A Royal Commission's arithmetic. A criticism of vaccination statistics and a plea for fresh figures and fair inferences / by Alexander Paul.

A ROYAL COMMISSION'S ARITHMETIC

A CRITICISM

OF

VACCINATION STATISTICS

AND

A PLEA

FOR

FRESH FIGURES AND FAIR INFERENCES

BY

ALEXANDER PAUL

LONDON:
P. S. KING & SON,
12 & 14 KING STREET, WESTMINSTER.
1897.

SIXPENCE.

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TO MY FELLOW JOURNALISTS

IN VIEW OF COMING DISCUSSIONS

OF THE ROYAL COMMISSION'S PROPOSALS

FOR

THE FURTHER ENDOWMENT OF VACCINATION

I DEDICATE

THIS PAMPHLET

A ROYAL COMMISSION'S ARITHMETIC

A CRITICISM OF VACCINATION STATISTICS

AND A PLEA FOR

FRESH FIGURES AND FAIR INFERENCES

THE main conclusions of the Royal Commission on Vaccination are based upon a series of striking statistical contrasts. By these contrasts the Commissioners are led to "think" that vaccination—

(1) Diminishes the liability to attack from small-pox;
(2) Mitigates the severity of the disease; and
(3) Greatly reduces the risk of a fatal result.

These claims fall far short of those which have hitherto been made for vaccination; they are by no means the strong positions upon which the compulsory law of vaccination was founded; but it may be said that if they are really made good by the Royal Commission's statistics, they will be to the anti-vaccinist like Mercutio's hurt. They may not make a wound "so deep as a well, nor so wide as a church door; but 'tis enough, 'twill serve," and the anti-vaccinist may die ranting like Romeo's friend against the "villain that fights by the book of arithmetic."

Do the statistics prove what the Royal Commissioners think they prove? Have the doctors whose statistics have been so readily accepted by the Royal Commission really fought by the book of arithmetic? Is this Mercutio really slain? I venture to predict that if the reader will patiently follow me in the examination of some of the Commissioners' figures he will be surprised to find that the argument from the statistics is

entirely inconclusive. And in the name of fair play to men who have suffered much from injustice, who really have something to say that deserves to be heard, but who to-day have still to struggle for a hearing, I appeal for this patient attention. After the report of the Royal Commission it is, indeed, no longer sane and reasonable to go on regarding anti-vaccinists as crack-brained and dangerous enthusiasts, as men who are comparable only to the Peculiar People or to that John Hampden whose gospel was that the world was not spherical but flat. Moreover, it seems that etiquette prevented the Commissioners from cross-examining their own medical experts upon the statistics discussed in the following pages,* and therefore it is not only reasonable, but in the public interest, that the statistical case of the Commissioners —which seems now to be the case upon which their qualified support of vaccination really depends—should be freely admitted to much less prejudiced discussion than it ha hitherto received.

Small-Pox Fatality among Children.

The fallacies lurking in the statistical method of the Commission will be conveniently examined from a starting point afforded to me by a table on page 50 of the Royal Commissioners' Report. It is a table showing what was the proportion of children's deaths to the total deaths from small-pox in six epidemics in different towns variously vaccinated. The town in which there was believed to be the fewest unvaccinated children stands first in the table. The other towns follow in what the Commissioners believe to be the order of their vaccination deficiency. Leicester,

* Dissent of Dr. Collins and Mr. Picton from the Report, page 174, paragraph 84.

which is notoriously a town that neglects vaccination almost altogether, thus stands last of the six. The following results are obtained :—

OF the Total Small-pox Deaths Percentage borne by those between the Age of 0–10.

	Per-centage.		Per-centage.	
Warrington	.... 22·5	Dewsbury	.... 51·8	1891–2
Sheffield	.... 25·6	Gloucester	.... 64·5	1895–6
London	.... 36·8	Leicester	.... 71·4 (or 66·6)	1892–3

The alternative figures opposite Leicester are supplied by the Commissioners from a conscientious desire to make allowance for scarlet fever complications in some of the Leicester cases. All these figures relate to particular epidemics, some of them in different years. The Warrington, the Leicester, and the London figures refer to 1892–93; the Sheffield figures to a selected period only of the Sheffield epidemic of 1887–88; the Dewsbury figures to 1891–92; and the Gloucester figures to 1895–96.

Undoubtedly, it is here shown by the figures standing opposite the names of the towns that the percentage of death borne by the children was smallest in the best vaccinated towns, and that the percentages rise as you go down the list. The Commissioners truly say (par. 185):—

"It will be seen that whilst at Leicester and Gloucester the deaths under 10 years of age were considerably more than half the total deaths, the deaths of children of a similar age at Dewsbury slightly exceeded one-half. In London the deaths under 10 were considerably less than half. At Sheffield and Warrington they were about a quarter of the total deaths. The variations are very striking, ranging from 22·5 at Warrington to 71·4 at Leicester, and the approximation between the percentages at Sheffield and Warrington, as compared with those of the other towns, is also worthy of note."

All this is true. The question is, What does it signify? The Commissioners suggest that what they call "these remarkable differences in the age incidence of fatal cases of

small-pox" are to be explained by "the difference in the degree of vaccination of the child population in the several towns." Should this conclusion be correct there would, of course, be an end to argument. The book of arithmetic, or what M. Virchow called "the brute force of statistics," would prevail. I think I shall have little difficulty in showing that there is no proof of its accuracy. It will be shown in the following pages that the proportional fatality of children in these six towns is certainly affected by other considerations than vaccination default. It obviously varies with the circumstances of each particular epidemic. The outbreak may occur in the schools of one town and in the workshops of another. And, of course, when you are calculating the percentage of children's deaths to total deaths, it is not their own numbers only that affect the percentages. The number of the adults dying changes the percentages too.

The Interesting Age Incidence Controversy.

It will be observed that the Commissioners speak of "remarkable differences in the age incidence of fatal small-pox." It was the real purpose apparently of the table to which I have called attention to show that it harmonised with what is known as the age incidence argument of the vaccinists. But that is an argument which by its very nature cannot receive any proof or confirmation by isolated epidemics. It is, I think, an entirely novel idea to apply the rough-and-ready age incidence test to particular epidemics of which the precise facts are already known to us.

The argument from age incidence of small-pox in its ordinary and legitimate use is very interesting. It is drawn from the mortality tables for a long series of years. These tables, I believe, show that in every thousand deaths from small-pox nowadays the preponderating number are deaths of adults, whereas in former times the children used to bear

the greater proportion of mortality. As to the cause of this change in the age incidence, some maintain, with the sympathy of the Commissioners, that it is the palpable effect of the protection given to young children by vaccination; others urge that the progress of sanitary improvement has enabled many of the feebler children to hold on to life a few years longer, so that they afterwards swell the adult mortality rates. Some again, point out that other and more modern epidemics affecting children have removed many of the weaker little ones and left fewer victims for the small-pox. It might be urged also by those who still believe in one attack of small-pox necessarily protecting against another, that in the former insanitary times, when small-pox epidemics were more frequent, many adults would be in this protected condition, whereas the children would be new material for the disease to work upon. Those who are attracted by this age incidence controversy will find it worth while to read what is said upon it on one side by the majority of the Commissioners, and, on the other, by Dr. Collins and Mr. Picton in their very able Dissent. The point, however, that I wish to make is this. Whatever conclusions have hitherto been drawn from these mortality incidence figures have been drawn from them because they were taken as affording a sort of rough-and-ready indication of the age incidence of the attacks. They were a fair and reasonable indication that in the former period the disease seemed mainly to attack children, whereas now it prefers generally to attack adults. The vast area from which the figures were drawn—the fact that the averages were calculated over a long series of years—reduced the risk of error, and nobody, in the circumstances, was very much inclined to question this method.

But is it not rather rash on the part of the Commissioners to apply the same method separately to six local modern epidemics? Or to assume that because they have

found the greatest *proportional* mortality among children in three badly-vaccinated towns they have proved the age-incidence change to be the sign of the protective influence of vaccination? Observe that here we are not dependent upon any such rough-and-ready method. We have the means of proving the case more precisely. We know the extent of these epidemics. We know the number of attacked in each town, as well as the number who died. We are not, therefore, limited to the drawing of inferences from mortality proportions alone. We have statistics of these epidemics undisputed except on one point, and that concerns the relative numbers of the vaccinated and the unvaccinated. So, if we must look at proportions, let us look at them in all the light we can bring to bear upon them; suppose, for example, we look at the proportions of illness.

