

Mr. Spear's report to the Local Government Board upon an outbreak of enteric fever in the Pemberton urban sanitary district, Lancashire / [John Spear].

Contributors

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Mr. Spear's Report to the Local Government Board upon an Outbreak of Enteric Fever in the Pemberton Urban Sanitary District, Lancashire.

GEORGE BUCHANAN,
Medical Department,
May 7th, 1890.

The Pemberton Urban Sanitary District covers an area of nearly 3,000 acres, and contains a population, according to an enumeration made in 1889, of 17,000. On the east it is separated from the municipal borough of Wigan by the Douglas river and the Ince brook. At Douglas bridge, which crosses the boundary, the height of the ground above Ordnance datum is 88 feet; two miles to the west, at Lamberhead Green, on the Orrell boundary of the district, an elevation of 255 feet is reached, the ascent being gradual and continuous. Part of the village of Lamberhead Green is within the boundary of the Orrell Urban District, and in that division of the village the land continues to rise to a height of 275 feet. Northward and north-eastward from this point the land slopes towards the Douglas, and southward towards the Withington brook.

Geologically, the district stands upon the coal measures, the surface soil being chiefly clay or shale.

Coal mining forms the staple industry of the population, and a number of the inhabitants are employed in the cotton mills of Wigan.

The district comprises the several detached villages mentioned below—

	Population.
(1.) New Town (on the eastern boundary) - - -	4,468
(2.) Marsh Green, with Kit Green and Scot Lane (on the north) - - -	1,171
(3.) Highfield (central) - - -	3,354
(4.) Goose Green, with Smithy Brook and Little Lane (on the south) - - -	3,317
(5.) Worsley Mesnes, with Poolstork Lane (south-east) -	1,315
(6.) Lamberhead Green, part of (on western boundary) -	3,394

Epidemic prevalence of fever was confined to Lamberhead Green, and affected both sanitary divisions of that village. Of the 960 houses of which the whole village is composed 45 were invaded by fever during the third quarter (July-September) of 1889; 25 of the infected houses being in the Pemberton, and 20 in the Orrell division.

A distinction has, however, to be made in the degree to which different parts of the village suffered. On either side of the road forming its eastern, or Pemberton, entrance there are 163 houses. Only one of these, and that one eight weeks after the epidemic outburst, was invaded by fever. Nearer the centre of the village, on the south side of the main street, and on somewhat less elevated ground than that upon which the remainder of the central part of the village is situated, is a group of streets and short rows containing some 250 houses. Of these only two, and only one at the first outburst, were invaded by fever.

Excluding Lamberhead Green, that is to say, in the whole remaining portions of both sanitary districts, there were but 13 family invasions during the third quarter of the year. In respect of these, however, there was a notable localization. Twelve occurred in the Pemberton Urban Sanitary District, viz., eight in New Town, and four in the locality intervening between Lamberhead Green and New Town.

To summarize, during the third quarter of 1889, the north side of the main village of Lamberhead Green was invaded by fever to the extent of 7.5 per cent. of the existing houses; the entrance and south side (somewhat less elevated localities) to the extent of 0.75 per cent. In the district intervening between Lamberhead Green and New Town, the corresponding per-centage of invasions was 0.70; in New Town it was 1.0. The district beyond this well-defined area, both in Pemberton and Orrell—a district comprising some 1,700

Topography.

Geology.

Industries.

Component villages.

The fever prevalence: Localization.

Summary as to localization.

houses—was, except for a single case at Orrell Post, free during this time, although both earlier and later in the year scattered cases occurred, as shown in the table below, in this wider area.

Table I.—The following table relates to the total number of ascertained family invasions during 1889 in the two sanitary districts.

