Statistical notes on small-pox, vaccination and inoculation in India / by J.R. Bedford.

STATISTICAL

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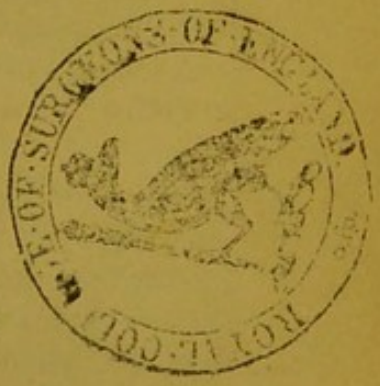

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[From the "Indian Annals of Medical Science." No. I.]

CALCUTTA:

PRINTED AT BISHOP'S COLLEGE PRESS.

1853.

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Foremost amongst the considerations of the sanitary philosopher, when desirous to make a practical application of his science to a people whose social habitudes are ill understood, must be the probable relation between them and the improved ones he desires to introduce or extend. With the view of elucidating some of these obscure conditions, I have, as occasion offered, collected a few facts bearing upon the present state of small-pox, vaccination and inoculation* in Bengal, which I venture to hope may throw some light upon the deeply interesting question of Public Health involved in their consideration, a subject attracting at the present time so much benevolent attention from Government.

An accurate investigation into the present circumstances of the population becomes even more imperative, when humane and intelligent men are to be found advocating such legislative arrangements as may render inoculation penal.

Of all modern sanitary measures those which provide for the prevention or mitigation of small-pox stand prominently forward in surpassing value. Their results are not tested by a slow diminution of the rate of mortality, which, satisfactory though it be, will sometimes admit of doubt, or at all events discussion, as to its originating cause, but exhibit within a few years after their adoption such a saving of life as must at once convince the most sceptical. We are not in possession of accurate statistics of the mortality from small-pox,

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* I employ the term "inoculation" throughout this paper, to signify inoculation with small-pox matter.

previous to the introduction of inoculation into England, in 1715, but the approximate calculations which have been made, and the records of the time, sufficiently prove the loss of life to have been enormous. In his recent work on Public Health, Dr. Chevers says, "the generality of readers are aware of the fearful destruction of life from small-pox, which prevailed antecedent to the introduction of variolous inoculation. The researches of Casper tend to shew that this scourge formerly swept away one-tenth portion of the human race. Duvillard has found: 1st, that in the natural state of 100 individuals of 30 years of age, scarcely four individuals escaped an attack of small-pox; 2nd, that two-thirds of all infants were attacked by it sooner or later; 3rd, that small-pox in the early years after birth, destroyed on an average one out of every three who were attacked by it; 4th, that one died out of every seven or eight affected, at whatever age it be."

"It is stated on the authority of the Spanish historians, that in a very short time after the infection reached Mexico, three millions and a half of people were destroyed by it in that kingdom alone."* Again Dr. Bascombe in his work on epidemic pestilences, speaking of those existing in the year A. D. 1613, informs us "the most deadly small-pox laid waste Crete, Alexandria, Calabria, Turkey, Italy, Dalmatia, Venice, Germany, France, Poland, Flanders, Persia and Asia; it prevailed also with great severity in England. The mortality from the natural small-pox at that period equalled in fatality the plague in its worst form."

Such illustrations of the intense mortality of small-pox, previous to the introduction of inoculation and vaccination, might be multiplied to any extent, but the above are sufficient for the purpose. What on the other hand is the present state of things, even under the imperfect application of sanitary measures? The following extract from the recent speech of Lord Lyttelton, in moving the House of Commons to go into committee on the vaccination extension bill, affords the most recent, perfect, and satisfactory answer I have yet met with:—

"The average of deaths from small-pox out of every 1,000 deaths from all causes, within the bills of mortality, were in the 10 years preceding 1760, 100; 1770, 108; 1780, 98; 1790, 87; 1800, 88; 1810, 64; 1820, 42; 1830, 32; 1840, 23; 1850, 16. In Chelsea Royal Military Asylum, in 48

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* *Cyclopædia of Practical Medicine*, Vol. iii, p. 736.