Deaths compared with Attacks.

Side by side with the figures which the Commissioners believe to exhibit such "remarkable differences" we have here another set of figures calculated from the data of the Final Report to show the proportion of small-pox illness suffered by the children:—

Children Aged 0–10 Years

——	Percentage borne by them of Total Small-pox Illness.	Percentage borne by them of Total Small-pox Deaths.
In Warrington	9·83	22·58
*Sheffield	12·42	25·60*
London	15·21	36·82
Dewsbury	21·64	51·82
Gloucester	35·67	64·52
Leicester	30·53	71·43 (or 66·60)

* See note to page 11.

It will be remembered that the Commissioners said of the figures now appearing in the column on the right :—"The variations are very striking, ranging from 22·5 at Warrington to 71·4 at Leicester." They *were* very striking, but are they so striking now when we see in the column to the left that there was a corresponding variation in the proportions of the sick? "The approximation between the percentage at Sheffield and Warrington as compared with those of the other towns is also worthy of note," said the Commissioners. It is, and so is the approximation in the other column. An important inquiry, I submit, is suggested by the nearly coincident changes in these two columns. The Commissioners, confining their attention to the right-hand column, regarded the variations as "phenomena accounted for on the supposition that vaccination has the protective influence alleged" (par. 194). But we, having both columns before us, have yet to be convinced that the variations *are* phenomena. What proportion did the fatal cases bear to the attacks? There will be no phenomena to account for if we should simply find that, in proportion as the amount of infantile illness rose in these various towns, so rose the infantile mortality. I may be asked why did the infantile illness increase? And those who ask that question will say that the phenomena are still to be explained, though they may be set back from the Commissioners' column to my own. Of course, I will deal with that subject—the influence of vaccination on the amount of illness—later on; and I will also show that even if this confronted me with a greater difficulty than I find it to be, the Commissioners would not be out of their dilemma. For their thesis is that, where vaccination is neglected, death from small-pox is more likely to follow attack; so that in two towns with the same proportion ill the proportion dying in the worse vaccinated town must not be the same, but greater. Meanwhile, it is clearly needful to investigate the

true relation of those deaths to attacks before we can conclude like the Commissioners—either that there are any phenomena to explain or that "the protective influence of vaccination" explains them. The relation for which we are seeking cannot, of course, be inferred from these two columns, which do not admit of accurate comparison. Indeed, even the single table of the Commissioners is fallacious.

The Proportions of Parts to Totals Fallacy.

The fallacy of the Commissioners in arguing from "proportions of children's deaths to total deaths" is this. They have suggested that these varying proportions are explained by something mainly affecting children's lives—that is, the special protection of children by vaccination; whereas, as I have said, it is obvious that if anything occurred in any of those towns that affected the adults as well, or even affected the adults only, this would equally cause a variation in the proportional figures the Commissioners are using. Dr. Collins and Mr. Picton, in para. 134 of their Dissent, have put this point. They say:—"Small-pox, if it spreads in a school, would necessarily fall upon a different age class from what it would if it spread in a factory or barracks." That is obviously true, and it is equally true that, whether it fell upon the one age class or the other, the "proportion of children's deaths to total deaths" would be affected. Take cases before us. In Warrington the small-pox was mainly spread in forges near the hospital, and there were 596 sufferers over 10 to 65 children under 10. In Leicester on the other hand, children were specially attacked owing to the proximity of the small-pox hospital to the scarlet fever wards. In Gloucester the disease was spread in schools near the hospital, and the children's fatality

was high; but there was a high fatality among the adults also; a fact which prevents any true disclosure in the comparison by proportions to totals. There was a greater equalisation of proportions there than in the other towns.* Thus, causes altogether apart from the vaccination of the children influenced these proportions, and rendered them entirely unavailable for the argument which the Commissioners have founded upon them. Nevertheless, in an address to the Royal Statistical Society on 16th February this year (1897), Mr. Noel A. Humphreys, of the Registrar-General's Department, adopted these figures of the Royal Commission without criticism or challenge, and so lent them the weight of his own authority as a known assistant in a Department of State Statistics as well as a member of a learned society

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* This will be best seen from the table below giving the actual numbers on which the Commissioners' percentages are founded. These numbers do not suggest even in the unvaccinated towns a heavy incidence on children as compared with adults :—

	Under 10.		Over 10.	
	Attacked.	Died.	Attacked.	Died.
Warrington	65	14	596	48
†Sheffield	581	128	4,096	368
London	358	67	1,995	115
Dewsbury	219	57	793	53
Gloucester	706	280	1,273	154
Leicester	109	15	248	6

† The Sheffield figures are obscure in the Report, and are not complete. On a comparison of par. 178 and Dr. Barry's Report, to which the Commissioners refer us, it will, I think, be found that attacks as well as deaths under one year being added to allow for just comparison with the other towns, the correct figures are as above stated 581 attacks, 128 deaths. The children's deaths are 128 out of 496 total deaths or 25·80—not 25·60 as in the Commissioners' table followed on page 8.

naturally trusted by the public with the investigation of statistical questions. He did not doubt that these figures "seemed to forbid disbelief in the assertion that small-pox mortality, at any rate among children, is directly governed by the proportion of successful vaccinations."

Corrected Impressions.

The footnote to page 11, giving the actual numbers of children and adults attacked and dying in the various towns, furnishes the means of ascertaining the true significance of the children's death rate. We can now put the rate at which the children died side by side with the Commissioners' table for the correction of impressions which they have, as I maintain, fallaciously produced:—

——	Percentage borne by children of total small-pox deaths.	Percentage of fatal cases among children.	Percentage of fatal cases over 10 years of age.
Warrington	22·58	21·53	8·05
Sheffield	25·60	22·03	8·98
London	36·82	18·71	5·76
Dewsbury	51·82	26·02	6·68
Gloucester	64·52	39·66	12·09
Leicester	71·43	13·76	2·42

Who would imagine from the Commissioners' table alone (now standing on the left) that the children's fatality was lowest in Leicester, as proved by the second column? Or that London had a smaller children's fatality rate than either Warrington or Sheffield? Leicester and London children having suffered less than the children of all the other towns, how is it that the Commissioners were able to produce the impression that they suffered so heavily? The third column explains. It supplies the illustration of an

argument I have already used. The varying incidence on the adult population affected the children's proportions apart altogether from any consideration of the protection afforded by vaccination, or lost for want of vaccination. Thus our inquiry into the actual relationship of death to attack has, I think, demonstrated that the Commission's fatality proportions are a pitfall, and that the age incidence argument is full of danger.*

Proof of a Pitfall.

It can be proved in another way that these fatality proportions are a pitfall and one which the Commissioners had the means of avoiding. The true fatality results—not the proportions to totals, but the actual percentages of deaths to illness in the children's class, and again the percentage of deaths to illness in the adults' class—can be tested by the Commissioners' own doctrine as set forth in the opening of this pamphlet. The doctrine implies that neglect of vaccination increases not only the liability to attack from small-pox, but the liability to severe and to fatal attack. Accordingly, no mere advance in fatality rates *pari passu*, or nearly *pari passu*, with the advance in the number of attacks, should satisfy the Commissioners that vaccination default is the dominating influence. Such a proportionate advance would be no more than we should look for if we had never heard

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* In considering this question of age incidence, it is important to bear in mind a remarkable official statement. Chicken-pox is peculiarly a children's disease, and it was formerly held to be never fatal. The Registrar-General in his Report for 1889, page X., says: "There were 83 deaths ascribed to chicken-pox, and it is very probable that most of these were in reality cases of modified small-pox, true chicken-pox being an ailment that is rarely if ever fatal." Had these 83 cases been classed as infantile small-pox deaths, they would, of course, have had an important modifying effect on the statistics.

of vaccination. More dangerous disease, more death. The one should follow the other as the night the day. But by the theory of the Commissioners something more is meant than this. They hold that in the towns neglecting vaccination there will be when an epidemic arrives, not only the increase of death that naturally follows more disease; but there will be the extra increase due to the greater liability of unvaccinated communities to suffer from the disease in its fatal form. Say there are 40 small-pox deaths in a well-vaccinated town. Then in a second town, which happened to be equally well vaccinated, you would not be surprised to hear of 80 deaths if you also heard that it had double the amount of small-pox. But if the second town had neglected vaccination, then, according to the Commissioners, it would be very surprising if it only had double the number of deaths in the first town. For by their theory the fatality risk of the unvaccinated town should be greater. You must pay at compound interest for neglecting vaccination. That is the position of the Commissioners. You must pay for less vaccination by a greater proportion of fatality. The Commissioners have reported against the cumulative penalties of the magistrate, but they find that you must pay cumulative penalties to Nature.

