

## MEASLES IN SCHOOLS: AN ACCOUNT OF A RECENT EPIDEMIC IN ST. HELENS.

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IN recent years the subject of school hygiene has come to occupy one of the foremost places in the routine work of a medical officer of health. Recent legislation has strengthened his hand considerably in dealing with matters pertaining to school life, and the advent of the school doctor and the school nurse have afforded him greater facilities for investigating and dealing with outbreaks of infectious disease among school children. Even in the short time that these new forces have been in operation there is a distinct indication of the improvement effected by them in taking in hand the commoner infectious and contagious diseases, which are still all too prevalent amongst school children.

The gathering together of children day by day from many different localities and bringing them into close contact form conditions which are eminently favourable for the rapid propagation of infectious disease, but at the same time with efficient administration these very conditions may be turned into good account in detecting disease and controlling its spread at the very earliest opportunity.

Some of these diseases, either from their individual peculiarities or from our knowledge of their epidemiology, are more easily controlled than others; but there is still a considerable number against which we have yet to form a satisfactory plan of campaign.

In this group measles undoubtedly takes the chief place, for in it we have a disease which is the most prevalent of all children's diseases, to which practically every child is susceptible, which is of the most infectious nature, and which is more or less responsible for an unduly large proportion of deaths in very young children.

To a considerable extent we are handicapped in dealing with it from our want of exact knowledge as to the nature of the causative agent and the details of its mode of spread, but as the results of administrative methods of control accumulate we can more confidently look forward to a time when its ravages in infant departments will be substantially diminished. In the hope of contributing a little more to our information on this subject, I submit for your consideration a brief account of our experience

of measles in schools during the recent epidemic at St. Helens.

Before commencing the main subject of this paper, it may be of interest to give a short survey of the outbreaks of measles in St. Helens during the past thirty-three years, in so far as it shows the periodicity usually associated with this disease—that is to say, outbreaks occur every second or third year, while during the intervening period the number of cases is comparatively small.

The only figures available for the earlier epidemics are the death-rates, but for the purpose of a general comparison these may be taken as a sufficiently accurate measure of the extent of the outbreaks from year to year. The years 1876, 1879, 1882, and 1884 were marked by extensive outbreaks, in which the death-rate ranged from 20 to 26 per 10,000, while in the intervening years it dropped to 2, or even less.

From 1886 to 1902, a period of sixteen years, this extreme difference between epidemic and inter-epidemic periods was much less marked, but it is still possible to trace in them minor outbreaks giving a death-rate of from 7 to 10 per 10,000. These occurred every second year, with only two exceptions, which were third year periods—namely, from 1886 to 1889 and 1897 to 1900. In the intervening periods the death-rate, with three exceptions, remained below 4 per 10,000. In 1903 only one death from measles was registered, but in the following year there were no less than 131. During the greater part of 1905 and 1906 the borough was practically free from measles, but in the second half of the latter year there began an extensive outbreak, which lasted until June, 1907. Again, during 1908 not a single death was registered as having been due to measles, and only thirty-nine cases were notified to the health department as compared with 2,123 in the previous year. Thus for over thirty years there has been a fairly regular succession of years of high prevalence and years of low prevalence. At the beginning and end of the period in question there has been a succession of major outbreaks, while in the middle period the outbreaks have been of a minor character.

Judging from the local behaviour of these epidemics in the past, it might be expected that 1909 would be the occasion of an extensive epidemic, and so it happened. Towards the end of January of this year cases of measles began to occur with increasing frequency in the schools on the western side of the town.

Throughout February the schools nearer the centre of the town became involved, and at the end of that month and the beginning of March the schools lying to the eastward of the borough began to show signs of the approaching epidemic. Indeed, this slow progression eastward was a most noticeable feature of the present epidemic, and can only be explained by the fact that it began in the schools on the west side, and travelled by personal contact from street to street.

There is no reason to correlate it with the prevailing direction of the wind; in fact, during the four months of the epidemic the number of hours in which the wind had an easterly direction is almost precisely the same as that in which it had an opposite direction.

