

improved system of scavenging and cleansing the precincts of the house as well as the general sanitary work have all helped. The hospital isolation of Diphtheria has a high preventive value, and the serum treatment now gives it also a direct return in life-saving. Notification led at once to a great increase in hospital treatment, as indicated by the proportion of deaths. In the five years preceding notification 7 per cent. of the deaths from Diphtheria registered as such took place in hospital; in the five years of notification 28 per cent.; in the last year (1894) 36 per cent. As a fact 19 per cent. of the cases notified as Diphtheria and Membranous Croup were removed to hospital. It is worth adding that we have hitherto not had in our hospitals that post-scarlatinal Diphtheria which is so serious a feature of the hospital treatment of Scarlet Fever in London.

REMARKS ON THE INCIDENCE OF DIPHTHERIA IN BIRMINGHAM.

BY

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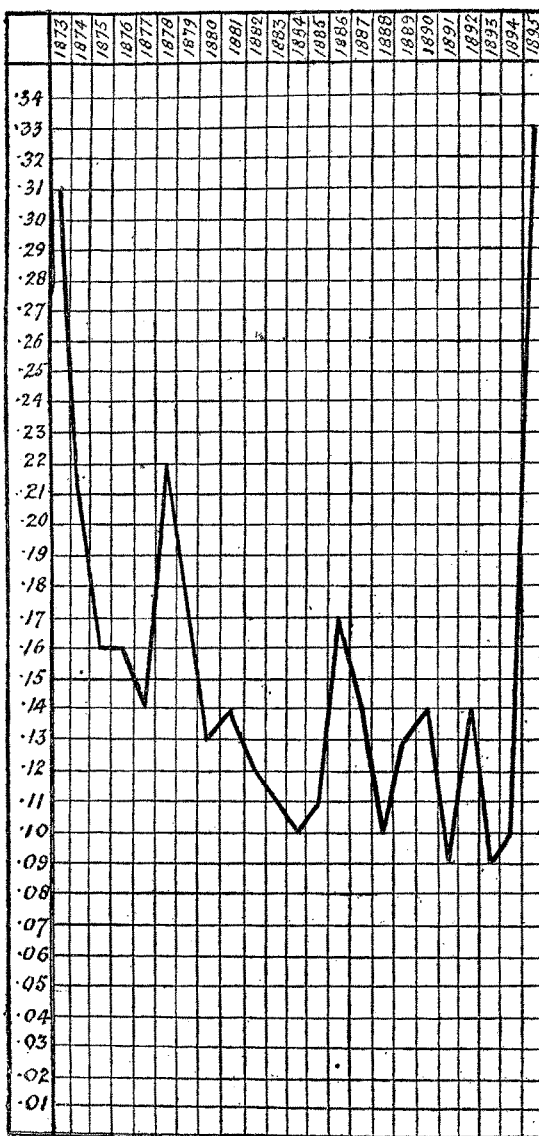
Diphtheria Death-Rate.—Perhaps the most interesting feature in the statistics for 1895 is the extraordinary and unaccountable increase in the prevalence and mortality of diphtheria. The deaths rose from an average of 58 in the previous 9 years to no less than 163, equal to a rate of '33 per 1,000. For the next highest death-rate from this disease, I have to look back to 1873, the first year of my appointment, and even then it was only '31 per 1,000. Ever since 1873 diphtheria had been on the decline, in which respect Birmingham occupied an exceptional position among the large towns; so that one began to hope that in a few years the disease would disappear altogether. The astounding increase observed last year will be clearly seen by glancing at the accompanying chart. With the exception of 1873, 1874, and 1878 no year has had a death-rate from diphtheria at all approaching that of 1895. And a curious feature about the increase is the suddenness with which it occurred, 1893 and 1894 being two of the best years on record in regard to this disease, while 1895 proved to be the very worst.

Diphtheria Cases.—The notified cases did not show quite so large an increase as the deaths. They numbered 640, against 316, 322, and 456 in 1894, 1893, and 1892, while the deaths amounted to 163, against 50, 43, and 67. The deaths were therefore three times as numerous as in the previous three years, while the cases were less than twice as numerous; so that the disease last year must have been not only more prevalent but of a more severe type.

Origin and Spread of Diphtheria.—The question of the origin and spread of diphtheria is as full of mystery as it is of interest and importance.

For many years some of our ablest sanitarians have been diligently studying it, but at present without any very marked results. I should like, however, to point out certain facts connected with it, which may be of interest.