Now, is it the case that in the advancing fatality of these six towns, this supposed law of Less vaccination greater fatality is observed? If it is, the facts will appear if the percentages of fatality among the children attacked, and the percentages of fatality among the adults attacked are contrasted with the percentages of alleged neglect of vaccination. I say "alleged neglect of vaccination," because for reasons which I hope will soon occur to the reader, it is not possible to accept the percentages of vaccination default as accurate. I am not bound by them, but the Commissioners are; for they are derived like the rest of my tables from the figures of the Commission Report:—

—	Of Total Children (aged 0–10) Ill of Small-pox		Of Total over 10 years of Age Ill of Small-pox	
	The Percentage of Fatal Cases.	The Percentage of (Alleged) *not* Vaccinated Cases.	The Percentage of Fatal Cases.	The Percentage of (Alleged) *not* Vaccinated Cases.
In Warrington....	21·53	49·23	8·05	6·04
Sheffield	22·03	39·24	8·98	7·86
London	18·71	63·68	5·76	9·07
Dewsbury	26·02	79·45	6·68	24·21
Gloucester	39·66	96·31	12·09	6·91
Leicester	13·76	98·16	2·42	20·56

New View of the "Striking Variations."

Here, so far from finding the fatality among the adults in the various towns rising on the principle of "less vaccination, more fatality," you find that the lowest fatality corresponds with the greatest neglect of vaccination. The details of the children's columns are remarkable for the same reason. Infant small-pox mortality is undoubtedly greater than adult mortality. That is proved by the table; but it fails to prove the close and increasing connection between vaccination default and death which we ought to have found.

Two features of this table recall the observation of the Commissioners that the variations in "the age incidence of fatal cases" is "very striking." The variation in the Warrington and Leicester figures is certainly "very striking," but not in the sense the Commissioners were led to suggest from an exclusive study of their "proportions" table. The striking thing is that the fatality should be so much lower in the infinitely worse vaccinated town. Most striking of all is the variation in the figures relating to Gloucester and to Leicester. Both these towns are shown to have almost

totally neglected the vaccination of these children down with small-pox. Yet the fatality rate among these children is seen to be more widely different than it is among the children in any other couple of the towns contrasted, however varied their condition in respect to observance of the vaccination aws.

The Test Contrast of Gloucester and Leicester.

Upon the cases of Gloucester and Leicester alone, surely the whole statistical argument of the Commissioners breaks down. What is the argument? That no cause apart from vaccination can adequately account for the great variation in the small-pox fatality among the children of the six towns. What is the fact? That the widest variation of all is observed where something other than vaccination *must* account for it; because there was practically no vaccination in either case. It is worth while detaching these two cases from the rest of the table, and regarding the remarkable contrast with undistracted eyes. These are the facts:—

——	Unvaccinated	Died.
Gloucester children	96·31	39·66
Leicester children	98·16	13·76

What was this "something else" that caused a greater variation in the fatality of those two unvaccinated communities than any differentiation that the Commissioners have attributed to varying vaccination conditions? The answer to that question may also answer another, which, as I have been conscious all along, must have been troubling the mind of the reader, and perhaps diverting his attention from my argument. What was it, if not neglect of vaccination, that caused the undoubtedly high small-pox *attack* rate in Gloucester?

The main body of the Commissioners ignore any other cause, though the Dissentient Commissioners suggest one. But I will not appeal to the Dissentient Commissioners. I have a witness who is apparently more acceptable to their colleagues.

Gloucester's Plight. The Hospital Scandal.

Dr. Francis T. Bond, Medical Officer of Health for Gloucestershire Combined District, and the hon. secretary of the Jenner Society—a combination of offices, by the way, which does not promise strict impartiality—published a pamphlet called "The Story of the Gloucester Epidemic of Small-pox," and there is in that pamphlet a passage bearing directly upon the question we are now considering. I could quote from no source more hostile to the anti-vaccinists. Dr. Bond's pamphlet breathes hostility to them in every page; and the Ark of the Covenant was not more sacred to the Children of Israel than is the cause of vaccination to Dr. Bond. "Vaccinated" and "unvaccinated" are words barely tolerated in his vocabulary. He prefers "protected" and "unprotected"; and these are the expressions he uses in argument regardless of the laws of logical inquiry which strictly forbid the use of terms that beg the question. But all this gives the greater force to Dr. Bond's own account of the influence of a misplaced temporary hospital upon the course of the epidemic in Gloucester. I have taken the liberty of marking in italics the words of Dr. Bond to which I attach special significance. After explaining (p. 13 of his pamphlet) that "the isolation resources of the City Council, never very large, had become exhausted, and a number of cases had to be left in their own homes," Dr. Bond tells how the temporary hospital buildings were run up, and how the railway traveller passing by Gloucester could note at a glance the unsuitability of the site; for "all around the hospital he could see the streets of new houses and semi-detached villas which had been growing up there

during the few previous years, and in which it was now, as it were, embowered." Then Dr. Bond goes on to say :—

> Into this congeries of temporary buildings, *with two large Board Schools and another large Parochial School all within less than half a mile of it*, were deported upwards of 700 cases of small-pox during the course of the epidemic. Small need for wonder that the full force of the pestilence made itself first and worst felt in this portion of the city. Not, as has been erroneously stated, because the sanitary condition of this portion was any worse than that of the northern side of the city, for it is in some respects the better of the two, but because the chief residential portion of the city is on this side, and in the large population, *teeming with children*, in which the hospital was thus placed, it found a ready field for scattering its infection. That the hospital was, in more ways than one, a potent cause of the increase of the epidemic, is unquestionable.

Dr. Bond says that in April, 1896, the high-water level of the disease was reached. On the 28th of that month, Dr. Brooke went down from London to grapple with the epidemic, and his report on 1st May to the City Council on the state of the hospital accommodation as he found it, was made public for the first time early this year. I have taken from it the following sentences which have a bearing upon our inquiry :—

> From a sanitary point of view, the whole administration of the hospital has been shockingly neglected. . . . We are informed at the hospital that it is impossible to obtain a sufficient supply of clean linen, and that they are already a month behind with the washing. . . . The ambulance shed near the main block is very foul and dirty, and smells most offensively ; and round many of the wards I found heaps of decaying animal and vegetable matter—bones, bread, vegetables, &c.—and sometimes a heap of foul linen and soiled dressings, soaked in discharges. In one of the wards we found neither kitchen, scullery, nor pantry, and in the bathroom a miscellaneous collection of dirty dinner things, patients' clothing, and soiled linen. . . . No one should be admitted but those connected directly with the hospital without a pass, to be obtained from the Medical Superintendent. I notice that the gate is left open and that people are allowed inside.

These passages relate to an hospital known as the Stroud Road Hospital. But there was another of which Dr. Brooke spoke in even stronger terms :—

With regard to the Hempsted Hospital I venture to say that the Sanitary Committee are incurring a great and serious responsibility in continuing to keep this hospital open, and to allow patients to be admitted. With regard to this I state definitely that I have found abundant evidence that both patients and staff are detained there at a grave risk.

These passages from a doctor's official report give an air of great probability to a much ghastlier picture of the hospital administration which has been published by Dr. Hadwen. I wish to refrain in this pamphlet from quoting controverted documents, but I may put side by side one of the warm accusations of Dr. Hadwen's and what seems to me to be a practical confirmation of it in a letter quoted in Dr. Bond's pamphlet. The letter was written in March by the vicar of St. Paul's, Gloucester, in defence of the hospital administration which, as we have seen, was, in May, so emphatically condemned by Dr. Brooke. I think, without offence to those impartial minds I am appealing to, I may urge that no prejudice against anti-vaccinists should be suffered to allow the hushing-up of inquiry into this hospital scandal at Gloucester :—

Dr. Hadwen, in "The Case for the Anti-Vaccinationists," published at Weston-super-Mare, referring to the Gloucester Isolation Hospital, says :—"There is a grim and ghastly humour about that term ! . . . . . It was not isolation, it was *congregation !* They took these poor children away from their homes at night to the overcrowded hospital, some of them even from their mothers' breast, and placed them in this pestilential death-trap, two, three, and four in a bed. Is it any surprise then that so many children died ?"