Our main source of information as regards the occurrence of cases was a system of notification by teachers and school attendance officers, for in St. Helens measles is a notifiable disease under Section 96 of the St. Helens Corporation Act, 1898, which provides that "whenever any scholar who attends any school within the borough shall be suffering from any infectious disease the principal or person in charge of such school . . . shall forthwith send notice thereof to the Medical Officer of Health." In virtue of this clause we can call upon the teachers to notify such cases of measles as may come under their notice, and to them we are indebted for the greater part of our information in the present epidemic.

The head of every school department is provided with a book of forms, on which to fill in the name, age, address, and disease from which the scholar is supposed to be suffering. The teachers are also requested to report on the same form any case that may come to their notice of a child attending school from a house in which an infectious disease is believed to exist, and to make a note to that effect in the appropriate column.

A small number of cases occur in which the teacher is unable to obtain information as to the nature of the illness. These are reported to the school attendance officer, who in due course makes inquiries at the house, and if he has reason to suspect the existence of an infectious disease he reports the matter directly to the Health Department. In this way a fairly full record is obtained of cases of illness occurring amongst children *in attendance at school*, but it is obvious that this method alone is not sufficient to keep one informed of more than a portion of the actual cases which occur;

still it forms a very useful indication of the extent and progress of an epidemic.

As soon as practicable after the receipt of the notification a school nurse visits the house at which the scholar resides and makes inquiries with a view to confirming the reputed diagnosis. If no doctor be in attendance she gives advice as to isolation of the patient and calling in of medical aid if the circumstances seem to warrant it. At the same time she makes a note of the date of onset, last attendance at school, particulars of the other members of the family, and any other information that may be of value.

As soon as each case of measles has been verified a note is sent to the school which the patient attends excluding him from further attendance for a period of not less than three weeks from the date of onset. Other members of the family are also excluded for a similar period if they are in the infant department, also if they are in the upper school and have not been protected by a previous attack of measles. The only children, then, who were allowed to attend school from an infected house were those in the upper standards who had had a previous attack.

In spite of the precautions that were taken, measles began to spread rapidly in the school first affected and to attack fresh areas. The disease soon became so general on the west side of the town, and cases occurred with such frequency in the schools, that it seemed almost hopeless to try to eliminate the school infection factor otherwise than by total closure of the departments most affected.

In some instances the way in which infection gained an entrance to the school was ascertained with a fair degree of accuracy, and as these instances serve to illustrate the difficulties one encounters in dealing with an extensive epidemic of this nature, it will be worth while to describe them in detail.

One of the most interesting of these instances is the chain of events which happened in a certain school (Christ Church Mission) on the west side of the borough. For several weeks this school remained free from measles in the very centre of the area first and most affected, and for a time seemed to enjoy an unwonted immunity, while all the neighbouring schools suffered severely. On March 5th, however, the head master notified some fifteen cases which had occurred almost simultaneously in two classes of infants occupying the same room. On inquiring at the school it was found

that the attendance, which for the previous three weeks had been about sixty, had dropped during the week in question to forty-two, and of the eighteen absentees at least fifteen were reported to be suffering from measles.

An examination of the registers showed that a little girl in one of these two classes had been at school up to February 11th, when she was noticed to be suffering from "a bad cold," and was sent home by the teacher. Later on it was proved that she had had measles. Nothing further happened until February 19th, when another member of this class, who was the school companion of the first, developed measles, and was known to have been sick in class on that date. Exactly a fortnight later (March 5th) we received the head master's notification of the fifteen cases, all of which had sickened between March 1st and 4th. The natural conclusion is that the first girl had been the source of infection to her companion, and that the second child, having attended school in an infectious condition, had given rise to the fifteen subsequent cases. It is rather curious that the first case did not cause a greater number of secondary cases, but probably the promptness of the teacher in sending her home the first day she appeared to be ill prevented further spread of the infection at that time. On the same date similar inquiry was made at another school (the Gerard) in the northern part of the town, where during the three preceding days eighteen cases of sickness had been notified. Almost the same history was obtained. A little girl had been in attendance in the infant department until February 3rd, when she was taken ill in school and sent home. A few days later the teacher received information that she was suffering from measles. No other case occurred in the school until February 19th, when a little boy in the same class developed measles. The disease was not recognised at that time, so that he must have been attending school in an infectious condition up to that date. From March 1st to 4th, ten to fourteen days later, eighteen cases of sickness occurred, of which twelve proved on subsequent inquiry to be measles.

