drains as offensive as in Broad

Street, did not supply a single one. In remoter streets, a slight preponderance of deaths on the upper floor is observable.

Hence it would seem that, if the sewage gases operated at all, they would do so by diffusion into the street atmosphere rather than through the house drains. But here also difficulties arise. If the air was so generally tainted, how did so many of the inhabitants escape? Why did not the men employed in Huggins' Brewery suffer, when out of 35 of those engaged close to that establishment in the construction of the then unfinished lodging houses called Ingestre Buildings, no less than seven died? Why did not the inmates of the workhouse suffer more than they actually did? Why should adjoining houses, and families living in one house and on the same floor, have presented similar contrasts?

Although there must have existed abundant causes of an impure condition of the atmosphere in the sewers, drains, basements and even courts and streets, during the hot, still days at the end of last August; although the general, pernicious effects of this are undeniable; and though a comparison of the cholera area of St. James's in this respect with other districts may be unfavourable to the former; yet, a minute inquiry into the details of the cholera outbreak shews that [68/69] the precise influence of this extreme, if not special, foulness of the local atmosphere cannot be satisfactorily defined. It fails, by itself, to explain the apparent anomalies of the remarkable outbreak of cholera in this parish.

*Public Water Supply.*—The western half of the cholera area in this parish is supplied with water by the Grand Junction Company. The eastern part, corresponding very nearly with the Berwick Street registration subdistrict, is supplied by the New River Company. It is obvious, therefore, that the public water supply from these two companies either had some equal and simultaneous share in favouring the cholera outbreak (which seems very unlikely when we consider the suddenness and limited extent of that outbreak) or (what is more certain) had no share at all.

The Grand Junction water has, according to Dr. R. D. Thomson, an average amount of 14.46 grains of solid matter in a gallon. The New River water at the reservoir, New River Head, a normal quantity of 17.18 grains. But during the cholera outbreak, some of the water supplied by the New River Company collected from houses in the Soho district adjoining Berwick Street has been stated to have contained 30 grains per gallon.

It is right to mention here with proper emphasis that, although no influence whatever was probably exerted by the public water supply in increasing cholera in St. James' parish, the condition of the [69/70] water butts and cisterns, as stated in the Visitors' inquiry lists, must have been exceedingly bad. Particular instances the committee forbear to mention. But enough was revealed to make them hope for the speedy abolition of the

cistern and for the consummation of the long advocated plan of a constant supply. Often these butts and cisterns are without covers. Very frequently, owing to the smallness of the back yards, they are in close proximity to accumulations of dirt. As mentioned by Mr. Whitehead, their state was a frequent reason for having recourse to the well water of the district for drinking purposes, to the character and effects of which we must next direct attention.

*Well Water Supply.*—Besides the artesian well sunk near St. James's Church, Piccadilly, there are many wells, public as well as private, scattered through the parish. All of [them] essentially derive their supply of water from the abundant springs which exist in the sand lying above the clay. This sand, it may be stated, is continuous with beds extending all through the gravel district westward across Hyde Park and derives its water partly from the rain-fall on the open country and partly from the surface water and accidental drainage from the soil of the inhabited districts.

These pump wells vary in depth, but all of them are sunk down to the London clay, which serves as their bottom. The sides are built in brick, laid dry, through which the water readily enters. The [70/71] arches are turned over with brick, laid in mortar or cement, and covered in with a key-stone also secured in mortar or cement. A section of the well in Broad Street is shewn with Mr. York's report, which may be read with advantage here.

There are two of these wells in the parish—one in Marlborough Mews in the north, the other in Little St. James's Street in the south—which are so rapidly fed from the water [table] in the sand that they cannot be pumped dry. [However,] the majority of them, as those in Bridle Lane, Charles Street, Duke Street and Broad Street, can be laid dry by continuous pumping in four or five hours. Since, therefore, into these last-named wells the natural supply finds a less ready entrance, it is obvious that the chances of soakage from the artificial soil and the numerous impurities incidental to densely inhabited districts are greatly increased.

In November 1854, in consequence of the relation then declared by Dr. Snow to have existed between the well water in Broad Street and the cholera outbreak, Dr. Lankester was requested to report on the well waters of this parish. In his report, it was shewn that the Broad Street well water contained 96 grains of solid matter to the gallon, the Bridle Lane water 96 grains, and the Marlborough Street water 50 grains. The water from Marlborough Mews (a quick filling well) contained only 30 grains. The water from the Burlington Gardens well, which is also fed very rapidly, contained 32 grains per [71/72] gallon, a fact supposed by Dr. Lankester to be exceptional, but coinciding nearly with the quick-filling well of Marlborough Mews.