years, on an aggregate strength of 31,705, not one death had occurred from small-pox after vaccination, and only four from second attacks of unvaccinated persons. In Ahmedabad, in Bombay, where vaccination was introduced in 1817, it became general in 1824, and small-pox had since been unheard of. In Hanover, in 1847, of 45,830 deaths, there were only eight from small-pox. In Denmark at one period small-pox had entirely disappeared, so universal was the practice of vaccination. England and France were now the only countries in Europe in which vaccination was not compulsory. In some countries, as Hanover, Bavaria, and Sweden, the law was directly compulsory, by pecuniary penalties, which was the plan he proposed in the present bill. In Austria, Belgium, Sardinia, Prussia, and other countries vaccination was made indirectly compulsory by various means; and in Prussia no one was allowed to be married who could not show that he had been vaccinated. In Ireland, where the greatest ignorance and prejudice might be supposed to prevail on the subject, no less than 58,000 persons had died from small-pox in the 10 years ending 1841; and in subsequent years, he believed, the state of matters was not much improved. In Connaught, which might be considered the part of Ireland where vaccination was most likely to be neglected, the number of deaths during the ten years ending 1841 was 60 in 1,000; in Lombardy, there were 1½ in 1,000, or 3 deaths in 2,000: these were the two extremes. The average number of deaths in England and Wales, during eight years was nearly 22 in 1,000; whereas, in a long list of countries in which vaccination was compulsory, it ranged from 8 in 1,000 in Saxony to the 1½ in Lombardy, and the average was not quite five. These facts, showed that in this country the mortality from small-pox was more than four times as much as it was upon the Continent."

These great results then are the legitimate consequences of scientifically devised, and judiciously, though as yet, in England and America, imperfectly carried out sanitary measures, and should serve as the most stimulating encouragement to India to ward off, by a similar course of action, the recurrence of such destructive visitations of small-pox as occurred in 1849-50. Amongst other means for effecting this desirable object, proposed by the late small-pox commission, was the suppression of inoculation by legal enactment —a proceeding the propriety of which has been almost universally assented to in Europe: The commissioners based this recommendation on the ground that the Native Ticcadars kept

the disease in existence. Before proceeding to legislate on so wide a scale however, the Government naturally desired to be well informed as to its propriety, and with this view sought the opinion of its magisterial officers. From the absence of all rumour of projected legal measures on the subject, it must be concluded that the majority were opposed to any such proceeding, although, with very few exceptions, the medical men consulted by the commission had reported in favor of it.

If Government were called upon to enact a sanitary law for a nation utterly unprotected by any prophylactic against small-pox, it is not to be doubted for a moment that vaccination should be selected to the utter exclusion of inoculation; but when, as it will be seen hereafter, so very large a proportion of the population is already protected by the latter, we may judiciously hesitate ere such legislation be recommended.

In this view of the question we must be guided by data shewing the proportion of protected to unprotected in the population, which the following table will in some measure afford:—

TABLE A.

Exhibiting the Comparative Proportion of the Population protected by Vaccination and Inoculation in different parts of Bengal.

1. Year of observation.	2. Name of observer.	3. Class under observation.	4. Number under observation.	5. Number Inoculated.	6 Rates per cent. of inoculated to population.	7. Number vaccinated.	8. Number unprotected.	9. Number who have had natural small-pox.	10. Number who have had small-pox after inoculation.	11. Number who have had small-pox after vaccination.	12. Number of friends known to have died after inoculation.
1848	Dr. Bedford,....	1. Prisoners in Chittagong Jail,....	1,000	871	87.1	2	36	91	3	1	7
1852	"	2. Population of Rampore Bauleah,	28,135	22,867	81.2	1,813	3,109	193			
1848	"	3. Patients at Chittagong Dispensary,	2,500	2,173	86.9	34	193				
1850	Dr. Wilson, ...	4. Prisoners in Bauleah Jail, ...	730	632	86.5	1	47	50			
	"	5. Chowkeydars in Bauleah, ...	47	43	91.4	0	0	4			
	"	6. Coolies in ditto, ...	174	146	83.9	8	9	11			
	"	7. School boys in ditto, ...	70	59	84.2	2	8	3			
	"	8. Coolies in Suburbs of Ditto, ...	162	90	55.5	67	3	2			
1850	Dr. Wise, ...	9. Prisoners in Dacca Jail,.....	785	729	91.5		27	29			
	"	10. Patients in Insane Hospital ditto,	208	157	75.4		45	6			
			33,811	27,767	82.12	1,927	3,577	389	3	1	7

* Dr. Wise in his letter to Small-pox Commissioners, from which these figures are obtained, makes no distinction between those protected by inoculation and vaccination. I am therefore compelled to assume the almost exclusive prevalence of the former, in accordance with the circumstances exhibited in the Bauleah and Chittagong Jails.

