The Leicester method of dealing with small-pox / by C. Killick Millard.

THE LEICESTER METHOD OF DEALING WITH SMALL-POX.*

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OBJECTION is sometimes taken to the term "Leicester Method" as applied to small-pox prevention, on the ground that there is nothing sufficiently distinctive in the method of controlling small-pox in Leicester to warrant the assumption of a distinctive title.

The term, however, has found its way into literature; it is frequently made use of by a not inconsiderable section of the community; and inquiries with reference to it are not infrequently received. I feel justified, therefore, in helping to perpetuate the term in the title of this paper.

There is a very good reason why the "Leicester Method" is so often quoted by those who are opposed to compulsory vaccination; for the essential characteristic of the "Method"—that which indeed constitutes its most distinctive feature—is that it professes to suffice for the control of small-pox without resort to universal vaccination, the one measure which is regarded as all-important in most places.

It follows from this that any discussion of the "Leicester Method" must necessarily involve the question of the practicability or otherwise of dispensing with universal vaccination.

I am aware that this opens up a highly controversial subject, which it will be difficult—indeed, impossible—to deal with adequately in the space of one short paper. It is desirable, however, that the question should be discussed, for the epidemic of small-pox which occurred in Leicester last year, and which was successfully controlled by the "Leicester Method," constituted a fresh test of the efficacy of the "method," and throws some additional light on the subject.

In order to prevent misapprehension, and to confine discussion within useful limits, I wish to make it quite clear that the issues which will be raised have no reference whatever to vaccination *as an operation*, but only to vaccination *as an institution*. It is important to keep the distinction quite clear between these two meanings of the term "vaccination," as much confusion is otherwise apt to arise.†

* Paper read before the Incorporated Society of Medical Officers of Health, March 11th, 1904.

† Thus it is sometimes argued that as a community is composed of individuals, then, if "vaccination" can be shown to protect the individual it neccessarily follows that "vaccination" must also protect the community: But a fallacy is involved here by the double sense in which the term "vaccination" is used, viz., first as an operation; and secondly as an institution.

Vaccination as an operation has reference to the individual, whilst vaccination as an institution has reference to the community.

I will say at once that I regard it as absolutely proven that the operation of vaccination confers on the individual complete, though temporary, protection against small-pox, and I accept without reservation the finding of the Royal Commission on Vaccination as to the duration of this protection.

It is also accepted, of course, that the protection conferred by vaccination can be renewed from time to time by re-vaccination.

Also let it be understood that the "Leicester Method" has never attempted to do entirely without vaccination. Vaccination has always been used to protect the small-pox staff, and such actual "contacts" as were willing to submit to it. The object is to do with as little vaccination as possible, instead of as much as possible, as would often seem to be the case elsewhere. Indeed, with some, vaccination almost seems to have become an end in itself rather than a means to an end, and the doctrine "the more vaccination the better" is therefore accepted as a guiding principle. In order to place my own personal belief in vaccination as an operation beyond the possibility of question, I have not only had my own two children vaccinated, but I have publicly taken them into the Leicester Small-pox Hospital, and had them photographed there by the bedside of a small-pox patient. This step may not have had much scientific value, but it constituted a useful object lesson, and the photograph obtained has been, I believe, of far more use to me in making converts to vaccination than would have been many pages of vaccination "literature" or columns of statistics.

Of much more scientific value is the fact that out of sixty-three engaged at the Leicester Small-pox Hospital in 1903, during which time nearly 400 patients were treated, not one contracted the disease, the only precaution taken being that all (with the exception of those who had already had the disease) were recently vaccinated.

The effect of vaccination as an operation in temporarily protecting the individual being then admitted, any arguments merely tending to prove this will be superfluous.

Leicester and Vaccination.—The town of Leicester holds a pre-eminent position as a stronghold of anti-vaccination. Indeed, owing to its importance as a municipality, and to the extent to which the vaccination laws have been openly set at defiance, it is usually regarded as the Mecca of the anti-vaccinationists.

Prior to 1883 Leicester ranked as a well-vaccinated town. In that year, however, owing to a deep-rooted and widespread popular agitation against vaccination, which had resulted from a bitter and

determined policy of compulsion accompanied by repeated prosecutions,* the new Board of Guardians, which had been largely elected "on the anti-vaccination ticket," decided to cease prosecuting, and, soon afterwards all attempts to enforce vaccination were openly abandoned. The extent to which vaccination fell into disuse is shown in Diagram I. It reached its lowest point in 1895, when only 75 vaccinations were registered out of 5,000 births.

This abandonment of vaccination is not so much to be regarded as resulting from the cessation of prosecutions, but rather as the result of the intense popular agitation engendered by compulsion, which made further compulsion impracticable.

Some increase of vaccination has occurred during the past three years, partly owing to the Vaccination Act of 1898, and partly to the presence of small-pox in the Borough in epidemic form. The number of vaccinations, however, is rapidly falling again.

The Present Vaccinal Condition of Leicester.—As the result of a census which I had taken in 2,000 houses, I estimate that there are between 60,000 and 70,000 unvaccinated persons in Leicester, chiefly children and young adults.

In accordance with the accepted theory that the vaccinal condition of a community is the predominant factor in determining the incidence of small-pox, prophecies have been freely made as to the disastrous results which would speedily follow on Leicester's gigantic experiment. Retribution in the shape of a dire epidemic and a terrible "massacre," especially of the children, has been repeatedly and confidently foretold. The highest authorities shared in these gloomy forebodings. Thus McVail, in his *Vaccination Vindicated* (published 1887), wrote as follows: "The 'immunity of Leicester' from small-pox is an everyday subject of anti-vaccinating gratulation. But . . . in Leicester, when its time arrives, we shall not fail to see a repetition of last century experiences, and certainly there will afterwards be fewer children left to die of diarrhœa. It is to be hoped that when the catastrophe does come, the Government will see that its teachings are duly studied and recorded."