No connection could be shown between the case on the 3rd and the one on February 19th, but I think it can reasonably be assumed that the latter was the source of the twelve cases which sickened simultaneously ten to fourteen days later, viz., between March 1st and 4th. Another instance will serve to show how the best directed efforts to keep a department free

from infection may be thwarted by the carelessness or ignorance of parents in sending a child to school while in an infectious condition. The school I refer to (Parr Flat) is situated in an isolated district in the extreme east of the borough, and though it had not yet been reached by the epidemic, it was included in the general closure up to May 7th in the hope that it would thereby escape infection. This, however, was not realized, for on June 23rd, seven weeks after re-opening, twenty-nine cases of sickness were reported, of which twenty-one proved to be measles, and all of these sickened during the preceding three days.

On making inquiry as to the cause of this fresh outbreak it was found that a little girl in the infant department had been kept at home for a week, from June 8th to 14th; the reason for absence sent to the teacher was that she had had a "bad cold." After her return to school a brother, also in the infant department, who had been in attendance up to the 17th, was kept away for the same reason. In the meantime the little girl had admitted to the teacher that she had had "spots on her body," and the teacher, becoming suspicious of measles, sent specially to inquire whether the boy, who was now ill, had a rash or not. The reply was to the effect that "he had only a cold and there was no rash." When the school nurse visited the house on June 23rd she found unmistakable evidence of a measles rash on the boy's arm and chest, and on questioning the mother more closely obtained the admission that the girl had been "just the same."

Here, then, is a clear history of a child attending school from an infected house who subsequently develops measles, while another member of the same family is out of school for only a week during the beginning of the disease. It is not surprising, then, that a crop of a score of secondary cases should appear some ten days later in that department.

In many of the schools a very strict watch was kept by the teachers in the infant department for children who showed early signs of measles, but teachers alone cannot be expected to have the necessary skill to diagnose the disease sufficiently early to permit efficient steps being taken to prevent further infection. Where practicable the schools were visited frequently by a school nurse or myself, in order that suspected cases might be individually examined and dealt with at the earliest opportunity. Owing to the large number of schools which ultimately became affected, and the large

area covered, it was clearly impossible for the staff of the Health Department to carry out this plan with success, as the following instance will illustrate.

In a certain school (St. Patrick's) in one of the poorer districts, almost daily visits were made for the purpose of making a routine examination for early cases of measles. From time to time small batches of cases were found and excluded, but as time went on these occurred at more frequent but less regular intervals, showing that infection was entering the school from several different sources. These successive "crops" of secondary cases were never large, but they became so frequent that, together with their "contacts," the number of scholars excluded approached one-third of the number on the roll.

At this stage the question arose as to whether the classes could be profitably conducted with an attendance bordering on 60 per cent. From a purely educational point of view it is doubtful if the teachers can be expected to devote their usual energy in teaching a class so depleted in numbers, knowing full well that the great bulk will have to be done over again as the sick children return to school. This disorganisation of school work due to the absence of many scholars and their return at irregular intervals several weeks, it may be months, later, is certainly a question worthy of due consideration.

Of the financial side of the question I need not say much, for with the disappearance of Article 101\* of the Code the monetary loss to the education authorities caused by the exclusion of individuals is a serious one indeed.

A consideration of these points, together with the plain evidence that our efforts to limit the spread of infection had not met with any obvious degree of success, led to closure of eighteen infant departments during the month of February and the first week of March.