As Indian statistics must in every case be received with caution, and as the data exhibited above will be referred to and made the basis of practical recommendations, it is desirable to analyse their value.

The first point which strikes the eye is the close agreement in the "ratio per cent. of inoculated to population" (Column 6), exhibited by the first seven "classes under observation." As these results are obtained from seven separate inquiries by two observers, their close similarity establishes a strong claim to confidence. The fact of inoculation is at once made patent to the observer by the large and well-marked cicatrix upon the fore-arm, so that inspection alone, where deceit cannot be practised, is sufficient to obtain precise information. The variation from the average exhibited by Class 8. "Coolies in the suburbs of Bauleah," is to be accounted for by the large proportionate number of vaccinations amongst them, which results from their poverty, and the fact of their residence being in proximity to the Government Vaccinators. The number under Classes 1 and 4, which almost entirely consist of people in the interior, demonstrate the entire absence of vaccination in the rural districts.

Altogether I think we may rest satisfied that the table exhibits a very close approximation to the truth.

The totals of the above table exhibit the general ratio per cent. as under :

Inoculated to population	82.12	per	cent.
Vaccinated to	5.6	„	
Unprotected to	10.57	„	

The above figure expressing the general ratio of "inoculated to population," is diminished by the comparatively large number of vaccinated in the vicinity of the Sudder Station of Bauleah. Judging by the special ratios of the jails exhibited in the table, 85 per cent., would probably more nearly express the proportion of inoculated to population in the interior of the country where vaccination is unknown.

The classes under observation in the above table speak for themselves. Of No. 2, "The Population of Rampore Bauleah," however, I may remark, that the relative numbers of inoculated, vaccinated, and unprotected comprised in it, were carefully obtained in connection with a census of the town, made under my special supervision in the early part of the present year.

The figures shew an immense preponderance of inoculated over vaccinated persons, whilst the proportion of unprotected is small.

It is difficult to form a comparison of the last-named condition as existing in Bengal and England, as I can find no data exhibiting the proportion of vaccinated to unprotected in the latter; but, according to the following table quoted by Mr. Grainger, at a meeting of the Royal Medical and Chirurgical Society, March 9, 1852,* the English would appear to shew a decidedly greater apathy in availing themselves of protective measures, than the inhabitants of Bengal:—

TABLE B.

Evidence of great neglect of Vaccination, as shown by the number of Vaccinations under one year of age, and the number of births, for 1851, *in England.*

	Vaccinations.	Births.	Per centage of Vaccinations.
In 13 unions in London, ...	4,641	21,598	21.
In 31 unions in the country, ..	706	7,674	9.2
Teesdale, ...	70	593	11.8
East Stonehouse, ...	1	438	..
Bideford, ...	22	567	3.8
Welwyn, ...	4	84	4.7
Hitchin, ...	85	905	9.4
Northleach, ...	4	339	1.1
Loughborough,.	61	968	6.3
Camelford, ...	1	388	..
Redruth, ...	378	1,925	19.
Kettering, ...	12	644	1.8
Cardigan, ...	34	531	6.4
Samford, ...	2	447	..
Ipswich, (1850)	56	1,153	4.9
Thingor, (1850)	10	586	1.7
Arundel, ...	0	73	..

Now, inasmuch as Mr. Grainger's table only exhibits the proportion of vaccination to population under one year of age, it may be supposed that such a preference exists for performing the operation at a more advanced period of life as to make up for the early neglect; but this supposition is negatived by the facts contained below, quoted by Dr. Chevers from the Reports of Poor Law Commissioners.†

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* *Lancet*, March 20, 1852.
† *Chevers on Public Health*, p. 261.

Table C.

