The London epidemic of small-pox.

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THE LONDON EPIDEMIC OF SMALL POX

(1901.)

THE following statistics of the numbers of attacks, deaths and fatalities of the epidemic, in cases the results of which were complete, either by death or by recovery, and available at the date of publication, are taken from materials contained in an article in the *Times* of November 30th, 1901, and subsequently revised by the compiler. The figures have been somewhat differently arranged, so as to make the lessons they convey more obvious than they were in the table given in the article.

SUMMARY.

	Attacks.	Deaths.	Fatality.
Vaccinated ...	233	47	20
Unvaccinated ...	97	58	60
Doubtful ...	19	11	58
Total ...	349	116	mean 33·2 per cent.

From the facts as they appear in this Summary, it is evident (1) that the severity of the attack and consequently the risk of a fatal result is three times as great in the unvaccinated as it is in the whole group of "vaccinated," leaving out of consideration *when* and *how* they were vaccinated, and (2) that if *fatality* is taken as a criterion, it is probable that of those classed as "doubtful"* in regard of their having been vaccinated, the great majority were either unvaccinated, or if they had been at some time vaccinated, it must have been so remote or the operation must have been so imperfectly performed that they were no better protected than if they had been unvaccinated.

The real bearing of these considerations is made much more evident when the figures are arranged according to age periods, as in the following table :—

	Vaccinated.			Unvaccinated.			Doubtful.		
Age	Attacks	Deaths	Fatality	Attacks	Deaths	Fatality	Attacks	Deaths	Fatality
Under 5 years	0	0	0	23	18	78·2	0	0	0
5—10 ,,	1	0	0	18	10	55·5	0	0	0
10—15 ,,	16	1	6·3	23	8	34·7	0	0	0
15—20 ,,	41	2	4·8	12	7	58·3	2	0	0
20—30 ,,	81	11	13·5	13	8	61·5	5	2	40
30—40 ,,	53	16	30·1	4	3	75·0	2	1	50
Over 40 ,,	41	17	41·4	4	4	100·0	10	8	80
Total ...	233	47	20·1 mean	97	58	59·7 mean	19	11	57·8 mean

* Those included in the "doubtful" group were alleged to have been vaccinated in infancy, but no vaccinal scars could be detected in them, either from their being concealed by the Small-pox eruption, or from their being obliterated, or from vaccination never having been really performed.

The lesson as to the protective influence of vaccination which is roughly indicated in the " Summary," will be seen to be much more emphatically enforced in the foregoing Table, from which it appears that though 20 per cent., or 1 in 5, of the so-called "vaccinated" class, as a whole, died, that fatality was confined to those who were over 30 years of age, who contributed no less than 33 to the total of 47 deaths. Or, in other words, up to 20 years of age the fatality was only 5·1 per cent. Then from 20 to 30 years it increases to 13·5 per cent., whilst from 20 to 30 years it jumps up to 30 per cent., a fatality which in those over 40 years of age is still further increased to 41 per cent., though even this does not nearly equal that in most of the age groups of the unvaccinated.

Is there any possible way of explaining these facts except by the assumption that there must have been some influence operating in this class which, whilst very strong in the early years of life, gradually ceased to operate as age increased?

There are only two influences which can be suggested to account for this gradation. One is youth, the other is vaccination.

The influence cannot have been youth, because, if we turn to the age groups of the unvaccinated, we find that the proportion of attacks in the earlier ages is much greater than in the later ones, whilst their relative fatality is much about the same, except in the very young and the very old, in which it is excessively high.

There seems, therefore, to be no possibility of avoiding the conclusion that the influence which so largely protected the young in the vaccinated group (when compared with the unvaccinated) not merely from attack but from a fatal result when they did happen to be attacked, was vaccination.

It may be well to note that the mean fatality of 33·2 per cent. of the whole 349 cases, as given in the summary, is much higher than that of the whole number of cases that have occurred up to the date of publication of these statistics will eventually turn out to be. For, whilst these tables only take account of cases completed by death or recovery, there were a large number of other cases in the hospitals at the time, most of which would probably recover. When these recoveries are hereafter taken into account it will probably be found that the general fatality will be less than 20 per cent.

But the figures above given show, so far as the first 116 who have died are concerned, what has been the main cause that has led to their death, and they also enable us to compare the respective fatalities at different ages in those who have been vaccinated in infancy only and those who have not been vaccinated at all.

RE-VACCINATION.

