

Dr. S.W. Wheaton's report to the Local Government Board on diphtheria in the Enfield Urban District and on sanitary administration by the Urban District Council.

Contributors

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REPORTS
TO THE
LOCAL GOVERNMENT BOARD
ON
PUBLIC HEALTH AND MEDICAL
SUBJECTS.

(NEW SERIES No. 10.)

Dr. S. W. Wheaton's Report to the Local
Government Board on diphtheria in the
Enfield Urban District and on Sanitary
Administration by the Urban District
Council.

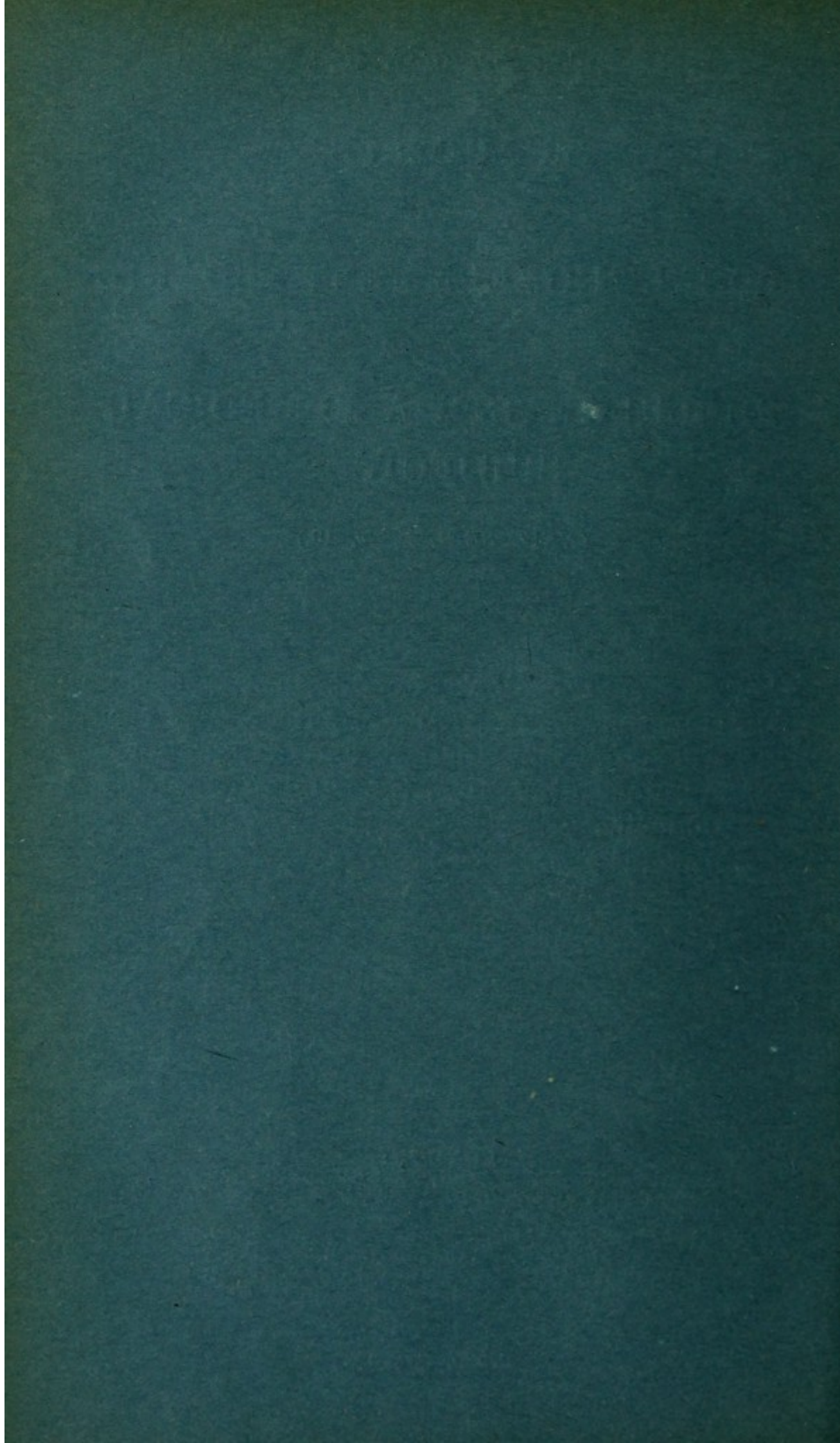


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39

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Government Board on diphtheria in the
Enfield Urban District and on Sanitary
Administration by the Urban District
Council.

ARTHUR NEWSHOLME,

Medical Officer,

14th June, 1909.

For many years past diphtheria has been more or less prevalent in the Enfield Urban district.

In September, 1908, the Board's attention was drawn to a rapid increase in the number of notifications of this disease, as shown by the returns of notifications of infectious diseases forwarded by the medical officer of health. The Registrar General's quarterly return also drew attention to the mortality from this disease in the district.

I was accordingly instructed to make enquiry into the prevalence of diphtheria, and as to the measures taken by the urban district council for preventing the spread of diphtheria and of other infectious diseases. I commenced this enquiry on January 7th, 1909, and following days.

This district has not a good record as regards the prevalence of infectious disease. In 1880 Dr. H. Franklin Parsons, then one of the Board's medical inspectors, and now their assistant medical officer, reported on the prevalence of fever in the district and on its general sanitary condition.* At that time enteric fever was the most prevalent infectious disease and was attributed by Dr. Parsons to unwholesome conditions in portions of the district. These included defective flushing of water closets, and especially liability to

* Dr. H. F. Parsons's Report to the Local Government Board on the prevalence of fever in the Enfield Urban District and on the general sanitary condition of the district, 1880.

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pollution of the water supply. This pollution he attributed to the intermittent water supply acting in conjunction with faulty connections between pans of water closets and water pipes. Water pipes were connected to water closets for flushing purposes without the provision of separate flushing cisterns. He also drew attention to the influence of defective sewers and house drains, and to the effect of polluted watercourses. The fever was especially prevalent in the Chase Side district. In 1888 Dr. Bruce Low, at that time one of the Board's medical inspectors, and now their second assistant medical officer, reported upon an outbreak of diphtheria in Enfield Urban District*. The diphtheria began to be epidemic in September, and was at first confined to dwellings of labourers and artisans in the Chase Side district. A variety of unwholesome conditions were found in this district at the time of this outbreak. A second and later outbreak occurred in December in another part of the district, namely, Bycullah and Bush Hill Parks, which were occupied by the well-to-do classes. This later outbreak was considered by Dr. Bruce Low to be due to infection through the milk supply, and the late medical officer of health, Dr. J. J. Ridge, was of the same opinion.

(a) GENERAL SANITARY CONDITION OF THE ENFIELD
URBAN DISTRICT.

The district has an area of 12,601 acres, and had in 1901 a population of 42,738 persons, living in 7,982 houses. In 1891 the population was 31,536. In 1901 females exceeded males in the population by 578. There were in 1901 19·7 domestic servants per 100 families. At the time of the last census in 1901 there were 280 houses building. In September last the number of houses was 11,349, an increase of 3,367 since 1901, and the population is now estimated at 56,745. This number is arrived at by taking an average number of five persons per house. The rateable value is £263,154. The district is oblong in shape, the diameters being from west to east $7\frac{1}{2}$ miles, and from north to south $3\frac{1}{2}$ miles.

The surface of the district as a whole has a fall from west to east. The urban district can be regarded as composed of three portions. The western is undulating, the hills increasing in height to the westward, where they attain an elevation of from 300 to 350 feet. The eastern half is flat, having an almost imperceptible fall to the alluvial flats of the River Lea. The central portion is nearly flat, but has a slight almost uniform slope to the eastward. Several streams run in a south-easterly direction across the district to fall into the Lea. The New River crosses the district from north to south on the line of the 100 feet contour, being carried over the watercourses on aqueducts. Geologically the western portion of the district is situate upon the London clay, the hills being covered in places by more superficial deposits of boulder clay and glacial gravel. The central or middle portion rests upon London clay, and beds of river gravel and brick earth overlying it. The eastern

* Dr. R. Bruce Low's Report to the Local Government Board on epidemic diphtheria in Enfield Urban Sanitary District, 1888.

portion rests upon river gravel and brick earth, with alluvium in the valley of the Lea. The western portion of the district consists almost entirely of pasture and woodland, although it is equal in area to the middle and eastern portions combined. In this portion there is only one populous area, the village of Hadley Wood. The greater part of the population is in the eastern portion, where are the places known as Enfield Lock, Enfield Highway, Ponders End, and Bush Hill Park, so that the greater part of the people are living on the river gravel and brick earth. Building upon the alluvial area, which is liable to flood, is almost entirely restricted to various factories and to glass houses for market gardening purposes. The middle portion of the district includes the old town of Enfield, Bycullah Park, Clay Hill and Forty Hill, which are residential areas. Included in this portion is also a populous area covered by houses of small rateable value at Chase Side. In the eastern portion of the district the population is almost entirely industrial. About 1,000 men are employed at the Government Ordnance Factory, 1,300 females at the Edison and Swan electric light works; and tube works, marble works, chemical works, floor cloth, white lead, paint, and gas works, together with flour mills and market gardening give employment to the people. In the central portion of the district the people are partly of the industrial and labouring classes, but living in this area are many clerks and others who go to London daily, and a number of well-to-do persons living in the residential portions. There are no factories of importance in this area. There is a weekly market at Enfield Town. There are over 60 miles of district roads in the district and 5 miles of county road.

