REPORT ON VACCINATION AS A BRANCH OF PREVENTIVE MEDICINE.

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II.

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SMALL POX AT LEICESTER.

I HAVE placed Leicester next to Sheffield in the tabular statement (see BRITISH MEDICAL JOURNAL, March 2nd, p. 487), because it has become the centre of the antivaccination movement; the performance of vaccination has been practically suspended in the town for several years past, and a gigantic experiment is being tried there of endeavouring to cope with small-pox by, curiously enough, substituting for compulsory infantile vaccination another set of even harsher compulsory measures—compulsory isolation, compulsory quarantine for twelve or fourteen days, and suchlike. The comparative immunity of "unvaccinated" Leicester from small-pox for several years past was becoming the stock argument of the antivaccinators. It is especially instructive, therefore, to see how small-pox behaves there on its introduction. From the official report of Dr. Priestley, the able medical officer of health, it appears that during the epidemic of 1892-93 there were:

<i>Under 10 Years of Age.</i>		
Vaccinated cases, 2; deaths 0	...	= 0.00 per cent.
Unvaccinated cases, 105; deaths 15	...	= 14.30 " "
<i>Over 10 Years of Age.</i>		
Cases once vaccinated, 178; death 1	...	= 0.57 per cent.
Unvaccinated cases, 48; deaths 4	...	= 8.30 " "
Revaccinated cases, 14; death 0	...	= 0.00 " "
Doubtful as to vaccination—that is, no marks visible—cases 2, death 1	...	= 50.00 " "

This is convincing enough by itself, but the health officer, who personally saw and had to deal with every one of the cases, further reports that: "It is a noteworthy fact that of the 19 deaths amongst the unvaccinated, 16 were of a malignant or semi-malignant type, that is, were accompanied with extravasations of blood in various parts of the body—the skin, eyes, lungs, etc. In fact, some of the cases have been of a most revolting and distressing character, calling to mind the descriptions given by some of the early writers in speaking of the 'black small-pox.'" Among the unvaccinated, 35 cases (22 of them in children under 10 years) were malignant or semi-malignant, and of these 19 recovered, "to be left, unfortunately, disfigured for life." No vaccinated case was of a malignant or semi-malignant type, though 10 vaccinated out of the 176, and 1 doubtfully revaccinated out of the 14, were of a severe confluent type; only 1 of the vaccinated cases died. Thirteen out of the 14 revaccinated cases were either mild or very mild, and aborted. It will have been seen from the table that there were 2, and only 2, cases amongst vaccinated children under 10 years of age during the whole epidemic, and as regards these the medical officer of health is doubtful if they were cases of small-pox at all, so very mild and abortive were the symptoms.

The length of stay in hospital of the different classes of patients is another interesting and practically important point, and it was observed during this Leicester epidemic that the average length of stay was—among the vaccinated under 10 years, 14.5 days; unvaccinated under 10 years, 47.3 days; vaccinated over 10, 28.6 days; revaccinated, 26.8 days; had previous small-pox attacks, 14 days; unvaccinated, 44.2 days.

Leicester has also repeated the experiences of other epidemics as regards the immunity from attack enjoyed by the efficiently-protected nurses and attendants at the small-pox hospitals. Of 40 officials connected with the hospital, 34 were "efficiently" protected either by revaccination or by a previous attack of small-pox, as shown by extensive "pitting," and not one contracted small-pox. The remaining 6 were "inefficiently" protected, having been vaccinated only in infancy, and having refused revaccination. Five of these contracted small-pox and 1 died. The only one of these 6 "inefficiently" protected to escape was the matron, who, of course, was not much exposed to the contagium, taking no

part in the actual nursing of small-pox cases, and only entering the wards occasionally.

I propose to refer, later on, to the evidence that sanitary conditions had nothing to do with the relative immunity of the vaccinated as compared with the unvaccinated. There is much that I would like to quote from Dr. Priestley's valuable report if space admitted of it, but for the moment I must be satisfied with the following:

After comparing the condition of Leicester in 1871-72 with its condition in 1892-93, he adds that in the latter year, with the "most stringent precautions taken in the way of isolation, disinfection, and quarantining, with a Notification Act well carried out, and with excellent sanitation, there have been 347 cases, showing that 1.8 per 1,000 of the whole population (estimated at 184,547) have been attacked, and the ratio of mortality to cases has been 1 to 16.5. In 1892-93 Leicester was equally well vaccinated (that is, when compared with 1871-72) as regards its adult population, but the antivaccination movement is beginning to tell, especially upon the children under 10 years of age, and it is chiefly these, proportionately, who have suffered most severely from the ravages of small-pox. This unvaccinated element under 10 years of age is, in my opinion, Leicester's weak point; and certainly has proved so during our late epidemic. Taking the children under 10 years, there have been 105 unvaccinated who have passed through our hands, whilst I am able to make the significant statement, that there has not been a single case of a vaccinated child under 10 years of age treated for small-pox at the hospital during the whole of our epidemic. That many such vaccinated children have come into contact with small-pox is proved by the quarantine statistics, from which it is seen that 91 vaccinated children under 10 years were in infected houses. Comparing these with the 271 unvaccinated children in quarantine of the same age period, we find that the incidence on the vaccinated bears to the incidence on the unvaccinated the proportion of 1 to 8.7 per cent.—that is, the unvaccinated children under 10 years of age have suffered eight times as severely as the vaccinated ones. The severity of the attacks must also be noticed, and the extensive pitting and scarring left in the unvaccinated children. We have seen that out of a total of 105, 83.8 per cent. have suffered severely or very severely, whilst 16.2 per cent. have suffered mildly or very mildly."

There is yet another interesting feature in the Leicester "experiment," and that is the system of "quarantining" for small-pox. By "quarantines," Dr. Priestley explains, "are meant practically persons in small-pox infected houses, for it is clear that such inmates must, more or less, have been exposed to the contagion. Such persons may be quarantined (1) in separate hospital wards and reception houses specially provided, a method, by the way, I do not recommend, whether from the point of view of economy or practicability; or (2) at their own homes, a method I have found satisfactory, both financially and otherwise. The value of quarantining has been well shown during the Leicester epidemic, and I have been able, with comparative ease, by means of my inspectors, to quarantine hundreds of persons at their own homes and with a success that has been gratifying both financially and otherwise. One thousand two hundred and sixty-one persons were quarantined, and of these 123 sickened (that is, 9.7 per cent.). Each infected house was visited daily by one or other of the inspectors for fourteen to sixteen days. Other persons who had come into contact with small-pox were also watched in the same way. These 'quarantines' were strongly urged—practically compelled—not to go to work for the whole or part of their quarantine period of fourteen to sixteen days, and during that time have been made such monetary allowances as the Committee have thought fit, the sum advanced in each case being no more than sufficient to cover rent and maintenance." This is a kind of compulsion which it must be evident would not be tolerated to any great extent if it be seriously thought in some quarters that the system might be made general. In comparison with it the compulsion of infantile vaccination is a trifling interference with individual liberty.

WARRINGTON EXPERIENCES.

The experiences at Warrington in 1892-3 are scarcely less instructive than those of Leicester. The figures set out in the

table already given speak eloquently for themselves, and need not here be repeated. But, from Dr. J. G. Gornall's exhaustive report on the subject I take the following further facts bearing on the influence of vaccination. A census was made of practically all houses in Warrington invaded by small-pox, with the following results. In 397 houses invaded by small-pox up to the end of March, 1893 (being the total number of invaded dwellings up to that time, excepting only 7 lodging houses), a total population of 2,424 persons was enumerated. Of these 545, or 22.4 per cent., were attacked by small-pox, and 56, or 2.3 per cent., died; 663 of them were under 10 years of age; of these, 51, or 7.6 per cent., were attacked, and 14, or 2.1 per cent., died; 1,761 were aged 10 years and upwards, and 494, or 28 per cent., were attacked, while 42, or 2.3 per cent., died. That is to say, the attack-rate in persons over 10 years of age was four times that in persons of the earlier period, while the death-rates are about the same. In other words, the diminishing protection afforded by vaccination as life advances is shown by an increased liability to attack. And since the mortality under 10 years of age is practically confined to the unvaccinated, the non-increase of the death-rate in the older class, coincidentally with an augmented susceptibility, is evidence of the power of vaccination to mitigate the severity of the disease after it has ceased to be able to prevent it altogether. Again, of the 2,424 persons already referred to, 2,313 were vaccinated, and 481, or 20.7 per cent., of these were attacked, and 32, or 1.3 per cent., died. Of the remaining 112 unvaccinated persons, 64, or 57.1 per cent., were attacked, and 24, or 21.4 per cent., died. Of 606 vaccinated children, 18, or 2.9 per cent., were attacked, and 1 (said to have been vaccinated, but presenting no trace of marks), or 0.16 per cent., died. Of 57 unvaccinated children, 33, or 57.8 per cent., were attacked, and 13, or 22.8 per cent., died. Of 1,707 vaccinated persons over 10 years of age, 463, or 27.1 per cent., were attacked, and 31 (including one whose vaccination was doubtful), or 1.8 per cent., died. Of 55 unvaccinated persons over 10 years of age, 31, or 56.3 per cent., were attacked, and 11, or 20 per cent., died.