Household Invasions in							
1889.	Lamberhead Green.		Other parts of Pemberton Urban Sanitary District.			Other parts of Orrell Urban Sanitary District.	
	Pemberton Division.	Orrell Division.	New Town.	Locality between New Town and Lamberhead Green.	Other parts of Pemberton Urban Sanitary District.	Far Moor.	Orrell Post.
January	—	—	—	—	—	—	—
February	—	—	—	—	—	1	—
March	—	—	—	—	—	—	—
April	—	—	—	—	—	1	—
May	—	—	1	—	1	—	—
June	—	—	—	—	—	1	—
Week ending							
July 6	—	—	—	—	—	—	—
" 13	1	—	—	—	—	—	—
" 20	—	1	—	1	—	—	—
" 27	—	—	—	—	—	—	—
Aug. 3	7	7	2	1	—	—	1
" 10	5	9	2	1	—	—	—
" 17	3	2	1	—	—	—	—
" 24	2	1	2	—	—	—	—
" 31	4	—	—	1	—	—	—
Sept. 7	—	—	—	—	—	—	—
" 14	1	—	1	—	—	—	—
" 21	1	—	—	—	—	—	—
" 28	1	—	—	—	—	—	—
October	—	—	—	—	—	—	—
November	—	—	—	—	—	3	2
December	—	1	—	1	—	1	—
Locality of fever prevalence during the third quarter of the year.							

Epidemic period.

I have spoken of the epidemic prevalence as occurring during the third quarter, but, so far as initial cases, i.e., new family invasions, were concerned, its duration was exceedingly limited. Of the total number of 45 family invasions at Lamberhead Green, 32 occurred within the 16 days, July 30th to August 14th. Making allowance for the somewhat wide variation, according to common experience, of the period of incubation in the case of enteric fever, and for the varying individual tendency to make early or late complaint of a sickness that commences insidiously, it seems not improbable that the exact date of infection in these 32 cases was the same.

For the reasons named, the limit of 16 days might, indeed, be reasonably extended, and three or four more household invasions in Lamberhead Green be brought within the category of simultaneous infections. Of the cases later than this, the circumstances, in most of them, suggested the probability that they were dependent upon, and secondary to, the earlier ones. The majority occurred in a dirty neglected locality in the Pemberton division of the village. In two instances the sufferer had washed linen and clothing from an infected house; in two, a next door neighbour had suffered before, and the same privy was used in common; another of these later sufferers had been a frequent visitor at an infected house, taking food, &c., there.

Beyond epidemic area.

As to the 13 household invasions beyond Lamberhead Green, a similar though less marked incidence in point of time was observed. Seven of the 13 occurred within the 16 days interval spoken of above, four of these being at New Town, two in the locality between New Town and Lamberhead Green, and one at Orrell Post. In four of these seven cases, however, including the one at Orrell Post, the patient had, I found, visited Lamberhead Green within a short while, and may possibly, therefore, have contracted infection there. The exact date of the visit could be fixed in three cases; in



two (one of them being the isolated case at Orrell Post) it was 10 days before first complaint of sickness, and in one 14.

The disease appears to have been of a strictly normal type, the distinctive characters and course of enteric fever being observed in a large proportion of cases. The fatality during the third quarter was equal to $12\frac{1}{2}$ per cent. of the ascertained cases. Type and fatality of the disease.

Of the 58 family invasions during the third quarter of the year, multiple attacks occurred in 27. In 12 families there were two sufferers; in eight, three; in three, four; and in four, five. The 58 infected households consisted of 362 inmates, and 111 of these suffered from fever. Individual family invasions.

In eight of the 27 families in which multiple cases occurred, it appears that the second sufferer fell ill within a fortnight of the first, and in six of these cases the interval was no longer than a week. As to these practically simultaneous attacks in families, they all occurred in the village of Lamberhead Green during the period of smart epidemicity of the disease—the beginning of August; and, with one exception, the subjects were all under 16 years.

The age and sex of the sufferers generally, distinguishing primary from secondary cases, are given below:— Age and sex.