Condition of dwellings.—In the central and eastern portions of the urban district the majority of the working class dwellings are arranged in rows with yards or gardens in the rear. About half of these houses were built from 20 to 30 years ago when there was a great era of speculative building. Most of the dwellings comprise two rooms and a scullery on the ground floor, and two or three bedrooms. The condition of a large proportion of the older houses well illustrates the evil results of uncontrolled speculative building. Hundreds of houses are composed of sandy bricks which are crumbling away, and absorb and hold the damp and moisture. The material between the bricks contains little if any lime; it can be picked out, and crumbles away with the touch, so that the whole house could be picked to pieces with ease. Roofs are badly laid, of inferior slate, the junction of the slates and the ridge is not properly cemented, so that rain enters many dwellings from detachment of tiles, or owing to its blowing in beneath the eaves or through a space left between the ridge and the slates. Projecting out-buildings at the back, and bay windows in the front, are often not furnished with eavespouting, consequently the rainfall from them is discharged on to the ground and soaks into the foundations. Damp courses are often provided, but have often been placed so low that they are beneath the surface of the surrounding ground, and therefore of little value in preventing dampness of the walls. Even when eavespouting for roofs has been originally provided, it is often found to be absent from decay

or dilapidation. Frequently the down pipes reach only to about 8 or 10 feet from the ground, and the rainwater is discharged on to the house wall. Cracks from settlement in house walls are not infrequent. Owing to these conditions dampness of houses is very pronounced, especially of the back rooms and the back kitchens or sculleries. Frequently the paper peels off the walls in the bedrooms, and in the back kitchens and sculleries the walls are often streaming with damp and covered with mould. Wet rot in boarded floors, and dampness of brick or tiled floors are common. There are few courts and few dwellings which should not obtain a fair amount of light and air if they were left as originally built, but the custom is to fill up the back yards with outbuildings, such as fowl-houses and greenhouses, and to make collections of all kinds of rubbish in them. The free circulation of air, and the due lighting in the rear, are often greatly obstructed from this cause. The ground around houses is frequently unpaved and not covered with any impermeable material. Where an area adjoining the house has been intended to be laid with concrete and cement it is often found that loose rubble was used, and only a thin layer of concrete and cement laid on the top. This soon wears through, when a hollow cavity is left into which rainfall and liquid filth soak, thus fouling the subsoil of the house. The paving around sink gulleys is often badly done, so that filth thrown to or near the gully soaks into the ground. In short much of the builders' work has been scamped and done cheaply and badly. The surface water in yards often stands in pools on the surface, owing to the central part of the yard being the lowest and no exit being provided for the surface water. Many rows of dwellings appear to have been built in depressions from which the gravel has been taken. The backs of the houses and the yards often appeared to be saturated with damp, especially where they had a north aspect. All these conditions are most marked in the Chase Side district but also are frequent at Enfield Lock and Ponders End. In residential areas, such as Hadley Wood, Byculla Park and Bush Hill Park, houses are well constructed. Houses which have been built for the working classes in recent years are of much better construction and materials, owing to increased supervision by the council's building inspectors.

Water Supply.—This is derived from the Metropolitan Water Board, under whose control several wells in the district formerly belonging to the district council have passed. Nearly all houses have cisterns. Separate flushing cisterns are now provided to nearly all water-closets in the district. Water cisterns are frequently found without proper coverings.

Sewerage.—Nearly the whole of the district is sewered on the separate system, the exceptions being houses in the rural portions which are drained to cesspools, and a number of the older houses in populous areas, the roof water from which enters the sewers. Nearly all the rain and surface water is conveyed by a separate system of drains to the watercourses. Unfortunately there has never been any comprehensive system of sewerage for the district as a whole. Sewers have often been laid from time to time by estate owners and

by private individuals as they were required for building operations, and connected to the main sewers, often without due regard to the levels and to future building operations. No plan has been kept of the sewers, or of the surface water drains, except one on a very small scale of the main sewers. Consequently the position, gradients, and construction of many are not known with certainty, nor the course of the house drains and their connections. The memory of the inspector of nuisances, and the knowledge of the men who are engaged in flushing them, have to be relied upon for defining their position, condition, and structure. The sewers are almost entirely constructed of socketed pipes. The main sewers follow the line of the fall of the surface and all converge to the south-eastern corner of the district, where the sewage disposal works are situated. These works are outside the district and in the Edmonton Urban District. One main low level sewer, which has been made 35 years, collects sewage from Enfield Lock and the Government Ordnance Works, and runs from north to south through the low-lying tract bordering the Great Eastern Railway at the eastern extremity of the district to reach the outfall. A comparatively new main sewer also runs from north to south along the Enfield Highway and collects the sewage from a large part of the eastern portion of the district. This is joined at the outfall by a main sewer which passes down Baker Street and collects sewage from the Chase Side portion of the district. A very long main sewer, most of which has been recently constructed, collects the sewage of Hadley Wood and runs right across the southern part of the district, collecting in its way sewage from Bycullah Park, Enfield Town and Bush Hill Park, to join the above-mentioned sewers at the outfall. There are thus four main sewers discharging at the disposal works. The sewage is collected in open and covered tanks, and is filtered through four large filters of clinker, 100 feet in diameter, fitted with automatic sprinklers. There is no treatment by chemicals. The effluent is dealt with by broad irrigation on land 112 acres in extent, which is under-drained. The land is ploughed over from time to time, and crops are grown on it. The final effluent escapes to the river Lea. In some parts of the district the street sewers are very defective and not self cleansing. All the sewers are hand flushed and no automatic flush tanks are provided on them. As to the ventilation of the sewers, covers with open gratings were originally provided as air inlets, or exits, at the manholes, but these have been closed up by iron discs. Ventilation shafts have been provided in places to serve for exits to foul air. If the sewers were self cleansing and had properly constructed manholes these would probably be sufficient. Inspection of the sewers is provided for by manholes. Unfortunately these have been very badly constructed in many instances. Their bottoms are often flat, or if there is a channel it is of rough cement only; frequently tiled or smooth cemented inverts are not provided. In the absence of sufficient fall and flow for self cleansing purposes filth is held back by the rough channels and floors and accumulates in the manholes, so that many are merely catchpits containing decomposing filth. In several instances the sewers in the streets fall in a direction opposite to the fall of the ground, and are in consequence of want of allowance for this fact very flat with almost

no gradient, so that the sewage stagnates in them. Not infrequently in a street with flat surface there will be two sewers falling in opposite directions, both with very slight fall. The sewerage is especially unsatisfactory in the Chase Side district, which drains to the old sewer in Baker Street, and at Enfield Lock, which drains to the low level sewer, which is also an old one. In those portions of the district where the sewers have been laid by the district council's own staff, such as parts of Bush Hill Park, the sewers are satisfactory and provided with proper manholes. Those sewers which have been laid of late under supervision of the council's officers are also of better construction, even in the case of property of small rateable value. The surveyor is well aware of the defects of the sewers, especially of the unsatisfactory low level sewer. Measures for their replacement by efficient sewers are to a certain extent delayed until the settlement of a proposal for the drainage of the whole of the Lea Valley, or of a portion of it, by a projected joint sewer. The system of surface water drainage is in places not satisfactory. Where surface water drains are provided they are often of insufficient fall, so that the water stands in the manholes. If this stagnant water become foul from any cause, or if the weather be warm, nuisance must arise. In the Chase Side district the drainage of the sub-soil is insufficient, and hence no doubt in part arises the general appearance of dampness of houses and yards. There are here several small watercourses with very slow flow, which in several instances run along the backs of the houses. Into these ditches the surface water drains from higher levels discharge. At the present time a new surface water culvert of large size is being laid down in Church Street, and will reach within half a mile of the Chase Side district. It is hoped that this may be extended in the future so as to drain the watercourses, to tap the surface drains, and so improve the general drainage of this area and dry the subsoil. Other open ditches in places are at the present time being replaced by pipe culverts, but a good deal of this kind of work remains to be done in the future.

House Drainage.—It will be anticipated from what has been said as to the defective structure of many of the dwellings of the working classes in the district, that if the house drains were laid with similar want of supervision they would also be unsatisfactory, and this is the case. They are constructed of socketed pipes, but in many instances in the older houses clay only has been used for the joints, so that filth escapes from the drain into the subsoil. Frequently the drain passes under the house. In a number of instances five or six houses are connected to one drain, which runs at the back of the houses, and turns at the end of the block to join the sewer in the street. In many cases the drains have not a proper fall, nor is there any means for inspecting their condition. They are connected directly to the sewer without intercepting trap or inspecting manhole. When cases of infectious disease occur in a house the house drains are examined by the inspector of nuisances, and if found defective, as is frequently the case, they are relaid. In this way a considerable number have been reconstructed, or are in course of reconstruction. Where a number of houses drain to one common drain which has to be relaid, the district council have

had to contribute part of the cost of the improvement. In these instances an inspecting manhole is usually placed on the joint house drain before it enters the sewer, and an intercepting trap is provided between it and the sewer. A vent shaft is also provided at the end of the joint house drain. A systematic inspection of all the house drains in many parts of the district is urgently required. The drains should be examined, their positions recorded on a plan, and any defects made good. In the better class of houses and in the case of houses which have been constructed recently, the house drainage is for the most part satisfactory, having been laid under the supervision of the building inspectors. The gullies in use are of stoneware; few dip traps, or bell traps, remain. Frequently the gratings over the gullies are fixed, so that the filth collected in them cannot be removed, and gives rise to nuisance, or blocks the exit. In most instances the sink pipes discharge over the gulleys in the open air, but from time to time when cases of infectious disease occur in houses, it is found on examination that the sink pipe is untrapped and connected directly to the drain. In the houses of small rateable value the leaden sink pipes do not project, but are cut off flush with the wall, so that the liquid refuse runs along the surface of the brickwork, and if, as is frequently the case, the area round the gulley is not properly cemented the foul liquid escapes into the subsoil. Rainwater pipes usually discharge over a gulley, but there are many exceptions where they discharge against the wall of the house or are connected directly to the sewers.

Excrement Disposal.—This is effected almost entirely by water-closets. There are a few pail privies in the rural portions of the district, which are emptied weekly by the council's workmen and their contents buried in gardens.

Water-closets are of the hopper or valve type. They are flushed from separate cisterns in most instances. In some parts of the district the flushing is very inefficient, the cistern being very small in the case of flush-down closets, and the quantity of water inadequate in the case of valve closets. In many streets the inhabitants are very neglectful, and many closets are so foul from neglect that they are unfit for use. In but few instances does one closet serve for more than one family. The closets of the houses of smaller rateable value are usually out of doors, and the building often most dilapidated, damp, and dirty. The roofs are frequently defective, and since they are without spouting they render the yards damp by discharging rainwater on the surface. There are no vent pipes in connection with the soil pipes of outdoor water-closets. The connection of the closet pan with the drain is often found to be made in a faulty manner. Ventilation of indoor water-closets is usually provided for by extending the soil pipe above the level of the roof.