It is unnecessary to enlarge further upon this aspect of the case. It is a mistake either to prophesy or to scoff at prophecy. It was desirable, however, to make some reference to it, for the fact that these prophecies, which were first made nearly twenty years ago, have as yet been quite unfulfilled, is one of the strongest reasons why the question of the influence of vaccinal condition in determining small-pox incidence should be re-examined.

The History of Small-pox in Leicester.—Leicester's mortality records

* In 1881 there had been no less than 1154 prosecutions in Leicester.

go back to the year 1838, when systematic death registration first began.

In Diagram I, the small-pox mortality per 1,000 population for the sixty-six years, 1838–1903, is shown graphically by the black pyramids, whilst the line represents the number of primary vaccinations per 500 births.

It is at once apparent that terribly fatal epidemics occurred in the earlier part of the period, culminating in the great conflagration of 1872–3. Since then the black pyramids are conspicuous by their absence. Taking the average small-pox mortality for the thirty-one years, 1873–1903 (*i.e.*, since the great epidemic), we find it is an insignificant 1·2 per 100,000, as compared with 44·6 per 100,000 for the preceding thirty-five years, 1838–1872, a reduction of 97 per cent!

Such a transformation is certainly remarkable. For practical purposes it is as striking as the change which has occurred in the German small-pox statistics (excepting, of course, that it only refers to a single town), and it merits our careful consideration.

To what has it been due? That is a question of considerable importance, because, obviously, it may have some bearing upon the decrease in small-pox mortality in the country generally.

Leicester, indeed, by abandoning vaccination, has performed a "control" experiment of some value in considering the influence of vaccination in other parts of the country.

It is clear that the decrease in small-pox mortality in Leicester cannot be ascribed to systematic vaccination or re-vaccination of its inhabitants. Some of it no doubt may be due to the reduced prevalence of small-pox in the country generally, which in turn may be the result of systematic vaccination, but at the most this can only be a very partial explanation.

I think we may attribute it chiefly to two causes, viz. :—

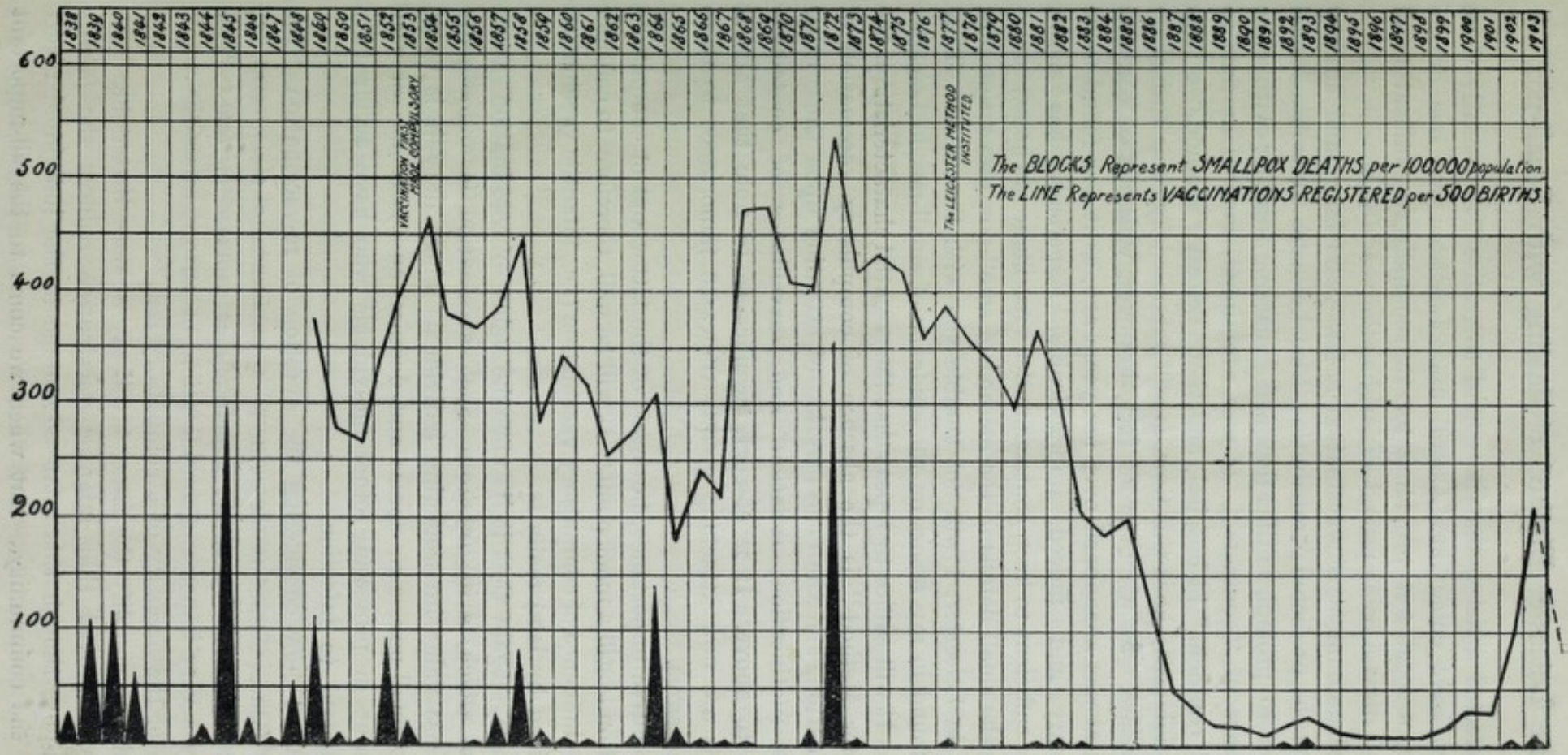
(1). To improved measures for controlling the spread of the disease.

(2). To an alteration in the type of the disease, which, in Leicester at least, has become less virulent.

It has been suggested that this reduced virulence in the type of the disease may be the result of systematic vaccination in the preceding generation, the parents of the present generation; but there is little, if any, evidence to support such a theory, and we know that similar inexplicable alterations in type have taken place in the case of other zymotic diseases, *e.g.*, scarlet fever.