Still the epidemic continued its steady progress eastward, and by the middle of that month practically every one of the twenty remaining infant schools, which were mostly on the east side of the town, began to show signs of becoming invaded. From the experience gained in the previous weeks the only step that seemed reasonably consistent was to close all these departments forthwith, before the infection gained a still wider footing. Accordingly a general closing order was made out for all infant departments for six weeks

from March 15th to April 23rd, a period which included the Easter holidays.

On the following Monday, April 26th, the departments reopened, but the attendance was so poor in number of the principal schools and so many of the children brought reports of brothers or sisters suffering or recovering from the disease that the general closure was maintained for another fortnight—namely, to May 7th. This made a total of eight weeks continuous closure of all the infant departments. On reopening at the end of that period the attendance proved to be practically as good as it was previous to the epidemic.

Such is a general description of the epidemic and its behaviour. I shall now proceed to give an analysis of the figures relative to the outbreak.

From the beginning of January to the end of April, a period of seventeen weeks, there were altogether 1,367 cases of measles brought under our notice. The actual number of notifications received considerably exceeds this, but the above number includes only those in which the diagnosis was verified. Many of the cases notified proved not to be measles, or the evidence was too slight to establish a diagnosis, or, as happened in a few cases, the nurse could not gain admission to the house.

These 1,367 cases were distributed amongst 860 families in the following way:—

One case in	509 families	...	509 cases.
Two cases in	227 "	...	454 "
Three "	98 "	...	294 "
Four "	20 "	...	80 "
Five "	6 "	...	30 "
	860 "		1,367 "

That is to say that there were 391 families in which more than one case occurred, and, as will be seen from a subsequent table, the majority of secondary cases in these families were younger children, who contracted the disease from a child attending school. In order to show the relative influence of home and school conditions in spreading infection, the 1,367 cases have been classified under the following heads:—

1st. Primary cases which occurred in children under school age—*i.e.*, four years—and who therefore could not have been infected otherwise than at home. For convenience, I shall refer to these as "home" cases.

2nd. Primary cases occurring in children of four to fourteen years of age who had been attending school during the epidemic and who presumably caught the infection there. These

form the group termed "school" cases in the table.

3rd and 4th. Secondary cases occurring in children of these two groups. These secondary cases are further sub-divided according as they were secondary to a "home" case or a "school" case. There were 52 instances of a "home" child and a "school" child sickening simultaneously, and two cases of measles in individuals over school age—namely, 1 of fifteen and 1 of eighteen. The secondary cases are those in which measles developed in another member of the same family not earlier than a week from the date of onset in the first or primary case; cases occurring before that time are classed as "primary."

It was interesting to note that the majority of these secondary cases sickened in from nine to twelve days after the primary case, and that only in a very few instances was the sickening delayed until the third week or later. As will be seen from the figures in the following table, the commonest sequence of events was that a "school" child contracted the disease first, and conveyed it to a younger member of the family who had never been to school, while the reverse sequence, infection of a "school" child by a "home" child, is comparatively rare.

The primary cases occurring in children under four years of age number 156. The primary cases in children of school age, four to fourteen years, numbered 804; the secondary cases corresponding to the first group numbered 240—these include 64 cases secondary to a previous "home" case, and 176 secondary to a previous "school" case. The secondary school cases numbered 163, which includes 34 secondary to a previous "home" case, and 129 secondary to a "school" case in the same family.

There were 52 instances of simultaneous sickening of a "home" child and a "school" child, a circumstance which points to infection taking place in the house rather than in the school. Deducting these 52 cases from the 804 primary school cases, with which they are included in the table, and adding them to the home cases, we get 212 primary cases, which were due to home infection, and 752 in which the infection most probably occurred at school.

These figures, however, require a still further correction, for, as I shall show in detail later on, there is reason to believe that we received notification of only 26·7 per cent. of the cases under four years, and 37·7 per cent. of those over that age. Calculating on this basis the 164 primary cases under four would represent a probable total of 590, the 804 of the four to

TABLE A.—INCIDENCE AT AGES.