DEATH RATES FROM DIPHTHERIA PER 1000 PERSONS LIVING



Diphtheria and Insanitary Conditions.—In the first place the present outbreak cannot be supposed to be directly due to any extension or intensification of the insanitary conditions existing in the town. I do not, of course, mean to imply that defective sanitation may not be a predisposing

cause of the disease. I firmly believe that it is so. But the sanitary state of Birmingham was practically the same in 1895 as in 1894, 1893, and 1892, yet the diphtheria death-rate was three times as high. It is clear, therefore, that sanitary defects could not have been the immediate cause of last year's sudden outbreak, and this conclusion is strengthened by a consideration of the prevalence of diphtheria in the past. In England and Wales the diphtheria death-rates have been as follows:—

3 years, 1858-60	...	...	...	372 per 1,000
5 " 1861-65	...	...	...	248 "
5 " 1866-70	...	...	...	127 "
5 " 1871-75	...	...	...	121 "
5 " 1876-80	...	...	...	122 "
5 " 1881-85	...	...	...	156 "
5 " 1886-90	...	...	...	170 "
4 " 1891-94	...	...	...	251 "

I think there can be no question that the sanitary condition of England and Wales is better at the present time than at any other period since 1860: yet the death-rate from diphtheria is higher than at any time since that date. Moreover, it is to be noted that the towns most affected by this disease are many of them very healthy in other respects. West Ham, which is now the seventh largest town in England, is a striking example of this, having had last year a diphtheria death-rate of 77 per 1,000, against 35 in the thirty-three large towns, while its general death-rate was only 17.9 against 20.7. London, too, which on the whole has a very good death-rate, suffers heavily from diphtheria. It seems, therefore, that there is no very close connection between known insanitary conditions and endemic diphtheria.

Diphtheria and House Accommodation.—There is a common idea that diphtheria is more prevalent in better class houses than in inferior ones. In order to test this notion I have tabulated the houses which were invaded by the disease last year, and find that 195 out of 517 consisted of 5 rooms and upwards. So far as I can learn from the census returns, there were in 1891 about 41,000 houses in Birmingham containing 5 rooms or more, out of a total of 95,000. Thus diphtheria occurred at one out of 170 of the smaller houses, while only one out of 210 of the larger houses was invaded, the larger houses thus suffering considerably less than the smaller ones.

Diphtheria and Closet Accommodation.—I have also inquired into the incidence of the disease upon houses using respectively ashpit privies, pans, and water-closets. I found that out of 517 houses invaded, 71 had ashpit privies, 247 pan privies, and 205 water-closets, 6 of the latter having either a pan or ashpit privy as well. I do not know the exact number of houses using each kind of closet, but judging from the actual number of pans and water-closets in existence, I should think that about as many use the one as the other. If this be so, there were rather more cases amongst

houses provided with pan privies than amongst those using water-closets. And I find that a secondary case occurred at one out of 11 of the houses having pan closets, and only one out of 29 of the houses using water-closets. These facts appear to show that pan closets favour the introduction of the diphtheria virus a little, and when it is once introduced, facilitate its spread in a marked degree.

Diphtheria and School Attendance.—I have endeavoured to discover how far the bringing together of a large number of children in schools affects the spread of diphtheria. Of the 517 houses invaded, there were 163 in which no children attended school, and 168 others in which the patient did not attend school, though other children from the house did so. I do not see how any school influence can be made out in these cases. This leaves 186 patients, who themselves were in attendance at school, out of a total of 517. But these 186 cases occurred in children attending no less than 74 schools, giving on an average a little more than two cases per school per annum; and in only 41 instances had there been a previous case at school within a fortnight. These 41 cases out of 517 may possibly have contracted the disease at school; I do not see the least probability that any of the others did so. I think it must be admitted then that schools have very little to do with the spread of diphtheria so long as proper precautions are taken to keep away all children from infected houses, as is done in Birmingham.

Diphtheria and Harborne Board School.—But while this is so as a general rule, there can be no doubt that occasionally a school does become a centre of infection. This was well illustrated last year at Harborne. There had been very little diphtheria there until October 9th, when the case of a child attending the board school was notified to me. At intervals varying from one to thirteen days, as many as ten other cases occurred at the school in less than six weeks, and the patients all being very young children, they would of course be closely associated at school. Moreover, between October 9th and November 29th, there were altogether 18 cases of diphtheria and croup at Harborne. Of these 18 patients, 13 attended the school, and four out of the remaining five lived with children who went there; so that only one case occurred in the district which did not connect itself either directly or indirectly with the school. From inquiries made, I learned that about nine years before there had been an outbreak of diphtheria at the same school, and the drainage had been re-arranged. The old drain was disconnected from the sewer, but was not taken out at that time. About October 16th this old drain was taken up, when it was found to be full of dry solid matter. This, however, was a week after the first case occurred at the school, so

that it does not seem to have originated the outbreak, though perhaps it had some influence on the spread of infection among the scholars. At my request the school buildings were fumigated. During the next month only two cases occurred at Harborne, and neither of these was in any way connected with the school.