As regards the measures for controlling the spread of the disease, there can be no doubt that enormous advances have been made. We are so accustomed now to compulsory notification, followed by immediate removal of the patient to hospital and by disinfection

DIAGRAM 1.—Illustrating Small-pox and Vaccination History of Leicester, 1838 to 1903.



The above diagram illustrates table in the Appendix. Prior to the year 1890 the figures are taken from tables 5 and 6. App. 3. 4th. Rep. R.C.V. prepared and handed in to the Royal Commission on Vaccination by Mr. J. T. Biggs.

The line represents registered vaccinations only. It does not include 4320 "extra" vaccinations performed by the Medical Officers to the Guardians in 1863-4

These were almost entirely the vaccinations of children omitted in former years. The rates per 500 births for these "extra" vaccinations is 702.

of all infected articles, that it is hard to realize how recently these measures have come into general use. Leicester was one of the pioneers, a local Act providing for the compulsory notification of infectious disease being passed as early as the year 1871.

The abandonment of vaccination a few years later, and anxiety to escape the predicted "retribution," led Leicester to devote special attention to prompt notification and isolation, together with close surveillance of "contacts." It was attempted, indeed, at first to isolate "contacts" in hospital, and the "Leicester Method," a term which originated about this time, is still supposed by some to include this measure. As a matter of fact, however, isolation of contacts in hospital was abandoned over ten years ago, as it was found to be unnecessary and, indeed, impracticable. Experience has shown that it is sufficient to keep contacts under surveillance at home.

As to the small details of the method of small-pox prevention now pursued in Leicester, I will not trouble you with them here. They will be found in my report on the epidemic of small-pox in Leicester in 1903. It will suffice to repeat that the essential characteristic of the "Leicester Method" is the absence of compulsory vaccination of the population, and the concentration of attention upon those other measures—notification, isolation, and surveillance of contacts—referred to above. It is of some significance to note that almost all towns are now attaching greatly increased importance to these other measures.

The relative importance, however, of the latter and of compulsory vaccination is still a moot point. It will be well, therefore, to consider what the influence of compulsory vaccination (*i.e.*, infantile vaccination as provided by law) really is.

I will say again that it is not the value of vaccination as an operation which is in question. Such vaccination is undoubtedly of immense value in protecting individuals whose duty it is to go amongst small-pox, *e.g.*, nurses and doctors, and it is also of very great value in protecting other individuals who have accidentally been exposed to infection.

Nor am I now considering the question of re-vaccination. The point at issue is, *what is the value to a community at the present day of infantile vaccination of the population as provided by law?* This is clearly a very important consideration, because it raises the whole question of the necessity of a compulsory law.

In order to simplify the issue, I will say at once that it has been abundantly proved that infantile vaccination reduces the *fatality* of small-pox, though this is an advantage to the individual rather than to the community. But when we come to the all-important

question of the influence of infantile vaccination upon the *prevalence* of small-pox, it is by no means easy to give a definite answer.

It is rather surprising to find that whilst there is an enormous volume of evidence to prove that vaccination temporarily protects the individual against small-pox, reduces the fatality of the disease, and alters its age incidence, there is comparatively *very little* which indicates its effect upon the prevalence of the disease. If we turn to the report of the Royal Commission on Vaccination, which took some seven years of hard labour to produce, and which represents the highest authority to which we can refer, we find that they avoid this aspect of the question almost entirely. In their summary of conclusions all that they venture to say, which at all bears on the point at issue, is. "We think: (1) That it (vaccination) diminishes the liability to be attacked by the disease."

It may possibly be thought that to diminish liability to attack is tantamount to reducing prevalence. Indeed, I know that many argue as if it really were so. But, if we consider, we must see that it certainly is not. For liability to attack has reference merely to the individual, whilst prevalence has reference to the community. To take an analogous case, inoculation greatly reduced liability to attack (in the individual), but it was found that it tended to actually increase prevalence by introducing the disease into districts previously free from it.

I am inclined to believe that infantile vaccination, through the medium of unrecognized cases, has a similar tendency, and that it increases the difficulty of stamping out the disease when it has been introduced.

Not only did the Royal Commission on Vaccination avoid stating in their conclusions that vaccination reduces prevalence, but after searching through their Final Report (in which the evidence taken is summarized) I have failed to find any direct evidence that vaccination does so. The kind of evidence which is required is evidence showing that in communities where infantile vaccination is systematically performed, small-pox is little prevalent, whilst in communities where it is neglected small-pox is much more prevalent.

If infantile vaccination really has any marked effect in reducing prevalence, we should certainly expect that there would be a very substantial difference in the amount of small-pox in well-vaccinated and in badly-vaccinated communities. Can such evidence be adduced? In the absence of it we can scarcely say that the contention that infantile vaccination reduces prevalence has yet been proved.

The proposition may be slightly varied. It is often said that unvaccinated persons are a danger to the community in which they

live, as they tend to spread small-pox. If this be true, those towns unfortunate enough to contain a large proportion of unvaccinated persons ought to suffer much more from small-pox than towns containing very few. Have we evidence that they do so ?

The Epidemic of Small-pox in 1903.—Some light is likely to be thrown on the subject by a study of the etiology of small-pox in a badly-vaccinated community. Leicester, as we have seen, is a notoriously badly-vaccinated community, and probably contains a larger proportion of unvaccinated persons than any other large town. The facts of last year's epidemic should therefore be of interest. The outbreak began at the end of December, 1902, and may be considered as terminating in October, 1903.* The statistics were briefly as follows :—

	Cases.	Deaths.	Fatalities.
Vaccinated	193	4	2·08
Unvaccinated	199	16	8·04
Uncertain	2	1	—
Total	394	21	5·33

There were eighty-nine cases, or 22 per cent, in children under ten, all unvaccinated. Four of these cases were infants under one.

None of the vaccinated cases had been vaccinated within seven years.