It was desirable to ascertain, if possible, what was the standard

composition of the water natural to the sand bed, without admixture from town soil. The artesian well water in Piccadilly contained, when first bored, 40 grains per gallon and no organic matter (Everett); that in Trafalgar Square contains 67 grains per gallon (Graham); and Thames water, a quantity varying from 14 to 38 grains. But neither of these analyses afforded the necessary data. Two specimens of water have therefore been procured from Hyde Park, one from a pump near Kensington Gardens, the other from the running pipe at the east end of the Serpentine. A sample from the Marlborough Mews well, one from a private well in Savile Row, and two samples from the Broad Street well have also been examined. Of the Broad Street samples, the first was taken [9 June 1855,] six weeks from the date of Mr. York's detection of a communication between the well and the cesspool of No. 40, during the whole of which period the well was closed; the second [on 14 June] after the well had then been pumped out three times and allowed to fill again. The results are stated in the following table, to which also is added the composition of Thames water taken at Kew, whence the Grand Junction Company derives its supply. [72/73]

Analysis of Waters from

	Spring at the Northern end of Kensington Gardens. Collected 4th June, 1855.	Hyde Park, near the Serpentine. Collected 1st June, 1855.	Marlborough Mews. Collected 2nd June, 1855.	Private Well. Collected 5th June, 1855.	Broad Street No. 1. Collected 9th June, 1855.	Broad Street No. 2. Taken after three pumpings out of the Well, 14th June, 1855.	The Thames at Kew; the source of the supply of the Grand Junction Company.
Specific Gravity, . . . . .	1000.454	1000.377	1000.438	1000.397	1000.398	1000.873	
GRAINS IN IMPERIAL GALLON.							
Carbonic Acid, . . . . .	8.214	9.170	14.290	13.888	26.374	24.644	5.89
Chlorine, . . . . .	2.503	2.808	3.413	7.504	11.240	10.592	.84
Sulphuric Acid, . . . . .	9.511	13.860	9.890	10.150	12.370	12.370	2.31
Lime, . . . . .	6.051	11.765	10.280	17.542	23.998	23.347	7.42
Magnesia, . . . . .	2.503	2.754	1.007	1.428	1.944	2.161	.50
Soda, . . . . .	4.430	2.156	{ & Potassa } about 6.500	7.580	10.861*	10.861	.84
Potassa, . . . . .	0	0	See Soda.	0	0*	0	.50
Iron, . . . . .	Trace.	Trace.	Trace.	Trace.	Trace.	Not quite so much.	(Silica),
Phosphoric Acid, . . . . .	Trace.	Trace.	Trace.	Trace.	Trace.	Trace.	Trace.
Nitric Acid, . . . . .	Trace.	Trace.	Trace.	Trace.	Much.	Very much.	.42
Ammonia, . . . . .	0	0	Considerable.	Considerable.	+	+	3.08
Organic Matter, . . . . .	5.404	3.080	4.32	5.404	5.404	4.755	
Total estimated . . . . .	38.796	45.593	40.421	63.496	98.791	95.330	22.05
Residue after Evaporation, } 212° Fh. . . . .	45.388	50.404	56.000	80.388	107.015	105.933	
Analysed by . . . . .	W. J. Powell.	T. J. Smith.	P. Worsley.	J. Ormsby.	W. J. Powell.	W. J. Powell.	Graham and Hoffmann.

\* This was not estimated, but inferred from Specimen No. 2.

† In Specimen No. 2, the process for detecting Ammonia was interrupted by an accident. Ammonia no doubt existed in both Specimens.

[73/74] It will be seen that the general result of these analyses is to confirm the differences already found by Dr. Lankester to exist between various well waters of this parish. The quantity of chlorine, combined probably with sodium to form common salt, is remarkable, especially in the Broad Street water. It is so great, indeed, that it must be derived from the debris, refuse, and excreta necessarily accumulated in a densely peopled district, not from the waste water [for street cleaning] of the neighbourhood, which is supplied by the Grand Junction Water Company from the Thames at Kew, where the river water contains, as is shown, a very small quantity of chlorine.

Phosphoric acid, existing either as a soluble phosphate, or as a phosphate of lime dissolved in carbonic acid, is present in minute quantity in all the waters. The nitric acid, which most likely exists in combination with ammonia and lime and which is found in large quantity in the Broad Street water, would be derived from decayed animal matter, probably from mortar rubbish, or even the pest field soil. The carbonic acid originates also from decomposing organic, chiefly vegetable, substances, and is either free or associated with lime or its salts. The sulphuric acid would also be combined with the lime and magnesia to form sulphates. Sulphate of lime is a natural constituent of nearly all spring waters. No sulphuretted hydrogen or sulphide of ammonium existed in any of the specimens. Organic matter was found in all. [74/75] From a general comparison of the well waters it would appear:

(1) In the open park, uncovered by houses, the water of the sand bed is comparatively free from saline constituents, especially from chlorides and nitrates, though it contains a large quantity of organic matter.

(2) Traversing with great rapidity and freedom of percolation through the soil of an inhabited district to feed a quick-filling well, it acquires a decided increase of saline ingredients, including both chlorides and nitrates.

