

Dr. Parsons's report to the Local Government Board on an epidemic of diphtheria in the Sowerby Bridge Urban Sanitary District, Yorkshire / [H. Franklin Parsons].

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Dr. Parsons's Report to the Local Government Board on
an Epidemic of Diphtheria in the Sowerby Bridge
Urban Sanitary District, Yorkshire.

R. THORNE THORNE,
Assistant Medical Officer.
September 2nd, 1889.

Sowerby Bridge is a small but very closely-built manufacturing town, occupying the steep slopes of the deep and narrow valley of the River Calder, at the point where this is joined by a smaller stream, the Ryburn. The main valley runs east and west, and the Ryburn Valley joins it on the south. The district of the Local Board of Health has an area of 536 acres. It comprises portions of four townships, viz., Skircoat, Warley, Norland, and Sowerby, and until recently extended into two registration sub-districts, viz., Sowerby and Halifax; but since April 1st of the present year the whole of the urban sanitary district has been included in the Sowerby registration sub-district. The population in 1881 amounted to 8,724, but is now probably nearer 10,000. The inhabitants are mostly of the artizan class, and are employed chiefly at woollen factories, engineering works, and a large corn mill. The subsoil consists of sandstone rock of the millstone grit formation. The steepness of the site and the high price of land have led to the houses being packed together in a remarkable fashion. Back-to-back houses predominate, and a large number of the houses have no open space belonging to them. In rows of houses arranged on the contour of the hill side, where the ground is on a lower level at the back of the row than at the front, there is often a triple arrangement of front house, back house, and cellar house; the back house being entered from a gallery. In one instance, indeed, I noticed three tiers of houses one above another. On the other hand there are comparatively few confined courts, and those only in the older and lower parts of the town, the houses elsewhere being mostly in streets of good width and open at the ends. Thus there are ample facilities for the circulation of air around the exterior of the houses, if little opportunity for its circulation within them. The houses are substantially built; and though, from a sanitary point of view, one must disapprove of the close packing together of the houses on the ground, leading, as it does, to absence of through ventilation and to objectionable position of sinks and closets, one cannot but be struck by the ingenuity which, in some cases, has been displayed to fit the largest amount of domestic convenience into the smallest possible space.

General description.

Sowerby Bridge has been sewered at different dates. The sewers are mostly of pipes, a few of the larger trunks only being brick culverts. They discharge by several different outfalls into the River Calder, which is already much polluted by sewage and dye water from places higher up the stream. The sewers have abundance of fall, and are described as being clean and free from deposit. They are ventilated partly by manholes in the roads, partly by the rain-water fall pipes which are in direct and untrapped connexion with the drains. The provision for ventilation, however, cannot be considered sufficient, as the sewers are not all ventilated at their upper ends, nor at sufficiently short intervals in their course; and it must be remembered that when rain is falling the rain-water pipes will carry down air into the sewers, and thus add to the tension of the air in them instead of relieving it.

Sewers.

The houses in Sowerby Bridge are provided almost without an exception with indoor slopstones, and the discharge pipe from the slopstone, in the great majority of cases, is connected directly with the drain. The attention of the Local Board was called to the danger of this arrangement at my visit to the district in 1886 in connexion with the Cholera Survey, and in houses built since then the slopstone pipe has been made to discharge in the open air, but little has been done towards getting a similar plan adopted at houses built before that date. The slopstone pipes are usually furnished with an S-shaped trapping bend, affording a water seal between 2 and 3 inches in depth; but some were found untrapped, or provided only with bell traps,

Drains.

here as elsewhere usually broken or out of place, so as to allow drain air to come up into the house. In particular instances also where the slopstone pipe seemed at first sight efficiently trapped, opportunity was found to exist for the escape of drain air into the house below the trap, from holes in the imperfectly-soldered seam of the leaden pipe, or from faulty connexion between the latter and the drain.