The cases occurred in 255 houses in 174 different streets. In 81 per cent of the invaded houses only a single case occurred, *i.e.*, no spread took place to other inmates. And in 72 per cent of the invaded streets only a single house was attacked, *i.e.*, no spread occurred to other houses in the street. All these streets abounded with unvaccinated children.

As regards the incidence of the disease upon the vaccinated and the unvaccinated sections of the community, it is interesting to note that 50 per cent of the cases were in unvaccinated persons, whereas probably not more than 35 per cent of the population were unvaccinated. There was, therefore, a somewhat increased incidence upon the unvaccinated class, but it was not nearly so great as I had expected.

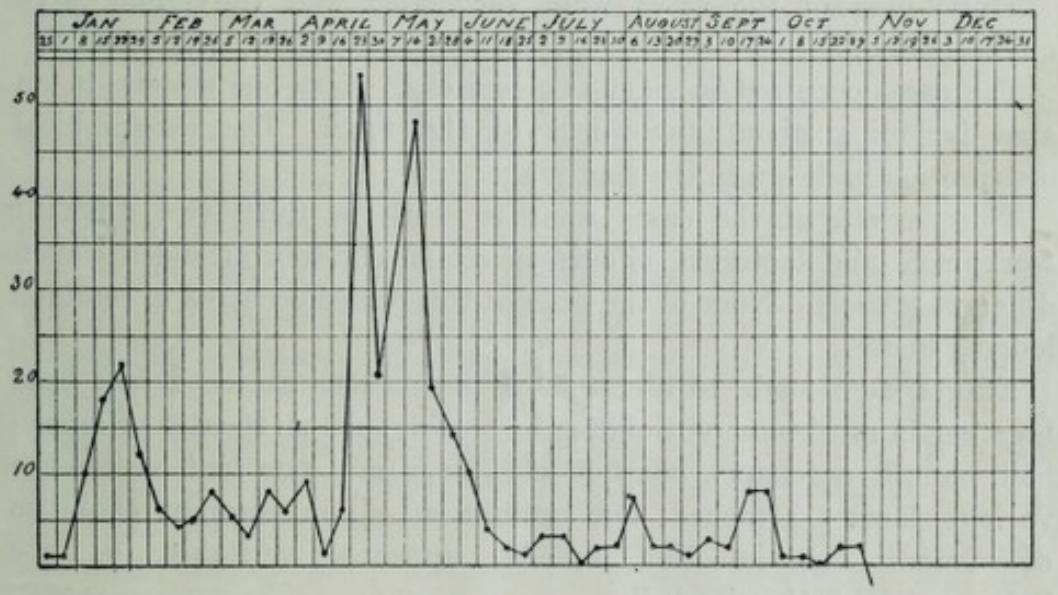
The most striking feature of the epidemic was a sudden and inexplicable outburst which took place just after Easter. During the four weeks ending May 14th no less than 157 cases occurred, or very nearly half the total for the epidemic. For the preceding

*The last case admitted in October, having been discharged, the hospital was closed. In December, the disease again appeared and 14 further cases were admitted before the end of the year ; 12 of these additional cases were unvaccinated and 2 vaccinated. There were no deaths.

fortnight the town had been almost clear of the disease.* Without warning, the cases began to pour in. The first week there were fifty-three, followed by twenty-one, thirty-four, and forty-eight in the following weeks. Then the outburst subsided almost as quickly as it began. The largest number notified in any one day was fourteen.

DIAGRAM II.

Shewing number of Cases of Small-pox removed to Hospital each week during the Epidemic.



The cause of the outburst is still a mystery. In the great majority of the cases, in spite of careful inquiries, no clue whatever could be obtained as to any possible source of infection. Indeed, during the first eleven days, April 15th to 25th, out of sixty-five cases which occurred, the source of infection was only discovered in a single instance. In one other case there was a remote clue, and one case was imported. The remaining sixty-three cases were absolutely untraced. In the latter part of the outburst, as might be expected, a certain number of secondary cases arose, traceable to the cases which had already occurred, but there were still a good many untraced cases. To simplify the problem we may confine ourselves

*Only two houses were infected during this fortnight, and one of these had been previously infected. I am quite satisfied that the cases from neither of these houses could possibly account for what followed.

to the first eleven days. The following are the particulars of the sixty-three mentioned cases which occurred during this short period :—

AGE AND SEX DISTRIBUTION.

Under 10 years.		10 to 20 years.		20 to 30 years.		30 to 40 years.		40 to 50 years.		50 to 60 years.		Over 60 years.	
M.	F.	M	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
6	5	9	13	2	5	6	4	1	7	1	3	—	1
11		22		7		10		8		4		1	

There was thus some excess of adult females, but I am quite unable to explain it, and it may only be a coincidence.

Thirty-nine of the cases were vaccinated and thirty-four were unvaccinated.

The cases occurred in sixty-two houses in sixty-one streets, in an area including about two-thirds of the town. The geographical distribution is shown in the spot map.

Thirty-seven of the cases went to work in thirty-two different workplaces and factories. Fourteen school children attended eleven different schools. None of the cases at this period occurred in common lodging houses.

Efforts were made to ascertain if the persons attacked had been together in any common building or crowd, such as theatre or music-hall, church or chapel, market, etc., or if any one had visited the various houses attacked, but nothing at all in common could be discovered. The infection, indeed, appeared veritably to have "dropped from the clouds."

Such a large number of cases occurring in such a short space of time without any clue to their origin and with so wide-spread and impartial a distribution ,is suggestive of aerial infection.

The Borough Small-pox Hospital is situated a mile from the town to the North-west, and during the time the infection must have been disseminated (*i.e.* the first fortnight in April) there were about thirty small-pox patients under treatment, who had been admitted from two to five weeks previously. The wind (as recorded once in each twenty-four hours) was in the right direction, *i.e.*, north-west, on April 2, 5, 7, 8, 13, 14, and 15. On the intervening days it fluctuated between S.W., W. and N.