(3) In [the Broad Street well] in which the rise of water is slower, still more of these impurities were found, not only under the influence of percolation from an obstructed cesspool but also after the effects of such percolation had been to a great extent removed by improvements in the drains and repeated emptying of the well.

The contamination of the water in the well in Broad Street by filtration from a cesspool during the time of the cholera outbreak is rendered certain by the result of Mr. York's investigations made in April. The condition of matters then revealed must have been of some duration. Nor is there anything wholly without parallel in these disclosures. Seventeen years ago, this same cesspool was opened on suspicion of contaminating the well water

and the suspicion proved to be correct. Many years ago, closet soil [excrement] was found running down the sides of the well in Warwick Street. Gas has been detected in the Tichborne Street and Bridle Lane [77/78] wells. Enormous quantities of black beetles were found in the well (since closed) in Marylebone Street.

The gross impurity of the water from the pump in Broad Street being fully established, it is equally true that it was in great repute through the neighbourhood for drinking purposes. Its use, indeed, was very general, from choice on the part of some, from necessity on that of others, as their own cisterns were foul and the water in them was liable to get heated and decomposed. It is remarkable that pump water so impure was so much liked. This might be partly explained by its low temperature, by the quantity of carbonic acid contained in it, and by the saline matter preventing its decomposition until after it had free access to the air. But evidence exists to shew that when so exposed for a few days, it became offensive. Even in a few hours, it lost its freshness.

It was Dr. Snow who first endeavoured to trace out a relation which, from previous researches in other quarters, he supposed might exist between the use of this well water and the cholera outbreak in the surrounding districts. The result of his laborious inquiry was in favour of that supposition. Mr. Whitehead, entertaining at first adverse views, ended his special investigation of Broad Street by a remarkable confirmation of Dr. Snow's numerical results. For full particulars as to these two independent investigations, reference must be made to [76/77] their respective reports, which are inserted hereafter. A careful perusal of them is here recommended.

It is shewn by Dr. Snow:

(1) That the outbreak, properly so-called, was principally confined to the area about the Broad Street pump.

(2) That 61 out of 73 persons who died during the first two days had been accustomed to drink the pump water either constantly or occasionally.

(3) That the water was used in various other ways, and might so have been taken in cases where its use in the ordinary way could not be distinctly traced.

(4) That in the workhouse where the well water was not used, only five deaths occurred, whereas 50 would have been a ratio proportionate to that of the neighbourhood around.

(5) That in a factory employing 200 people where the water was drunk daily, 18 people died.

(6) That 70 men employed at the brewery in Broad Street never drank the water and escaped cholera.

(7) That in a number of individual instances which were particu-

larly investigated, the drinking of the water was followed by cholera. In one case, a lady living quite away from the district who had the water sent out to her, died after drinking it. Her niece also died under the same circumstances.

(8) That at any point decidedly nearer to another pump, the mortality from cholera, as a rule, ceased. In an inquiry extending over 48 fatal attacks which took place nearer to another pump, many [77/78] apparent exceptions were found to be cases of death in persons who really had a preference to the more distant Broad Street water.

(9) That in a particular street [Cambridge Street] containing fourteen houses, the only four which escaped without a death were those in which the Broad Street water was never drunk.

(10) That this water was employed for drinking purposes only, and was used cold—a statement which we may so far anticipate as to say is confirmed by the experience of Mr. Whitehead, who met with but a single exception to this rule.

From all these several facts Dr. Snow is of opinion that, although the early cases of cholera and the later cases were due to some other mode of diffusion, the outbreak between 31 August and 10 September was attributable to the well water as the medium of dissemination of the cholera poison. He believes, moreover, that the well water must have been not merely generally contaminated by cesspool drainage, but specially with the evacuations of a cholera patient.

Mr. Whitehead's investigation of Broad Street shews:

(1) That of the 90 fatal attacks among its resident population, 84 took place between 31 August and 6 September, 56 between 31 August and 2 September, and 50 on 1 and 2 September.

(2) That of the 90 deceased persons, 45 positively drank the water shortly before illness. Of only 13, altogether, is it at all confidently said that they did not [78/79] drink it. Moreover, that of the above-mentioned 84, the non use of the water is asserted of only 8. And of the 56 persons attacked between 31 August and 2 September, it is positively affirmed of only 2 that they did not drink this water.

(3) That undoubtedly of 100 persons residing in Broad Street who were attacked with cholera or diarrhoea (including dead and surviving), 80 drank the water, whilst 20 are affirmed not to have drunk it. Out of 336 persons living in that street and who were not attacked with either disease, only 57 had drunk the water, whilst 279 had not.

(4) That there is a great probability that the numerical proportions were even more remarkable than this, all cases involved in any doubt having been rejected.