Dr. Bond, of the Jenner Society, in his Story of the Gloucester Epidemic (page 71), quotes a letter from the Vicar of St. Paul's, Gloucester, in which it is said :—"I am quite certain that no evil can possibly arise from the judicious placing of two small children, most of them under 8 years old, in an ordinary sized adults' bed. There is a very large double-bed which I have seen made up for four little mites, the pillows being placed at the head and foot, and I think this arrangement gave even more room (the bed being much wider) than when two are placed in a single adult's bed."

Without any undue disrespect for the Commissioners' statistics, I think it is now safe to say that something else than the neglect of vaccination has been found to explain Gloucester's 39 or 40 per cent. of fatal small-pox illness among children.

Leicester's Singular Immunity.

Then we come to Leicester, which with the greatest (and almost total) neglect of vaccination among suffering children has the least fatality (13·76) in proportion to illness of any of the six towns. It was because its adult patients were also very fortunate, having a fatality rate of only 2·42 per cent., that the doctors were enabled, in that alarming table which I quoted on page 5, to show that the children suffered 71 per cent. of the *total* deaths. But it will be remembered that at the side of the figures 71 they gave an alternative figure (66·6). The Commissioners explain this in para. 182 of the Report. They say:—

> In consequence of the proximity of a scarlet fever ward to the hospital in which small-pox cases were treated, several children in that ward were attacked by small-pox, of whom three died. It may be suggested that this circumstance would be likely to render the infant mortality exceptionally high at Leicester as compared with the other towns.

The alternative figure, therefore, excluded these three deaths altogether from the calculation. A little more of such fair consideration of exceptional circumstances is all that anti-vaccinists ask for. But if the Commissioners incline to allow the deduction of deaths due to the accident of proximity to the scarlet fever hospital, we shall be allowed also to deduct the illness caught in the same way. These three deaths of scarlet fever hospital patients from small-pox, I learn from the report of the Leicester Medical Officer of Health, were three deaths in thirteen cases. If all are deducted

for the reason that another cause for them than neglect of vaccination is plainly possible and even probable, the fatality rate comes down from 13¾ per cent. to 12½ per cent. How notable it is, by the way, that such a correction should have to be made in the figures of Leicester—the very place in regard to which one is readiest to jump to the conclusion that non-vaccination was the head and front of the offending! In Leicester only 109 children were attacked, and thirteen of them, or nearly 12 per cent., were patients prostrate with scarlet fever when they were exposed to infection.

How the Commissioners regard Leicester.

It can hardly be doubted that, if the medical mind was not so strongly committed to a belief in vaccination, the contrast between Leicester and Gloucester would have given rise to that further and more searching inquiry into the statistics of vaccination and small-pox, which it is my object to urge. But without casting any aspersion on a noble profession, I think it may be pleaded that we cannot reasonably expect the medical man, with the bias of his medical education and training, to bring to this task the impartiality of a trained statistician. In the case of Leicester, at all events, the medical mind clearly refused to cast even a temporary doubt on the efficacy of vaccination or danger of non-vaccination. The immunity of Leicester was at once put down to the fact that this Midland town had the good fortune to be visited by an epidemic milder than that which visited the other towns. The Commissioners, from the casual references they make to this important question, appear to adopt that view. Now, the Leicester outbreak may have been limited; it well might be, for reasons suggested on the next page; but that such small-

pox as did break out differed in severity from the small-pox of other epidemics, is an assumption in the face of evidence which points the other way. The Commissioners, themselves, as will presently be seen, give figures which show that the proportion of confluent small-pox was very high in Leicester.

But if Leicester did not suffer extensively from the epidemic, *why* did it not? Is it no longer a canon of the medical schools that in the absence of vaccination, small-pox will attack a town severely? Leicester was warned for years that it would find this out when small-pox came; and it must be borne in mind, in the candid consideration of Leicester's case, that if it abandoned what it believed to be a discredited protection, it took care to provide itself with others. For this reason I have always felt that the immunity of Leicester taken by itself was not necessarily evidence of the futility of vaccination. It is open to anyone to say, "You cannot draw conclusions from Leicester, where sanitation, notification, isolation were enforced with a nervous and exceptional strictness, in order to belie predictions, and escape the threatened penalty." But this has not, I think, been said in the Final Report, for if it had been said, what would have been the obvious reply? It would have been said that if by such measures disaster might be avoided, then the converse is true, and by neglect of these measures disaster might come upon a city. Where then is the conclusiveness of a statistical argument that takes no note of anything else but neglect of vaccination?

Relationship of Vaccination to Severe Attack.

From data supplied by the Commissioners' report I have constructed another table to exhibit the relationship (if there is any) between the percentage of vaccination default in

four of those six towns, and the percentage, not of fatality, but of severe attack, whether fatal or not.

It is not my fault, let me explain, that my argument is henceforth confined to four towns. The final report does not supply me with the necessary data to give a faithful comparison in the cases of Sheffield and Gloucester. In regard to Sheffield, indeed, although the Commissioners had so much evidence from that city, the figures are not at all given on a system uniform with that adopted in regard to the other towns. Those we have hitherto been dealing with are not, as the Commissioners admit in par. 178, the complete figures for the epidemic, but only those up to a certain date. For the further details of the Gloucester epidemic we have to await the tardy appearance of the appendices to the Final Report. A statistical case upon which so much is founded should at least be scientific and complete.

The dissentient Commissioners (one of whom—Dr. Collins—speaks with authority on such questions) say (par. 105 of the Dissent):—

> Three main varieties of small-pox are recognised—the discrete, the confluent, and the malignant. The first is rarely fatal even in the unvaccinated; the last is almost always fatal even in the vaccinated. It is the confluent variety that mainly dominates the case mortality of the whole.

All the Commissioners may be taken to agree with this, for in the statistical tables of their report they generally divide the cases into groups of mild, discrete, coherent, and confluent small-pox, and, as I understand, the malignant cases have been added by the Commissioners to the confluents. It is from data supplied on pages 67–9 of their Report that I have drawn up the following table comparing the amount of severe, or confluent, small-pox in four epidemics with the amount of alleged vaccination default:—

—	Of the total Children Aged 0–10 Ill of Small-pox		Of the total over 10 Years of Age Ill of Small-pox	
	The Percentage suffering from Confluent Small-pox was—	The Percentage not Vaccinated was—	The Percentage suffering from Confluent Small-pox was—	The Percentage not Vaccinated was—
In Warrington	38·46	49·23	25·50	6·04
London ...	31·00	63·68	13·63	9·07
Dewsbury	44·44	*79·16	22·22	*24·36
Leicester	49·54	98·16	16·93	20·56

* The percentages of "not vaccinated" in Dewsbury here given differ slightly from those on page 15. This is because the Commissioners when dealing with fatality represent the total cases of small-pox illness as 1,012; in the classification of cases they only account for a total of 1,008.

The percentages of confluent cases and of unvaccinated cases do not move together at all. On the children's side one sees that the figures of vaccination default get higher and higher as you descend their column. The progression of severe small-pox, on the other hand, is irregular, and when it rises it does not rise in proportion to the neglect of vaccination. On the adults' side the severe small-pox first diminishes as vaccination default increases, and though it rises and falls again simultaneously with the figures of vaccination default, the proportions are entirely unsuggestive of cause and effect. Lastly, the table confirms what I have before said about Leicester. It is now proved that the remarkable lowness of the fatality in Leicester could not be because of the immunity of the patients from severe attacks in the children's class at all events. For if the Commission's figures are correct, Leicester had undoubtedly more confluent cases in the children's class than any other of the six towns.

At the same time in proportion to its vaccination default it had fewer.

Divergencies Explained, but *not* by Vaccination.

Now it has appeared from our investigations so far that small-pox is not (even when considered on the small scale of only six epidemics) a wholly erratic disease. There is some approach to uniformity in its operations after all. There is a rough correspondence in the ratio of attacks and deaths in the children's class and in the adults' class; and where there is any variation to account for it has been so far our two-fold experience, first: that vaccination default has not at all corresponded with the irregularities to be explained; and secondly: that, contrary to the experience of the Commissioners, we have been able to find other possible and even probable causes of the irregularities.