Refuse disposal.—The house refuse is chiefly collected in moveable receptacles. Galvanised bins are supposed to be provided for this purpose, but in many instances in the poorer parts of the district these have been broken or destroyed, and the refuse is thrown about in heaps in the yards. In many places the inhabitants are so careless that they will not trouble to throw refuse in the bin, but toss it out anywhere about the house, where it

accumulates and causes much nuisance. There are very few streets with backways. In nearly all instances the bins have to be brought through the houses by the scavengers to empty them. No less than 5,433 loads of house refuse were collected in 1907. The refuse is collected for the most part weekly by the council's scavenging staff, and is conveyed either to a large gravel pit or to a brickmaker in the district. The gravel pit is the property of the council and is situate quite close to one of the wells supplying the New River at the Hoe Lane Pumping Station. A very large excavation has been made over 10 feet in depth, which is being filled up with refuse. It is intended that the top soil should be thrown back over the surface of the refuse to prevent nuisance, but this had only been partly done at the time of my visit. If this is not done nuisance must arise in hot weather, and in view of the proximity of dwellings it is most necessary that this precaution should be taken.

Nuisances.—It will be gathered from the foregoing account that nuisances must be prevalent in many portions of the district. These in great part arise from the scamped and defective work of former years. They arise from defects of drainage, leading to blocked drains or overflowing gulleys, from defective or absent paving of yards, from dilapidations leading to influx of water from roofs, and dampness of walls, floors and foundations. From filthy water-closets, due to neglect, to inadequate flushing arrangements, or to dilapidation. From the want of receptacles for refuse, or more frequently to people neglecting to use them and throwing refuse about the yards. From keeping of animals and poultry in close proximity to houses, without taking of precautions to avoid nuisance, and from accumulations of stable manure in heaps, owing to receptacles for this purpose not being provided.

There is very little pig-keeping in the district, and I did not observe any nuisance from this source at the time of my visit, but nuisance has arisen from this cause and has been dealt with.

In 1907 no less than 430 house drains were found to be blocked or defective, and were cleared of obstruction or repaired, and 68 were reconstructed. Also 67 soil pipes and drains were provided with vent pipes, and 327 water-closets provided with flushing cisterns or water supply.

Slaughter-houses.—There are 17 in the district, of which 13 are registered. There is no public slaughter-house. A register is kept, in which the number of animals for which there is lairage is entered, and in some instances particulars also of the structure of the slaughter-house. Slaughter-houses are in most instances situate in close proximity to dwellings, to the occupants of which in hot weather they cannot fail to be a nuisance. Their condition is various. Many are old buildings constructed of wood only. In several the lair is under the same roof as the slaughter-house, consisting merely of a portion partitioned off from it. Some are dirty and require cleansing and limewashing, but as a rule they are kept as clean as their defective structure will admit. Offal is collected in receptacles as a rule and removed promptly, but I met with one exception, where it was thrown into a manure pit. In 1907 no

less than 31 parcels of diseased organs were found in the slaughter-houses, and were condemned as unfit for food. The disease in most instances was tuberculosis. No meat has been condemned as unfit for consumption in this period.

Cowsheds, dairies, and milkshops.—There are 37 cowsheds, and 73 dairies and milkshops. They are registered and the register is kept up to date. The inspector of nuisances has a book in which it was intended to keep a record of the cowsheds, their water supply, drainage, and the number of the cows, but this is not filled in at the present time. The condition of the dairies and milkshops is as a rule satisfactory, that of the cowsheds varies greatly. Some are of good construction, others the reverse of this. In some instances as many as 70 cows are kept. As a rule there appears to be sufficient air space per cow, but in the matter of cleanliness of sheds and of cows, precautions to avoid contamination of the milk in the act of milking, and its collection and storage, there are great differences. In several instances the men wash their hands before milking and put on aprons for this purpose. In a few cases the cows udders are cleansed, and their hindquarters freed from the manure clinging to them or the hair clipped to avoid its adhesion, but these are exceptions. No proper receptacles are provided for the manure, which in many instances accumulates in heaps in undrained yards, forming a quagmire of filth in which the cows splash about if they are let out to drink. The water supply from wells is in some cases open to suspicion.

Bakehouses.—There are 42, of which only one is underground. They are registered, and particulars are kept of their lighting, ventilation, flooring, and cubic space. Their condition is as a rule fairly satisfactory, but collections of refuse in yards adjoining them are a cause of nuisance in some instances, and must lead to the development of swarms of flies which are so troublesome in bakehouses. In one instance there was a bedroom over the bakehouse; in another a yard covered more or less with stagnant mud and water adjoined it; in another instance the water-closet used in connection with it was without means for flushing, except by hand.

Common Lodging-houses.—There are none in the district. Many families take in lodgers, and many houses are occupied by more than one family, so that overcrowding results occasionally.

There are no offensive trades in the district.

(b) PREVALENCE OF DIPHTHERIA.

I have examined the returns relating to the prevalence of infectious disease in the district from the year 1883 onwards. There have been no extensive epidemics of scarlet fever, but there are few years in which this disease did not prevail to a moderate extent. The greatest number of deaths from this cause in any one year during this period was nine in 1903. In 1893 and 1901 there were eight deaths in each year from scarlet fever. Enteric fever has never been epidemic in this period, the mortality seldom exceeding 10 deaths in any one year. The greatest mortality has been 18 and 16 deaths in 1902 and 1892 respectively, and the largest number of

notified cases has seldom exceeded 50 per annum, the largest number being 101 in 1892.

Diphtheria in 1883, 1884 and 1885 appears to have been almost absent, there being no deaths from this disease in 1884; but in 1886 it began to be prevalent and continued through 1887 and 1888. Dr. Bruce Low made his report before referred to in 1888. The deaths from diphtheria in these three years were 24, 34 and 41. After these three epidemic years the disease has continued to be prevalent until the present year, with outbreaks in particular years, notably in 1897 and 1900.

The table below is copied from the medical officer of health's report on the outbreak, and shows the ascertained or estimated population for the various years since 1890, when the Infectious Disease Notification Act, 1889, came into force, together with the number of notified cases of diphtheria and the deaths from diphtheria in those years.

Year.	Population.	No. of Cases.	No. of Deaths.	Year.	Population.	No. of Cases.	No. of Deaths.
1890	25,000	52	4	1900	43,394	107	25
1891	31,532	41	6	1901	43,000	76	7
1892	33,570	94	19	1902	44,162	45	4
1893	34,295	128	16	1903	49,151	47	6
1894	37,106	88	8	1904	49,699	53	1
1895	35,000	114	16	1905	51,315	39	2
1896	36,000	78	10	1906	52,797	56	6
1897	37,500	103	21	1907	54,688	83	15
1898	39,360	70	16	1908	—	365	32
1899	40,289	69	10				

The history of diphtheria prevalence in 1908 may be divided into two periods, one extending up to July 25th, during which it was almost continuously present in the district but did not become epidemic, and a subsequent period in which it became epidemic.

A few cases of diphtheria were notified every week until that ending June 13th, in which there were three. In only one instance did the weekly notifications exceed five. This was in the week ending March 14th, when there were eight notifications. In the week ending June 20th there were none; in the following week two; in the two following weeks each two; in the two following weeks none; making a total, up to the end of the week ending July 25th, of 70 cases in 1908. The next five weeks furnished 3, 3, 2, 5, and 1 notifications respectively. The first week in September there were two notifications, and the next week, that ending September 12th, there were seven. This week marked the commencement of the epidemic period of the disease, as distinguished from the previous period. In the following weeks 16, 13, 21, 28, 36, 35, 14, 25, 12, 12, 13, 11, 15, 12, 9 cases were notified, making a total of 295 cases notified since July 25th, and a total of 365 cases during the year 1908. Of these 32 have terminated fatally during the year. Of the cases which occurred previous to July 25th full and complete particulars cannot be obtained. This is due to the

fact that the late medical officer of health, Dr. J. J. Ridge, had been ill for some time and died on May 25th; but subsequently to July 25th full details have been kept of the cases. Of the 70 which occurred previous to July 25th 12 died. Of the 295 cases notified since July 25th 20 have died up to the time of making this report. The case mortality earlier in the year was therefore greater than during the epidemic.

Diphtheria during the period before the epidemic.—With the exception of a comparative incidence on the area known as Enfield Lock, the 70 cases which occurred previous to July 25th were scattered nearly all over the district, and the residential portions did not escape as was the case later on. The only place which has been entirely free from diphtheria throughout the year is Hadley Wood. Of the 70 cases 21 occurred at Enfield Lock. In six households only did multiple attacks occur. The disease at this time did not appear to have much infectivity, as shown by its failing to spread in households, although in many instances the sufferers were children attending school, or members of families children from which were attending school, yet no epidemic occurred. In one instance, where paralysis followed the diphtheria, the child attended Chesterfield Road School for six weeks, having during the earlier part of this period suffered from sore throat, which, in the absence of medical attendance, was only known to have been diphtheria by the development of marked paralysis at the end of this period. Chesterfield Road School is a very large one with 3,857 children on the books, and practically all the children in the Enfield Lock district attend it, with others from outlying places. Among these earlier cases, in nearly all instances, unwholesome conditions were found at the invaded dwellings, such as defective drains, untrapped sink wastes, dampness, defective, or absent, paving of yards, accumulations of filth and household refuse, foul water-closets, and general dilapidation and filthiness of interiors of houses.

Certain points of interest arise in connection with some of the earlier cases. For instance, the first case notified in 1908 was a girl aged 14 years living at Fortescue Villas, which are two houses belonging to the guardians used as a home for children. There had been no diphtheria in the home in 1907. The girl had been in the home 2½ years. There were 50 children in the home who were attending the Chase Side and St. Michael's schools, but the sufferer was not attending school. Twelve days later another child aged 12 was attacked in the home who was attending the St. Michael's schools. No further cases have occurred in the home, and no outbreak occurred at that time among the children attending either of the schools. Examination of the home showed defects of drainage. The drain from the premises had been found blocked previous to the first child's illness, and had been relaid. Further examination of the premises on the occurrence of diphtheria disclosed the facts that the manhole covers on the drains did not fit, and that the pans of the water-closets had become very foul from neglect. These defects were promptly remedied. Owing to the lapse of time and the fact that the staff has completely changed since the occurrence, I cannot ascertain whether there was any

coincident sore throat in other children at the home. On March 1st a case was notified at the Chase Farm schools of the Edmonton guardians. The children reside at these schools and do not mix with any other children. The sufferer, a girl aged six years, had been in bed since August, 1907, suffering from disease of the hip joint. On the 27th of February the child was ailing, on the 29th sore throat appeared, and diphtheria was undoubtedly present on the 1st of March, ending fatally on that day.