It will be seen that the differences between these figures are very wide indeed, and not merely fractions or units. The inference to be drawn is irresistible.

Further, Dr. Gornall records that of 824 persons in the military barracks none caught the disease. No case occurred amongst the 117 revaccinated persons in the postal service, nor in the police force, whose members were all revaccinated. Nor did any case occur amongst the 23 nurses, etc., who were exposed to contact with small-pox in the discharge of their duties at the local small-pox hospital.

SMALL-POX IN HALIFAX.

In Halifax the antivaccinators have, during the last five years or so, acquired an ascendancy on the board of guardians, with the unfortunate result that the Vaccination Acts have become almost a dead letter in the town. In 1891 only 516 out of the 4,868 children born were vaccinated. It must be borne in mind, however, that although this shows that children in increasing numbers are growing up unprotected against small-pox, the present adult population is still fairly protected. Let us hope the local experiences of small-pox in 1892 and 1893 may have opened the eyes of some at least of those who have been deluded by the sophistries of the opponents of vaccination. In the course of eighteen months 513 cases of small-pox were admitted to the Halifax Fever Hospital and 44 (8.5 per cent.) died. Of these 425 were vaccinated and only 8 of them (or 1.8 per cent.) died. The remaining 88 were unvaccinated and 36 (or 40.9 per cent.) of them died. Looking more closely at the figures, we find that there were no vaccinated cases whatever under 5 years of age, but that 50 unvaccinated children under that age were attacked, and 20 (or 40 per cent.) of them died. Between 5 and 10 years of age there were 4 vaccinated cases, all mild and non-fatal, whilst there were 17 unvaccinated cases of that age, 9 of them confluent and 2 fatal. Above 10 years of age there were 421 vaccinated cases 325 of them being "discrete" or mild, 96 of them "semi-confluent" or "confluent," or severe, and only 8 (or 1.8 per cent.) of them fatal; whilst of the 21 unvaccinated cases above 10 all were severe, and 14 (or 66 per cent.) were fatal. Two revaccinated persons were attacked, but in one of them

the revaccination had taken place thirty-four years previously, and in the other the revaccination had been inefficiently performed five years previously. Of the hospital officials 1 only was attacked, and that during the first week of the epidemic before revaccination. All the others were revaccinated, and all escaped small-pox.

OLDHAM.

Oldham is a centre of antivaccination. In fact, it may be said that at present the Vaccination Acts are a dead letter in the town. Although the good people of Oldham may possibly not profit by their striking experiences of small-pox in 1893, yet it is worth putting the facts on record for the benefit of others who are still amenable to reason in this matter. It will be seen from the table that between January, 1892, and June, 1893, 605 cases of small-pox were treated in the Westhulme Hospital, the cases coming from Oldham, Chadderton, and Royton. Of these, 15 were vaccinated children under 10 years of age and all recovered; 97 were unvaccinated children under 10, and 27 (or 27.8 per cent.) died; 431 were vaccinated adults, and of these 19 (or 4.4 per cent.) died, whilst 51 were unvaccinated adults, of whom 14 (or 27.4 per cent.) died.

In a very careful and comprehensive report on this outbreak, Dr. Niven, then medical officer of health, showed that he did his best to promote vaccination and revaccination, and that in the case of actually invaded families he was fairly successful. His report goes to show that efficient vaccination or revaccination immediately after exposure to the infection of small-pox (especially within three days after the appearance of the eruption in the patient first attacked) reduces, practically to a minimum, the risk of subsequent development of the disease in the individuals who have been exposed to it.

SMALL-POX AT HASTINGS.

An outbreak of small-pox, which occurred in the Hastings registration district early in 1894, has been closely investigated by Dr. Bruce Low, of the Medical Department of the Local Government Board, and the facts and figures set out in his report are very instructive. Between January and June, 1894, there occurred 86 cases of small-pox, of which 9 were fatal. In 7 of these cases it was not found possible to obtain definite information as regards vaccination. Two of them died, and neither examination of their arms nor questioning could obtain information, whilst no relatives were found. As to the other 5 non-fatal doubtfully vaccinated cases, there were no visible marks or scars on their arms nor were the patients themselves or their friends able to give definite information as to vaccination. Of the remaining 79 cases, 67 were vaccinated, and 3 of them (or 4.4 per cent.) died; whilst 12 were unvaccinated, and of these, 4 (or 33.3 per cent.) died. Of the 67 vaccinated, only 4 (all mild and non-fatal) were under 10 years of age. Of these 4, one was an infant whose mother was attacked with small-pox three weeks after her confinement. She was removed to hospital, and her baby, after having been vaccinated, was sent with her. On the twelfth day after admission the infant developed "eight spots," but suffered little or no constitutional disturbance, and made a rapid recovery with no trace or mark of the illness. The mother, on the other hand, who had no visible vaccination scars, and who did not know whether or not she had ever been vaccinated, had a severe confluent attack. The three other vaccinated children attacked were: (1) a child, aged 3, with three vaccination scars, who had only "six spots"; (2) a child, aged 2, with two vaccination scars, who had "one spot," there being three other small-pox cases at the time in the family; and (3) a child, aged 4, with three vaccination scars, who had only "a few spots," although his father, mother, and sister, had small-pox at the same time. In all three of these children the illness was of a trivial kind. On the other hand, 10 unvaccinated children under 10 were attacked, and 4 (or 40 per cent.) of them died.