One of the disadvantages of the back-to-back plan of building houses as practised in Sowerby Bridge is the objectionable position in which the slopstone is often placed in houses of this kind. In Sowerby Bridge the usual positions are: 1st, in a cupboard next the fireplace; here the warmth promotes decomposition of any putrescible matter which may cling to the slopstone, and effluvia therefrom can pass to the upper shelves of the cupboard, which are used for keeping such things as plates, cups and saucers, and sometimes articles of food. 2nd, in a cellar head or stairfoot at the back of the house against the centre party wall: these places are dark and unventilated; the pipe cannot be made to discharge in the open air, and any effluvia from the sink find their way into the living rooms or bedrooms or into the places where food is kept. 3rd, in the cellar; a position more or less liable to similar objections. Owing also to the way in which the houses are built one above another, the waste pipe from the slopstone in an upper house is often carried through a lower one.

Closets.

The newer houses in Sowerby Bridge are mostly provided with separate waterclosets. The usual place for the watercloset is in the cellar or basement, often under the pavement or ground in front of the house. The lighting and ventilation of the closet are often very defective. The older houses have mostly midden privies, which, owing to the limited space, are often in unsuitable positions, as under or abutting against houses, or in narrow confined spaces to which little light and air can reach. Pail-closets have in some instances been substituted for midden privies. There was formerly much difficulty in procuring the removal of the contents of privies and ashpits; farmers did not care to take the stuff away owing to the quantity of useless rubbish mixed with it, and the steepness of the hills up which it had to be carted; but the Local Board now undertake the removal of the refuse, and have applied for a loan for the erection of a "destructor" to burn it.

Byelaws.

The byelaws at present in force within the district with respect to new buildings are of an obsolete type. The question of revising them upon the basis of the Board's model series has been under consideration for the past three years, but is not yet decided. The difficulty, I understand, is as to the provision of external space about houses.

Water supply.

Water from the Halifax Corporation Waterworks is in general use in the district. It is received into a service reservoir at Cote Hill in the upper part of the district and delivered on a constant service. I have no reason to suppose it to have been contaminated in distribution. Only a few outlying houses are supplied from other sources.

Diphtheria.
Previous history.

Before the present outbreak Sowerby Bridge appears to have been free from diphtheria for some years. On looking through the file of annual reports of the late Medical Officer of Health, Dr. Britton, I find that no deaths from diphtheria were registered in the Sowerby Bridge district in the six years, 1876-81, and only three in that period from croup. In 1882 and 1883 four and seven deaths respectively occurred from diphtheria; in his annual report for 1882 Dr. Britton says, "There have been scattered cases of this fatal disease during the last four months, principally on the hill sides, and due, in my opinion, to sewer gas finding its way into the houses. The weather has been of that character that the pressure of sewer gas in the upper portions of the district has been very great and more than ordinary traps could withstand." In his report for 1883 he says, "There were a number of cases of this fatal disease scattered about during the first half of the year. There was no special cause for these cases that I could ascertain, unless it was the want of ventilation of the sewers on the hill side, from which sewer gas was forced into the houses, even where drains were properly trapped. Since then several ventilators have been put in." In his report for 1885 Dr. Britton says, "Croup (diphtheritic). Of this disease there have been



“ a great many cases in the district during the last two years.” There were nine deaths from it. “ These 18 deaths represent a much larger number of cases, and I have made a house-to-house inspection to ascertain if possible the cause thereof. By far the larger number of cases have been in the neighbourhood of the north side of Bolton Brow, such as Willow Street, Parker Street, &c., the deaths being in the proportion of 13 there to 5 in other parts of the town. The cause is very obscure, and I did think that it might arise from the want of ventilation to the sewers in blind streets; and in consequence several new ventilators were at once put into them. This view, however, I have somewhat modified by the light of more recent inspection, and am now led to think that the emanations from an old dam in this part of the town have had much influence. This dam contains a very large amount of sewage, mill refuse, &c., which at certain times when the water is low gives out a most offensive smell.” Since that time the dam has been emptied, cleaned out, and partly filled up.

No deaths from diphtheria or croup appear to have occurred in 1886. Three deaths from “croup” were registered in 1887, but the district was free so far as known from recognised diphtheria from 1885 up to the end of the third quarter of 1888.

Of the epidemic of diphtheria in 1888-89, the progress and extent up to the date of my visit in the middle of May are shown in the following table:—

Outbreak in 1888-89.