*Exhibiting the Total Number of Vaccinations compared with the number of Children, born in certain Unions and Parishes of England.**

	Unions and Parishes.	Children.	Vaccinations.	Unsuccessful.
1844	542	412,891	290,453	12,261
1845	580	486,632	362,087	14,322
1847	621	..	267,895	20,133
1848	626	..	389,367	15,135

In connection with this Dr. Chevers says:—

"We find, then, that notwithstanding the large and rapid increase of population, which is known to have taken place within the intermediate period, the vaccinations in 1847 were, 22,558, (or, making allowance for an excess of unsuccessful cases, 30,420,) fewer than they were in 1844! In 1848, an improvement is visible; still, when we consider that the births in that year were about five hundred thousand, the numbers given do not appear to represent that extension of vaccination which the Public Health demands. Indeed, we learn from a report to the Poor Law Commissioners, that taking 627 unions and parishes in England and Wales, in the year ending September, 1848, the number of persons under one year who were vaccinated, exclusive of those vaccinated at the cost of their parents, amounted to no more than 33 per cent, of the total births registered in the same period."

The proportions of vaccinations to births noted in Mr. Grainger's Table B., is in some cases incredibly small, for according to the contained figures, it would appear that whilst the ratio per cent. of protected amongst the one year old population of the year 1851, did not rise any where above 21 per cent., in some towns it fell as low as 1·1. The table quoted by Dr. Chevers affords a more favourable view, because as it has been said, I presume the "vaccinated" comprehend all ages, and these being only compared with the "children born" afford a larger figure than had they been put side by side with the total population. Even taking the most favourable of these statistical returns however, the ratio of protected to the

* It does not clearly appear whether the "vaccinated" in this Table mean those of all ages, or only those under one year of age; but, as the proportion of "vaccinated" to "children born" amounts to about 70 per cent., whilst the subsequent context speaks of the proportion between vaccinations under one year and births as being in the proportion of 33 per cent. of the former to the latter, I apprehended it must do so.

newly-born does not exceed 70 per cent., whilst as I have shewn in Bengal it amounts at least in relation to the whole number living to 85.0. Taking the mental characteristics of the two nations into account, this circumstance is most remarkable, and can only be accounted for by the fact that the native inoculators of Bengal perambulate the country carrying the virus to every man's door, whilst in England the obligation of seeking for protection lies with the recipient. In my inquiries connected with the census of Rampore Bauleah, I was unable to ascertain the particular class who constituted the unprotected 15 per cent. of the population, with the exception of the Itsha families,* who formed but a small fraction, the total strength of their members being only 153. The remainder must have consisted of young children and adults, who from poverty or apathy had never undergone the operation.

This large amount of protection by inoculation is however apparently limited to Bengal, as we find the medical officers of the most important districts of the North-West Provinces, in their letters to the Small-Pox Commission, denying the existence of the operation amongst them. For example Dr. Kirk says:

"In reply to your letter of the 18th instant last, I have the honor to acquaint you that in the Bareilly district there is no such thing as inoculation practised, and scarcely is it known, except as a hearsay, with the exception of some tribes who inhabit the Turaie, who have scarcely any communication with the rest of the world."

Baboo Dhurm Doss, Sub-Assist. Surgeon, Agra Dispensary, replies "Inoculation is not practised in the Upper Provinces." Dr. Ross again, "Inoculation for small-pox is not practised in the Delhi territory. The Hindoo inhabitants content themselves with making a pilgrimage to a celebrated shrine of the goddess Situla."

It does not appear however, that this absence of a prepossession in favor of inoculation leads to any desire for, or confidence in, vaccination, the cause of which apathy probably resides in the belief of the people, as mentioned by Dr. Ross of Delhi, "that it would be an unpardonable sin to interfere with the operations of the Almighty."

A widely different state of things exists amongst the inhabitants of all the hilly regions, who are unbiassed either way, but gladly accept whatever may be offered them as a protection

* Families systematically refusing both inoculation and vaccination.

against their greatest scourge—Small-Pox. The Report of the Small-Pox Commissioners contains no evidence of this, but the experience of every officer who has served in the vicinity of the hill tribes will supply the necessary verification. When I was in charge of Goalparra, Assam, in 1843, the Garrows came in spontaneously, and in great numbers for vaccination. The numbers operated upon in the districts around Simla, within the last twelve months, have been very large indeed. That the mountaineers, widely dissimilar from the people of the plains in the primitive character of their habits, and freedom from caste and superstitious prejudices, should readily yield assent to whatever protective measure may be proposed, is not to be wondered at; but that the inhabitants of Bengal should exhibit less apathy and superstition than those of the North-West Provinces is certainly a source of surprise, when we consider the bigotry of character and narrowness of view which is usually attributed to them.