	Sex.	Total.	1-2.	2-4.	4-8.	8-12.	12-16.	16-20.	20-30.	30-40.	40-50.
Initial sufferers	M.	25	—	1	2	6	7	3	4	1	1
	F.	33	—	1	6	6	8	1	2	7	2
Secondary sufferers	M.	28	1	2	6	8	1	4	4	2	—
	F.	25	—	3	7	6	2	3	2	2	—

Of the 32 initial sufferers at Lamberhead Green during the 16 days of smart epidemicity, 29, or 90 per cent., were children under 16 years. The corresponding proportion during the remainder of the third quarter at Lamberhead Green was 54 per cent., and in the districts beyond that village, of the 13 initial sufferers, only one (a boy who had visited Lamberhead Green a fortnight before his seizure) was below 16 years of age. No notable discrepancy in the infection of the two sexes was observed at Lamberhead Green during the 16 days, when 15 males and 17 females were attacked. Subsequently, females between 30 and 40 years of age suffered somewhat disproportionately; probably, as it seemed, from the fact, already spoken of, of their greater exposure in busying themselves about infected houses.

It would seem from the foregoing evidence that there are two principal sets of conditions needing consideration. In the third quarter of the year enteric fever showed a disposition to become prevalent amongst the general population of Lamberhead Green, New Town, and the intervening locality, and several scattered household invasions resulted. Over and above this, some time in July, possibly only for a single day, the youthful population of a certain part of Lamberhead Green were exposed to the infection in a special way; and as the first cases of a series of resulting attacks occurred on or about the 30th of July, the approximate date when this special infective influence exerted itself (taking eight days as the shortest probable period of incubation) may be fixed as July 22nd. Conclusions from preceding evidence.

I will consider first the evidence as to the origin of the comparatively moderate prevalence amongst the general population.

Except for the 163 houses at the Pemberton entrance of the village, and for 26 houses in the lower locality to the south, all Lamberhead Green is supplied from the high level reservoir of the Pemberton Local Board; the remainder, with other parts of the Pemberton district (including New Town and the intervening locality), being supplied from the low level service. From the high level reservoir there are supplied, in addition to the above, the whole remaining portions of the Orrell district (about 500 houses), the portion of Kit Green in the Pemberton district (48 houses), and a small locality (30 houses) in the Upholland urban sanitary district. As these extra Lamberhead Water supply.

Green localities were free from fever at the epidemic period, the water supply at its source may be considered exculpated as regards the fever outbreak.

The same may be said of the water after its distribution. For the greater distance from the reservoir two distinct mains are used for the two divisions (Pemberton and Orrell) of Lamberhead Green, and each main is continued beyond that village to supply other parts (Kit Green) that did not suffer. The service is a constant one.

Sewers.

The Pemberton and Orrell divisions of Lamberhead Green are each provided with public sewers, and I could not discover that there was any connexion, such as would admit of the passage of sewer air, and consequent possibility of a common infectiveness, between the two systems. The main sewer of the Pemberton division afterwards passes through the other infected localities of the Pemberton district; that is to say, it follows the line of the road eastward to New Town, bending then to the left, and passing through New Town to the pumping station and sewage farm. This is the main course, and, so far as circulation of sewer air is concerned, it is always open. As to the sewage itself, however, about half way on the road to New Town it is usually diverted so as to be carried by gravitation across the fields to the sewage farm.

The sewer of the Orrell division takes a course at right angles to the one above described, being carried from Lamberhead Green down the northern slope towards a junction, some two miles distant, with the outfall sewer of the Wigan Corporation. It passes in its course through Kit Green, receiving the sewage of the Orrell division of that village, and, about half-a-mile from its termination is joined by the sewer coming from Far Moor and Orrell Post.

The sewers of the two divisions of Lamberhead Green, although, so far as I could ascertain, entirely distinct, have this in common: they each form the upper or higher level part of a sewer system; neither of them are well ventilated; both, at the time of fever prevalence, owing to drought, had for some time been sparingly flushed; and as in houses draining into each of them a single case of enteric fever occurred earlier in July (*vide* Table I.), it may be inferred that each, at the time when fever showed a disposition to become prevalent in the areas drained by them, had received the infective material of typhoid fever.* External conditions, too, were, of course, the same. Meteorologically, they consisted of a prolonged continuance of hot and dry weather, followed, about the time of fever prevalence, by heavy rainfalls.