Further, as regards severity of attack, 56 of the vaccinated cases were mild and only 11 severe; but of the unvaccinated cases, only 4 were mild, whilst 9 were severe.

BLACKBURN QUARANTINES.

Blackburn furnished some instructive lessons from its

visitation by small-pox in 1893. Out of 79 cases, 3 were vaccinated children under 10 who had mild attacks and recovered, and one a child whom the health officer states was unvaccinated and who died. Of the 75 cases over 10 years of age, 68 had been vaccinated and only 2 died, 4 were unvaccinated and 3 of them died, whilst in the remaining 3 cases there was no evidence of vaccination, and 2 of these died. Vaccination was also noticed to influence very materially the fatality of the disease in those attacked. Thus, of 33 vaccinated patients showing 3 or more vaccination marks not one died. Again, the protection afforded by revaccination after exposure to infection was noticeable. There were 243 persons detained in quarantine for 14 days in consequence of their having been exposed to infection. Of these, 211 were revaccinated, 15 were already sufficiently protected by revaccination or a previous attack, and 17 were not revaccinated. Of the 211 revaccinated, 2 caught the disease, one having been exposed 4 days and the other 5 days before the performance of revaccination. Of the 17 persons who were not revaccinated 5 caught the disease. This surely goes to show that if only vaccination and revaccination were efficiently and judiciously carried out, the great expense and restriction of individual liberty involved in these "quarantines" could be avoided. Here are a couple of particular examples. A case of small-pox occurred in a house where there were 4 other persons. Three of these were revaccinated and escaped, the fourth refused and was attacked. In another instance small-pox occurred in a house where there were 3 other persons. These were revaccinated and escaped. The only other person who had been in contact was a brother who lived in another part of the town. He was only in this house a few minutes. He was not revaccinated, and he was attacked by small-pox 12 days afterwards. Dr. Wheatley, the medical officer of health, was often much struck, when attempting to persuade the inmates of common lodging houses to be revaccinated, by the large number of them who had been revaccinated previously. Many of them had been revaccinated in the army or navy, and others in public institutions. It is to this large amount of revaccination that he attributes the fact that small-pox did not spread in the lodging houses to a greater extent than it did.

SMALL-POX IN BOLTON AND DERBY.

Of the 44 cases of small-pox which occurred in Bolton during 1893, 1 fatal case in a vaccinated child under 10 years of age is recorded in the table already given, but the medical officer of health explains in his report that he has doubt as to its having been small-pox at all. Of the 30 cases amongst vaccinated adults, all of whom recovered, it is instructive to find that 29 were "discrete," and that only 1 was of the "confluent" type. All the unvaccinated cases were severe.

Of the 46 cases of small-pox in Derby during 1893, 14 showed no marks of vaccination, 5 showed only one mark each (good in 4 instances), 11 showed two marks each (good in only 4 cases), 8 had three marks each (good in 6 cases), and 7 had four marks each (good in 5 cases); so that only 11 of the persons who suffered from small-pox were properly vaccinated. Of the 14 patients showing no marks of vaccination, 5 died, or 35.7 per cent. Of the remaining 32 patients who had been vaccinated, only 2 died, or 6.2 per cent., and both had been vaccinated imperfectly—one in one place only and the other in two places only. No patient was admitted to the hospital who had ever been revaccinated. The whole of the staff connected with the hospital had been revaccinated, and not one of them was attacked with the disease.

STRIKING ILLUSTRATIONS FROM HUDDERSFIELD, ETC.