The Borough Fever Hospital lies to the south of the small-pox hospital, and a quarter of a mile away. At this time it contained only about twenty-five fever and diphtheria patients. The hospital was emptied as soon as the outburst occurred in order to be used for small-pox. One of the patients developed small-pox a week after returning

home, she must therefore have been infected in the fever hospital during the time the infective influence was at work.

With the exception of the fever hospital and a few isolated houses, there is no population nearer to the small-pox hospital than Leicester itself. The nearest village, Anstey, is 1¼ miles away in the opposite direction.

The chief fact against a theory of aerial infection is the great distance of the hospital from the town, and the comparatively small number of patients under treatment during the critical time. At a later period the number rose to five times as many, but though a certain number of untraced cases did occur all through the epidemic, there was never again anything approaching an outburst. This, however, like all other negative evidence, does not exclude the possibility of aerial infection, the vagaries of which are notorious. Assuming that aerial infection can occur (and the writer is one of those who believes that it can), it would seem that certain subtle, imperfectly understood, but apparently transient conditions, meteorological or otherwise, are a necessary antecedent.

The fact that there was no specially-marked incidence upon that portion of the Borough nearest the hospital is not of much significance, because at a distance of a mile incidence would naturally become diffused.

On the whole, however, I think we must conclude that a theory of aerial infection in this case is very improbable and difficult to sustain, and I have only put it forward because of my entire inability to suggest any other theory more adequate to explain this very remarkable outburst.

Practically the only alternative theory is that a number of unrecognized cases, of a highly infectious type, were going about the town, but had this been the cause of the present outburst, it seems almost incredible that not one of them should have left the slightest clue to their existence. At other periods of the epidemic these unrecognized cases were frequently discovered. Whatever the cause, however, the outburst served one good purpose. Hitherto it had often been alleged that the "Leicester method" had never been adequately tested, and that Leicester had always been "lucky." This outburst it will be admitted, I think, afforded a very severe test; 157 cases occurred in four weeks in 128 houses in forty-two streets, from some cause or causes quite beyond control and without warning. If ever the "Leicester method" should have broken down it was then. I do not think any town of the size of Leicester during the last few years has had to deal with a much larger number of cases in so short a space of time. The success with which the disease was

stamped out is indicated by the fact that in successive weeks the number of fresh cases dropped from 46 to 22, 14, 10, 4, 2, 1, and a fortnight later there were none. Even a so-called well-vaccinated town could scarcely have done much better.

Such a result seems to indicate that provided the task of stamping out small-pox is a straightforward one, the "Leicester method," in Leicester at least, is adequate for the purpose without recourse to universal vaccination.

If, however, cases occur so slight that no doctor is consulted, or if the doctor fails to recognize the disease owing to his never having been taught as a student that the diagnosis of small-pox was of any importance, or if the disease is being continually re-introduced by tramps from other parts of the country, then the task is not a straightforward one, and the "Leicester method" hardly has a fair chance.

As regards the rest of the epidemic, a fruitful source of the spread of infection, as I have said, was the occurrence of very slight cases in which the eruption was so slight and so modified (in some cases there was none) that they were not recognized as small-pox until they had given rise to further cases. We discovered twenty-two of such cases, and eighteen were never removed to hospital. I believe there were many other cases which never came to light at all, and that these accounted for the occurrence of many of the cases in which the source of infection could not be traced. If this view is correct, these unrecognized cases played a very important part in the spread of the disease.

This trouble with slight unrecognized cases is by no means peculiar to Leicester. It is a well-known difficulty everywhere.

It is a point of very considerable importance, however, that these very mild, modified, and therefore unrecognized cases, usually occur in persons vaccinated in infancy (*i.e.*, many years before), and *because they were so vaccinated.*

These very slight cases in vaccinated persons are not nearly so infectious, probably (other things being equal) as well-marked cases of the disease in unvaccinated persons, and, in the old days, when disease had to be treated at home and little or no attempt was made at isolation as we now understand it, these latter cases were doubtless a much more important factor in spreading infection than the former. Hence the view that unvaccinated persons were more likely to spread the disease, and they were consequently regarded as a danger to the community.

But now, under modern conditions, all that is changed. In order to carry out isolation and other modern measures, it is of course absolutely essential that the occurrence of a case of small-pox should be

at once recognized and reported ; and where this is done, and these modern measures are efficiently carried out, the experience of Leicester, as we have seen, seems to show that the disease can usually be stamped out very quickly, even though the surrounding population consists very largely of un-vaccinated persons.

If, however, the case is not recognized, these modern measures are obviously useless, as they cannot be put into operation.

But infantile vaccination certainly encourages the occurrence of these slight unrecognized cases, and in this way it is an indirect cause of the spread of small-pox.

I am inclined to believe from my experience of small-pox in Leicester, that the importance of this factor has hitherto been much underestimated. Indeed, the occurrence of these highly modified cases has not infrequently been used as an argument in favour of vaccination with no hint as to any possible disadvantage. It is only after careful attention has been directed to this aspect of the case that we shall be able to appreciate its full significance.

It may be that we shall then find that this unthought of effect of infantile vaccination goes a long way towards neutralizing the advantages of the measure, and that anti-vaccinators when they allege that vaccination tends to spread small-pox, are not quite so wide of the mark as we usually believe them to be, albeit the true explanation of the phenomenon may not be such as they would care to accept.

Moreover, the experience of Leicester during the last epidemic, as in the previous epidemic ten years ago, seems to show that where modern measures are carried out, unvaccinated persons run much less risk of contracting small-pox, even in the presence of an epidemic, than is usually supposed. It was predicted that once the disease got amongst the unvaccinated children of Leicester it would " spread like wild-fire." I certainly expected this myself when I first came to Leicester, and it caused me much anxiety all through the epidemic. Yet although during the ten months the epidemic lasted 134 children (under fifteen years) were attacked, infected largely by vaccinated adults, it cannot be said that the disease ever showed any tendency to " catch on " amongst the entirely unvaccinated child population. These 134 children lived in seventy-three streets, and most of them attended school. They were surrounded by other un-vaccinated children, yet little or no spread resulted from them. The explanation, I believe, is that when an unvaccinated child is attacked with small-pox it is usually sufficiently ill to have to be kept at home and to necessitate a doctor being called in. Provided he recognizes the nature of the illness early enough, the proper steps can be taken, the rest of the

household can be protected by vaccination, and the disease will probably go no farther. The same explanation holds good also in the case of unvaccinated adults. Indeed, under modern conditions of small-pox prevention it seems probable that there is less risk of the infection being spread by well-marked cases of the disease than by very slight and easily overlooked cases. Now the former is the type of case usually met with in unvaccinated persons, whilst the latter is common in the vaccinated. Hence, it is possible that, so far from the unvaccinated being the real danger to the community, it is rather the vaccinated who are so.