Month.	Households newly invaded.	New Cases in Households previously invaded.	Total New Cases.	Deaths.	
1888.					
October	1	—	1	—	Distribution as regards time.
November	19	3	22	3	
December	31	19	50	13	
1889.					
January	19	8	27	5	
February	10	3	13	1	
March	8	2	10	3	
April	2	2	4	—	
May	4	—	4	2	
Total	94	37	131	27	

The ages and sexes of the sufferers are shown in the next table:—*

Age and sex.

Ages.	Males.			Females.			Total.	
	Initial Cases.	Secondary Cases.	Deaths.	Initial Cases.	Secondary Cases.	Deaths.	Cases.	Deaths.
Under 1 year	2	1	3	4	—	3	7	6
1-5 years	18	7	8	13	4	5	42	13
5-10 „	18	7	2	25	6	5	56	7
10-15 „	2	1	—	8	4	—	15	—
15 and above	1	2	1	1	4	—	8	1
Total	41	18	14	51	18	13	128	27

The disease, it will be seen, affected especially children between the ages of 1 and 15 years, the majority of the cases (84 out of 128) being in children of from 4 to 14 years, which in Sowerby Bridge may be looked on as the school-going period of life; the exceptions were chiefly in the later stage of the epidemic. There were, however, several cases in infants under one year old, and a few in adults, the latter being mostly secondary to other cases in the same households,

* Respecting three cases, two in one family and one in another, this information could not be obtained, owing to the parties having subsequently removed.

and contracted in attending on the sick. The mortality was greatest in proportion at the earlier ages of life; nearly all of the cases in infants under one year old were fatal. The first recognized cases in the respective households were more often fatal than the later ones; of 94 initial cases 23, or 24·5 per cent., died, whereas of 37 secondary cases only four, or 10·8 per cent., died.

Locality.

The cases have been scattered more or less over the whole district, or rather there have been several groups of cases in different parts of the district. One such group of cases occurred about Tuel Lane, and another at the Beech, both in collections of new streets in an elevated position in the northern side of the district. Another group occurred about Bolton Brow and Wakefield Road in the eastern part of the district, and another again at West End. There have been few cases in the central older and low-lying part of the town, but this part is largely occupied by business establishments. Some of the most confined and dirtiest streets, *e.g.*, Terrace Street, have escaped, while others apparently more favourably situated have been invaded.

School attendance.

The grouping of the cases, both in locality and time, has appeared to depend largely on circumstances of school attendance. There are in Sowerby Bridge four public elementary day schools, viz., the Board School, Tuel Lane; the National School, Tuel Lane; the St. George's National School, West End; and the Wesleyan School, Bolton Brow. The following table shows the particulars as to school attendance of the first patients in the respective households:—

	School.						Not at School, or not within a Week before illness.	Total.
	Board.	National.	St. George's.	Bolton Brow.	Other.	Not ascertained.		
Average daily attendance:—								
Boys -	116	109	85	—	—	—	—	—
Girls -	107	129	92	—	—	—	—	—
Infants -	143	99	106	125	—	—	—	—
Mixed -	—	—	—	205	—	—	—	—
1888.								
October -	1	—	—	—	—	—	—	1
November -	17	—	—	—	—	—	2	19
December -	3	2	1	2	2	2	19	31
1889.								
January -	1	2	4	4	—	—	8	19
February -	—	—	—	5	—	—	5	10
March -	—	1	1	1	2	—	3	8
April -	—	—	—	—	—	—	2	2
May -	—	1	—	1	—	—	2	4
Total -	22	6	6	13	4	2	41	94

At the outset the epidemic was confined to children attending the Board School; but later on, when it had become widely spread in the town, many cases occurred which must have been contracted otherwise than at school; and there were also two small groups of cases, one about Christmas among children attending the St. George's School, and another about a month later among those at the Bolton Brow School.*

* These groups are made more distinct if we re-arrange the months thus:—

Month.	School.					Total.
	Board.	National.	St. George's.	Bolton Brow.	None.	
Dec. 25–Jan. 24 -	1	3	5	2	11	22
Jan. 25–Feb. 24 -	—	—	—	7	4	11