In the search for the true cause of the variations which the Commissioners have found to be "very striking" and have been unable to explain except by varying degrees of vaccination, it will now be well to place side by side the percentages of confluent cases and the percentages of deaths. Is there, perchance, in this relationship a clue to the "striking variations"? As the Commissioners say (but do not say often enough), "Let us inquire."

Here are the contrasts or relationships:—

—	Of Children Ill		Of Adults Ill	
	Confluent Cases.	Deaths.	Confluent Cases.	Deaths.
	Per cent.	Per cent.	Per cent.	Per cent.
In Warrington	38·46	21·53	25·50	8·05
London	31·00	18·71	13·63	5·76
Dewsbury	44·44	26·02	22·22	6·68
Leicester	49·54	13·76	16·93	2·42

I think it must be owned that as regards Warrington and Dewsbury this table completely explains the "striking variations" in the case fatality of the two towns, and explains it without any need of the vaccination hypothesis. The figure 26 opposite Dewsbury in the death column certainly has up to now been a little troublesome. It was too big when we were looking for some average relationship between deaths and cases; it was too small when we were testing its supposed relationship to vaccination default. But now it is as nearly the right size as we could hope to find it, allowing for some necessary inequality of averages taken in different places. The deaths of children in Warrington are 56 per cent. of the children suffering from the confluent small-pox; the deaths in Dewsbury are 59 per cent.; in London they are 60 per cent.; and in Leicester (lucky Leicester, the unvaccinated), under 28 per cent. The deaths over ten years of age are 31 per cent. of the confluent cases of the same age-class in Warrington; and in Dewsbury they are practically the same (30 per cent.); in London for some reason or other they were over 42 per cent.; in Leicester (lucky, unvaccinated Leicester again!) they were but a trifle over 14 per cent. Only one perplexity remains now, for we have already in the previous part of our inquiry got at the secret of Leicester's immunity. Why are the London confluent figures so high? Vaccination has failed to explain them. Is there anything else that can? I suggest that the explanation is given in par. 262 of the Commissioners' Report, where it is explained that Dr. Luff adopted a different classification from the other medical reporters to the Commission. He had two divisions of discrete small-pox—"discrete and severe discrete;" then came "confluent." It is reasonable to suppose that his "confluent" class therefore included more strictly selected severe cases than the same class in the other towns, and that any doubtful "confluents" were set back into the

"severe discrete" classification. The Commissioners will agree, for they say in par. 267, "In London a different classification of the types of disease renders comparison less easy." This would account for the singularity of London's position in the following curious comparison of the percentage of confluent cases to all cases of all ages in the four towns. I am going to put London last this time, and I will put for contrast the deaths on the one side and the vaccination default on the other :—

Of all Cases of all Ages

——	Deaths.	Confluent Cases.	Cases not Vaccinated.
Warrington	9·38	**26·77**	10·28
Dewsbury....	10·80	**26·98**	36·16
Leicester	5·88	**26·89**	44·25
London	7·73	**16·27**	17·38

The statement of the Commissioners that London cannot be so easily compared with the other towns because of a different classification in the type of disease, will entitle me to lay all the more stress on the singular fact that the three other towns which *can* be fairly compared show such a singular approach to each other in the amount of confluent disease considered as a percentage of the total illness, notwithstanding the great variation in their conditions as to vaccination.

Death, a function of Confluent Small-Pox, not of Vaccination Default.

But what I most desire to point out is the evidence given by the comparable figures that the confluent cases (not the vaccination default) mainly determine the fatality. Moreover, the worst vaccinated town which neglecting vaccination

devoted its attention to other means of coping with its epidemic, kept its case fatality lowest of all, 5·8, or little more than half that of the two other towns with practically the same percentage of confluent small-pox.

Summary of Conclusions.

At this point I may be allowed to review my own position, and to recall to the reader, before taking him a step or two farther, exactly what I claim to have shown him.

First, with regard to the fact that the percentage of the total small-pox deaths borne by young children is highest in the worse vaccinated of six contrasted towns, I claim to have shown that these percentages are entirely fallacious, as proved by the separate comparison of infant and adult small-pox mortality in the towns compared.

Secondly, I have separately examined the percentages of fatal cases of small-pox among children in the six epidemics, and the like percentages among those over ten years of age; and having contrasted these percentages with the percentages of vaccination default in the same age classes, I have shown that the death percentages have not mounted higher and higher with the increasing neglect of vaccination, as they were bound to do on the hypothesis of the Royal Commissioners—that mildness of attack and diminished fatality are the results of vaccination.

Thirdly, with reference to the suggestion that variations in the age incidence of fatal attacks are due to "the difference in the degree of vaccination of the child population in the several towns," I have shown that the widest variations both in age incidence and in child fatality are to be observed in Gloucester and Leicester, two towns whose juvenile population at the date of their epidemic was almost entirely unvaccinated.

Fourthly (although No. 3 implies that this part of my task was superfluous), I have accounted for the high attack rate and high mortality in Gloucester, and for the proportion of fatality among children in Leicester, by causes other than neglect of vaccination.

Fifthly, I have shown that by far the lowest fatality rate was experienced in Leicester, although it was also by far the worst vaccinated town; and I have demonstrated from the Royal Commissioners' own figures that this was not because the epidemic was any milder there.

Sixthly, I have shown that just as no relationship could be traced between the varying small-pox fatality in the different towns, and the percentage of vaccination default, so, also, in the towns for which the figures are available, no relationship can be discovered between vaccination default and severity of attack as measured by the percentages of confluent cases.

Seventhly, I have shown that there is a clear relationship between the percentages of confluent small-pox and the death percentages of several towns, irrespective of their varying vaccination conditions, and that so far as the statistics teach anything, they teach that small-pox fatality is a function of confluent attack, and not of vaccination default.

[My eighth and final conclusion, which I have yet to establish, will be found on page 42.]

The Prejudice against Anti-Vaccinists.

I have yet to show that these are not such sweeping and audacious conclusions in the face of the Royal Commissioners' Report as to some of my readers they may seem to be. The whole inquiry, indeed, is justified, and has been suggested by observations in that report, and especially in the masterly

and thought-stimulating Dissent of Dr. Collins and Mr. Picton. It is the natural fate of most minority reports (or dissents, as they are called when the minority is smaller than a quorum of the Commission) to be overshadowed for a time by the document that carries the majority of signatures; and Dr. Collins and Mr. Picton are at present under this additional disadvantage, that there is still an unaccountable indisposition on the part of the editors of most influential newspapers and magazines to allow the controversy on vaccination to be effectively pursued in their pages. The prevailing view was aptly described in *The Daily News* on one of those rare occasions when it was impossible for the morning journals to ignore the question, which they usually consider it mischievous, or worse, to raise. The occasion was the appearance of the Royal Commission's Final Report, and what the editor of *The Daily News* said, in effect, was that to be asked to consider evidence as to the efficacy of vaccine lymph was like being asked to revise one's opinion on the law of gravitation.

Mr. Malcolm Morris availed himself of his privilege of writing in *The Nineteenth Century*, to refer to the Commission's work as superfluous, and to say that the medical profession was alone competent to judge in this matter, and that the opponents of vaccination were for the most part incapable of appreciating scientific evidence. And even the courteous editor of *The Nineteenth Century* (so I learn from *The Vaccination Inquirer* for January) refused, in a letter to the President of the Anti-Vaccination Society, to permit of any reply to Mr. Malcolm Morris. No one can doubt that the editor of *The Nineteenth Century* is honestly of opinion that the evidence in favour of vaccination is so overwhelming that to treat it as an open question would be to trifle—and to trifle dangerously—with the public. Therefore, he declines to take the responsibility of doing so. This so-called responsibility is the bugbear of the whole controversy. One

cannot imagine Mr. Knowles taking up, on any other subject, the intellectual attitude implied in such reasoning. It means that we are to allow ourselves to be so much impressed by the case for the plaintiff that we will not suffer cross-examination or give ear to the defence. Is there no responsibility in offering to the public—in pages purporting to be devoted to free discussion—a one-sided case favoured by such injustice as that? But an increasing number of men and women are emancipating themselves from this habit of mind towards the anti-vaccinists, and are becoming unprejudiced enough to appreciate and admire a dispassionate argument on vaccination like that of Dr. Collins and Mr. Picton. It will be surprising to me, as one not unaccustomed to the study of Blue Books, if their remarkable review of the results of the Commission's inquiry into the whole subject does not, before long, become, in the opinion of the public, the really authoritative report, while that signed by the majority is forgotten, or treated only as a curiosity.