Huddersfield in 1893 had 48 cases of small-pox, and though that number is comparatively small, it teaches, when analysed, the same lessons as the more serious outbreaks. Forty-six of the cases were amongst persons over 20 years of age, and the remaining 2 cases were under 12 years of age, one being a child of 5, unvaccinated and the daughter of an anti-vaccinator, who very wisely had the rest of his family vaccinated, the other being a boy of 12 practically unvaccinated, because, although subjected to the operation in infancy, "the vaccination did not take." Dr. Kaye, the medical officer of health, also reports that the severity of the attack, with its

attendant disfigurement by pitting, and consequent detention in the hospital, was roughly in proportion to the condition of vaccination exhibited by the marks on the patient. These facts were observed and acknowledged by the patients themselves. Twelve of the patients were unvaccinated, and only 2 deaths occurred amongst them. Dr. Kaye includes in his report an illustration, reproduced from a photograph, of one of these fatal cases, a child 18 months old, and he justly remarks that "if any convincible antivaccinationist could have witnessed the horrible condition of both these fatal cases—features swollen beyond recognition, and covered from head to foot with loathsome-smelling scabs, and totally incapable of doing anything for themselves—I do think he would have seriously reconsidered his position." Dr. Kaye also gives illustrations of two unvaccinated adults of 24, one on the ninth and the other on the tenth day of eruption, and by way of contrast an illustration of an adult of 34, having three vaccination marks, and only a few scattered small-pox spots. The striking contrast is just what is observed in every epidemic and every small-pox hospital. Dr. Kaye has approximately calculated that the unvaccinated constitute about 3 per cent. of the population of the borough, or say 2,955, whilst the remaining 95,600 may be taken as more or less efficiently vaccinated. If vaccination possessed no preventive influence the incidence of small-pox would be the same amongst the vaccinated and the unvaccinated, and there should not be more than 1 unvaccinated case to every 33 vaccinated. In Huddersfield, however, the proportion in 1893 was 1 unvaccinated case to 3 vaccinated cases.

Seventy-two cases of small-pox occurred in Keighley in 1893, 31 of them being vaccinated, and 41 unvaccinated, but only 1 of the former died, whilst 6 of the latter were fatal. Only 1 vaccinated child under 10 years was attacked, the disease being of a mild type; whilst 24 unvaccinated children under 10 were attacked, 17 of them having the disease in a "confluent" form, and 4 of them dying. Of the 40 "confluent" or "semi-confluent" cases, 33 were unvaccinated, and only 7 vaccinated, 4 of the latter being "semi-confluent." In the vaccinated the average duration of the illness was 36 days, in the unvaccinated it was 53 days.

In Ossett there occurred 41 cases of small-pox in vaccinated persons and 4 in unvaccinated during the two years 1892 and 1893. All of the former (except one who committed suicide) recovered, but one of the latter cases was fatal. The health officer adds in his report that during the last 13 years there have been 116 cases of small-pox in the district, 104 having been vaccinated in infancy (including doubtful cases), and 12 having never been vaccinated. Only 5 deaths have taken place, and all of them have been in unvaccinated subjects. There has been no instance there of a revaccinated person having contracted small-pox.

Salford had 174 small-pox cases during 1893, and 21 proved fatal. Of children under 10 years of age 7 who had been vaccinated caught the disease, but none died; whereas of 20 unvaccinated children, 7 died. Amongst vaccinated adults over 10 years of age there were 125 attacks and 8 deaths; whilst amongst the unvaccinated there were 17 attacks and 5 deaths. As regards the hospital staff, Mr. Mullen, the medical superintendent, reports that "with a very few exceptions the nursing staff of the Ladywell Sanatorium, all of whom had been successfully revaccinated, were afforded the opportunity of adding to their experience by being detailed in turn for attendance on small-pox cases. Not one of the staff contracted the disease."

Of 152 cases of small-pox treated in the Southampton Fever Hospital during 1893, 116 had been vaccinated and none proved fatal; whilst out of 15 unvaccinated persons 7 died, and out of 21 patients whose previous vaccination was uncertain 1 died. One case, recorded by Dr. Harris, the medical officer of health, admirably illustrates the influence of vaccination. Two constables had occasion to visit a house in which a boy was suffering from small-pox, although the nature of the illness was not discovered until after their visit. On finding they had made this visit, Dr. Harris immediately inquired for the men at headquarters, and informed the inspector that they should be immediately revaccinated, offering at the same time himself to perform the operation if the men would come to his house. When they came he could persuade only one to accept the proposal, with the

result that that one escaped, while the other, who refused, was admitted to hospital a fortnight later with severe "confluent" small-pox, from which he nearly lost his life.

Out of hundreds of persons who were revaccinated during the outbreak, only 2 contracted the disease, and in them it assumed a mild form. All persons employed at the hospital were revaccinated before commencing duty, and in no instance did a member of the staff contract small-pox in spite of their daily close contact with the disease.