Private drains.

As to private drainage, there are few internal house-drains in either district in direct communication with the public sewers. Yard gullies are often defective, and the unpaved soil around often more or less sodden with filth.

Excrement disposal.

The privy midden is in universal use in both districts. The structures, speaking generally, are large and deep, admitting of much accumulation of refuse, and, no doubt, of soakage of foul matters into the soil. They are often in very close proximity to dwellings, and when emptied, the refuse has first to be thrown on to the unpaved surface of the yards. This work of removal is provided for in the Pemberton district by the authority; in Orrell it is left to owners and tenants, who are dependent upon the goodwill of neighbouring farmers. At New Town, Pemberton, nuisance has been caused by the deposit of the collected midden refuse on vacant land in close proximity to rows of houses.

There can be little doubt that the unwholesome method of excrement storage and disposal assisted in the spread of the disease in families, and to near neighbours. Moreover, as to the first case that occurred at Lamberhead Green, on July 11, before the epidemic outburst, it is noteworthy that the sufferer lived in a house exposed to emanations from foul midden privies into which typhoid discharges had been thrown at a time of a localised outbreak of enteric fever a year previous. There is much ground for the belief that the typhoid contagion may lie dormant in the soil for prolonged periods, becoming again active during the heat of summer.

Other points:
Highway drains.

In both districts there are highway drains for the reception of storm water from the roadways, and it is probable that some small amount of sewage (slop-water) gains access to these channels. They are said to be quite separate and distinct in the two sanitary districts.

* And, as regards the air of the Pemberton sewer, there is the possibility of its specific infection from the still earlier cases at New Town.

It so happens that a graveyard stands on the northern or higher side of Lamberhead Green, just below the principally infected localities. It is drained at a depth of nine feet into the Pemberton main sewer. The method in which interments are reported to be carried out appears objectionable. According to my information, unsealed coffins are still deposited in vaults; and, as to ordinary graves, since the prescribed interval between each is only $2\frac{1}{2}$ feet, it occasionally happens that in digging one the coffins in another are exposed. Graveyard.

The defects of sewerage and of methods of excrement disposal above described may, perhaps, in a season favourable to the development of the typhoid poison, and in localities that have suffered previously from time to time from typhoid fever, be held to account for some degree of prevalence of that disease amongst the general population; but the sudden and practically simultaneous occurrence of many cases amongst the children of Lamberhead Green evidently requires further explanation. I will proceed now to examine more closely the history of those cases. Considerations respecting influence of ordinary sanitary conditions.

Of the 29 initial sufferers under 16 years of age during the first 16 days of the epidemic prevalence at Lamberhead Green, 11 (aged from 13 to 16) were engaged in various household or industrial occupations, and did not attend school. Of the school children, no very great incidence upon the pupils of either school was observed, and the schools were, moreover, closed for three weeks, for the summer holidays, on July 18th; that is to say, four days before the date suggested by the evidence as the one upon which infection operated. It does not appear, then, that school attendance could have exerted any influence. Schools.

I have had occasion, in several outbreaks of typhoid fever, to suspect that bathing in sewage-polluted waters may, in isolated instances, have led to infection; but in this case such an explanation could not, it was found, apply in any material degree. It will be observed that girls suffered even more than boys. Bathing.

The supply of milk in no way corresponded with the distribution of infection. Of 25 initial sufferers at Lamberhead Green two were stated to have used no milk, and amongst the others the supply was obtained from eleven different sources. Milk.