(5) That in regard to the two factories situated next door to each

other, both equally well arranged in regard to other sanitary conditions, the workmen of one in which the mortality was high had the water for drinking purposes, whilst those of the other never drank it and entirely escaped—the former fact being strengthened by the circumstance that the family of the proprietor never used the water and did not suffer.

(6) That in addition to the contrast pointed out by Dr. Snow as regards the exemption from cholera on the part of the 70 men employed at the brewery where the water was not drunk and the amount of suffering amongst the 200 persons engaged at a neigh-[79/80]bouring factory where the water was drunk—[a] contrast even more remarkable is found between the workmen of this brewery and those engaged on the closely adjoining unfinished lodging houses called Ingestre Buildings. Amongst these latter, [Broad Street] water was in use and cholera proved fatal to 7 out of 35.

(7) That of 97 people residing in 10 houses in which no attack occurred, 87 did not drink the water at all. The remainder did not drink it during the height of the outbreak or drank it either in small quantities or mixed with spirits.

(8) That in a great number of particular instances, narrated at length in pages 136 to 145 (paragraphs 4 to 15),<sup>8</sup> the evidence of an injurious influence exercised by the water becomes strengthened as the inquiry becomes more strict and searching.

(9) That the want of good sanitary arrangements in certain houses [compelled] the residents to resort to the pump for drinking water. On the contrary, in certain instances where the drains were in good order, the cisterns were clean and the inhabitants did not send to the pump.<sup>9</sup>

(10) That through the district generally, the aged and infirm, when isolated, escaped, not merely because they had more house accommodation but because they did not use the water, having no one to send for it.

(11) [80/81] and lastly, that on looking beyond Broad Street to certain cases at a distance from the pump, a remarkable amount of evidence still presents itself in support of the facts observed in its immediate vicinity. (See p. 167.)<sup>10</sup>

Not guided, however, by individual instances, but viewing the accumulated evidence, of which the preceding is but a brief abstract, one is unable to avoid the conclusion that there existed some connection between the use of the well water in Broad Street and the subsequent suffering of the neighbourhood from cholera. The well-established, exceptional cases

<sup>8</sup> See Document 30-II (Online Companion).

<sup>9</sup> [CIC note:] In regard to 4 out of the 6 houses in Marshall Street mentioned [on] p. 67, it has been positively ascertained that this was also the case. The then occupiers of the other 2 are now beyond reach.

<sup>10</sup> See Document 30-II (Online Companion).

**CIC's Conclusion:**  
*"there existed some connection between the use of the well water in Broad Street and the subsequent suffering of the neighbourhood from cholera."*

mentioned by Dr. Snow and Mr. Whitehead as opposed to this conclusion are comparatively few and appear insufficient to neutralise the general result.

It is remarkable that, of the two suppositions—first, that the air alone, and secondly, that the water more especially was concerned in exciting the disease—whilst the former appears less and less equal to explain individual cases in proportion as these are examined more and more in detail, it is precisely in the variety and exactitude of its particular application to individual facts that the latter finds its most positive support. Moreover, in estimating the value of the facts put on record by Dr. Snow and Mr. Whitehead, it must be remembered that the former seized the important advantage of an early inquiry and that the latter balanced the disadvantages of delay by his [81/82] previous knowledge of the district, the people, and the outbreak, [as well as] by the gradual and cautious character of his investigation.

It must also be borne in mind that the weight of both positive and negative evidence appears to be clearly and unmistakeably in one direction, viz.—to shew that the water had some preponderating influence in determining an attack. If it be supposed that the drinking of the Broad Street water by those who died was a mere coincidence, dependent on and to be expected from, the fact that so many persons in the neighbourhood, especially in Broad Street, constantly drank it, it must be remembered that this fact of coincidence also bears with greater force on any mere atmospheric hypothesis. Of those in Broad Street itself who during the great outbreak coincidentally breathed the air, one only in ten died. On the other hand, of the coincident water drinkers, who of course were fewer in number, a much larger proportion was fatally seized. If some idiosyncrasis or resisting power be assumed to explain the escapes amongst the air breathers, it must equally be admitted in aid of those of the water drinkers who did not suffer. And it is obvious that the demands upon so unsatisfactory an explanation are much smaller in the latter than in the former case. If it be urged in explanation of an atmospheric influence that cholera might be conveyed exclusively to some by a partial distribution of an impure air, it may be [82/83] replied that no consideration of the streets, local levels, sewer-grates, house drains, or direction of the wind will explain the existence of such partial atmospheric impurity, whereas the individual use of the water has been actually traced and its consequences may be not unreasonably inferred.

Anxious to give due weight to every fact and consideration that have offered themselves in this inquiry, the committee is unanimously of opinion that the striking disproportionate mortality in the “cholera area,” as compared with the immediately surrounding districts—which, to quote the words already used at the commencement of this section of the report, constitutes “*the sudden, severe and concentrated outbreak,*” beginning on 31

August and lasting for the few early days of September—was, in some manner, attributable to the use of the impure water of the well in Broad Street.