		Ages.																	Totals.
		Under 1 year.	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-18	Over 18	
Primary cases	...	15	36	40	67	123	232	206	114	57	26	24	9	9	3	1	1	1	964
Secondary cases	...	42	65	63	70	57	31	21	20	14	8	10	1	1	—	—	—	—	403
Totals	...	57	101	103	137	180	263	227	134	71	34	34	10	10	3	1	1	1	1,367
Deaths...	...	6	13	9	7	—	6	—	—	—	—	—	—	—	—	—	—	—	41

Number of families ... 860.

		Under School Age (4 years).	Infants and Standard I. (4 to 8 years).	Standard II., etc. (8 to 14 years).	Above School Age.
Primary cases	...	158	732	72	2
Secondary to school case	...	176	111	18	—
Secondary to home case	...	64	32	2	—
Totals	...	398	875	92	2
Deaths	...	35	6	—	—

fourteen years of age group 2,144, and the 52 simultaneous cases, 139.

On transferring these from the "school" group to the "home" group, we get 729 probable cases in which the infection was caught at home, and 2,005 in which the school was the probable place of infection. Putting this in simple figures, nearly three times as many cases originated in school as at home. I do not think this is by any means an exaggerated estimate, for in the particular instances of school infection which I quoted it was seen that even a single case was capable of giving rise to a "crop" of 12 to 20 secondary cases.

Another point which tends to confirm the view that school infection was the predominating factor is that the epidemic spread comparatively slowly from school to school, but when once it gained a footing in the school its progress there was very rapid indeed. It will be readily seen, too, that infection which takes place at school is distributed over a much wider area than that which takes place at home. In the latter case it is probably limited to the members of one family or their immediate neighbours. In the former it affects many children in different streets and districts, making these the centres of fresh areas of infection.

Another interesting point is that the number of secondary cases due to a "home" primary case is proportionately greater than those due to a "school" primary case. Thus, from the figures in the table, 158 "home" cases gave rise to 98 secondary cases—that is, 61 per cent.—and the 804 cases at school age to 305 secondary cases in their own families—that is, 38 per cent. The probable explanation of this comparatively greater infectiousness in the former group is that the younger children are at home during the whole period of the disease, and that there is opportunity for more prolonged contact than is possible in the older children, who often attend school during the earlier stages of the disease. It is quite likely, too, that the virulence of infection is related to the severity of the disease, and that, as younger children are almost invariably more severely affected than the older ones, their relative infectiousness is similarly increased.

The number of deaths which occurred in the families visited was found by referring to the Registrar's death returns for the corresponding period. As is invariably the case, the number of deaths is far greater among the children under school age than in the group of older

children. The exact figures are 35 deaths among the 398 cases occurring in children under four, only 6 in the 675 cases in the four to eight years of age group, and none among the older children. This works out to a fatality of 8·8 per cent. among the younger children, and of 0·67 per cent. in the older children, or, taking the two groups together, a total fatality of 3 per cent. The fatality rate in the group of younger children as compared with the elder—it was exactly thirteen times greater—appears at first sight disproportionately high, but this figure is not at all at variance with the well-known fact that measles is a most fatal disease for young children.

Although the number of cases on which this calculation is based does not by any means represent the whole of the cases which occurred, yet there is no reason to suppose that these do not represent a fair sample of the total cases. That being so, the fatality rate which holds good for the known cases will likewise hold good for those which did not directly come under our notice.

The insufficiency of notification by school agencies alone is shown in the following table, which gives in comparative columns the number of deaths from measles and its complications in the Registrar's returns for the first four months of this year, and those which occurred in the 1,367 cases notified by school officials:—

TABLE B.

NUMBER OF DEATHS AT EACH AGE PERIOD, AND PROBABLE NUMBER OF CASES CALCULATED FROM THE DEATHS.