Of the 23 cases of small-pox in Swansea in 1893, 22 had been vaccinated and recovered, whilst the only unvaccinated person died. As an instance of the protection afforded by vaccination, Dr. E. Davies, the medical officer of health, reports that the wife of one of the patients contracted small-pox, and was removed to the hospital with an infant child 4 months old, which was vaccinated just before the mother sickened of the disease. In the hospital this child occupied the same bed as the mother during her illness, but did not contract the disease.

FACTS FROM BIRMINGHAM, WALSALL, ETC.

Birmingham has lately been suffering from small-pox, and at the time of writing the epidemic has not entirely subsided. But in his *Annual Report* for 1893 Dr. Alfred Hill gives an interesting account of the epidemic so far as that year is concerned. Of 979 cases 847 had been vaccinated, and 105 had not, whilst in 27 cases previous vaccination was doubtful, no scars being visible. Of the 847 vaccinated patients at all ages 38 (or 4.5 per cent.) died, either during the year or after its close, most of them having less than 3 scars, and having therefore been very imperfectly vaccinated, whilst of the 105 unvaccinated 32 (or 30.5 per cent.) died. No case of small-pox occurred amongst the large number of vaccinated infants (under 1 year) in the town, but 14 occurred amongst the small number of infants who were unvaccinated. Only 6 vaccinated children between 1 and 5 years old were attacked, as compared with 21 unvaccinated, in spite of the fact that the vaccinated must be quite five times as numerous as the unvaccinated. Again, no death of a vaccinated person under 15 years of age occurred, but 20 unvaccinated persons under that age died. Then as regards the length of stay in hospital, the vaccinated patients were far better off than their unvaccinated fellows. Taking all the patients treated in the City Small-pox Hospital during the first eleven months of the year, the following instructive facts were observed:

	Average Number of days in Hospital.
All vaccinated cases	30
Cases with 1 mark	34
" 2 marks	33½
" 3 "	29½
" 4 "	28
" 5 "	26½
Unvaccinated cases	50

Thus the average duration of the illness in persons who had been vaccinated was about three weeks less than in those who were unvaccinated.

Yet one further fact. Over 100 persons were engaged on the staff of the small-pox hospital, all of whom had been recently revaccinated. Not one of them contracted small-pox. Could stronger evidence be forthcoming?

In 1893 Walsall was the seat of a severe epidemic, there being 778 cases, of which 71 (or 9.1 per cent.) died. Only two of 123 vaccinated children under 15 years who were attacked died, and one of these died not of small-pox, but of pneumonia; whilst out of 141 unvaccinated children under 15 attacked, as many as 41 (or 29 per cent.) died. Of adults above 15 years of age, 431 vaccinated were attacked, but only 4 (or 0.9 per cent.) died; whilst of 66 unvaccinated, as many as 20 (or 30.3 per cent.) died. "No case of small-pox," as Dr. J. Scott Wilson, the medical officer of health, reports, "was admitted to the hospital in which the patient had been recently revaccinated."

In his annual report for 1893 on the Bingley Local Board District, Dr. G. K. McGregor thus refers to the question of small-pox and vaccination: "Experience of vaccination, more especially of revaccination, has clearly proved its marvellous efficacy, both in the prevention and the mitigation of small-pox; and to such an extent has successful revaccination impressed itself upon me, that I have no fear myself

personally of the closest possible contact with the most malignant cases of small-pox, and I have no fear whatever in advising persons so successfully revaccinated to have the most intimate contact with even the more virulent cases of small-pox."

In the Ecclesall Bierlow rural sanitary district, towards the close of 1893, small-pox broke out at Totley amongst a colony of navvies, and before it died out, in July of that year, 222 cases and 19 deaths had occurred; 130 of these cases had been vaccinated and none of them died; in 19 other cases the fact of previous vaccination was doubtful, and amongst these there were 3 deaths; whilst the remaining 73 patients were unvaccinated, and 16 (or 19.1 per cent.) of them died. Of the 3 deaths in the doubtful class, one was said to have been vaccinated in infancy but had no visible marks; a second had a single doubtful mark; the third died rapidly of hæmorrhagic small-pox, the medical man in attendance being unable to ascertain his condition as to vaccination. So far as Dr. Gale, the local health officer, could ascertain, no person was attacked who had undergone successful revaccination, and he adds that "from beginning to end the epidemic was an example of neglected vaccination."

ONE TAKEN; THE OTHER LEFT.

As an illustration of the certainty with which small-pox singles out the unvaccinated, Dr. Gale records the following particulars of an outbreak in a family at Green Oak: Father, vaccinated in infancy, not attacked; mother, vaccinated and revaccinated, not attacked; S., aged 17, unvaccinated, severe small-pox, recovered; W., aged 13, unvaccinated, severe small-pox, recovered; A., aged 11, unvaccinated, severe small-pox, died; E., aged 10, unvaccinated, severe small-pox, died; J., aged 8, vaccinated and revaccinated, not attacked; C., aged 6, vaccinated six days before the first symptoms of the disease too late to give protection, severe small-pox, recovered; N., aged 4, vaccinated, not attacked; G., aged 2, vaccinated, not attacked.