In this conclusion, the committee finds support from the gradually accumulating evidence collected in other localities as to the important influence of contaminated water in increasing cholera, especially in the districts of the metropolis lying south of the Thames. [There], as stated by the Registrar General, “the balance of mortality is heaviest in every district and in every week against the impure water to an extent that leaves little room for doubt on the mind.” Moreover, alluding to the Registrar-[83/84]General’s inquiries, Dr. Sutherland has remarked—“it is difficult to resist this statistical evidence of the predisposing effect of the Battersea water and of the loss of life which has arisen from its use.”

It will presently be discussed what may have been the manner in which the water from Broad Street produced its effects.

#### Hypotheses Concerning the Outbreak

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#### *Hypotheses Concerning the Outbreak*

The attentive observer of the history and accompanying circumstances of this remarkable cholera outbreak will readily trace in its principal features, with all its apparent anomalies and enigmas, an epitome of those wider visitations which have spread over larger areas. For some time, it probably will form a convenient arena within which the advocates of different hypotheses concerning the cause and mode of diffusion of the disease will find abundant materials for scientific disputation. We may here briefly glance at the leading elements of such a discussion:

(1) The generally received opinion that the unknown cholera agent is material rather than dynamical—a poison rather than an atmospheric, terrestrial, or electric influence—is strongly supported by the phenomena of this outbreak. [84/85] The affected district stood alone in its intense suffering, although embraced on all sides by closely populated neighbourhoods which almost escaped. No [atmospheric] influence could well be imagined to confine its operations to so small an area, over-leaping or avoiding the surrounding people. On the contrary, all the facts seem to point to the introduction, importation, or invasion of a *material agent*, either gaseous, liquid or solid, having specific poisonous properties.

(2) Supposing such a morbid material to exist, it would seem very unlikely that the *total* quantity necessary to produce such direful results as to destroy in three days more than 300 persons within so narrow a circle could have been conveyed at once, and as such, into the district by imported articles of either food or drink, both of which are distributed to the inhabitants—not by exclusive arrangements, but in common with surround-

ing parts. Neither could this *total* quantity well be conceived to have been carried to the devoted spot by atmospheric currents without leaving more evident traces of its passage over the neighbouring people, from whatever quarter it might have proceeded. On the contrary, all things favour the idea of its having been introduced in small quantities and then having been *multiplied* within the cholera area itself. Thus far, inference is tolerably clear. Now, however, uncertainty begins.

(3) The nature of this hypothetical material agent is also—[85/86] lutely unknown—whether it be organic or inorganic, itself living, decaying, or altogether unendowed with life.

(4) Whether its multiplication, evolution, or growth takes place in favouring conditions externally to the human body and then its influence is exerted upon susceptible persons; whether it is conveyed to the body in minute quantity, multiplies solely within it, and thus gives rise to the phenomena of the disease; or whether its increase may take place both within and without the body are questions involved in controversy, to which at present no one can satisfactorily reply. The first view, that of external multiplication, is the one most generally entertained. The second, the doctrine of internal development, has two modifications—one in which the poison is supposed to multiply exclusively in the blood by a true zymosis; the other, advocated by Dr. Snow, which supposes the increase to take place only on the internal mucous surface of the alimentary canal. The mixed hypotheses would of course include various combinations of these opinions.

(5) Concerning the mode in which the morbid agent reaches the human body and enters into and acts upon its complex apparatus, differences of opinion also prevail. The whole question is still undecided. It may be conveyed in the air we breathe, enter the system by the lungs, and so act as a poison in the blood—whether it be [86/87] developed only externally to the system, or solely within it. On Dr. Snow's hypothesis, it enters in small quantity by the alimentary canal and, there alone developing itself, originates its poisonous effects. On the mixed hypotheses above suggested, the poison, multiplying externally, may be supposed to enter by the lungs and increase still further in the blood; or, multiplying externally, may gain access to the digestive organs and undergo further development therein.

Reverting now to the entire range of circumstances connected with the particular eruption of cholera now under consideration, we find [the following:] The elevation and soil of the affected district are favourable to health; overcrowding, with its concomitant disadvantages, was rather more marked than in adjacent districts; local circumstances connected with the sewerage, under the influence of peculiar and temporary meteorological conditions, may have caused a special impurity in the air; the public water

supply could not be accused of exercising any pernicious effects; lastly, the well water used for drinking was without doubt excessively impure.

Looking abstractedly at the possible media by which the cholera agent might be rapidly diffused beyond the limits of a household through an area so large as the affected district of St. James's, we are practically limited to two—air and water. Solid bodies, such as food, clothes, or [87/88] living domestic animals could not have formed adequate vehicles for its transmission. Its direct conveyance from person to person, in the strict sense of contagion, is a wholly inadmissible supposition. In this particular instance, reasons have already been given for believing that the explanation which refers this singularly sudden and severe explosion chiefly to the use of the impure drinking water is more conformable to the facts than that which refers it to atmospheric influences only.