Diphtheria in Wards.—The attack-rate for each ward shows that one ward, that of All Saints', has suffered pre-eminently from diphtheria, its case-rate being more than twice as high as any other.

Diphtheria and Elevation.—It has sometimes been supposed that the more elevated parts of the city suffer more severely from diphtheria than the rest. I have arranged the wards in order of elevation from the highest to the lowest, the result showing that there is no definite relation between elevation and the prevalence of diphtheria. The ward which suffered most of all from the disease was All Saints', and yet there are no less than five other wards which occupy a higher position than this one does. On the other hand, the most satisfactory case-rates were in Bordesley and Deritend, which are by no means the lowest wards in the town. Again, the highest point in the city is in Edgbaston and Harborne Ward, and the lowest is in Saltley; yet these two wards had almost identical case-rates from diphtheria. And this want of constant relationship between diphtheria prevalence and elevation does not appear to have been peculiar to the year under notice, for I find that in 1894 the highest number of cases occurred in All Saints', Ladywood, and St. Paul's, which are fairly high wards; while in 1893 the greatest prevalence was in St. George's Registration Sub-district, embracing St. George's, St. Stephen's, and St. Mary's, which are rather low wards.

NOTES ON THE ORIGIN OF DIPHTHERIA.*

BY

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THE diphtheria question in London is one of enormous importance, and any evidence connected with the origin of the disease is of value. The 57 cases occurring in Stoke Newington in 1895 are too few to warrant one in using them except to corroborate the large amount of evidence which has already been collected to prove the following points:—

(1) If the throat, from any cause, becomes disorganised (sore, relaxed, ulcerated), then the risk of catching diphtheria is very much greater than when the throat is healthy. The escape of drain and sewer gases and other noxious odours into dwellings, at least predisposes to diphtheria, by the tendency which these conditions have to relax the

throat. In nine cases there were such insanitary conditions in the homes of the patients as gave rise to the escape of offensive odours, and in four cases there was dampness of premises—another condition very liable to relax the throat. Six of the cases of diphtheria in the parish during 1895 had been previously suffering from sore throat, and two cases had quite recently had their tonsils cut. Thus 36·8 per cent. of the cases appeared to arise from these causes. Three cases occurred in healthy children, doubtless, as the result of the opening up of drains for the purpose of repair. That is to say, although there were defective drains in the houses, the children did not contract diphtheria, but when these drains were opened up and the polluted soil around the leaky drain was exposed, in three cases children at once developed the disease. This points to the conclusion that the emanations from faecally polluted soil are especially prone to give rise to diphtheria, and for this reason parishioners are always advised to send children away, when possible, before any such work is commenced; no such work is ordered to be done in this parish unless and until there is a clean bill of health in the house.

(2) In 25 cases there were no insanitary conditions present, and school attendance is either alleged by the parents or surmised by myself, on sufficient grounds, to be the cause of seven of these. The most marked increase in diphtheria has occurred during school ages since the passing of the Elementary Education Act, 1870, and some of it is doubtless due to direct infection from slight unrecognised cases in school-mates, such infection being enhanced by the over-crowded condition of the scholars, and the very general absence of fresh air. School attendance thus appears to be responsible for 12·2 per cent. of the cases.

(3) Sore throat in other members of the same household I ascribe (in the absence of other likely causes) as the probable origin in three cases, for it is now an accepted fact that conditions presenting the symptoms and appearance of ordinary sore throat are capable of giving rise to severe and typical diphtheria in others.

(4) In 23 cases the parents had no theory to offer, and I was unable to decide as to the likely cause of origin.

Certain animals are probably capable of conveying the infection—more especially cats, canaries, and fowls. In only five of the infected houses dealt with in this report were no animals kept, and in only two instances of the remaining 49 were the animals other than healthy. These were examined for the diphtheria bacillus with negative results. Nothing could be stronger than the circumstantial evidence which lay against one unhealthy cat; it was a stray animal, very emaciated, its hair was patchy, rough, and very thin in parts, and it suffered from a peculiar kind of cough. The mother stated that the child was in the back garden when

* From Dr. Kenwood's Annual Report for 1895.