Practically however this great difference of habit and prepossession should exercise an important influence upon any legislative sanitary measure which may eventually be adopted, The discussion of this point may conveniently be postponed until the close of the paper.

Small-Pox which prevails in a severely epidemic form only at intervals of years, will probably be found to exist sporadically throughout India without intermission.

It becomes therefore a point of no little interest to ascertain whether such sporadic attacks be due to contagious or spontaneous origin. We read in the *Cyclopædia* of *Practical Medicine*, Vol. 3, page 743, "It cannot indeed be denied that great difficulties are experienced in tracing the source of contagion in numberless cases, and that the doctrine of spontaneous origin admits of being supported by some ingenious and plausible arguments, but the weight of evidence is decidedly in favour of the invariable origin of small-pox by contagion."

Statistical data bearing upon so intricate a question are difficult, if not impossible to obtain in any number. I find two pretty well marked cases of apparently spontaneous origin of the disease in my notes, which I may venture to quote. The first is mentioned by Dr. Webster at a meeting of the Royal Medical and Chirurgical Society, January 28, 1845, in these words:—

"In March last, one of the criminal lunatics confined in Bethlehem Hospital, was attacked with symptoms of variola, but having been previously vaccinated, the disease assumed a mild form. One or two other inmates were then

affected, and the complaint subsequently extended to the other wards. Of the patients attacked, unfortunately one had never been vaccinated. In this case, the disease assumed a most virulent form, and terminated fatally in a few days. This was the only death met with; and although five or six other instances occurred, despite the strictest surveillance and seclusion of the patients, the malady did not spread farther, which would have been a most serious matter in an Institution like Bethlehem Hospital, having a population of about 700, including the lunatics and the residents of the house of occupation. *How the small-pox was first introduced into the criminal wing*, it is difficult to determine; for, although every inquiry was made, it was impossible to trace its origin. The person first attacked had held no communication with any individual beyond the walls of his own division of the establishment, excepting by a letter he received from a distant part of country; but this could not have produced the disease. It is, however, right to mention, that small-pox then prevailed at a little distance from the hospital, in South Lambeth, and, as westerly winds prevailed much at the time, perhaps the infection might have been wafted in this way to the prisoner."

The other case occurred under my own observation during the present year, and is thus entered in my note-book:—

"A man named Bothon, inhabitant of Mohella Goalpara, aged 30, presents himself with a severe attack of small-pox, almost confluent. He has been vaccinated twice without effect. He is a cooly, has been employed during last month in cutting bamboos in Mohella Hatumkhan, and is unconscious of having been in the vicinity of any inoculated person. No deaths from small-pox in town mortality returns during the month."

Now the evidence in favor of small-pox having spontaneously originated in the person of Bothon, is tolerably conclusive. First, we have his own declaration of ignorance as to having been exposed in any way to contagion. Secondly, the non-existence of small-pox in any part of the town, but one, a considerable distance from his own residence, and which I ascertained from inquiry he had not visited; and, thirdly, the absence of all deaths from small-pox during the whole month of April in the town mortality records, which are made up every 24 hours. The value of the second point of evidence depends upon the fact that my vaccinators and the Mohella Chowkeydars have standing orders to report the existence of small-pox, or the presence

of inoculators in the town—circumstances towards which my own attention is also constantly directed.

This apparently spontaneous attack of small-pox, in the person of Bothon, is calculated to throw some light upon the incubation periods of the disease, inasmuch as he communicated it to several others, as my notes thus continue to describe:—

"The man Bothon above adverted to as having been seen with full developed small-pox on 19th of April, had five children, two of whom had been vaccinated, and three were unprotected. Of these three, two were attacked with the disease on the 3rd of May, 1853, and recovered, whilst the youngest child, aged six months, escaped. During the existence of small-pox in this family, they were visited by a man named Punchoo Mathor, living in Cossyepara, who was also attacked with the disease on the 9th of May. Roopchand, aged nine, living in the neighbourhood of Bothon was also attacked on the 3rd of May.