What Misled the Commissioners.

No one who has studied the whole Report, and paid due attention to the Dissent, will be at a loss to know how it is possible that Lord Herschell and his colleagues could draw conclusions so widely at variance with those we have now reached. I have already hinted at the explanation on page 14. It is that in the detailed figures supplied to the Commission there must have been serious mistakes in the classification of the vaccinated and unvaccinated. Accepting these figures without submitting them to the tests adopted in the preceding pages, and some of them without any cross-examination of the compilers, the Royal Commissioners have naturally taken them as proving the case for vaccination.

Let no one rashly assume that this suggestion of error in the

classification of vaccinated and unvaccinated is one of those aspersions on the medical profession of which the anti-vaccinists are so freely accused.

Medical Admission of Errors in Classification.

The error theory I do not invent. It is suggested to me by one of the special medical reporters to the Commission itself. This story of two brothers will explain. It is from Dr. Savill's Report to the Commissioners upon the Warrington epidemic, and is quoted in the Dissent (par. 106):—

> The brothers Peter and James L———, æt. 20 and 8 respectively are very good illustrations of the difficulties which often beset an inquiry as to vaccination in fatal cases. For a long while I was assured on good authority that they were both unvaccinated persons. I was told that no record could be traced of their vaccination, and no marks could be seen during life. The death certificate, of which I procured a copy, contained the word "unvaccinated" in both cases. Both mother and father of these lads were dead, and those members of the family available could give me no definite information. I therefore included them, at first, in the unvaccinated class. But some time later I succeeded in finding an older brother, who stated in general terms that he was sure all his brothers and sisters had been vaccinated except little Walter, another child who contracted the disease and recovered (Case 80). This statement was confirmed by his Uncle Sam and an old friend of his mother's. Next I sought an old friend and servant of the family, who said she always "thought Peter was vaccinated; but as to Jimmy I used to see his marks thro' washin' 'im so often; he had two good 'uns." Finally, I determined to search the vaccination register myself and found that against the name of Peter L———, who was born on May 26th, 1872, the vaccination entries were vacant, but against the name of James L———, who was born on April 12, 1884, there was an entry of successful vaccination on August 22nd, 1884.

That story, it will be admitted, gives an acute point to the observations of the Dissentient Commissioners:—

> We could have wished, in view of the doubt cast upon the classification of small-pox patients into vaccinated and unvaccinated, that

resort had been oftener had to the vaccination registers for corroboration or correction (*Dissent*, par. 106).

It is important to note that these mistakes, when they are made, occur in the very cases where a wrong classification would lead to the conclusions of the Commissioners that vaccination diminished risk of severe attack and fatal result. The anti-vaccinists will be most grateful to Dr. Savill for putting so clearly a point that if made by one of them would certainly have been scouted as malicious. He says :—

> In nearly all fatal cases the eruption is profuse, and tends to hide the vaccination scars if they exist. Hence the doctor's or nurse's evidence "unvaccinated," if based solely on their own observation, is less valuable than the Doctor's statement "vaccinated." Such was probably the source of error which arose in Case 473. If the pocks are very plentiful or are situated over the vaccination scars, or when the congestion and induration of the skin so characteristic of severe small-pox is present in large amount, then the plainest of scars, and certainly a faint one, is liable to be described as absent.

Small Errors, great Consequences.

The Commissioners sometimes pass these important considerations very lightly by; sometimes they forget them altogether. They pass them very lightly by, because they say that the few mistakes which they can admit to be possible in the cases they have examined could not materially affect the sweeping conclusions they think they have obtained. But, on the contrary, very small mistakes would unquestionably have very large effects upon their calculations. You know the familiar case of a transfer of a vote in the House of Commons. One crossing over counts two in a division. So one crossing over from vaccinated to unvaccinated makes vital differences in the effective divisions made by the Commissioners. For example, suppose Dr. Savill had not persevered in his inquiries about that boy

James L., what would have been the difference in the figures as to Warrington in the Commissioners' Report? At present they show that of 33 vaccinated children under ten two had small-pox in the confluent form, or 6·1 per cent. That is made to contrast with the statement that of 32 unvaccinated children at Warrington 23 had confluent small-pox, or 71·9 per cent. I want to say something else about that contrast to show how much less convincing as to the efficacy of vaccination it is than it looks; but see in the meantime the difference that James L.'s case would have made had Dr. Savill not refused to accept almost everybody's assurance that the child was unvaccinated :—

Contrast as it stands	6·1 71·9
Contrast with J. L.'s case misplaced	3·1 72·7

Yet the Commissioners think that mistakes of the kind acknowledged by Dr. Savill to be peculiarly probable could not materially affect their conclusions!

An Instructive Digression.

Although it is a digression, I think the reader will pardon a further reference to the case of the Warrington children to illustrate how the Royal Commissioners deceive themselves and their readers by their method of presenting the case. They do not look, or ask us to look, at the whole. They produce upon themselves and upon us cumulative impressions by an effective presentation of separate parts of a case which can only be truly judged if examined as a whole. We read, for example, at page 56 (par. 208) :—

> In Warrington, of 33 vaccinated children under 10 years of age, 2 died, or 6 per cent.; of 32 unvaccinated children *of a similar age* 12 died, or 37·5 per cent.

That statement stands by itself in the Report, and, so standing, it can but make one impression, because everything is out of view that may distinguish or differentiate between these two groups of cases, excepting that one consisted of vaccinated children, and the other did not. The impression is accordingly made. It is not until the Commissioners have ceased altogether to consider the circumstances of fatality, and have got to their supposed proofs of the influence of neglected vaccination on severity of attack that we learn—nearly 60 paragraphs further on (par. 265)—that in the second group there were, as I have said, 23 confluent cases. Now, that this is a fact of enormous importance as affecting fatality, we have seen; but the Commissioners present it (and also look at it themselves) as if it had to do not with fatality at all, but only with non-vaccination. Nor is that the only unscientific characteristic of the statistical demonstration which the Royal Commissioners have accepted from their medical (but not statistical) experts. In the sentence I quoted just now from par. 208, note the words I italicised, "of a similar age." When the Royal Commissioners say that the twelve unvaccinated children who died were "of a similar age" they mean that they were, like the vaccinated confluents, under ten. But were they really "of a similar age"? Because the Dissentient Commissioners point out (par. 102 of the Dissent) that *eight* of the twelve fatal cases among the unvaccinated were babies, one month old, or less. The reader, however, knows nothing of this when he reads the startling contrast I have quoted from par. 208. And startling and convincing no doubt it is to the uninitiated to hear that of 33 vaccinated children only 6 per cent. died, whereas of 32 unvaccinated cases 37·5 per cent. died. But how different it all seems to anyone with knowledge enough of the facts to make these four notes of reservation:—

1. The *two* confluent cases in the first group were fatal cases, *although vaccinated.*
2. Eleven of the 23 confluent cases in the second group were recoveries, *although not vaccinated.*
3. If there were 23 cases in the second group instead of two it was because the second group included a whole class in which there could not be any vaccinated for the purposes of the comparison—that is to say, all infants under the vaccination age, and any children besides whose vaccination may have been postponed under medical certificate because of ill-health.

   [This by the way is one explanation why in the tables in the earlier part of this pamphlet the unvaccinated are invariably a larger percentage of the children than of the adults.]

4. There is and always will be the possibility of mistakes in the classification of vaccinated and unvaccinated until a reference to the vaccination registers becomes a matter of honour with the doctors in view of this vaccination controversy.

The Possibility of Mistake Ignored.

Having, I think, proved that the Royal Commissioners pass too lightly by the important consideration of probable mistakes in the classification, let me now show how in at least one argument where its bearing is most important they forget or ignore it altogether. This argument will be found on page 57, pars. 213, 214, etc. The Commissioners in this part of their Report are endeavouring to make out that if the anti-vaccinists are right, and if there is no well-established relationship between vaccination and immunity from small-

pox, then those selected for their impressive statistical tables as being vaccinated—

> might just as well be so many persons chosen at random out of the total number attacked. So far as any connection with the incidence of, or mortality from small-pox is concerned, the choice of persons might as well have been made according to the colour of the clothes they wore. How comes it, then, that those selected out of the mass merely because on the hypothesis we are considering, they have been the subjects of a wholly ineffectual or even mischievous proceeding should suffer from attacks of small-pox so much less fatally than the mass from which they are drawn?