Other Food Supply.—Inquiries in this direction met with purely negative results except as regards the following exceedingly suspicious circumstance. On July 22nd—the day on which it has been suggested special mischief befell the youthful population of Lamberhead Green—the village fair was held, and, with very few exceptions, the early sufferers had, I found, indulged themselves either in ice-cream, pease-pudding, or ginger-beer (and often all three), sold at the fair booths. As to the ice-cream, all I learned was that three dealers, coming from Wigan, it was believed, provided it, and that in Wigan no unusual prevalence of typhoid fever was at the time experienced. Of the pease-pudding and ginger-beer, a quantity of that sold had, I found, been made in a dirty, ill-ventilated room, in which a boy lay ill of fever. This was the case that appears in Table I. as occurring in Lamberhead Green in the week ending July 13th. It was one characterized by much diarrhoea during the early stages of the attack. The process of making the “pease-pudding” and ginger-beer was described to me; where the boy lay he could have stretched out his hand and touched the vessels in which these articles were being prepared; they stood, moreover, the whole night in a scullery adjoining, and ventilated from, the sick chamber. Other food supply.

Several of the affected children were able to tell me not only what they had at the fair, but at what stall they obtained it, and while positive statements were forthcoming in the case of 14 of the earlier sufferers that they had partaken of the things prepared in this fever chamber, there was reason to believe that the same held good as regards nine others. In fact, it seemed not unlikely that all the child-sufferers at the time of the epidemic outburst had been exposed to this possible danger. The fair booths.

The marked incidence of the epidemic disease upon the children inhabiting the north side of the village (already referred to) is difficult at first sight to satisfactorily explain within the limitations of this hypothesis, and, in fact, seemed to me at first destructive of it. It has to be noted, however, that the family making and selling the suspected articles of food and drink lived

themselves on the north side, in the midst of what afterwards became the chief infected locality. It may be suspected that the children of the locality were more likely, in the spending of their half-pence, to patronise their own neighbour's stall, and, when the unsold residue of the pease-pudding, &c., came to be given away in the evening, as I am informed it was, it may be suspected that neighbours' children were the most favoured recipients. That this was so, in fact, is not wholly a matter of suspicion, but may be inferred from the number of neighbours' children known to have partaken of the articles in question, and the limited amount represented to have been made.

Previous history of enteric fever in the district.

The circumstances of this outbreak received an additional interest when inquiry into past history of the district disclosed a remarkable correspondence between the recent experiences and those of an epidemic in the same locality in 1880. The latter was investigated by Dr. Airy for the Local Government Board. Comparison between the two periods, so far as information allows, is made below.

1880.

May: Death from typhoid fever in a house between Lamberhead Green and Wigan.

District free until the middle of July.

Three houses in three different streets of Lamberhead Green then invaded.

No fresh cases until the beginning of the second week of August (dating cases from medical aid).

Then five fresh cases in different families on five successive days. On August 14th great increase. Fresh families in different directions found to be infected at rate of four or five a day. From 23rd of August rapid decline.

Disease widely distributed. Epidemic, however, broke out and was concentrated in the two sanitary divisions of Lamberhead Green.

No comparable experience in the district for some years previous. Nevertheless, mortality from fever in the district above the average in the country.

Fatality of recognised attacks during epidemic period about 7 per cent.

The sanitary circumstances of Lamberhead Green during the two periods, together with those other circumstances considered above as possibly associated with the epidemic of 1889, may be thus compared:—

1880.

WATER SUPPLY.

Chiefly from a local spring; some surface wells. Public water supply very partially introduced.

SEWERAGE.

Pemberton Division.—Public sewers; imperfectly ventilated and flushed; certain sewers with poor gradient. A few catch-pits in the line of the sewers.

1889.

The same.

The same, except for a household outbreak at an outlying farm in a different direction.

Two houses in two different streets of Lamberhead Green, and one between Lamberhead Green and New Town, then invaded.

No fresh cases until 30th July (dating cases from first symptoms).

Then in two days three families infected; in first three days of August 15; in following week 17. Then rapid decline of infection, epidemic spread ceasing before the end of August.

Disease extended beyond Lamberhead Green, but less widely. It broke out and was concentrated in the two divisions of that village.

The same.

[Deaths from fever since 1880 in the Pemberton and Orrell urban sanitary districts as follows:—

1880	- 25	1885	- 3
1881	- 7	1886	- 5
1882	- 10	1887	- 7
1883	- 7	1888	- 4
1884	- 7	1889	- 17]

1889.