The origin of the outbreak is uncertain. The first case of diphtheria appears to have been that of a girl named Elizabeth A. Mansley, aged eight years, residing at Hollins Mill Lane, in one of a row of outlying cottages in a somewhat damp situation between the canal and the river. This girl, who attended the Board School in Sowerby Bridge, was kept at home from 16th October on account of an illness attended with sore throat. She died on November 7th of what was certified as "ulcerated throat;" but Mr. Horsfall, Medical Officer of Health, under whose care she was, in view of subsequent events has no doubt that her case was one of diphtheria. No history of exposure to diphtheritic infection could be ascertained, but a brother living in the same house had shortly before been ill for two or three months with enteric fever.* No exceptional sanitary defect was discovered at the house; the slopstone pipe is in direct connexion with the drain, as is the rule at Sowerby Bridge. Water is laid on to the house from a private supply belonging to an adjoining mill, and obtained from springs in the hill side: in dry weather the spring water is supplemented by that from an open reservoir, and when the latter source is in use the water is spoken of as having a yellow colour. It is laid on to 24 houses, in no others of which had there been, so far as known, any diphtheria, though there was a fatal case later on in January in another house at which water was obtained by dipping from the reservoir. It is not known that diphtheria is transmissible by drinking water, and in the absence of any evidence of special incidence upon the consumers of the water from this reservoir, I am not able to attribute to it any share in the causation of the outbreak.

Origin uncertain.

After Elizabeth Mansley's death the house was cleansed but not fumigated; the clothes she had used were boiled in water and exposed to the air. Later on two other children of the same family, Florence and Herbert, suffered from diphtheria; they were both taken ill on or about December 2nd, and both died on December 12th. They both attended the infant department at the Board School; three other children of the family not attending school escaped. I am informed by the clerk to the School Board that Florence and Herbert were reported to have been sent away from home to their grandmother on or about the 24th of August on account of the illness of a member of the family, no doubt the boy already mentioned who had fever. Florence returned to school on September 10th and Herbert on October 15th; but they were both absent from November 2nd to November 20th, and again from November 29th.

At its outset, as I have already mentioned, the epidemic was confined to children attending the Board Schools, but whether the disease was introduced there by the Mansleys, or whether they themselves contracted it there, I cannot say. From the dates given above it appears that Florence and Herbert were attending school at a time when their sister was ill at home with diphtheria, *i.e.*, up to Friday, November 2nd. They themselves, however, did not contract the disease until a month later.

The Board Schools are a modern block of buildings comprising three departments, for boys, girls, and infants respectively. These three departments are in different rooms, with separate entrances, and they have also separate playgrounds and closets. Children in different departments do not therefore, it is said, mix at school, though they may meet on their way thither or at each other's houses. The cases of diphtheria amongst children attending the Board Schools have been nearly confined to girls and infants: among the boys only three cases are known to have occurred, two of which were secondary to other cases in their families, and the third resided at Norland outside the district.

This boy was last at school on November 9th, and went home ill that day. In point of time he was thus the second case among the children at the Board School. I visited his home but could learn no history of exposure to infection. The house is an inn, but being off the main road there are few casual callers, and the customers are mostly people living in the immediate neighbourhood among whom no previous cases of diphtheria were known to have occurred.

The closet accommodation at the Board Schools consists of three ranges of trough closets at the far end of the playground. Each range has an iron

* Associated with the cases of diphtheria in time and locality were a certain number of cases of sore throat not presenting the distinct clinical characters of diphtheria, though probably of the same nature. I did not, however, hear of any prevalence of such sore throat preceding the outbreak of diphtheria.