In what way then did this water operate? As the vehicle of a predisposing, an accessory, a collateral and specific, or a simple specific agency? Various hypotheses may be entertained:

1. The undeniably impure well water, impregnated with matters from the cesspool and the soil, may have acted not specially, but only as a predisposing cause of the outbreak by occasioning a gradual deterioration in the health of those who drank it or a more sudden change in the condition of their fluids. Either may have rendered them more liable to the invasion of the disease or less able to resist it if attacked. Or, the water acting as an accessory cause may directly have enhanced the activity or aggravated the effects of the real morbid agent.

In either case, the true cholera agent or special cause of cholera would be supposed to be

[a.] conveyed through the air, being generated solely, under favouring conditions, on surfaces exposed to [88/89] the air or in the air itself, previously rendered impure by exhalations from sewers, cesspools, masses of filth, or the human body. Or

[b.] developed solely in the bodies of persons predisposed to the disease.

Or [c.] increased in both ways.

2. The water may have acted collaterally and specifically by yielding something necessary to the development, disengagement, or operation of the true morbid agent—in a word, as the vehicle of one of a series of coefficients indispensable to the production of the disease. On this hypothesis, one or more equally necessary coefficients may have been conveyed through the air, or by means of food, or might exist or be produced in the bodies of persons who were to be attacked. Cases not traceable to the water may have been due to the combined action of the same coefficients conveyed in other

media.

3. The water may have played a more direct part, as the vehicle of a specific poison in various ways:

a. Thus, as Dr. Snow believes, such poison may have entered it in the evacuations of some patient who had cholera or choleraic diarrhoea immediately antecedent to the great outbreak—the poison being supposed thus to have been conveyed in minute quantities from one person to many, and then to have been multiplied in their bodies in contact with the alimentary mucous membrane. Cases not traceable to the water he supposes to [89/90] be due to some other mode of introduction of a minute quantity of the poison into the digestive tube, and its subsequent and sole development there.

b. Another mode in which the water might act as a medium for the transmission of a poison would be both by contamination of the well by a special agent in the intestinal or urinary excretions from a patient labouring under cholera or choleraic diarrhoea and by subsequent multiplication or development out of the human body . . . as, for example, in the contents of the cesspool or in the impure water itself, with which latter it would then be distributed.

c. Again, without supposing the existence of any special poison in the cholera evacuations, the water of the well in Broad Street may have become impregnated by the cholera agent in another way and so have become the vehicle of its transmission. [For example], the cholera poison being multiplied by chemical change or organic growth external to the human body only, may have reached the cesspool in the area of the house close to the well, either through the general atmosphere or through the sewer atmosphere. [Subsequently, it] may then have established itself and multiplied under favouring conditions of stagnation and high temperature, either in the atmosphere of the cesspool or on the surface of the impure accumulations in it, and have been finally washed over into the well by fluids cast into the cesspool at the time.

d. Lastly, the same processes might occur as are [90/91] supposed in the last hypothesis with the addition that, having so gained access to the well, the poison may have further increased or multiplied, previous to its distribution, in the impure well water itself.

On either of these last three suppositions, cases not traceable to the water might be supposed to be produced by the contamination of other fluids or of bad food by some portion of the poison (gaseous, vaporous, or in dry particles) inhaled or swallowed into the stomach.

Other ways may yet be conceived in which the water of the well in Broad Street may have become impregnated with a specific poison capable

of producing cholera, or may have indirectly contributed to determine an attack.

The committee refrains, however, from expressing an opinion in favour of any hypothesis of its mode of action.

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[The following text, in small font, appears to have been added after the rest of the manuscript was already typeset.]

Two questions deserve some attention, viz. the nature of the contamination of the well water, and the relation of the local outbreak in St. James's to the general epidemic throughout the metropolis.

*Nature of the Contamination of the well-water.*—At the time of Dr. Snow's inquiry in the early part of September 1854, and indeed up to April 1855 when Mr. Whitehead's investigation was complete, the entrance of sewer or cesspool drainage into the well in Broad Street was not proved. All the evidence was to the opposite effect. Subsequently, however, as already explained, the basement of the house [at] No. 40 was found to have atmospheric connection with the street sewer and the cesspool to be so choked and defective as to have allowed percolation into the soft black soil around, and thence into, the well itself.