Although there are 600 children at the schools no further attack occurred until May 14th, when a boy aged six was notified as suffering from the disease, and on May 18th, a girl also aged six. There was no general prevalence of sore throat among the children during this period or subsequently. On examination the drainage arrangements were found to be unsatisfactory and such that emanations from the drains or sewers might have entered the building. The main drain had no proper fall, and contained a great deal of foul deposit, the junctions between the pans of the water-closets and the soil pipes were unsound, so that foul air could enter from the soil pipes. The drain ventilators were brought up to the level of the middle of the dormitory windows only, so that foul air escaping from them might, on occasion, be drawn into the dormitories. The pans of the water-closets were fouled by deposit, and the drain gulleys also contained much foul deposit. These defects have been remedied. No further cases have occurred at the schools. In the Enfield Lock district one case occurred in the person of a boy whose parents kept a milkshop, and who was serving on a milk round, but no spread of infection could be traced to this source. Several cases of the introduction of diphtheria into the district from more or less distant places occurred, but, so far as is known, were not followed by any extension beyond the invaded families. There were also instances where the parents of children took them by tram or rail to children's hospitals in London for advice, not knowing that they were suffering from diphtheria.

It would appear probable that although during this pre-epidemic period the infection of diphtheria was scattered up and down the urban district only individuals who were peculiarly susceptible to infection were attacked. It is well known that susceptibility to infection varies greatly in individuals, and that in certain individuals it appears to vary from time to time. Whether in these individuals who were attacked their susceptibility was enhanced by the presence of the unwholesome conditions which were found in their habitations must be a matter of conjecture, but the continued exposure to such conditions cannot fail injuriously to affect the health and to lower resistance to disease. It should also be noted that there was no prevalence of sore throat in the district or parts of it, such as occurred later during the period of the epidemic.

Diphtheria during the epidemic period.—Of the 295 cases reported subsequently to July 25th and up to December 31st which are included in this period, 20 died, 212 were removed to hospital, and 83 were nursed at home. During this period in 36 dwellings two cases occurred in each dwelling, in 11 dwellings three cases, and in three dwellings four cases, leaving 178 which were single cases. It will

thus be seen that although the epidemic was confined to the artisan and labouring classes, in whose homes there were nearly always several children who were unprotected by a previous attack, there was not a very pronounced spread of infection in households. For this limitation of the spread of infection in households the prompt removal of sufferers to hospital and the other measures taken by the officers of the sanitary authority must be given full credit.

As to locality the epidemic was almost entirely confined to two of the five wards into which the urban district is divided. These were the Chase and Ordnance wards. There were 198 cases in Chase ward, and 56 in Ordnance ward. With the exception of the Town ward the population of which is only a little more than half of the others, there is no great disparity in the populations of the various wards as estimated from the number of houses in them. Not only was the epidemic limited almost entirely to these two wards, but the localities in which it occurred were confined to small portions of these wards.

In the Chase ward it was almost quite confined to an area known as Chase Side, which is almost quite detached from Enfield Town, to the north of which it lies. In Ordnance ward it was nearly wholly confined to the district known as Enfield Lock, which also is an area quite separated from the rest of the district. In Chase Side the disease prevailed in four streets with the subordinate streets opening into them. These streets form a square having the workhouse in its centre and are Baker Street, Chase Side, Lancaster Road, and Gordon Lane. The people living in this area are, I am informed, poorer than in other parts of the district. In Enfield Lock the disease prevailed in an area in which are included a group of streets situate on each side of Ordnance Road and opening out of it. In both areas the disease was confined to houses of small rateable value occupied by the artisan and labouring classes. In neither of these areas was there a special concentration of houses, any courts, or common yards, or any excessive overcrowding in dwellings, such as might conduce to the spread of diphtheria in this area by personal infection to an unusual extent in comparison with the rest of the district.

In investigating the causation of the epidemic of diphtheria which occurred in these two areas a number of considerations present themselves.

Epidemic prevalence commenced during the second week in September, the schools throughout the urban district having reopened on September 1st, after having been closed for the summer holidays since July 30th, therefore infection received through attendance at school at once suggests itself as the principal factor. When, however, inquiry was made, this surmise was not borne out by the facts. During the six weeks preceding the re-opening only 14 cases had been notified in the urban district, only one case occurred in the week preceding the re-opening. All the 14 cases had been removed to hospital. Since the throats of children are examined before discharge from hospital, and the patients are discharged only after two successive examinations have shown the absence of diphtheria bacilli, there would not appear to be much probability that children returning to school after recovery could have introduced infection on the re-assembling of the schools.

The risk of infection by contacts also under these circumstances would appear to be very small. The diphtheria did not commence in any one school and subsequently extend to other schools, as is usually the case in epidemics attributed to infection at school. At the very commencement of the epidemic, *i.e.*, in the second week in September, diphtheria was declared in the persons of scholars of five schools, all of which were attended by children from Chase Side. During the first week of re-opening of the schools only two cases were notified in the whole district, one of which was not attending school, the other attended St. Michael's girls' school. No further cases occurred among scholars of this school until September 18th and 24th respectively, and no serious outbreak has occurred among the 251 scholars, but a total of 11 have been attacked during the epidemic at infrequent intervals. Of the seven cases notified in the second week after re-opening, two were not attending school. There has been no very marked incidence on particular classes or departments in schools. The most marked example of this was at the Gordon Lane infants' school, with 161 children on the books. Here six scholars were attacked between September 8th and 27th, and the school was then closed from September 28th to October 26th. The day after closing three scholars were notified as suffering from diphtheria, but no more scholars were attacked until three weeks after re-opening, when cases began again to be notified at intervals of about 14 days. In 55 instances the children attacked by diphtheria were under school age. Of these 55 children 51 were the first cases in households and 42 were unassociated with other attacks among children in their homes. Of the 13 which were associated with other cases in their homes, eight consisted of four groups of two cases not associated with other cases attending school, and in five instances a second child who was attending school was attacked, in one instance on the same day, in all other instances at a later date than the child who was not attending school. In five instances where the only children attacked in the household were not attending school adults were attacked later. The attacks were distributed over all the schools which children living in the implicated areas would attend, and when the number of cases occurring in the various schools was compared with the numbers on the books it was seen that the numbers attacked were proportional to the numbers of children attending them.

Three schools have been closed with a view to checking the spread of diphtheria. These schools are the Gordon Lane infants' school, already referred to, the St. Luke's infants' school, and the Chase Side council schools. These three schools were closed from September 28th to October 26th, from October 2nd to November 2nd, and from October 10th to November 2nd, respectively. The St. Luke's infants' school is small, the number attending being 123. From the time of its re-opening after the holidays up to the time of closure, only three cases had been notified at infrequent intervals, but the closing appears to have been determined owing to a teacher being attacked by the disease on October 1st. The Chase Side schools are large council schools with 1,501 children on the books. Among these 89 cases of diphtheria have been notified. There are three departments in one building, and a junior mixed school held

in a separate building which was not closed. The boys', girls', and infants' departments were closed from October 10th to November 2nd. Up to October 10th 3 boys, 9 girls and 12 infants had been notified. During the period of closing 8 boys, 13 girls, and 2 infants were attacked who were scholars. After re-opening 4 boys, 22 girls, and 11 infants were attacked up to December 31st. On account of the prevalence among the girls the Christmas holidays were anticipated in this department, which was again closed on December 16th, since which two cases only have been notified up to December 31st among scholars in this department. From the commencement of the epidemic the children placed in proximity to scholars who were attacked in the schools were examined by the school medical officer, Miss P. Gaffikin, and in this way many contacts who showed suspicious symptoms were excluded from attendance. There are at least 11 schools which are attended by children from the Chase Side district, and diphtheria has occurred among the scholars of all. It must be remembered that if diphtheria is prevalent among the children of a certain district and all those who are of school age attend public elementary schools, diphtheria must be present among the scholars whether infection takes place at school or no. It may also be noted that no epidemic occurred in the earlier part of the year in what I have called the endemic period, although as before noted there were, previous to July 25th, opportunities for dissemination through infection at school. In the Ordnance Road area all the children attend one school together with some children from outlying places. This is the Chesterfield Road school, a large one with 1,834 children on the books, among whom 35 cases of diphtheria occurred. Here there was no marked incidence of the disease at any particular time or in any particular class or department. It has not been thought necessary to close this school or either of its departments on account of diphtheria.

There are in the urban district 22 public elementary schools. I visited all, with the exception of two rural schools. Most of the schools are small and many are old buildings. The principal defects were the absence in some cases of facilities for cross ventilation of the class rooms, and in many instances for the rapid renewal of the air in them when they were vacated by the scholars in play or meal times. This is more difficult of attainment in the case of some of the newly built schools than in some of the older ones. The cloak rooms also in many instances communicate directly with the class rooms without any intervening cross ventilated passage, and in some instances the fresh air would be largely drawn from the cloak room. I did not find any unwholesome conditions in connection with any of the school buildings of such gravity that the presence of diphtheria among the scholars could be in any way attributed to them. The disease was quite as prevalent among scholars attending the newly-built schools provided by the council as among those attending the older and smaller schools.

The possibility of the epidemic being due in some way to infection received through the medium of milk was considered and inquiry was especially made with this object by the medical officer of health. The limitation of the epidemic to the artisan and labouring classes,

although the milkmen serving them also served the more wealthy classes, is, however, strongly against any milk infection. In cases of milk-spread infection it is usually the more wealthy classes, who consume more milk, who suffer to a preponderating extent. Condensed milk only was used by 48 invaded families. There are a very large number of milk sellers in the district and no special incidence was shown on the customers of any one of them.

Disease among animals.—No information could be obtained of any prevalence of disease among cats, fowls, or pigeons in the invaded areas at the time of the epidemic.