The argument is repeated conversely in par. 217, where, following up a statement that the unvaccinated were 20·9 per cent. of the total number of sufferers in the six epidemics the Commissioners say :—

> Upon the hypothesis, then, that vaccination has no relation to small-pox, and no tendency to mitigate the effect of the disease, we have before us an arbitrary selection which might just as well have been made by drawing lots of 20·9 per cent. of the total number of persons attacked ; why should those thus selected display so remarkably different a proportion of fatal cases, a death rate to attacks of 35·4 per cent. in the one class and 5·2 per cent. in the other.

It is hard to understand how Lord Herschell could allow passages like these to slip into a report which he had to sign, for to his mind, at all events, trained as it is in weighing evidence and argument, its ludicrous misrepresentation of the anti-vaccinist position should have been instantly apparent. So far from the 20·9 per cent. being in the same position as patients chosen at random, or by lot, from the crowd, the anti-vaccinist sees that they must necessarily contain the largest proportion of fatal cases. If there are mistakes in selection, these mistakes are made precisely because the cases are of the severest kind. And even where no mistakes are made, they must necessarily include the whole class of feeble infants like the eight at Warrington of whom we have heard? That argument of the Commissioners, therefore, entirely

ignores the point we have been considering, and simply mocks the anti-vaccinist.

Indirect Proof of Error.

The possibility, aye, and the strong probability, of such mistakes being established, what further proof can be adduced to show that the Commissioners have been the victims of these errors? I have no doubt that our mathematicians could easily deduce many more than I have given from the material supplied in the Report. And my contention is that the Royal Statistical Society would do a service to their country by setting themselves to the study of such medical statistics, if only to discover their incompleteness and their undoubted (however unconscious) bias. I content myself with only two or three observations, in addition to those which were made in the earlier part of my pamphlet.

I call attention, first, to the following epitome of the Commissioners' statistics—an epitome which it seems to me carries its own contradiction on the face of it :—

Fatality in Six Epidemics, according to the Commissioners.

——	Children.	Persons over 10.
Vaccinated....	2·7	5·4
Not vaccinated	36·0	34·3
Vaccinated and unvaccinated grouped together	26·4	8·2

The Commissioners do not themselves appear to see any improbability in the first and second row of figures. The closeness of the correspondence exhibited in the second line between the fatality among the unvaccinated children and that among the unvaccinated over 10 years of age is actually pointed out in triumph (para. 214) as though it were a conclusive negative proof of the virtue of vaccination. To me it is a conclusive proof of error in the classification.

The Commissioners evidently have in their mind that age incidence theory again, and again are misapplying it. They reason in this way. These children had not the protection which has in our opinion reduced the children's liability to small-pox, and hence their mortality from this disease approximates to that of the adults. But where is the medical man who will say that in past times, or in present times, the small-pox mortality in children under 10 years of age, and in persons over 10, ever approximated so closely as to give averages of 34·3 and 36 per cent.? The Commissioners themselves in their detailed estimate of the unvaccinated fatalities, which will be found in my next paragraph, do not show in any town, except Gloucester, such a near approximation of children's and adults' deaths; and Gloucester, as we have seen, was in an altogether exceptional position.

Indiscriminating Penalties.

Next, I call attention to the singular want of uniformity in the results which the Commissioners consider to be the penalty of neglected vaccination. I gather from the Report (paras. 204 to 210 inclusive) that the following were

The Percentages of Deaths to Attacks among the Unvaccinated in Six Towns, according to the Commissioners.

——	Children.	Persons over 10.
Warrington	37·5	33·3
Sheffield	43·9	54·2
London	26·7	20·9
Dewsbury	32·1	18·7
Gloucester	41·0	39·7
Leicester	14·0	7·8

In the irregularity of these figures, an irregularity which is just as striking in the marvellously low fatalities ascribed to

the vaccinated, I find further support of the theory of inaccurate classification.

It is also curious to note the difference between the unvaccinated fatality rate in Leicester and in other towns. There were practically none but unvaccinated children there; there were only two vaccinated children attacked in that town with virtually only unvaccinated children; and so there could be practically no swelling of the unvaccinated fatality by any mistake in classification of confluent cases. But in Dewsbury, where the total small-pox fatality among children, considered apart from vaccination, was 26 per cent., to Leicester's 13·75; the alleged unvaccinated death rate is 32·1, to Leicester's 14. So with Warrington. Its small-pox death rate among children, considered irrespective of vaccination, is only one and a-half times Leicester's rate; but from the table just given, it will be seen that the fatality rate of the unvaccinated is given as more than two and a-half times Leicester's unvaccinated fatality rate. One cannot help the suspicion that if it had been possible to make a mistake in distributing the fatality rate between vaccinated and unvaccinated in Leicester, these "striking variations" would not have been witnessed.

Supposed Protection of Vaccination against Attack.

I have only one more point to make on the Royal Commission's statistics. It relates to the way in which they are produced for the purpose of the claim that vaccination diminishes the liability to attacks of small-pox.

The attack rate is arrived at by an estimate of the number who were ill, and the number who escaped being ill, in the "invaded" houses, but the information is avowedly incomplete. To refer to Warrington, again, I find Dr. Savill, who called attention to the difficulty of identifying the unvaccinated, saying that he could find no reason

for the remarkable difference in the attack rate in the two classes, unless the fact that vaccination protected the vaccinated persons from attack. But as we now know there *was* a reason in the fact commented upon by the Dissentient Commissioners, who say :—

> Of 57 unvaccinated children living in the invaded houses 22 were under one year, 13 were one month or under, and of these eight were attacked, and all of them died; these eight babes constituted one-third of the total unvaccinated deaths. The inclusion of such cases in the unvaccinated class raises the unvaccinated case mortality, while the vaccinated class is necessarily free from a similar contingent of young infants.

I find a good illustration of the futility of these calculations in par. 307 of the Final Report, where certain Leicester houses are divided into two groups, one of which is said to be more intensely infected than the other. The second group is made to present this contrast :—

Attack rate among the re-vaccinated...	...	16·1	per cent.
„ „ „ „ vaccinated ...	...	35·3	„ „
„ „ „ „ unvaccinated...	...	59·6	„ „

I thank the Commission for these figures. The worthlessness of the contrast I can easily show. In doing so, unfortunately, I feel that I am also destroying the value to me of the admission that re-vaccination did not save 16 per cent of the re-vaccinated from being attacked. I regret also to give up the confession that primary vaccination did not save 35 per cent. But everything must yield to my main purpose, which is to show the specious character of these statistics. Distrusting this plan of grouping the cases, I have combined the two groups to get the benefit of the large average—a safe principle in statistics—and I find that the result is to reduce the attack rate among the re-vaccinated from 16·1 to 5·2. The Commissioners do not provide me with material to judge how the other classes

will be affected by a similar grouping (they may in their appendices not yet issued), but the one discovery is enough for me. If the case for re-vaccination can be so given away by the medical experts of the Commissioners, I am not concerned to follow those particular figures any further.

So long as these medical statistics are characterised by the unscientific inexactitude of such comparisons, it is much safer to rely on broad general results, and these results as vouched for by the Dissentient Commissioners, are here stated:—

> It would appear therefore that whether as in the case of the London Small-pox Hospital we have regard to the ratio of vaccinated to unvaccinated persons attacked compared with the varying ratio of the vaccinated to unvaccinated in the population at large, or whether we consider the similar ratios in different towns where vaccination has been practised to varying degrees, we find that for the population at all ages the proportion of small-pox attacks on the two classes of vaccinated and unvaccinated respectively approximates closely to the proportion which the two classes bear to each other in the population generally.

...

Conclusion of the whole matter.

Resuming and completing the review broken off on page 29, of the positions I claim to have established, I add that—

Eighthly, and lastly, I have shown that vital errors in the statistical case for vaccination may and do arise from imperfect and inaccurate classifications, and particularly from the wrongful inclusion of severe and fatal cases in the unvaccinated class.

An Appeal for Good Statistics.

This brings me to the simple, but surely most important, object of my lengthened examination of the Royal Commission's statistical case. It is to appeal to the public, and especially to statesmen, to statisticians, and to my fellow

journalists, for their support of at least one demand of the anti-vaccinists. Bores or no bores, fanatics or no fanatics, cranks or no cranks, there is one challenge they are entitled to address to the upholder of a compulsory vaccination law; and they may address it with equal force to those who, like the Commission, are no longer upholders of a compulsory law, but are upholders of a further State endowment of vaccination. That question is why should exact figures and a correct classification not be available for the determination of the justice of this vaccination law?