trough filled with water by a ball-tap at one end, and emptied by lifting a plug at the other. Prior to the outbreak the troughs were emptied only once a week, on Friday evenings, and their interior surface, being inaccessible, was never thoroughly cleansed. They are described by the Medical Officer of Health and the Surveyor as having been, when their attention was first called to them, in a very offensive condition. Complaints were also made by residents in Tuel Lane below the schools of occasional offensive effluvia from drains connected with the sewer down which the contents of the closets pass, and the time when these effluvia were perceived was thought to be that when the closets were flushed. (The closets are now flushed every day; deodorants are used, and the seats have been made to lift up so that the interior of the trough can be swept clean with a broom.) There was also formerly a defective watercloset of the pan kind for the use of the masters on the boys' side, but as I have mentioned there were few cases of diphtheria among the boys. A child in the infant department was taken ill of diphtheria on November 11th or 12th, another on November 13th, and two girls on November 16th, from which date until December 7th hardly a school-day passed without one or more children ceasing to attend on account of having diphtheria. From Friday, December 7th, the schools were closed by the advice of the Medical Officer of Health until after the Christmas holidays. Since their re-opening on January 7th hardly any cases have occurred among the children attending them.

The majority of the children attending the Board Schools who suffered from diphtheria lived on that side of the town, about Tuel Lane and the Beech; but two children suffered who went thither from Sowerby New Road, a distant part of the town, at that time otherwise free from diphtheria. There were also several cases among children who attended the Board School from Causeway Head outside the Sowerby Bridge district.

The circumstances mentioned point strongly to attendance at the Board Schools as having been the agency by which at first diphtheria was spread abroad in the district. It is less easy to say whether the then foul condition of the school closets had any share in causing or predisposing to the disease; or whether its spread may not have been due simply to the presence at school of children in an unrecognised infectious condition. Although care seems to have been taken to exclude from school all children from infected houses so far as known, yet instances were heard of in which children continued to attend school for some days while they themselves, or their brothers and sisters at home, were suffering from sore throat which eventually turned out to be diphtheria.

A similar explanation may perhaps account for the groups of cases at the St. George's and Bolton Brow Schools. Two girls named Kirkman attending the Bolton Brow School suffered in December from sore throats, but were not seen then by any medical man. They returned to school for a time in January, but later on one suffered from dimness of sight, so that she could not see to do her work, and the other lost her voice. It seems probable that their illnesses in December were diphtheria, and that the subsequent ailments were forms of local paralysis such as frequently follows that disease. (In the Sowerby Bridge epidemic, however, cases of paralysis following diphtheria have been exceptional.)

After the end of November, however, many of those who were attacked with diphtheria were not children at school. Very few of the persons first attacked in a household were adults; they were either children of school-going age who for one reason or another had not been at school within a week before the attack, or were children too young to go to school; a few were infants at the breast. Respecting the origin of these cases, in some a history could be obtained of exposure to infection in visiting or playing with others previously affected. In some cases other members of the household had previously suffered from sore throats which had not been thought to have been of diphtheritic nature. The social gatherings about Christmas time may have had something to do with the cases in the end of December and January. Thus in one family three children suffered from diphtheria who had been to a small party in a house in which there had been diphtheria a month before, the party was on Monday, January 7th, and one boy was taken ill on Saturday, January 12th, the others a few days later.

Respecting the transmissibility of the disease from person to person, however, it has to be remarked that there was but little subsequent spread in families in which definite diphtheria occurred. In only 25 out of 94 households was the first case followed by others; but in some there were several cases, the total number of secondary cases being 37. In families containing several children an attempt was often made to separate the unaffected ones from the sick, either by sending them away, or by letting them sleep in the living room if there were not another bedroom available; and such attempts would seem to have been not without use, though in some large families of children there was no spread of diphtheria, even though no attempt was made to isolate the first case.

It was difficult to account for some of the cases in which an infant under a year old was the first or only member of the household to be attacked. There were six such cases, the ages varying from 7 to 11 months: some were still at the breast. Three were taken ill in December, two in February, and one in March. The milk supply was in every instance obtained from a different dealer. One child had only returned from Lancashire three days before it was taken ill; it had been staying a fortnight in a place where diphtheria was not known to exist.

Respecting modes of propagation of the disease other than from person to person, inquiries were made as to milk supply, which was found to have been obtained from about 34 different sources, no one dealer having supplied more than 12 households in which diphtheria occurred.

Inquiries were also made as to diseases among domestic animals, but without result. Owing to the absence of yard space to the houses no animal is generally kept, except a cat. Only one instance was heard of in which the cat was ill about the time that diphtheria was in the family. It had sores on its head and died, but its body was not examined.