Meteorological conditions.—The spring of 1908 was cold and stormy until the middle of May, when there was fine warm weather until the middle of June, then thunderstorms occurred, and the second half of the month was cool and dry. During July the weather was cool and about half the days were showery. The temperature at Enfield on one day only exceeded 90° Farh., and on five days only exceeded 80°. In August temperature continued low, reaching 80° on one occasion only, and the latter half of the month was very wet. There was rain every day from August 20th to September 5th. A gradual fall of temperature accompanied this period of rainfall. After the cessation of the rains the rest of September was dry and the temperature at Enfield continued to rise from September 5th during September, attaining 78° at the end of the month, and continuing at about this level during the first week in October, from which time it fell gradually. Speaking of the weather conditions in September, 1908, the Registrar General in his quarterly returns says that the spell of warmth towards the end of September was of exceptional intensity for the time of year, the warmest periods being on the 7th or 8th, between the 17th and 20th, and at the close of the month. On the 30th the shade temperature reached 80° at several English stations and exceeded 75° over a large portion of Great Britain. October opened with a continuation of the remarkable spell of warmth noted at the end of September, the readings of the thermometer on the first three days being unusually high both in the day time and night. The thermometer remained above the average until after the middle of the month. During the rest of the year the temperature has continued low and the rainfall unusually small. The period of diphtheria prevalence was one therefore of rising temperature from September 5th to October 4th with falling temperature thereafter. The level of the ground water will in all probability have been at its highest about the middle of the month of September; since as much as .59 inches of rain fell on September 3rd, and I am informed that at this time the ditches in the Chase Side district were running full, and since this time the level will have been falling until the end of the year. The conditions associated with the onset of the epidemic were therefore a rising temperature and a rising of the ground water. Associated with its further progress were at first a fairly constant high temperature followed by a gradual descent until the end of the year, and a continuous falling of the ground water level from about the middle of September onwards.

Physical conditions of the two areas.—The greater part of the Chase Side area is flat, but there are a few streets on rising ground. The district lies at the foot of the hills of Enfield Chase, just at their junction with the flat valley of the Lea, and building has extended to a small extent up the hill slopes. The subsoil is gravel, sand, and brick earth, overlying the London Clay of which the hills are composed. Consequently the water falling on the hills tends to flow into the gravel bed on which nearly all the houses are situate. The district is liable to heavy floods, during which the water rushes down from the hills and enters the surface water drains and sewers, which on occasion have proved insufficient to carry it off without flooding. Some of the streets appear to have been built in areas depressed below the general surface by the removal of the gravel before building operations were commenced. The system of surface water drainage is unsatisfactory. Surface water is discharged into a number of watercourses which have very little fall and in which water stands. Many of these are close to houses. The drains receiving the surface water from the roads and rainfall from dwellings are often badly laid. The manholes situate on them are often found to contain stagnant and sometimes offensive water to a depth of 3 or 4 feet, so that the pipes themselves must be standing full of water. This Chase Side is undoubtedly much the wettest area in the district.

The Ordnance Road district is also flat; the subsoil of gravel and loam. The surface drainage falls into the Turkey Street brook, which joins the river Lea and cuts off this portion of the district from other populated areas. The drains conveying the surface water are here also unsatisfactory, and in some the manholes on them were standing partly full with stagnant water. In one instance it was found that owing to the blocking of the exit of a sewer manhole sewage had overflowed through a rain-water pipe crossing this manhole and had filled a surface water manhole. There is no doubt that this district also is damp owing to insufficient drainage for removal of the ground water, and that this feature distinguishes these two areas from the rest of the urban district.

As to the influence of sewers.—At first it would appear that this was an instance in which the spread of diphtheria could be attributed to the influence of certain sewers. These sewers might be regarded as having become infected so that the organism producing diphtheria was growing in them, and had been disseminated by means of sewer emanations or by leakage from them into the subsoil. On the other hand it might be thought that some particular virulence was present in emanations from them, producing sore throat, which by lowering the resistance of the mucous surfaces of the throat made individuals susceptible to the infection of diphtheria. The Chase Side area is almost entirely served by the Baker Street sewer, with the exception of two streets, Gordon Hill and Brigadier Hill, and a portion of a third, Lower Gordon Road. With these exceptions the sewers of all the streets in which diphtheria has prevailed are connected up to this sewer, so that the disease might be said to have followed the branches of this sewer. Against this thesis, however, is the fact of incidence on certain streets just mentioned which are not connected to it, and also that after the Baker Street sewer leaves

this area it receives sewage from populous areas which have almost entirely escaped invasion by diphtheria. The sewer which receives sewage from the three streets above mentioned, in which diphtheria has been prevalent, but which are not connected to the Baker Street sewer, also receives the sewage from three institutions with a total population of 1,000 persons. In these institutions there have during the year been three cases of diphtheria only, which occurred quite early in the year. These institutions are the Chase Farms Schools, with 600 children, in which the three cases before referred to occurred; the St. Joseph's Home for Boys, with 200 children, who have been entirely exempt from diphtheria throughout the year, and the Workhouse. In the first two institutions the children do not leave the school premises and have no communication with other children in Enfield; the workhouse, with a population of 200, has also been exempt. At the latter children are not retained on the premises, and the inmates are all of an age in which susceptibility to diphtheria is small, but the inmates of the other two institutions were of the most susceptible age. The workhouse is situate in the centre of the Chase Side area, but the two schools are quite outside it and placed on high ground on hills of London Clay.

The Ordnance Road area is entirely drained to one sewer known as the low-level sewer. After collecting sewage from this area this sewer runs from north to south for several miles and passes through Ponders End to the sewage farm. In the lower part of its course a number of houses are connected to this sewer at Ponders End, but diphtheria has been almost entirely absent there throughout the year, and the neighbourhood of the sewage farm has been free from diphtheria. The proposition, therefore, that the diphtheria had been disseminated, or in any way produced through the medium of these trunk sewers and their branches, could not be sustained.

The influence of local unwholesome conditions, including local sewers.—A careful examination of the whole district has convinced me that, in the two areas in which diphtheria has arisen in epidemic form, unwholesome conditions are very much more prevalent than in any other portions of the district. These conditions include defective local sewers, defective house drainage, inadequate paving of yards, dampness of dwellings, and accumulations of filth and refuse about dwellings.

With regard to sewerage, in those streets in which diphtheria had been especially prevalent the sewers were most defective, one of the principal defects being the collection of decomposing solid matters in the manholes due to their faulty construction. From this cause the manholes can only be compared to so many cesspools and catchpits. For many years all the ventilating covers to manholes have been sealed with iron discs, so that the only escape for the effluvium produced by their decomposing contents is either through the house drains or in some instances through the ventilating pipes which have been provided at the ends of a few of the sewers. This closing of the ventilating covers to the manholes in this district is noted by Dr. Bruce Low in his report on diphtheria in the district in 1888. In this year the ventilating gratings on the manholes were closed on account of offensive emanations from them. The outbreak of diphtheria followed this blocking of the

gratings, and at first was confined to the Chase Side district. In some cases the sewers are so flat that they are no doubt in places filled with sewage, which probably extends also up the house drains. But few house drains are provided with means of inspection, so that their exact condition cannot be ascertained. Where manholes have been constructed on the house drains for inspection purposes, following an outbreak of infectious disease in the house and examination of the drains, intercepting traps are provided between the house drain and the sewer, but in most cases they are absent. The house drains, on examination, are found to be jointed with clay only, badly laid, and they frequently pass under the houses, so that pollution of the subsoil by leakage of filth from them must be of frequent occurrence. The gullies in which the house drains terminate are usually outside the houses in the yards, so that effluvium from the sewers and house drains would be discharged in the open. The gully is usually properly trapped, but the junction with the drain is frequently imperfect, and the cementing or paving around the gully broken or defective, so that fluids thrown to the gully, or trickling down the side of the wall of the house, may penetrate the subsoil, thus carrying organic filth into it. The sink pipes are cut off flush with the wall of the house, so that fluids instead of discharging fairly over the centre of the gulley trickle down the side of the wall. The inspector of nuisances tells me that when the smoke test is applied to drains the smoke often enters the house by forcing the gully trap and escaping up the sink pipe, owing to the proximity of the gully to the wall of the house. Water-closets are with few exceptions out of doors, so that they do not directly communicate with the interiors of houses. The soil pipes are often badly laid, with clay joints, and defective connection to the pan, so that filth may escape into the soil, or effluvium find an exit from the defective connection to the soil pipe.

Another cause of fouling of the subsoil around houses is the absence of paving of the curtilage, or the defective character of such covering. At the time of my visit many yards contained stagnant water, which was soaking into the ground owing to the absence of paving. As before mentioned, where paving is provided it is frequently composed of loose rubble, with a superficial layer of cement, which is cracked or broken so that liquid escapes into the ground. When under such circumstances household refuse and filth are thrown about the yard, owing to careless habits or absence of an ashbin, the fouling of the subsoil must be very considerable. Dampness of dwellings is very marked and is due to want of spouting for the back part of the premises, defective or broken spouting of the main roof, the termination of down pipes at 8 or 10 feet above ground level, so that the rain-water is discharged against the wall of the house, or to raising of the ground level above the damp course. Another cause is found in the sandy crumbling bricks, which hold water, the crumbling dirt-like mortar, and the absence of pointing between the bricks.

Accumulations of filth about premises are very frequent, due either to the careless habits of the people or to the absence of dustbins or other receptacles of filth. The keeping of animals, especially poultry, in uncovered undrained enclosures adds to the

pollution of the soil in the neighbourhood of the houses by filth of organic origin. Exactly similar conditions prevail in the Ordnance Road area.