It is impossible to reply that the facts cannot be more precisely ascertained. Under the compulsory law every vaccinated child can be accounted for. If a child is vaccinated, the certificate of vaccination is in the hands of the proper authorities; if he is not, the district registrar knows that the vaccination has been neglected. The neglect of the parents is ascertainable for the purpose of prosecutions; it should be equally provable for the purpose of statistics. But year after year the Registrar-General's Returns give us three columns after the deaths from small-pox. They are headed—"Vaccinated," "Unvaccinated," and "No Statement." We might as well have no information at all. As Dr. Creighton says in his much-discussed "Encyclopædia Britannica" article on "Vaccination":—"These figures may prove anything according to the bias of the individual. The column of 'not stated' commands the situation." In the case of adults dying from small-pox the difficulty of ascertaining the truth about vaccination is intelligible; but in the case of children born in these days of compulsory vaccination the "not stated" column is a serious reflection on the Registrar-General's Returns. Had Mr. Humphreys come to the Royal Statistical Society to claim for his Department their aid and that of the public in obtaining really trustworthy statistics, he would have done far more justice to his honourable position in that Depart-

ment than he did by simply reprinting conclusions from the fallacious table of the Royal Commissioners with which I dealt at the outset of this inquiry.

Which Side is most Disinterested?

I want to ask, further, why anti-vaccinists should have to contend against so much prejudice in making a demand so reasonable as this? It behoves the public to remember that the anti-vaccinists are the most disinterested parties in this controversy. With the exception of those among them who are in the sad position of having lost their children, or had them seriously injured by vaccination, they have had nothing to gain in this discussion but obloquy. But about £100,000 a year is paid out of national and local funds for the maintenance of vaccination. This is apart from the cost of the administration of the Vaccination Acts by the Local Government Board, the amount of which the Commissioners tell us cannot be accurately stated. The proposal of the Royal Commission is to endow vaccination still further by entitling every duly qualified medical man who vaccinates a child to claim the fee which is now paid only to the public vaccinator (Report, par. 530). The credit of the profession is already deeply involved in the maintenance of vaccination. Mr. Malcolm Morris's article (alluded to on page 30) shows how deeply some doctors resent the very qualified approval given by the Royal Commission to vaccination. Doctors follow a noble profession. Still, they are but human after all. Will their impartiality in this controversy be secured when they know that to question the efficacy of vaccination is not only to relinquish their own fees—for about them no honourable man would hesitate—but to imperil the earnings of their professional brethren? That is and would be their position. What is that of the anti-vaccinists? Let a noble member of the

medical profession say—a man of eminence, who has not scrupled to face the moral consequences of a frank expression of opinion on this subject—an opinion to which he was led in the course of an honest examination of the facts for the purpose of his "Encyclopædia Britannica" article, and an opinion to which he was led in spite of all the previous bias of a medical education in favour of vaccination as a matter of course. This is what Dr. Creighton said in his book on Jenner and Vaccination:—

> The anti-vaccinists are those who have found some motive for scrutinising the evidence, generally the very human motive of vaccinal injuries or fatalities in their own families, or in those of their neighbours. Whatever their motive they have scrutinised the evidence to some purpose; they have mastered nearly the whole case; they have knocked the bottom out of a grotesque superstition.

Is there no Debt of Justice to Pay?

Dr. Creighton says these are the anti-vaccinists. It may have been so when he wrote, but now (thanks partly to himself for opening our eyes to the points requiring consideration in this controversy) they are a much larger and, as I have argued, a more impartial body. But I seize upon this disinterested and generous testimony of a medical man to ask, in my concluding sentences: Is there no debt of justice due to the anti-vaccinists? The Report of the Royal Commission is, after all, a striking vindication of their work in the past. Next to its intrinsic justice and reasonableness, nothing should more strongly commend the acceptance of the demand I have taken it upon myself to make for the anti-vaccinists than the testimony which this Royal Commission Report bears to the wisdom and acuteness of their previous criticisms of the case for vaccination. I am free to say this, being but a recent sympathiser with their opinions; and a sympathiser, first and mainly, because of

my discovery that they have been, and still are, in too many quarters refused that which is so rarely refused in this free country—a patient and unprejudiced hearing. Is it they who should have to plead for a hearing, or is it their opponents? How is it that the public are so slow to perceive that from Jenner's day till now the case for vaccination has been constantly shrinking under their patient, long-suffering, courageous resistance? Talk of revising our opinions on the law of gravitation! Or of leaving our consciences in the hands of medical experts while anti-vaccinists are still prosecuted, fined, and even sent to prison, because their consciences are not so easily disposed of! The law of vaccination (except, unfortunately, the compulsory law) is under incessant revision to meet the difficulties of its advocates, who have been ever in retreat from their original position. Jenner's original claim was:—

> What renders the cow-pox virus so extremely singular is that the person who has been thus affected is for ever after secure from the infection of the small-pox; neither exposure to the variolous effluvia nor the insertion of the matter into the skin producing this malady.

The story of the decline and abatement of this claim may be read in the Dissent of Dr. Collins and Mr. Picton; and everybody knows that the most that is now claimed for vaccination by its advocates is a doubtful efficacy of a few years standing. Failure and excuse for failure is the history of the supposed prophylactic. Sometimes it is the lymph, sometimes the lancet that is blamed. In recent times the number of scars made by the lancet and their characteristics have been critically regarded. Upon this the Dissentient Commissioners make the pertinent remark:—

> Attention is called in section 293 of our colleagues' report to the results of some 20,000 cases of small-pox when classified according to the number of marks they exhibited. It must be borne in mind that these cases must be regarded as 20,000 failures of the protective properties of vaccination as originally proclaimed.

This is so; why should not the hypothesis of total failure of the prophylactic be as open to discussion as the number and nature of the marks? In other blood-poisons, such as that of the snake or the mad dog, we are content enough to assume that the constitutional effect is incommensurate with the local results. Why not in the case of the vaccine poison?

Dangers of Vaccination.

The last and the most serious retreat that has been forced upon the upholders of vaccination gives to the demand I have made on behalf of the anti-vaccinists a claim to consideration which ought to be absolutely irresistible. It is no longer denied, even by the majority of the Commission, that serious evils, and even death, attend vaccination. The Registrar-General's Returns had already proved that, and now the Commissioners while veiling and palliating the mischief as much as possible cannot avoid admitting that "some of the dangers said to attend vaccination are undoubtedly real and not inconsiderable in gross amount." One horrible species of injury used to be alleged against vaccination, and the charge was publicly stated by the Local Government Board to be "disproved by all medical experience"; but such injury is now by the Royal Commission acknowledged to have been communicated in vaccination. It is only in the Dissent of Dr. Collins and Mr. Picton that an adequate idea of the dangers revealed to the Commission is presented; and this is precisely one of the subjects that demands further discussion. In particular the public, instead of allowing themselves to be encouraged to turn a deaf ear to anti-vaccinists, will, I hope, endorse their demand for a thorough and impartial investigation of one theory which has been propounded to explain the danger which the public has most dreaded from vaccination—the danger now admitted *not* to have been

"disproved by all medical experience." That theory is that the inherent (although mostly latent) properties of vaccine lymph are more akin to those of another loathsome disease than they are to small-pox, and that consequently the lymph disease, harmless as it may be in thousands of cases, here and there finds mysteriously in some infant's body a medium in which to develop the phenomenon of reversion, and so to break out in that odious virulence which has so justly prejudiced the poor against the process of vaccination. Can the public possibly hear of this ghastly suggestion, put forth recently for the second time in Creighton's History of Epidemics in Great Britain, with all the responsibility attaching to such a statement by a professional man, without demanding that before a single prosecution is ever again sanctioned, the truth or error of that theory shall be determined?

Enough has been said to show that the issues raised by the Royal Commission on Vaccination cannot rest where they have left them. Whatever may be thought of my presentation of these issues I have endeavoured to present them fairly. I hope it may be cordially conceded to me that I have at least made out a case for the final abandonment of the attitude of suspicion and reserve towards the anti-vaccinist, and for more scientific methods in collecting and studying the statistics of small-pox and vaccination.

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