It may be urged in reply to this, that very slight and easily-overlooked cases do sometimes occur in unvaccinated subjects. This is true, but it is relatively very much less common than amongst the vaccinated. Moreover, it only happens (as a rule) *provided the prevailing type of the disease is very mild*, so that even if spread does occur the consequences are much less serious.

This raises rather an important consideration. I put it forward with some diffidence, because at present it is merely a suggestion, but it is only by looking at every possible aspect of a question that we are likely to arrive at the whole truth.

The point I would submit for consideration is this: Is it possible that the type or "strain" of disease propagated by vaccinated cases of small-pox differs at all from that propagated by unvaccinated cases?

We know that the severity of an attack of small-pox varies greatly in the same epidemic in different individuals. This, no doubt, is due to differences in the "soil," *i.e.*, the constitution of the individual. But beyond this, the severity of different epidemics, or, as we say, the "prevailing type" of the disease, varies greatly even in the same locality and amongst the same population. This, no doubt, is chiefly due to differences in the "seed."

It is obviously of the highest importance that the type of the disease should be kept as mild as possible. The experience gained in the days of inoculation taught that a careful selection of very mild cases from which to obtain the infective matter with which to inoculate, was of much importance in securing a mild type of the disease in the person inoculated.

At the present day, as we have seen, infection is very largely spread by slight unrecognized cases. Now, such cases occurring in unvaccinated subjects implies the very mildest type or "strain" of the disease which it is possible to obtain, just the kind of case which we should choose if we could select our source of infection.

On the other hand, slight unrecognized cases occurring in vaccinated

subjects do not by any means necessarily imply a mild strain of the disease, as the mildness of the case is usually artificial, being produced by vaccination; and, as a matter of fact, we know that only too frequently the type of disease conveyed by these slight unrecognized cases in vaccinated subjects is severe.

It is conceivable, therefore, that vaccination, whilst it undoubtedly reduces the fatality of the disease so far as the individual vaccinated is concerned, may have an ultimate and unsuspected effect in another direction. Of course, if the great majority of the persons attacked in an epidemic are vaccinated subjects, the net result of the vaccination will be (other things being equal) to lower the fatality of the whole epidemic, but if this theory be correct it would make the disease tell rather hardly on those who were unvaccinated, who thus got all the disadvantages with none of the advantages of vaccination.

This leads us to a point in connection with vaccination statistics which I must confess I have never seen satisfactorily explained, viz., the excessively high fatality of small-pox amongst the unvaccinated in certain modern epidemics. Take, for instance, the Sheffield epidemic of 1887–8, which was specially reported on for the Royal Commission on Vaccination. Out of 4,703 cases 4,151 were vaccinated and 552 were unvaccinated. The fatality of the disease in the vaccinated group worked out at 4·8 per cent, whilst in the unvaccinated it was the truly appalling figure of 49·6 per cent. Total for all cases 10 per cent.

Many other epidemics show similar figures, and we are usually led to infer that the difference is all, or almost all, due to the beneficial effect of vaccination in reducing fatality, and that if all the cases had been unvaccinated the same high fatality would have prevailed for all. But it has sometimes been pointed out by those who are opposed to vaccination, that there is no reason to think that the fatality of small-pox in the pre-vaccination days, severe though it may have been, was nearly so high as 30 or 40 per cent. It would seem probable, indeed, from the evidence we have, that the average was more like 10 or 15 per cent at most, though subject no doubt to fluctuations. It looks, therefore, as if amongst the unvaccinated the severity of the disease had in some way been increased.

If, however, we turn from Sheffield, which was accounted a well-vaccinated town, to Leicester, which was just the opposite, we find, in the epidemic of 1892–3, that there was no evidence at all of such a high fatality amongst the unvaccinated, the figures being: Vaccinated, fatality 1 per cent; unvaccinated, fatality 12 per cent; total for all cases, 5·8 per cent. The experience of the 1903 epidemic has

been similar: Vaccinated, fatality 2 per cent; unvaccinated, fatality 8 per cent; whole epidemic,* fatality 5·3 per cent.

Of course, this surprisingly low fatality may be merely a coincidence, and we have, unfortunately, no guarantee that it will always be the same; but, on the other hand, it may conceivably be more than a coincidence.

In any case it affords some excuse for suggesting that the ultimate effects of vaccination on the community may be somewhat more complex than is usually supposed.†

The Vaccination of "Contacts."—This is a measure which I believe to be of great value, and which I therefore freely resorted to during the epidemic.

Thus, out of 1,084 persons living in 233 houses (excluding houses where the first case was not recognized), 794 (or 73 per cent) were induced, as the result of great efforts, to get vaccinated.

As regards the definition of a "contact," I usually class them for convenience into "inside contacts," *i.e.*, persons living in the same house with the patient, and "outside contacts," *i.e.*, persons not living under the same roof, but who have been in the same room with the patient after he was taken ill. The risk of "outside contacts" developing the disease is as a rule comparatively slight, and the need for vaccination proportionately less. In the case where a patient had been at work or at school after being taken ill, the other employés or school-children were not treated as ordinary contacts, and were not asked to get vaccinated, but the school or factory was kept under surveillance and any absentees immediately visited. In some cases a school (or a particular class) would be closed.