Examples may be given occurring in the Chase Side area. In Gordon Road, 13 cases of diphtheria occurred. On examination by the inspector of nuisances, in every instance unwholesome conditions were found to exist on the infected premises. There are two sewers in this road, each starting from about its middle and running in opposite directions. Both of these are very flat, the sewage stagnates in them, and the manholes contain decomposing solid filth. There is an open watercourse at the back of some of the houses. There are few drains whose course in relation to the houses is known. In one instance, where an inspection chamber had been placed on a drain leading from three houses, I found the sewage ponded back in the bottom of the chamber. There is evidently little, if any, fall on the house drains. At Gordon Hill, a street of comparatively few houses, 14 cases occurred. Unwholesome conditions were found on the premises in all but two instances. Owing to the absence of plans, the position of the sewer in the street is doubtful. It apparently is larger at its commencement than at its junction with the main sewer. At the bottom of the road a manhole on the surface water drain was found to contain liquid filth to a depth of 4 feet. In Churchbury Road, a short road, eight cases of diphtheria have occurred. The dwellings are especially damp and dilapidated, the sculleries often reeking with damp and their walls covered with mould. The yards in many cases contain stagnant water. There is no means of inspecting the condition of the house drains or sewers, nor is their situation and structure known, but there is every reason to suppose that their condition is unsatisfactory. The houses appear to have been built after removal of the gravel in the area on which they stand. In Canonbury Road, also a short road, five cases occurred. Here also the gravel appears to have been removed before building. The houses are damp, as also the yards. The sewer has no provision for ventilation or inspection. At its junction with the Baker Street sewer is a manhole in which solid deposit accumulates, the exit pipe from the manhole being 3 inches above its floor, and the flow in the sewer above this point very slow. In Drake Street, a very short street, where five cases have occurred, the yards are very damp, and much refuse is thrown on the ground. Other unwholesome conditions were found in all the houses invaded with one exception. The sewer in this road is very flat, so that sewage stagnates in it and in the inspection manhole. In Lea Road, where ten cases have occurred, the yards at the backs of the houses are very dirty from accumulated refuse. When attention was drawn to them by the occurrence of diphtheria, other unwholesome conditions were found in all the houses, with one exception. The sewer in this road is very flat, and a manhole situate on it was filled with decomposing deposit. In Kynaston Road, where 12 cases have occurred, the paving of the yards is very defective; in addition, other unwholesome conditions were found in all invaded houses with one exception. The sewer in this street has no proper fall, and the sewage stagnates in it and in the

49

manhole placed on it. At Brigadier Hill, a road containing few houses, nine cases have occurred. Although there is a sharp fall in the road, examination of the sewer in it showed that the fluid in the upper portion was almost stagnant, the sewer either having been laid with insufficient fall or having subsided owing to settlement of the ground. The manhole on this sewer contained much offensive solid deposit. Other multiple unwholesome conditions were found at the invaded houses with two exceptions. Many other similar descriptions could be given of streets in this area. In the Ordnance Road area, the incidence on particular roads has not been so heavy as in Chase Side. In Standard Road, in this area, 15 cases have occurred. With two exceptions, examination on the occurrence of diphtheria disclosed unwholesome conditions on the premises. The house drains here are known to be very defective, and many have from time to time become blocked. In many instances notice has been served on the owners to relay them, but the work is not yet completed. The houses are in many instances very damp, being built of sandy bricks, with absence of spouting for the back premises and for the bay windows in front. The two sewers in this road are very defective. They have been laid in sections from time to time without proper levelling. Each starts from the middle of the road, and they are supposed to flow in opposite directions. It is evident that in one case the sewage is stagnant in the sewer, and is probably escaping into the subsoil. The other is not much better in gradient, and filth was accumulated in the inspecting manhole placed on it. In Bradley Road, which is an adjoining and parallel road, and where eight cases have occurred, the conditions, both of houses and sewer are, if anything, more unsatisfactory. There can be little doubt that there is much leakage from the sewer which runs along the backs of the houses and which contained stagnating offensive sewage. Many other like instances could be given.

It will therefore be seen that there are two conditions which characterise these two areas in which diphtheria has been epidemic, namely, dampness, and infiltration of the subsoil of and around dwellings by organic filth. As the result of an inspection of the whole urban district I have come to the conclusion that these conditions do not prevail in other portions to anything at all approaching a like extent. These two conditions are, however, always present in these two areas, and if they were instrumental in producing diphtheria their increased potency must be found in some factors which came into action in the autumn of 1908. In this connection reference must be made to the meteorological conditions at Enfield in the autumn of the year 1908 already detailed. These were exceptional, and concerned both rainfall and temperature.

Heavy rainfall was experienced in the last half of August and up to September 5th, and must have carried much organic filth into the ground from the surface of yards and from defective leaking house drains and sewers, as well as increased the general dampness, and probably also caused a quick rise in the level of the ground water. This period of rainfall was accompanied by a lowering of temperature, and diphtheria was not unusually prevalent during its persistence. The cases notified in the five weeks

ending on August 29th being 3, 3, 2, 5, 1, respectively, and in the week ending September 5th two only. When, however, the temperature rose together with the rising ground water diphtheria broke out. That is to say, there was at the time of the commencement of the epidemic a combination of excessive dampness, unusual fouling of the subsoil by organic matter, and high temperature, the first two factors being exceptionally present in the invaded areas as compared with the rest of the district. These three factors appear to have been specially associated with the epidemic in these two areas.

Sore throat, called by the local medical practitioners "septic," has been especially prevalent in Enfield in the Chase Side and Enfield Lock areas during the autumn of 1908. It began at the beginning of September, and still continues, especially in Chase Side. It is characterised by inflammation of the tonsils, soft palate, and pillars of the fauces, which are swollen, and the mucous membrane of which is red and congested. There is some enlargement of the glands of the neck and general depression. The school medical officer informs me that it is easy to pick out children who are suffering from this affection, owing to their pallor, languid appearance, and the enlargement of the glands of the neck.

Bacteriological examination of the throat secretions from a number of cases of this form of sore throat in a very few instances has led to the detection of the bacillus of diphtheria. The passage of sore throat of this form into typical diphtheria has not been observed. The treatment which has been most successful consists in the use of local antiseptic gargles or sprays combined with the administration of tonics, especially of perchloride of iron.

It is noteworthy that the epidemic of diphtheria in 1887-8, investigated by Dr. Bruce Low, began in this same Chase Side area, in the same streets, and at the same time of the year, as the one now under consideration, and extended to other parts of the district later. In that year there were 41 deaths from diphtheria, which is in excess of the number which have occurred in 1908.

(c) MEASURES TAKEN FOR THE PREVENTION OF THE SPREAD OF DIPHTHERIA AND OTHER INFECTIOUS DISEASES.

The medical officer of health has no assistant or clerk, nor has he any office provided for his accommodation. The inspector of nuisances has a staff consisting of two assistant inspectors, each of whom holds the certificate of the Royal Sanitary Institute, two office clerks, and an ambulance attendant, who also acts as disinfecter.

The certificates of notification of infectious disease are addressed to the medical officer of health at the council's offices at Enfield. They are mostly brought by hand by the medical practitioners certifying, but some come by post and others are made by telephone in the first instance. I found that some which had been made to the late medical officer of health by telephone to his residence had not been recorded in the register, because apparently no certificate had been forwarded at the time. During office hours, which are 9 to 5 on weekdays, with the exception of Saturdays 9 to 1 p.m., a member of the sanitary staff is always present and receives the notification. One of the assistant inspectors also attends

on Sundays at 9.30 a.m. to examine any notifications which may have been placed in the letterbox. Apart from this arrangement there is no provision for dealing with notifications which might be delivered after office hours. Although I am informed there are very few which are delivered at such times, the necessity for some arrangement to deal with them promptly is obvious.* On receiving the notification the inspector of nuisances enters it in the register and then telephones to the isolation hospital to enquire if the patient can be received there. Investigation is then made by the assistant inspector of nuisances going to the house together with the ambulance attendant. The ambulance being kept at the council's offices, these two officials usually go with it. Investigation is always made on the day of receipt of the notification by the staff.

Many of the cases of diphtheria have been visited by the medical officer of health before the removal to hospital, or if not then the house is visited by him within a few days, usually in the company of the inspector of nuisances. The Register of Notifications is kept in book form. It contains columns giving the reference number, the date of notification, the patient's name and address, the disease, the name of the certifier, and lastly the action taken. The last column is not filled in. For guidance in the investigation made on the first visit to the infected premises the inspector of nuisances is furnished with a printed form of queries to be filled in. These are full and satisfactory, but unfortunately they are not filled in on the premises in all cases, but on return to the office, so that there is risk of inaccuracy in small but perhaps important details. The filling in of these forms is, moreover, often done by the ambulance attendant, not by the certificated inspector. It need hardly be said that these particulars are of great importance, and clear definition and knowledge of the exact meaning of the terms used is necessary, particularly in tracing the source of infection of the patient, consequently the queries and entries should always be made by a trained and, if possible, certificated inspector. The forms are not thoroughly filled in. For instance, the space for the suspected source of infection is usually left blank, as often also the condition of the drains and of the water supply cistern. A sanitary inspector, however, visits the house again within a week of the date of the notification. He makes a careful examination of the drains, if necessary applies the smoke test to them, and makes a more careful and thorough examination of the sanitary condition of the premises than that made on the first visit. A report on the condition of the premises is made in the inspector of nuisances' journal, and if necessary is presented to the district council at their meetings. Notices are served for the abatement of the nuisances found, and for the most part have been readily complied with without the necessity of legal proceedings. If at the time of this visit any suspicious illness is noted among other members of the family, the medical officer of health is informed. If the family have no regular medical attendant the medical officer

* I am informed that arrangements have now been made to meet this objection and deal with notifications received at all times after office hours.

of health visits the house, and in the case of diphtheria he may make a preparation from the throat of any suspicious case for diagnostic purposes. Where a medical man is in attendance his notice is drawn to the illness and his opinion asked for. In consequence of the diphtheria prevailing almost entirely among the poorer classes the medical attendant usually does not make a second visit after the case which he has notified has been removed to hospital. It follows that except for this visit of the inspector the occurrence of secondary cases might not be brought to light except by the parents noticing the illness and calling in the medical attendant. Unfortunately in many instances parents have not called in medical advice until the disease has been well established. Thus antitoxin has not been administered at the most favourable time, *i.e.*, quite early in the disease, and also opportunity of infection of other members of the family has been afforded. There would be great advantage if arrangements could be made for visits to households of this class by a medical man after the notification and removal of the first case to hospital. This visit would often be the means of detecting the subsequent cases at the earliest moment, it would also ensure the detection of cases that might otherwise have been overlooked, their isolation and the prevention of the spread of the disease to the rest of the family. The notification of one case of diphtheria has frequently led to the discovery of others in the household or family, the onset of whose illness had preceded that of the notified patient, and who, although apparently well, were in an infective condition. Medical practitioners do not always consider the great desirability of examining the rest of the family or household after notifying the diphtheria in the case of the patient whom they have been called to see, thinking that such work is the duty of the officers of the sanitary authority, who can be remunerated for it. Similar visits are also desirable after the return of the patient from hospital to home, unless the medical attendant undertakes this duty. These are necessary to ascertain the condition of the patient when he arrives home from hospital and the condition of the rest of the family. They also give the opportunity to caution the parents as to the possible need of partial isolation of the patient for a further time as far as possible, as to the necessity of early notification of any suspicious illness occurring subsequently among the members of the family, and to see that the sanitary condition of the premises is, or has been placed, in a satisfactory state. In Enfield when a patient is discharged from the isolation hospital the inspector of nuisances is informed by telephone. The inspector then visits the house or sends his assistant to caution the parents as to the need for isolation of the patient for some time as far as possible and to further examine the condition of the premises. When a patient is removed to hospital no printed instructions are given to householders prescribing the precautions to be taken to avoid dissemination of infection, the period for which other children of the family are to be kept from attendance at school, inmates of the house from their work, &c. Such instructions are given verbally only.