In regard to re-vaccination, the writer of the article in the *Times* observes: " The evidence with regard to re-vaccination is small. " Eleven patients are said to have been re-vaccinated at different " times. In six cases the operation had been performed recently, but " after the patient had sickened of Small-pox or during incubation, " that is to say, a few days before the eruption appeared. Of the old

"re-vaccinations, one is returned as six years ago, and a second as "having been done in 1894. The rest are of older date. This does "not include two or three cases in which re-vaccination is said to have "been unsuccessfully attempted at some time or other. Of the eleven "patients, two died, one re-vaccinated 10 years ago, the other 23 years "ago. In view of the great amount of re-vaccination which has been "carried out since the outbreak began, the absence from the list of "any patients freshly re-vaccinated in time to anticipate the disease is "significant."

It must not be supposed that this first instalment of the experience of London in the matter of Smallpox and Vaccination in this epidemic presents any novelty to those who are familiar with that of previous epidemics of the disease in recent times. In proof of this statement it may be well to give the statistics of two of the most important recent epidemics: Gloucester, a town in which infant vaccination had been greatly neglected, and Middlesbrough, in which it had been well maintained.

GLOUCESTER EPIDEMIC, 1895-6.
Total Attacks, 1979.‡ Deaths, 434. Fatality, 22·2.

	Vaccinated (in infancy).				Unvaccinated.		
Age	Attacks	Deaths	Fatality per cent.		Attacks	Deaths	Fatality per cent.
Under 10	26*	1†	3·8	...	680	279	41·0
10-20	263	5	1·9	...	48	14	29·1
20-30	373	29	7·7	...	17	8	47·0
30 and over	549	85	15·4	...	23	13	56·5
Total ...	1211	120 mean 9·9		...	768	314 mean 40·9	

MIDDLESBROUGH EPIDEMIC, 1898.
Total Attacks, 1411. Total Deaths, 202. Fatality, 14·2.

	Vaccinated (in infancy).				Unvaccinated.		
Age	Attacks	Deaths	Fatality per cent.		Attacks	Deaths	Fatality per cent.
Under 10	43	0	0	...	62	29	46·5
10-15	121	2	1·6	...	21	4	19·0
15-25	437	22	5·0	...	42	16	38·0
25 and over	612	84	13·5	...	73	45	61·6
Total ...	1213	108 mean 8·9		...	198	94 mean 47·4	

* 25 out of this 26 were over 5 years of age.

† This was a case of very doubtful vaccination. Of course, if it be eliminated, the fatality under 10 years becomes *nil*, as it was at Middlesbrough.

‡ This number refers to the City of Gloucester only, within the then Municipal boundary. There were about 80 more cases in the suburbs. The age groups in the statistics of this epidemic and that of Middlesbrough do not precisely correspond with the more detailed arrangement of the London cases, but they are sufficiently alike to allow of the *fatalities* of the three epidemics being fairly compared.

FACTS TO BE NOTED.—1. General correspondence of the three epidemics in all respects except one, namely, the large proportion of attacks and deaths of unvaccinated children at Gloucester.*

2. In each epidemic (a) Great difference in fatality, at all ages, between vaccinated and unvaccinated—most marked in childhood; (b) *Fatality* in "vaccinated" insignificant in early life; slight from 10 to 20 years, but increasing then and afterwards with age; *attacks* in childhood also few, but increasing with age; (c) No such difference in attacks or fatality amongst unvaccinated, the former very high in childhood in the town in which infant vaccination had been neglected (Gloucester), and both also excessive even where there were few unvaccinated children to be attacked (Middlesbrough); (d) The great majority of the vaccinated, having been protected only in infancy, are over 20 years of age.

LESSONS.—1. Good vaccination in infancy protects up to about 10 years of age, with a high degree of probability, against *attack* of Small-pox, and almost with certainty against *death*.

2. Even up to middle life it continues to give some protection against *attack*, and still more so against *death*, though in a more rapidly decreasing degree as age advances.

3. Re-vaccination, at about 10 years of age, is necessary in order to maintain protection against attack from Small-pox, and should certainly be repeated after an interval of 10 years at the outside in the case of imminent danger from the actual neighbourhood of the disease.

4. The protection given by efficient vaccination is comparable for a time with that given by an attack of Small-pox, but is not so lasting.

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* It has been sought to explain away the lesson of the large number of unvaccinated children attacked in the Gloucester epidemic by the statement that there were so many more unvaccinated than vaccinated children there, that it might be expected that a much larger number of the former than of the latter would be attacked. But, although this is true of the commencement of the epidemic, it does not apply to the greater part of it. For, out of about 10,000 children who were unvaccinated at the outset of the epidemic, more than 8000 had been vaccinated before it reached its climax. So that, during the greater part of the epidemic, there were more vaccinated than unvaccinated children in Gloucester. If it had been otherwise the slaughter of the children, bad enough as it was, would have been as terrible as it used to be in the times before Jenner.