My experience is that the risk of infection being contracted under such circumstances is usually so slight that vaccination is scarcely

* If all the cases be included which have occurred up to the end of February, 1904, we have:—

	Cases	Deaths	Fatality
Vaccinated	224	4	1·8
Unvaccinated	224	16	7·1
Uncertain	2	1	—
	450	21	4·6

† It is taking a very narrow view of all the possible influence vaccination may have upon fatality, merely to compare the relative fatality of the vaccinated and unvaccinated groups in an epidemic.

Let us assume, for the sake of argument, that vaccination whilst reducing fatality in the vaccinated individual, does nevertheless tend, by some subtle unsuspected influence, to increase the severity of the prevailing type or "strain" of the disease. It would then be conceivable that vaccination might increase the fatality of an epidemic, although an examination confined merely to a comparison of the relative fatality of the vaccinated and unvaccinated groups would confirm the belief that the vaccination was actually having a very beneficial effect.

worth while. Had vaccination been performed in all such cases it would have involved several thousands of vaccinations, and at the most it might perhaps have prevented a score of cases.

It is quite otherwise with close contacts, such as the inmates of invaded houses. As the result of very careful comparison I find that amongst those who get vaccinated only 2·3 per cent of contacts develop the disease, as against 12·4 in those who do not get vaccinated. When the vaccination is performed not later than the third day after the appearance of the eruption in the patient, the proportion who develop the disease is reduced to an insignificant 1 per cent, and this irrespective of whether the contacts have been previously vaccinated or not.

The remarkable success with which the other inmates of an invaded house can be protected from taking the disease by means of vaccination after exposure to infection, provided the disease is promptly notified as it should be, robs small-pox of one of its greatest terrors. It is, indeed, one of the greatest of all arguments against the necessity for universal vaccination.

For a detailed account of the recent epidemic, and of the procedure adopted in dealing with it, I must refer you to my report. I have, however, said enough, I think. to show you that the "Leicester Method" in Leicester has succeeded very much better than was anticipated.

This seems to indicate that it is more practicable to deal effectively with small-pox without recourse to universal vaccination than is usually supposed.

It is true that there is still a large proportion of the population in Leicester (over 60 per cent probably) who have been vaccinated at some time or other in their lives. We cannot say precisely what effect on the spread of the disease this "residue of vaccination" may have had, and therefore we cannot be certain that the "Leicester Method" will be equally successful should practically the whole population become unvaccinated, as there seems strong probability that it will do.

Judging, however, from the comparatively small difference in the incidence of the disease on this "vaccinated residue" and on the unvaccinated, and bearing in mind the deleterious effect of unrecognized cases which are so liable to occur in this vaccinated "residue," I feel justified in thinking that Leicester's prospects for the future are not so gloomy as many people appear to think.

In the meantime the case for compulsory vaccination is certainly weakened, for a measure so drastic, and in many ways so open to objection, can only be justified on the ground that it is of urgent public necessity.

Moreover, we can no longer seriously suppose, in the face of Leicester's experience, that the exemption of a few "conscientious objectors" in other towns is likely to have any appreciable effect in determining small-pox incidence. How unnecessary, then, it seems for the well-meaning but ill-advised occupant of the magisterial bench, "dressed in a little brief authority" and anxious to assert it, to lecture and bully those who apply for the exemption which the Legislature, acting on the express advice of the Royal Commission on Vaccination, intended that they should have, on the ill-founded and very doubtful assumption that such persons are a public nuisance and a danger to the community.

Whatever our views may be, I think we shall agree that these over-zealous magistrates are doing the cause of vaccination no good; and it is therefore sincerely to be hoped that the law will shortly be so far modified as to enable those who wish to obtain the exemption they are clearly entitled to without the risk of their being subjected to this petty tyranny and annoyance.

Revaccination.—So far we have simply considered the question of infantile vaccination, *i.e.*, vaccination as provided by law, and which has been created by law into a state institution operating through elaborate machinery which entails a heavy expense on the community. It is this institution of vaccination which has aroused such deep-rooted and intense hostility in so many quarters, and which has brought such numbers of otherwise law-abiding citizens into a conflict with the law.

It is this institution of vaccination which has transformed what was otherwise a purely medical question into the most burning popular controversy of our generation.

Nevertheless, I think we may believe that it has in the past served a most useful purpose in helping to lessen and mitigate the ravages of what undoubtedly was the most dreaded, and rightly dreaded, of all epidemic diseases, at a time when other adequate means of checking the disease were unknown. Even though the value of the institution may to some extent have been over estimated, owing to the whole of the reduction in small-pox mortality which has occurred having been attributed to its agency alone, I still believe that the institution of vaccination has been in the past of immense value to the country.

When vaccination was first introduced a century ago, preventive medicine as we now know it was non-existent. At that time almost everybody suffered from small-pox, and the discovery that an attack of vaccinia could be substituted for small-pox must indeed have been a boon to humanity.

But the chief question which now concerns is, Is the institution of

vaccination helping us very much at the present day? There certainly exists a strong feeling that it is not doing all that it ought to do, or all that it is expected to do, and hence the agitation for a radical alteration in the shape of compulsory revaccination.

It must be admitted, in view of the fact now so clearly recognized that the protection conferred by vaccination is only temporary, that revaccination is only the logical sequel and complement to infantile vaccination. The pity is that this was not recognized when the latter was first made compulsory, and when general vaccination of the population was practically the only weapon of defence against this loathsome disease. If revaccination as well as infantile vaccination had been made compulsory, very many of the thousands of deaths from small-pox which have since occurred would have been prevented.

But to introduce compulsory revaccination now, in the twentieth century, is certainly like locking the stable door after the horse has been stolen. We may safely say that never, in the whole history of this country, since the days when small-pox first appeared on our shores, has a compulsory revaccination Act been less necessary than at the present time. Our machinery for controlling small-pox by other means has never before reached such a pitch of perfection, and it is being improved every year. Almost every town and district now possesses a skilled Officer of Health, with a staff of skilled Inspectors under him. Almost every town now possesses an isolation hospital to which every case of small-pox can be removed immediately it is reported. Throughout the country compulsory notification of infectious disease is in force, and medical men, are becoming more expert in small-pox diagnosis. Medical students are no longer turned loose on the country as "qualified" medical men without receiving some instructions on the subject, as was formerly the case.* Improved methods of disinfection are available. An elaborate system of surveillance of contacts is being more and more employed, accompanied by daily and even hourly communication (by post, telephone and telegraph) between different sanitary districts.