As showing the protection afforded by vaccination even after exposure to the disease, the following facts are instructive. An unvaccinated child was attacked with small-pox in a house in Totley Rise. The mother immediately brought her three other children to the vaccination station, where they were successfully vaccinated; and although they continued to reside with their ailing sister, not one of them was attacked. In April an unvaccinated boy living in Chesterfield Road was attacked; he was the son of a strong opponent of vaccination, who had been prosecuted under the Vaccination Acts. His unvaccinated sister and father afterwards developed the disease. A fourth case occurred in the same house in the person of an infant vaccinated eight days before the first symptoms of the disease showed itself. The vaccination had the effect of modifying the eruption, but was too late to prevent it altogether.

Of 16 cases of small-pox which came under the immediate notice of Dr. Vann, the medical officer of health for Durham City, during 1893, 10 were vaccinated, 6 were unvaccinated, and none were revaccinated. Of the 10 vaccinated cases 6 were very mild, 2 were mild, and 2 severe, one of the latter being a man aged 31, in whom small-pox was complicated with other disorders, and who ultimately died. The number of vaccination marks in this patient was doubtful. On the other hand, 4 of the 6 unvaccinated cases were very severe, 3 of them dying. Two were severe, and in no case was the disease mild.

In Idle, near Bradford, in 1893 there were 10 cases of small-pox. Four of them were unvaccinated persons, and each one had the disease severely; the other 6 were mild cases.

In Leeds, in 1892, 125 cases of small-pox came to the knowledge of Dr. Spottiswoode Cameron, the health officer, and were removed to hospital. Of these, 111 were said to have been vaccinated, although in a large proportion of them the vaccination had been very imperfect; 13 had never been vaccinated, and respecting 1 there was no record. Of the 111 vaccinated 2 (or 1.8 per cent.) died, both being upwards of 37 years of age; whilst of the 13 unvaccinated 4 (or 30.7 per cent.) died, 2 of them being more than 26 and 2 being children aged 3 months and 4 years respectively.

To the same effect was the experience of Leeds in 1893. There were 586 cases of small-pox and 30 (or 5.1 per cent.)

of them died. Of these, 257 were "well vaccinated" cases and all recovered, only 3 of them being of the confluent or severe type; 241 others were "imperfectly vaccinated," and 13 (or 5.3 per cent.) of them died; 42 were said to have been vaccinated but showed no sign or mark, and of these 4 (or 9.5 per cent.) died; whilst 46 cases were "unvaccinated," and of these 13 (or 28.2 per cent.) died.

In the Newport Pagnell rural district during 1893 8 cases of small-pox occurred, 6 of them originating in the following manner. A young man, tramping from Yorkshire, caught the disease whilst sleeping at a lodging-house in Leicester. It developed soon after his arrival at his father's cottage, with the result that he, his father, mother, brother, and a young child were shut up together in a cottage with only two bedrooms. The father, mother, and brother caught the disease, and the father, who was an elderly man and had never been vaccinated, died. The mother, an elderly woman, believed she had been vaccinated, but showed no signs of it; she recovered. The two young men had been vaccinated in infancy, and the attacks were mild, especially in the case of one, who did not feel even ill enough to go to bed. The child, who had recently been vaccinated, did not take the disease, although shut up with the rest of the family. On another occasion, a man who had been tramping about the country arrived at a lodging house at Penny Stratford ill with small-pox. He was kept there during the period of infection, and the other lodgers were quarantined at the expense of the sanitary authority for twelve days and revaccinated. No other cases occurred. The man had been vaccinated in infancy and recovered.

In Oldbury 138 small-pox cases and 4 deaths occurred in 1893. Of these, 125 were vaccinated, and only 1 (or 0.8 per cent.) died, death in that case being really attributable to pneumonia, and not small-pox. Out of 11 unvaccinated cases 3 were fatal, 1 being a child aged 6 months, who died one mass of pustules on the eighth day after first appearance of rash, and the other 2 being children aged 3 and 4 months respectively. Two revaccinated persons caught the disease, but had it very mildly; in one of the cases the revaccination had been performed ten years previously, and in the other case the patient, who had already been exposed to direct infection by her two sons, took small-pox on the third day after attempted revaccination, but had the disease so mildly that less than a dozen abortive papules made their appearance. The patient was discharged as recovered within ten days. Dr. Cunningham, the health officer, mentions that of all those persons who sought revaccination during the small-pox prevalence, not one contracted the disease, although some are known to have been afterwards in actual contact with infection.