As regards local conditions, the diphtheria was not confined to any one situation; some cases occurred on high ground, others in the bottom of the valley. They were more numerous, however, in the comparatively new streets on the hill slope north of the valley than elsewhere.

There were a good many cases in the neighbourhood of the Beech and Willow Hall Lane, near the dam mentioned in connexion with a previous outbreak, but not more than in some other localities at a distance from the dam. Since Dr. Britton's report this dam has been emptied and partly filled up with earth. Dampness, especially of the cellars, was noticed at a good many of the houses in which diphtheria occurred. Most of them were back-to-back houses, but no special preference of the disease for basement houses or those on a lower level was noticed, and multiple cases occurred in several of the top houses entered from a gallery. Nor was any particular incidence noticed upon houses with waterclosets over those with midden privies, or *vice versa*.

Of sanitary defects observed at houses where diphtheria had occurred the most frequent was the liability to the entry of drain air through slopstones placed and constructed as described on an earlier page of this report; also through cellar drains and indoor waterclosets. This entrance of drain air would be especially liable to happen during times of rainfall. In some instances complaints were made of offensive smells from road gullies near the house door. Such drain defects are, however, common in Sowerby Bridge, and not confined to houses in which diphtheria occurred. Two other circumstances throw doubt upon the connexion between the occurrence of the disease and the breathing of drain air, viz:—

1st. That the death-rate in the district from enteric fever, a disease which is believed, on much stronger evidence than in the case of diphtheria, to be transmissible by drain air, has not been excessive. In the 13 years, 1876-88, the average annual death rate from continued fevers per 1,000 persons has been, in Sowerby Bridge, .20; in England and Wales, .30.

2nd. That the cases of diphtheria have not clearly followed the course of any particular sewer. There are, as before mentioned, several distinct sewer systems at Sowerby Bridge. The largest takes the sewage of Tuel Lane, the Beech, Bolton Brow, part of Wakefield Road, and Wharf Street north of the canal. The largest number of cases of

diphtheria have occurred on the various branches of this sewer. Another set of sewers drains West End, a portion of the district south of the Calder, in the angle between that stream and the Ryburn; there have been a good many cases of diphtheria in this part also. Another sewer drains the central part of the town, including Wharf Street south of the canal. This sewer having the least fall would be most liable to lodgment of sediment, but hardly any cases of diphtheria have occurred along it. Cases of diphtheria have occurred in houses connected with other smaller systems, and in houses not connected with the public sewers.

Action of
Sanitary
Authority.

The action taken at Sowerby Bridge to prevent the spread of the disease, besides the closing of the schools, has been confined to home measures of isolation, such as keeping the children of affected households from school, and keeping the children who were ill, as far as practicable, in a separate room from those who were not. The Local Board have an arrangement with the Halifax Corporation for the use of the latter authority's hospital for infectious diseases: this hospital is three miles distant from Sowerby Bridge, and the arrangement has been, in practice, confined to cases of small-pox, and no attempt has been made to use the hospital for the isolation of diphtheria. Disinfectants have been furnished, and when the illness was over the house has generally been cleansed and lime-washed; but fumigation has rarely been carried out, and the Sanitary Authority have no apparatus for disinfecting by heat. The Medical Officer of Health has not thought it his duty to visit houses in which cases of diphtheria had occurred, unless the cases were in his own practice.

Recapitulation.

To recapitulate—

1. An outbreak of diphtheria, a disease from which the Sowerby Bridge district had apparently been free for some years, commenced in October or November 1888.
2. The origin of the outbreak was not ascertained, but the earliest known cases were among children attending the Board Schools. The closing of the Board Schools for a month stopped the further progress of the disease among the children attending those schools.
3. The disease having become disseminated in the town by the Board School children, its further spread took place by other agencies, of which one seems to have been infection contracted by one person from another, partly through the medium of cases of sore throat not recognised as diphtheria. The attendance of children at certain other schools appears to have assisted the spread of the epidemic in a later stage.
4. It is possible that sanitary defects, and especially the entrance of sewer air into houses, may have had a share in determining the incidence of the disease, but the evidence on this point is not by any means conclusive.

H. FRANKLIN PARSONS.

May 30, 1889.