Almost exclusively from the public supply.

The same.

Orrell Division.—Highway drains receive sewage, and discharge into ditches; in a few cases, so it is said, into the sewers of the Pemberton authority.

HOUSE DRAINAGE.

Often directly connected with the sewers; unventilated.

District sewered in 1883. Highway drains retained for storm water; no connexion now with those of the Pemberton district.

House drains now "disconnected"; gullies in house yards.

EXCREMENT DISPOSAL.

Large middens, often close by dwellings. No system of emptying.

Midden system still in vogue, although structures newly erected of less size than the old. Removal of refuse now undertaken by the authority in the Pemberton district. Large accumulations still, however, the rule.

PAVEMENT OF SURFACE.

Streets unmade. House yards unpaved.

Many of the streets now paved and channelled.

House yards unpaved.

DWELLINGS.

Ill-ventilated, and often dirty in the older parts of the village (Pemberton Division).

The same.

MILK.

Not used in certain of the infected houses; in others obtained from several different sources.

The same.

Annual fair held July 26th.

Held July 22nd.

Graveyard.

The same.

The meteorological conditions, speaking roughly, were similar in the two periods; that is to say, the weather was warm, and shortly before the outbreak of disease there was a heavy downfall of rain.

Other conditions requiring the attention of the Authority.

Although from circumstances connected with the distribution of the fever it did not appear that suspicion attached to the water supply of the district, still examination of the sources of supply showed that in certain respects their further protection was desirable. Neither the high nor low level reservoir is efficiently secured against the entrance of surface water that is liable to contamination from public roadways, &c.

The house accommodation of the district requires much attention. There are houses at Lamberhead Green that from dilapidation, dampness, want of proper ventilation, and from the sewage-sodden state of the surrounding surface are unfit for habitation. At New Town, a damp, low-lying locality, there is a great want of proper surface drainage and paving; the houses are largely of the "jerry" class, and are often dilapidated and dirty; middens containing foul accumulations of refuse stand close by the kitchen doors and windows, and at one spot, close by a row of houses, a quantity of midden refuse was last summer deposited by the contractors in the employ of the Authority.

Speaking again of the sewer system, it is evident that much unpurified sewage finds its way into the Douglas. There is only one tank for the deposition of sludge before the fluid is applied to the land, and whenever the tank requires cleansing the sewage is passed by the overflow direct to the river. The same thing happens in time of any heavy rainfall, the pumping then ceasing. In the latter case, and when the river rises, the New Town sewer soon becomes water-logged. This, I am told, frequently happens; and, in fact, owing to the subsidence of the ground, sewage to about a foot in depth habitually stands in a part of that sewer. The ventilation of the sewers generally is inadequate. Originally they were ventilated entirely by perforated man-hole covers, but, through inattention or design, many of these have become securely closed. A few three-inch or four-inch pipes have been erected, but form a wholly insufficient substitute. Street branch

sewers are generally unventilated. There are two small outlying districts that are yet unprovided with sewers.

I have perhaps described sufficiently the evils arising in the district from the common method of excrement disposal. The Authority should resolve upon the introduction into their district of some more wholesome form of privy accommodation, and with this object should consult the Office report on "Excrement Nuisances in Towns and Villages."

One of the elementary schools visited by me in the course of my inquiry (the Wesleyan school at Lamberhead Green) requires considerable sanitary improvement. In one room—giving accommodation for 75 children, it was said—I found 105 infant pupils assembled for the afternoon's work, the classroom adjoining being occupied by the children of another standard. The schoolroom was, moreover, badly ventilated, and a range of foul cesspit privies stood about 20 feet from the door.

The Authority have provided themselves with a hospital for the isolation of infectious disease, well situated and admirably designed. Twelve cases were isolated in this building during the recent outbreak of typhoid fever. A disinfecting chamber has likewise been provided.

The Authority have now adopted the system of compulsory notification of infectious disease. Each outbreak that comes to the Authority's knowledge receives the personal attention of the medical officer of health.

JOHN SPEAR.

March 22nd, 1890.