Age. Years.	Registrar's Returns.		Notified cases.	
	Deaths.	Probable cases.	Deaths.	Known cases.
Under 1 ..	31	295	6	57
" 1 ..	63	489	13	101
" 2 ..	39	440	9	103
" 3 ..	12	230	7	137
" 4 ..	9	2,584	0	969
" 5 ..	13		6	
" 6 ..	1		—	
" 7 ..	1		—	
" 14 ..	1		—	
Totals ..	170	4,038	41	1,367

	Under 4 years.	4 years and over.	Totals.
Probable cases .. ..	1,454	2,584	4,038
Reported cases .. ..	398	969	1,367
Percentage of reported to probable cases ..	26·7%	37·5%	33·8%

Assuming that the case death-rate was the same for notified and non-notified cases, I have calculated on that basis the number of probable cases which would produce the number of deaths given in the Registrar's returns for each age period. From the numbers in the table it will be seen that approximately one-third (33·8 per cent.) of the total cases were notified, and that a relatively greater number of cases at school age were notified than of younger children, the proportion being roughly one-third and one-fourth in each case.

There is a distinct difficulty in obtaining information about the younger members of a family who may be suffering from measles. Since they are not in attendance at school we have no direct means of knowing whether they are ill or not, and it not infrequently happens that the older children continue to attend school even in the infant department while a younger one is ill at home with the disease.

Even when the teachers are careful to make daily inquiry of the scholars it is not always possible to elicit a trustworthy answer from the children. Several instances came to our knowledge of parents continuing to send infants to school although there was infection in the house, and without sending notice to the teachers. This may have been done partly in ignorance, but I think I am justified in saying that in a few cases there was a deliberate attempt to hide the fact of a baby having measles in order to "avoid trouble."

With the closure of the infant departments our main source of information was cut off, and the cases which did come under our notice were chiefly obtained through contacts attending the upper departments. These, together with the death returns, afforded a fair indication of the general progress of the epidemic, but at the same time this information was too scanty and arrived too late to be of much value in taking steps to control the spread of the disease.

The progress of the epidemic from week to week is shown in the next table, which sets out the number of cases notified and the number of deaths from the Registrar's returns.

It will be seen from a comparison of the figures that during the first six weeks of the epidemic the cases under school age are few in proportion to the cases of school age, but after that time they increased rapidly, and obtained their maximum at about the same time as the school cases. In the week following the closure of the infant departments there is a sudden fall

TABLE C.  
NUMBER OF CASES NOTIFIED AND OF DEATHS WEEK BY WEEK.

Week ending:	Cases notified.			Deaths from Registrar's Returns.
	Under 4 years.	4 to 14 years.	Total.	
January 7th ..	2	5	7	—
" 14th ..	4	13	17	—
" 21st ..	4	23	27	1
" 28th ..	11	35	46	0
(1 Infant dept. closed)				
February 4th ..	11	60	71	2
" 11th ..	21	55	76	2
(2 more closed)				
" 18th ..	56	115	171	8
" 25th ..	60	112	172	11
(7 more closed)				
March 4th ..	45	120	165	14
(8 more closed)				
" 11th ..	34	80	114	19
(All remainder closed)				
" 18th ..	22	53	75	19
" 25th ..	17	42	59	33
April 1st ..	18	12	30	28
" 8th ..	10	14	24	8
" 15th ..	11	8	19	18
" 22nd ..	2	10	12	4
" 29th ..	2	9	11	3
May 7th ..	4	2	6	4
(All infant depts. re-opened)				
" 15th ..	10	13	23	1
" 22nd ..	5	6	11	0
" 29th ..	2	2	4	1
June 5th ..	5	5	10	1
" 12th ..	2	2	4	1
" 19th ..	1	2	3	2
" 26th ..	3	25	28*	1
July 3rd ..	2	1	3	0
" 10th ..	4	8	12	3
(Summer holidays, all schools closed)				

\* Twenty-one cases in one school.

in the number of cases, due largely to the loss of notification from the teachers in these departments. The numbers, however, show a steady fall all through the period of closure, and, with the exception of one week, ending April 5th, there is a corresponding fall in the number of deaths, which shows clearly that the epidemic was abating.