If the patient be nursed at home printed instructions are given to the parents prescribing the measures to be taken for isolation of the

sufferer and prevention of infection. An upper room in the house is chosen, and a sheet wetted with crude sanitas solution is hung over the doorway; no children from the house are allowed to attend a day or Sunday school; all soiled linen is directed to be placed in a receptacle containing a disinfectant solution supplied by the inspector. The attendant on the patient is cautioned as to measures for prevention of infection through her person or clothing, but is not prohibited from other duties as long as she takes these precautions. The printed instructions are slightly different for diphtheria, enteric fever, and scarlet fever, respectively. The inspector of nuisances makes visits at intervals to see that these instructions are carried out and to supply disinfectants.

Persons who have been in contact with the sufferers are allowed to resume their occupation if they cease to live in the infected house, except in the case of milkmen or dairymen.

The teacher of each department of the school which the patient or members of his family were attending is informed of the case at once after the first inquiries have been made, as also the librarian of the Public Library. Children who have been in contact with the sufferer are kept from school for seven days or a fortnight after his removal to hospital, or after his certification of freedom from infection, in cases where the patient is kept at home. No fixed period appears yet to have been adopted and enforced for this purpose. Library books are disinfected by the inspector of nuisances, who places them or their edges in a chest with cotton waste soaked in a 40 per cent. solution of formaline.

There is little difficulty in obtaining permission to remove patients to hospital who cannot be properly isolated at home; where a separate room cannot be obtained for the patient removal is insisted on.

Disinfection of the house is performed the next day after removal of the patient to hospital. The rooms, or room, which the patient has occupied are sealed with strips of paper, after spraying the interior with a two per cent. solution of formaline by means of a hand spray, and sulphur candles (three or four, according to the size of the room) are left burning in it. All drawers and cupboards are left open. The patient's boots are left in the room. Bedding and personal clothing are removed to a steam disinfector at the sewage farm. Sheets and linen articles are steeped in a solution of izal, one in one thousand in strength. The bedding is removed to the disinfector in canvas bags in a covered van, and returned in the same method but in a different van. When the patient is removed to hospital the paper is not stripped from the walls, but where the sufferer is nursed at home this is done, as also in the poorer class of houses where the walls are very dirty. In the latter case the owner is required to strip and repaper or limewash the walls. There is no difficulty in enforcing this requirement, and a postcard is left with the owner to send to the inspector when the work is completed. Two men are employed in the work of disinfection. They are untrained, and their work is not directly supervised by the inspector of nuisances as should be the case. They wear overalls whilst at work, but return

to their homes without changing their clothes or taking a disinfecting bath. There is no accommodation at the sanitary offices for this purpose. The drains of infected premises are flushed with chloros solution. The ashbin, or ashpit, is not emptied, or the contents disinfected, but left for the usual weekly collection of refuse. Blank forms are provided for the medical attendant to certify when the patient is free from infection in the case of patients treated at home. The medical attendant often sends a swab from the throat for examination to the medical officer of health in diphtheria cases, and does not fill up this certificate until the throat has been pronounced to be free from the diphtheria bacillus by the latter.

The council have two ambulances. One has been retained for use in diphtheria only. They are kept at the council offices so that they can be despatched at very short notice. There is a drawback, however, to this arrangement, because no nurse accompanies the ambulance. The work of removal, and any necessary care the patient requires, is left to the attendant or the driver. The ambulance attendant also assists in supervising the scavenging. A form is filled up at the patient's house by the inspector or ambulance man and is sent to the hospital with the patient. This form states the patient's name and address and the date of onset of various symptoms, such as headache, sore throat, rash, vomiting, the family history and patient's history. It is also stated if the patient had a discharge from ear or nose previously, whether there were vermin on the head or body, or sores, how many children there were in the family, and how many had not had the illness from which the patient was certified to be suffering.

On October 10th, 1908, the district council decided to supply diphtheria antitoxin free of charge to all medical practitioners asking for it. The inspector of nuisances was furnished with a supply at his office, and the medical officer of health also had a supply, so that it could be obtained on application to either of them. Antitoxin has been used since this date to a considerable extent both with a curative and prophylactic object. The medical officer of health has made a bacteriological examination of swabs from the throat in all cases where requested, and if diphtheria bacilli have been found he has informed the medical attendant forwarding the swab. The school medical officer has also taken swabs from the throats of many suspicious cases attending the schools and sent them to the medical officer of health. In this way some cases of diphtheria have been detected and removed to hospital, others having only slight symptoms of illness but with diphtheria bacilli present have been excluded from school and isolated at home as far as possible under the circumstances. During 1908 the medical officer of health has examined 306 swabs from the throat, 128 of which gave positive results. A large proportion of swabs which were taken from the throats of children attending school who were contacts, and who in some instances presented signs of sore throat, gave negative results. The school medical officer and the medical officer of health have co-operated throughout the epidemic. When any increased incidence was noted in any particular school the school medical officer of health has visited it and examined the

children who had been in contact with the sufferers, but there has up to the present been no general examination of the throats of all the children in the schools. It has been found that where children in whose throats diphtheria bacilli had been found, but who presented little or no signs of ill-health, have been excluded from attendance at school, the parents made little endeavour to isolate them at home. As a matter of fact in many instances this must have been difficult to effect, even with the best intentions on the part of parents, owing to the limited accommodation in the houses.

Over 100 children have been excluded from school on the ground that this was desirable to prevent spread of disease, either because they presented suspicious symptoms or had been found to harbour diphtheria bacilli in their throats. The children were examined again before they were allowed to return to school. Children suffering from diphtheria who were nursed at home have not been allowed to return to school without a medical certificate of freedom from infection. The school teacher has been informed by the inspector of nuisances when the house of a scholar who has been attacked by diphtheria has been disinfected so that other children may return to school seven days later, but up to the present the teacher has not been informed when the sufferer might return to school. When the schools have been closed the opportunity has been taken to thoroughly disinfect the whole premises. The floors have been swept daily with sawdust damped with disinfectant, and school premises have been carefully examined for any sanitary defects which, when discovered, have been remedied. Slates are not used in the schools, but lead pencils. The latter are not disinfected after daily use by the pupils. No endeavour has been made that the same child should always have the same writing or reading book.

Isolation Provision.—Accommodation for cases of ordinary infectious diseases is provided by the Enfield and Edmonton Joint Hospital Board, who have a hospital in Enfield Urban District, about one mile distant from Enfield Town.

The accommodation provided at this hospital consists of a reception pavilion, which, however, at the time of my visit was used as an observation block, and contained three cases of mixed infection by measles and scarlet fever. There are two scarlet fever pavilions, one of which accommodated 32 cases of scarlet fever and three cases of mixed measles and scarlet fever, the other 35 cases of scarlet fever. There is also a new pavilion having two one-bed observation wards attached, which accommodated 28 cases of scarlet fever, and five cases of which the diagnosis was uncertain. A temporary building of iron contained 14 cases of mixed infection by diphtheria and scarlet fever. In another temporary iron building were accommodated 11 cases of diphtheria. A pavilion intended for enteric fever only, contained eight cases of this disease together with 10 of diphtheria. It will thus be seen that the accommodation for diphtheria is insufficient, as also that for doubtful cases and for cases of mixed infection. Owing to its being necessary to use the reception pavilion for observation purposes, cases on admission have to be driven straight to the wards. The joint hospital board are now preparing to build a pavilion for

observation purposes. Owing to the want of accommodation, 29 cases of diphtheria from Enfield district could not be received and eight from Edmonton. These were by arrangement sent to the hospitals of the Walthamstow or Cheshunt Urban District Councils. The accommodation for the nursing staff, which is provided in an administration block, in a temporary iron building, and in the porters lodge, is insufficient. Although at the time of my visit, the hospital contained a smaller number of patients than at any time since October 19th, 1908, two nurses had to sleep in the town of Enfield. There is a resident medical officer and a medical superintendent, the latter lives in Enfield.

On admission the patient is examined by the resident medical officer. All the buildings are connected by telephone, so that he can be summoned at once. The clothing which the patient is wearing on admission is removed, disinfected at the hospital, and returned on his discharge. The blankets in which the patient is wrapped, which may belong to the parents or householders or to the district council, are returned in the ambulance and disinfected by the district council. Antitoxin is administered to diphtheria patients by the resident medical officer on admission, the dose given being proportionate to the severity of the case.

Parents not infrequently are allowed to accompany children to the hospital in the ambulance. The resident medical officer makes smear examinations of the secretions of the throat in diphtheria cases soon after admission. Patients who have had diphtheria are not discharged from hospital until two successive cultures made from the throat have shown the absence of diphtheria bacilli. The medical superintendent examines all patients on the day of discharge from hospital. The parent or friend removing the patient is given the opportunity of also examining the patient, and of making any observations in a book provided for this purpose. A record is kept of the presence of any sequelæ of the illness, such as discharge from the nose or ear. There is no arrangement for sending discharged patients from Enfield to their homes, which are often many miles from the hospital. This has not even been done in the case of patients sent to Cheshunt or Walthamstow hospitals. Trams are not available and the railway is of little use for patients returning home. A notice is sent from the hospital to parents or friends two days previous to the discharge of the patient, telling them the day and hour at which he is to be removed and also cautioning them not to bring to the hospital children or persons who have not had scarlet fever. A form is given on discharge with printed instructions for avoiding risks of infection from the patient, also advising isolation of the patient if discharge appears from the nose or ears, and the sending for a medical man if this occurs. In the case of diphtheria a printed slip is added advising the calling in of medical advice if symptoms of paralysis, indicated by alteration of voice, defect of sight, difficulty in swallowing, or loss of power in the limbs, should occur subsequent to discharge from hospital. Diphtheria and enteric fever patients on recovery are discharged from their wards; the discharging block is used for discharge of scarlet fever cases only. The Enfield Urban District is included in the Middlesex Districts Joint Small-pox Hospital District.