FACTS FROM PONTEFRAC, ST. HELENS, WEST HAM, ETC.

In Pontefract in 1893 there were 58 cases of small-pox, and the local medical officer of health reports of them that "those who had been well vaccinated had the disease in a mild form, and those who were imperfectly vaccinated, or not at all, had it more or less severely. The two deaths occurred as usual in persons who had not been vaccinated (one was a chronic sufferer from bronchitis). Four cases were noticed of the small-pox and revaccination running concurrently, 1 taking small-pox ten days and the other 3 eleven days after revaccination, showing that the small-pox poison was already in the blood before revaccination. Both cases were of a very mild character, modified, no doubt, by the revaccination. No revaccinated person took the disease. The majority of the cases had only two vaccination scars. There were only 2 cases under 5 years, both unvaccinated or showing no scars. Seven cases over 5 years were found unvaccinated, and, with one exception, all the cases had the disease in a severe form."

"During the year 1893, 44 cases of small-pox occurred in the town of St. Helens, Lancashire, and 5 of them proved fatal. Not having the ages of these patients, I have not been able to distribute them in the tabular statement, but from the annual report of Dr. McNeill, the health officer of the town, I quote the following: "In all, 44 cases occurred in 1893 with 5 deaths, and, as in 1892, no one who saw the cases and who had to take the responsibility of checking the spread of small-pox, could fail to notice the great value of 'efficient' vaccination and revaccination. No case of small-pox oc-

curred in any of the members of the hospital or sanitary staff. Of the 5 persons who died, 3 were unvaccinated, in 1 the vaccination marks could not be seen on account of the 'confluent' nature of the pox, and no history could be obtained that vaccination marks ever existed. In the 5th case there was a history of vaccination, but no marks visible. Of the 38 persons who recovered, all had history of having been vaccinated. One man, aged 30, had been revaccinated at the age of 12 years. He had, however, only faint cicatrices existing. His attack was a mild one. In 17 other cases the vaccination cicatrices were very feebly present, while in the remaining 11 they were fairly marked."

Between January, 1893, and June, 1894, 935 cases of small-pox occurred in the borough of West Ham, and 103 (that is, 11 per cent.) terminated fatally. Of these cases, 613 were treated in the Borough Small-pox Hospital together with 94 from outside districts, and the experience of Dr. Moir, the medical superintendent of that institution, as shown in the subjoined table, is very instructive as regards the influence of vaccination, though similar to that of others:—

Condition as to Vaccination.	Percentage of Deaths.
Unvaccinated	35.00 per cent.
Said to have been vaccinated, but with no mark	23.57 "
Imperfectly vaccinated	11.00 "
Showing good marks	4.10 "
" 2 "	2.50 "
" 3 "	1.90 "
" 4 "	0.55 "
Revaccinated	0.00 "

Whittington, in Derbyshire, suffered from a sharp outburst of small-pox in 1893 and the early months of last year, there being 135 attacks and 13 deaths. I am unable to distribute these figures according to ages in the general statement, but the following little table, prepared by Dr. Barwise, the county health officer, and Mr. A. M. Palmer, the local medical officer of health, is very instructive.

Small-pox in Whittington during 1893 and First Quarter of 1894.

Age Period.	Number of Persons in Invaded Houses.	Attacks.	Vaccinated in Infancy.			Not Vaccinated.		
			Not Attacked.	Attacked.	Died.	Not Attacked.	Attacked.	Died.
Under 10 years ...	177	25	148	11	0	4	14	5
10 to 20 years ...	111	34	77	31	0	—	3	1
20 to 30 " ...	85	37	48	35	2	—	2	0
30 years and upwards ...	109	39	70	39	5	—	—	—
Totals ...	482	135	343	116	7	4	19	6

Therefore, of 459 persons vaccinated in infancy and living in houses invaded with small-pox, 25 per cent. were attacked and 1.5 per cent. died; whilst of 23 persons unvaccinated and in invaded houses, 82.7 per cent. were attacked, and 26 per cent. died. No vaccinated person under 20 years of age died.

(To be continued.)

THE Clothworkers' Company have voted £500 and the Worshipful Company of Lethersellers £210 to the special fund for opening the wards at present closed at St. Thomas's Hospital.

WILLS AND BEQUESTS.—The late Mr. Edmund Charles Johnson, of Eaton Place, has by his will bequeathed £500 to the Medical School of St. George's Hospital, the interest to be paid to the Henry Charles Johnson Memorial Prize in Anatomy founded by him in memory of his late brother.