Beyond this, it is proved by the statements of Mr. Whitehead and Dr. Rogers that diarrhoea had affected certain inmates of that house just anterior to the cholera outbreak. In particular, it is pointed out by Mr. Whitehead that the great outburst followed immediately after there had [91/92] been thrown into the cesspool on 28, 29, and 30 August considerable quantities of water containing the diluted dejections of an infant who is registered as having died on 2 September [from] exhaustion after diarrhoea. Although . . . this case is published by the Registrar-General among the cholera deaths, there is necessarily a doubt as to the real nature of the attack. On the one side, the previous history of the child, the presence of only certain symptoms, and the opinion of Dr. Rogers, the medical attendant, have great weight. On the other, it must be noted that cholera symptoms are rarely well marked in the young and that the diarrhoea which prevails during a cholera epidemic is now generally admitted to be choleraic and due to the same cause as cholera itself. There was, moreover, some probability that a child already prone to infantile diarrhoea might become the victim of a choleraic seizure.

Unfortunately, no microscopic examination of the water was made earlier than 3 September. On that day, it was found by Dr. Snow to contain minute whitish flocculi, described by Dr. Hassall as destitute of organisation. It also contained some oval animalcules, but no portions of digested food are mentioned. Six weeks later, Dr. Lankester discovered in it living and dead

*CIC  
"refrains" from  
Choosing  
an Hypothesis*

*Addendum  
to the Report,  
Written after  
Mr. York's Findings*

vegetable and animal organisms, together with shapeless debris.

It is evident, therefore, that microscopical and chemical analysis only confirm the matter-of-fact existence of much organic, as well as inorganic, impurity in the water. Neither scrutiny has served to detect anything which could be pronounced peculiar to a cholera period or capable of acting as a predisposing, co-operating, or specific agent in the production of that disease. But this need not excite surprise. Although the dangerous character and serious influence of impure water in increasing the mortality from cholera in other localities is now unquestionable, no ingredient to which any special action could be assigned has yet been detected in such water by the most refined appliances of scientific research. Nor, indeed, in regard even to the atmosphere itself during a cholera epidemic has the strictest investigation hitherto led to any satisfactory revelations.

However, we may find an argument upon the fact that other well waters in the same neighbourhood containing much the same recognisable organic and inorganic impurities did no harm and that the Broad Street water itself in 1832 and 1849, when it was probably also extensively used for drinking and must have been charged with very similar general impurities, produced no perceptible deleterious effects. [Consequently], we may admit the possibility that its apparently fatal influence in determining the brief but severe explosion last autumn was owing, not to a general impurity, but to the temporary existence of some special contamination.

*Relation of the local outbreak in St. James's to the general epidemic throughout the Metropolis.*—It is quite unnecessary to look beyond the cholera area of St James's and St. Anne's to perceive that the well water in Broad Street was not, in all cases, the [only] means by which a choleraic seizure was determined. As already stated, there were persons within that area who died of cholera without having drunk the water—some before, some after, and some during the great outbreak. [92/93] The occurrence of such independent cases is an important incident in the local visitation. But the questions suggested by them merge in the consideration of the general mortality throughout the metropolis, away from the neighbourhood of Broad Street altogether.

From the fact, more than once alluded to in this report, that the height of the local outbreak in St. James's corresponded with the period of greatest mortality throughout the rest of the metropolis, it has already been inferred that probably some general conditions were at work, simultaneously influencing the operation of the cholera agent throughout all London. Hence, it follows that any conclusions arrived at concerning this local outbreak require to be checked or tested by a reference to the phenomena of the general epidemic. Rightly to employ this test, however, would demand what is now quite unattainable, a uniform investigation of the whole metropolitan

**Amended Conclusion, I:  
A Possible Explanation  
for Why the Outbreak  
Happened**

cholera field.

A comparison of the *daily* deaths from cholera in all London with those in St. James's and St. Anne's would illustrate the characters of suddenness and severity in the local outbreak even more forcibly than the weekly returns contrasted in the table at p. 14. Such a comparison now appears in the Appendix, where it is further shewn that by deducting the disproportionate local mortality of the outbreak, the remaining daily deaths in the rest of London cease to exhibit so marked an increase on 1 and 2 September. . . . This remainder is itself largely composed of the results of smaller local outbreaks, such as those in Deptford and Rotherhithe. It follows that the residual influence of cholera at that period being still further diminished, the number of daily deaths dependent upon it would shew greater uniformity.

The simultaneous occurrence of these local outbreaks itself points to some general favouring condition, subject, however—in ways perhaps not always recognized—to certain, much more directly influential, local circumstances. Hence, although it is most unphilosophical to reject the broad conclusions founded on the study of a widespread epidemic, it is equally so to disregard such more limited deductions as may be derived from the investigation of a local outbreak, or to refuse the light which these latter may perchance reflect on the varied and often perplexing phenomena of a general visitation. [93/94]

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#### Recommendations of the Committee to the Parochial Authorities

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In making the following recommendations which naturally flow from the conclusions established in the preceding report, the committee cannot omit to remark that whilst the sanitary advantages of the parish of St. James's are mainly due to natural circumstances, the disadvantages are artificial and removable. The Committee is of opinion:

1. That, in carrying out any future improvements or in making any public alterations in the parts of the parish affected by cholera last year, care should be taken to remember the importance of opening more direct lines of communication between several of the streets and of getting rid, where possible, of streets or courts closed at one end.
2. That the building of model lodginghouses be still encouraged in place of the existing residences for the families of working men.
3. That efforts be made to abolish slaughterhouses, cowsheds, grease boiling houses, storehouses for bones, and other offensive places of business from this, and all other, densely inhabited districts.
4. That attention should be frequently called to the state of the

**Amended Conclusion, II:  
A Possible Conjunction  
of Local and General  
Causes**

public sewers, especially near to any slaughteryard or cowshed, and also generally in very dry weather to the condition of the small, [94/95] or feeding, sewers. Means should be provided for flushing them when necessary. Such alterations as that suggested by Mr. York, by which he proposes to convey a large supply of surface water into the lower end of the Marshall Street sewer, should be encouraged and carried out.

5. *That, not only on the ground of their liability to special contamination, but from the fact of their constant, habitual and unavoidable impurity, the surface wells of the parish be no longer allowed to be resorted to for drinking purposes. The committee is even prepared to recommend that these wells be closed altogether, and that stand pipes connected with the water mains be erected at certain places for public use.* The committee would further impress upon the parochial authorities the desirableness of again reviving the discussion as to the propriety of sinking one or more artesian wells for the entire supply of the parish.

6. *That, as a first duty, strenuous efforts be made to realize the long-talked of abolition of cisterns and the introduction of the method of constant supply.*

7. That a medical inspector of the parish be appointed, by whose aid important information would be continually collected, and the sanitary condition of its overcrowded portions incessantly watched, and whose duty it would be to forewarn the authorities of the existence of causes, calculated [95/96] to be detrimental to health, which, under existing arrangements, lie dormant, or accumulate to produce some unexpected and overwhelming calamity. The position and duties of such an officer would enable him to teach the poorer inhabitants many useful lessons on matters relating to private and public health, and to discover and remedy many unsuspected causes of individual and public disease.

8. That a list or code of sanitary instructions be drawn up and printed for periodical distribution amongst the inhabitants of the parish.

Sub-committee: Edwin Lankester, MD, Chairman  
Henry Bidgood  
Richard King, MD  
John Marshall, FRCS, Reporter  
Henry Whitehead, MA  
Jehoshaphat York, Secretary

25 July 1855.

*Plan [Map] shewing the ascertained deaths from cholera in part of the Parishes of St. James, Westminster, and St. Anne, Sobo, during the summer and autumn of 1854* [in two parts, folded and inserted between pp. 96 and 97].

Dr. Snow's Report. [97–120]

The Rev. H. Whitehead's Report. [121–69]

Mr. York's Report [170–74]

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[175] The foregoing Reports were brought up and considered at a meeting of the general committee, specially convened to receive the same on 25 July 1855, when it was resolved unanimously:—"That the said reports be approved, adopted, and presented to Vestry."

At a Vestry held on Thursday, 9 August 1855, the said reports were presented by Dr. Lankester, the chairman of the sub-committee. After the question had been discussed, [they] were formally adopted and referred back to the committee to superintend their publication.

F. Crane, T. H. Rice — Church Wardens

Thomas Beames, MA

Richard King, MD

Henry Bidgood

Edwin Lankester, MD

Joseph Brown

John Marshall, FRCS

J. G. French, FRCS

G. W. Sanford

William Geesin

John Snow, MD

Charles Harrison

Thomas Watkins

John James, MRCS

Henry Whitehead, MA

Jehoshaphat York, Secretary

[176] Appendix A

Questions in Visitor's Inquiry List.

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Name of the occupier or rate-payer.  
Resident or non-resident?  
Number of rooms in the house.  
Average size of each room.  
Number of persons (average) inhabiting each room in August 1854.  
In what rooms did cholera occur in August and September last?  
How many cases were there?  
At what hour did the attack in each case occur?  
How are the rooms ventilated?  
Do the top sashes let down?  
Condition and position of the privy or water closet.  
Is there any common sewer in the street?  
Does the main drain of the house communicate directly into the sewer, or into an intercepting cesspool?  
Do the drains of the house emit any stench?  
What drinking water was used in August last?  
What receptacles exist to contain the supply of water? How often are they cleaned out?  
Is the supply sufficient?  
Is the house provided with a receptacle for ashes, dirt, &c.?  
How often is it cleaned out?  
In what part of the premises is it situated?  
Does any offensive place or business exist in the immediate neighbourhood of the house?  
Is the basement of the house used as a dwelling?  
Is any, and what part, of the house lighted with gas?[177/178]

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Appendix B [affixed to 176]

[Table of daily mortality, by streets, 26 July–1 October 1854.  
See 1855-08: Cholera Inquiry Committee, Appendix B to *Report*,  
in Supplementary Figures of the Online Companion]