The result is that we have so far learnt how to control the disease, that it is ceasing to be the serious danger to the community that it once was.

In all probability the near future will show still better results. Our methods are still capable, no doubt, of considerable improvement in many directions, and as the improved methods become more generally

* There is still room for improvement in this respect. I should like it to be obligatory on all medical students to receive practical as well as theoretical instruction. In no other disease is early and accurate diagnosis of greater importance to the public.

adopted and more efficiently carried out, the whole country will benefit, and the disease will become less and less formidable.

The tramp question still remains to be solved, but when it has been solved, as no doubt it will be when once attention is seriously directed to it (by labour colonies or otherwise*), one of the most potent factors of small-pox dissemination will disappear.

In the face of these considerations I venture to suggest to you (with some diffidence of prevailing opinion) that we should hesitate before asking for compulsory revaccination. Let us think what it means. At least two revaccinations in a life-time will be required, as in the German Army; a single revaccination will have a very uncertain effect. A single revaccination was in force in the German Army prior to the great epidemic of 1871–2. Think what it will cost the community! Think of the aggregate of pain and suffering and ill-health, for after all vaccinia is a disease; the heavy annual expenditure on vaccination fees and lymph; the loss of time from work! Think of the friction it is certain to cause, and the bitter animosity it will certainly arouse! It is a heavy price to pay. And then consider the ill it is hoped to avert. For years together whole towns remain entirely free from small-pox; it is only now and again that it gives serious trouble, and then we often make the trouble much worse than it really is. Think of the fuss which is sometimes made over a single case of small-pox; a whole district is scared about it, and if as many as half a dozen cases occur it is written up in the papers under prominent head-lines as though it were a national calamity. The creation of a vaccination boom, though doubtless done with the best of intentions, does not help to remove alarm, and serious injury to trade may easily result. The most trifling small-pox outbreak is apt under such circumstances to prove altogether disproportionately costly.

I am bound to say that I think the course pursued in Leicester is a wiser one. As there is no object there in frightening the population into getting vaccinated, no more is made of a few cases of small-pox than the occasion really calls for, and during the whole of the recent epidemic, with the one exception of the Easter outburst, when things certainly did look serious for a few weeks, there was nothing approaching public alarm, and I believe the trade of the town was quite unaffected. The money cost of the epidemic to the rates, I estimate at about £2,300, probably not more than would have to be spent *every year* on vaccination if vaccination and revaccination were systematically carried out on the whole population.

* Some system of voluntary re-vaccination of tramps may be desirable. An adequate pecuniary inducement would probably be more efficacious than a compulsory law.

In Leicester during the twenty-seven years that notification has been in force, the average annual number of cases of small-pox has been only thirty-four. The average number of children born annually has been over 5,000, so that (allowing for probable deaths) at least 8,000 vaccinations (including revaccinations) would have to be performed each year in order to prevent thirty-four cases of small-pox ; *i.e.*, over 200 vaccinations would be required for every single case of small-pox prevented. (This is allowing for one revaccination only.)

Bearing in mind the mild type of small-pox which has prevailed and still prevails in Leicester, you will be able to understand that the people of Leicester will require a good deal of persuasion to convince them that, so far as their town is concerned, universal vaccination and revaccination are either desirable or necessary.

There is good reason to hope that small-pox like scarlet fever, is, from some natural cause ceasing to be the dread disease it once was. Throughout the country the fatality of the disease during recent years has certainly been less than it used to be. In Leicester our last sixty cases (half of them unvaccinated) have not resulted in a single death. We cannot, of course, rely on this very favourable type being maintained, but so long as it is so it is certainly not a very opportune time to ask for such a serious measure as compulsory revaccination.

Moreover, we shall do well to remember that the best laid plans of mice and men sometimes miscarry. Experience has shown that this is especially apt to be the case with elaborate and " scientific " schemes of disease prevention. Preventive medicine can scarcely yet be described as an " exact science," and no matter how clearly a scheme works out on paper beforehand there is always the possibility that it may not do all that it is expected to do, or that its ultimate effects will not be precisely what are anticipated. In any scheme of revaccination which is likely to be carried in this country it is certain there would be many deficiencies, many short-comings, many leakages. I regard it as almost certain that we should still need to retain our present machinery of small-pox prevention, *i.e.*, we could not dispense with our small-pox hospitals (they still have to have them, I understand, in Germany), so that expense would still remain, though it would, no doubt, be lessened. Personally, I am apprehensive of the effect of slight unrecognized cases occurring in persons revaccinated many years before who would serve to spread the disease to those (and they would be numerous) who would have slipped through the mesh of the vaccination net.

Finally, let us assume that we succeed in obtaining a liberal scheme of revaccination which in practice proves to fulfil our most sanguine expectations, that small-pox is completely stamped out, and that our

small-pox hospitals and other machinery are rendered unnecessary. The public as I have tried to show, will have to pay heavily for their bargain, and we as Medical Officers of Health will find that one of our most important duties and the one which, if efficiently performed, brings us the most *kudos* has ceased to exist. The value of our services to the communities that employ us will be materially reduced, and we may reasonably anticipate that our remuneration will be proportionately reduced also.

For my own part I am content that things should remain as they are, and I prefer to do my own work as Medical Officer of Health rather than hand it over to the Public Vaccinator. So long as the "Leicester method" continues as successful as it has hitherto proved to be, I think we may regard it as being a higher and more ideal method and one more in keeping with the principles of true preventive medicine, than is the *neo*-Jennerian method of preventing a little small-pox by the substitution of a great deal of vaccinia.