After re-opening there is a slight rise in the succeeding fortnight, which is most marked in the second week. This was due to the occurrence of minor outbreaks of three or four cases in some of the schools. These outbreaks were dealt with by excluding the affected individuals and their contacts, a method which seems to have been effective in stopping any further spread.

The week ending July 26th has a total of 29 cases, but of these 21 occurred in one school, an outbreak of which I have already given full particulars. In the column dealing with the deaths from the Registrar's returns it will be noticed that these follow fairly closely the number of cases notified, and that the

maximum number of deaths occurs about a fortnight later than the maximum of cases notified. This table, however, is not quite so complete as the others, for in a number of instances the date of onset was not ascertained with sufficient accuracy to allow the cases to be classed in their appropriate weeks, but this defect is not sufficiently great to detract from its value as indicating the rise and fall of the epidemic from its commencement to the summer vacation.

It has not been possible to ascertain fully how many susceptible children escaped infection during this epidemic, but the following figures, which were obtained in the course of routine school inspection since the schools reopened, will give an indication of the number who escaped.

Of a total of 556 infants examined in eight schools information on this point was obtained from 391 parents or guardians. Of these 391 children, 164 (42 per cent.) had had measles previous to this year, and may therefore be regarded as "protected." Of the remaining 227 susceptible children 149 (38 per cent.) had measles this year and 78 (20 per cent.) had not—that is to say, out of five infants roughly four have had measles and one not. Of these four two had measles previous to this year and two caught the infection in the present epidemic. Fully two-thirds of the "protected" children had had their attack of measles in the epidemic of 1906-7, when they would have been two to three years of age.

The chief points of difference between the previous epidemic and this one are that the former extended over a much longer period, namely, from August, 1906, to June, 1907, that its appearance in the schools was of a more sporadic nature, and that it did not attain so marked a climax as in the present instance. During its course individual schools were closed from time to time, but there was no prolonged closure of all the infant departments as in the case of the 1909 outbreak. That this last outbreak came to an earlier and more definite end can, I think, be justly attributed to the continued closure of the infant departments, the more so as many of these were closed before the disease had gained much headway in them.

The efficiency of school closure in limiting the spread of such a highly infectious disease is still a debateable question, but when one considers the infectiousness of this disease, even in its earlier stage, and the extreme susceptibility

of children under seven, it is readily seen how these factors combine to make the infant department of a school a most favourable ground for its propagation.

Certainly our recent experience in St. Helens has been that it is in the schools that this disease finds its readiest means of spread, and that when an outbreak has become very general and fresh sources of infection are being imported almost daily into a class, there comes a time when the most careful weeding out of "infects" and "contacts" fails to arrest its progress, and that nothing short of total closure is of any avail. The former method was fully tried in the earlier part of this epidemic, when it most affected the schools on the west side of the town, but, as I have shown, it did not meet with any degree of success. The closure of the schools on the east side in anticipation of their being ultimately affected to the same degree was undoubtedly the factor which contributed most to the fall of the epidemic, while the prolonged closure prevented the possibility of these departments becoming re-infected, after the first "crop" of cases had run their course.

Action on the part of health authorities or of school officials in excluding individual cases cannot be expected to attain its full measure of success unless, at the same time, it be supplemented by the intelligent co-operation of parents in practising isolation of the infected children. This is manifestly difficult to obtain, but with systematic home visitation by a capable health visitor much may be done to educate public opinion in this direction.

In the recent outbreak in St. Helens it was gratifying to find that in many instances mothers had made some attempt to isolate the sick child, even before the visit of the school nurse, and that there appeared to be an appreciation of the danger of the disease for very young children. This certainly is a very great advance on the practice of putting all the children together, so that "they might have it at once and be done with it," and the popular idea that "the sooner they have it the better." This responsibility, however, does not rest entirely with the parents, for we require a still greater willingness on the part of teachers and school authorities to sacrifice high averages of attendance for the sake of eliminating children suspected of being infectious from their classes. Until these conditions are realised, measles and kindred diseases may be expected to continue to exact a heavy toll of life and health amongst our infant population.