Disinfection.—The Council have a disinfecting apparatus made by Messrs. Manlove and Alliott. This is situate at the sewage farm.

(d.) ADMINISTRATION BY THE URBAN DISTRICT COUNCIL.

The medical officer of health is Mr. Wm. P. Warren, L.R.C.P., L.R.C.S., L.M. Edin., of Enfield Highway. He was appointed by the district council on June 25th, 1908, in succession to the late Dr. J. J. Ridge, but his appointment has not yet been approved by the Board. He holds the appointments of district medical officer, public vaccinator, and police surgeon. Mr. Warren, who has no diploma in public health, has been in general practice in the district for 26 years. The late Dr. Ridge held in addition the post of superintendent of the joint hospital for infectious diseases. When the appointment of medical officer of health became vacant the Board, in reply to a letter from the district council concerning the terms of the appointment, wrote on May 27th expressing the opinion, that, in view of the large increase in the population of the district, the question arose whether much more time should be given to the discharge of the duties of the office than had hitherto been the case. They suggested that if an arrangement for the discharge of the duties of medical inspection of school children by the medical officer of health were made, there might be sufficient work to occupy the whole time of an expert officer at adequate remuneration. In reply the council stated on June 12th that they had delegated their powers under the Education Acts to an Education Committee who had appointed a lady medical officer at a salary of £300 per annum, and "the council were advised that the whole of her time would be fully occupied in the duties of medical inspection of school children." "Under these circumstances, and in view of the fact that the council had an exceptionally good inspector of nuisances, who has the benefit of two certificated assistants in addition to two clerks, the council felt that there was not sufficient work for a whole time medical officer of health." "They had accordingly decided to appoint a part time officer at a salary of £150 per annum." On June 26th, the council applied to the Board for their sanction to the appointment of Mr Warren on these terms. To this the Board replied expressing regret at the decision of the council and asking them to reconsider their proposal. To this the council replied repeating the arguments which they had already brought forward, adding that "although the population was steadily growing the improvement in the manner in which the drains are now laid and other sanitary requirements are carried out is so great that they only require regular supervision, which work the council felt could be better done by an experienced sanitary inspector than by a medical man," also "that although Mr. Warren held other appointments he had three partners to whom he could delegate his private work, as under the terms of the appointment he was to devote the necessary time to enable him adequately to perform the duties prescribed by the Board's Orders and the Public Health Acts." The council declined to reconsider their decision. The Board declined to sanction the appointment with a view to repayment of a moiety

of the salary from county funds, and pointed out that since Mr. Warren was a district medical officer their sanction was necessary, apart from the question of repayment, under the third paragraph of section 191 of the Public Health Act, 1875. They stated that, before deciding whether they would permit Mr. Warren to hold the post of medical officer of health, they would instruct one of their medical inspectors to enquire into the sanitary circumstances and administration of the district. They also added that section 18 (2) of the Local Government Act, 1888, prescribed the qualification necessary for the post of medical officer of health in a district which contained at the last published census a population of 50,000 or more, which qualification Mr. Warren did not possess, and that it was advisable that the council should make an appointment which would satisfy these requirements, since the census of 1911 would probably show that Enfield had a population in excess of this number. The post of medical superintendent to the Enfield and Edmonton Joint Hospital, which had been held by the late medical officer of health of Enfield, and which it is most desirable should be held by the medical officer of health of one of the two districts comprising the joint hospital district, was also filled up by the appointment of another Enfield practitioner, Dr. R. H. Cook, M.D., Aberdeen, at a salary of £200 per annum. It will thus be seen that three appointments, the duties of two at least of which might advantageously to the public interest have been performed by one individual, were distributed among three, none of whom has any public health qualification, and judging by the amount of remuneration, the post of medical officer of health was thought to be of the least importance. It will be obvious that an individual performing the duties of district medical officer and police surgeon in such a wide district as Enfield, and having also a large private practice, cannot carry out the multifarious and responsible work of the medical officer of health of such a district. The fact that he has a practice extending nearly all over the district must tend to prevent his taking an unbiassed attitude, and his giving perhaps unwelcome advice to the council, members of which may be his patients. The inspection of slaughterhouses, dairies, milkshops, and cowsheds, and of bake-houses, must necessarily bring him in conflict, on occasion, with their owners, who may be his private patients. Under the existing arrangements the medical officer of health has no control over the inspection of school children in his district, or over the hospital for infectious diseases.

The *inspector of nuisances* is Mr. A. J. Munro, Associate of the Royal Sanitary Institute. He receives £280 per annum, of which a half is repaid from county funds. There are also two certificated assistant inspectors of nuisances and two office clerks. The inspector of nuisances is responsible for the removal of house refuse, the flushing of sewers and the emptying of cesspools.

Mr. Munro has a very good knowledge of his district and is an active and energetic officer. Systematic inspections of the district are made and about 1,000 dwellings are examined yearly under ordinary circumstances, but in 1908 owing to the extra work required in dealing with the outbreak of diphtheria the sanitary staff has not been sufficient to allow of this work being continued.

The Infectious Disease (Notification) Act, 1889, was adopted in 1889. The whole of the Public Health Acts Amendment Act, 1890, has been adopted. The Infectious Disease Prevention Act, 1890, has been adopted. There are byelaws for new streets and buildings, which were allowed in 1899; with respect to nuisances, which were allowed in 1887; for pleasure grounds, allowed in 1904; relating to tents, vans, sheds, and similar structures used for human habitation, allowed in 1897. There are also byelaws with respect to earth closets, allowed in 1887; as to houses let in lodgings, allowed in 1887; with respect to slaughter-houses, allowed in 1887; common lodging houses, allowed in 1887. There are regulations for allotments, allowed in 1893; and regulations for dairies, cowsheds, and milkshops, made in 1900. The council have recently arranged for an inspection of all the dairy cows in the district twice yearly by a veterinary surgeon for the detection of tuberculosis. Any suspected cows are to be tested with tuberculin and samples of their milk examined by a bacteriologist. The council have no byelaws for offensive trades. They have not taken any action under the Housing of the Working Classes Act, 1890. They have not adopted the Private Streets Works Act, 1892.

For assistance in preparing this report I am indebted to the medical officer of Health, Mr. W. P. Warren, who had already prepared a report on the epidemic, of the facts in which I have largely availed myself. I am also indebted greatly for assistance to Mr. Munro, the inspector of nuisances, and to Mr. Scott, the clerk to the urban district council. For permission to use his records of rainfall and temperature at Enfield I am indebted to Mr. J. McEwen, of Byculla Park, Enfield.

RECOMMENDATIONS.

(1) *Prevention of Infection.*—The experience of this district as regards diphtheria indicates the need for more systematic control of the spread of infection of this disease.

(a) Each case when notified should be regarded as the possible centre for other cases, some of them already in existence, though unrecognised; others in the period of incubation; and investigations should be made accordingly with a view to the detection of unrecognised cases and for the early diagnosis of further cases as they occur. It is the duty of the medical officer of health, as part of his work under the Board's Order of March 23, 1891, to "inquire into and ascertain by such means as are at his disposal the causes, origin, and distribution of disease within the district"; and in the discharge of this duty he will co-operate with and utilise to the fullest extent practicable the information in the possession of the practitioner who notified the first case, or of other practitioners as well as any collateral information which he can secure from the school medical officer, teachers, attendance officers, &c.

(b) The inquiry forms for cases of infectious disease should be filled in by a trained and certificated inspector; all necessary particulars should be filled in on the spot at the time of the first visit. Formal notices signed by the medical officer of health as well as exact verbal instructions should be given to householders where infectious disease has occurred, advising them as to means for preventing the spread of infection, the period for which children

who are contacts must be kept from school. Teachers should be informed when children who are contacts, or who have suffered from diphtheria, may return to school after disinfection of their homes, a definite period being stated and enforced in each individual case.

(c) *Disinfection of dwellings* should, so far as is practicable, be performed under the direction of a certificated inspector of nuisances.

(d) *Ambulance arrangements*.—The council should endeavour to make an arrangement with the Joint Hospital Board for a nurse to accompany the ambulance for the removal of patients. Relatives of patients should not accompany them to hospital in the ambulance. The council should also consider the desirability of making arrangements by which patients discharged from hospital whose homes are distant should be forwarded to their houses in conveyances provided for this purpose.

(e) *Isolation Provision for Diphtheria*.—The urban district council should endeavour, through their representatives to get the joint hospital board to provide additional accommodation for cases of diphtheria at the fever hospital and observation wards for the reception of cases of doubtful nature or mixed infection.

(2) *Condition of Dwellings*.—A very large amount of work remains to be done in removing unwholesome conditions due to erection of houses without supervision in former days. All dilapidations should be dealt with as soon as possible, also all instances of defective roofing, absence of spouting for conducting water from roofs, badly laid gullies, defective paving of yards and dampness of dwellings. If the existing staff is insufficient to carry on this work during the prevalence of infectious disease it should be increased.

(3) *House Drainage*.—The examination of all house drains should be proceeded with as quickly as possible. They should be tested with the water test and means for their inspection and ventilation provided. Plans should be kept showing the position and details of house drains.

(4) *Surface Drainage*.—Measures should be taken by providing deep culverts or otherwise more effectually to drain the Chase Side and Enfield Lock districts. All foul or stagnant watercourses in the neighbourhood of houses should be filled in and replaced by culverts or piped drains.

(5) *Sewerage*.—The urban district council should cause a comprehensive examination to be made of the sewers in the district, particularly at Chase Side and Enfield Lock. Advice should be taken as to the best way of providing for the efficient sewerage of these districts, so as to provide that all sewers shall have sufficient fall to be self cleansing and to prevent the collection of solid filth in the bottoms of the manholes. To do this effectually it may be necessary to provide additional trunk sewers, to relay a number of sewers and to reconstruct manholes. A plan should be prepared without delay showing the position of the sewers, and of manholes, ventilating shafts, and flushing chambers. The connections with the house drains should also be shown, and a record kept of all particulars relating to the sewers.

S. W. WHEATON.