Punchoo above mentioned does not practise inoculation or vaccination in his family. He died in about eight days, and in ten days after his death, his wife was delivered of a child, and on the same day exhibited the disease. She died in fourteen days. Her infant was covered with eruption in about twelve days, and died in eight days, another child aged about seven, was affected simultaneously with the mother, and escaped."

The accuracy of these facts is borne out by the dates of death of the two last-named, being found recorded in the Town mortality returns at periods corresponding with the information I had received on inquiry at their residence.

The spontaneous origin of small-pox in this country receives also additional proof from its frequent occurrence in the Upper Provinces, where inoculation, according to the authorities I have before quoted, does not prevail. Upon this subject, Baboo Dhurmo Dass Bose, Sub-Assistant Surgeon, Agra, says in his letter to the Small-Pox Commissioners, "Moreover when we see that the constant practice of small-pox inoculation, which may be reasonably taken as one of the leading causes of small-pox visitation, does not hold good here, yet although this practice is quite unknown, still it rages epidemically every year, and sometimes with very great violence."

Again Dr. Murray, writing from the same place, informs us—"I have the honor to state, 1st, that there has not been any extensive attack of small-pox at Agra since my

arrival in May, 1848. There have been a few cases during the cold season, but they disappeared as the hot season advanced. Inoculation is not publicly practised here. The mortality last year in the city of Agra from small-pox, was 59 Hindoos and 16 Mussulmans, and up to the 17th April this year, 14 Hindoos and 6 Mussulmans. There are no ticcadars at work at Agra."

Going back for further evidence on this subject to the "Report on Small-Pox in Calcutta, 1844," we find the following: "Mr. McLean writes that small-pox prevails annually in the months of March, April, and May; that by far the greater number of persons attacked are under 10 years of age; that of these nearly one-third perish; that the disease is more fatal to adults; that inoculation is unknown." Speaking of the Report of the Superintending Surgeon at Cawnpoor, in March, 1830, it continues:—He mentions a remarkable circumstance, small-pox inoculation is either unknown, or not at all practised in Allahabad."

I think that further extracts are unnecessary to prove that small-pox is constantly to be found in the Upper Provinces of India, irrespective of inoculation. This being granted, the question is narrowed to a consideration as to whether the annual origin of the disease, (for it would appear to die away entirely in the hot season), be due to spontaneous development, or contagion communicated by travellers from Bengal. Before this problem can be solved, we must be in possession of mortality returns from all the large cities, which will serve to elucidate the causes of individual deaths, and point out the particular times at which epidemics begin their ravages. It is very much to be regretted that the wish expressed by the late Small-Pox Commissioners in their circular letters to Civil Surgeons, to trace the rise, course, and progress of the epidemic, which appears to have spread very widely over all the villages and provinces of Bengal, was not more clearly responded to. As far as can be elicited from the officers whose replies appear in the Report, the severe epidemic of 1849-50 did not extend beyond Bhagulpoor in the North, and was less severe in the Western than in the Eastern parts of Bengal.

The success of vaccination in its relation to season, is an interesting topic of inquiry. In this respect it has been asserted to obey the laws which govern variola. The latter is shewn by the following table from the Report of the Small-Pox Commissioners, page 24, to attain in India the maximum of destructive power in the months of March and April.

Table D.

Shewing the total Monthly Mortality by Small-Pox during 18 *successive years, from* 1*st May,* 1832, *to* 1*st May,* 1850, *in Calcutta.*

November, ..	120	March,....	3689	July, ...	551
December, ..	512	April, ,....	2846	August, ...	189
January, ...	1316	May, ...	1419	September, ..	181
February,....	2372	June, ...	761	October, ...	134

From this it would appear that it is not the coldest season which is most favourable to the development of small-pox, but the intermediate one, comprising the months of March and April, and when the mean Temperature of the 24 hours amounts respectively to 82. and 86. in the shade in Bengal. It would be interesting to compare this fact with what obtains in Europe, where it is understood that small-pox exhibits no peculiar Meteorological relations, and to ascertain whether the Isothermal zone of Bengal is distinguished by like peculiarities. The reports of the Registrar-General of England, however, are unfortunately not sufficiently explicit upon this point, and we are as yet in ignorance as to the full influence exercised by climate. If vaccinia in this country, obey the same law as variola, we ought to find the proportion of the "successfully vaccinated" greatest in March and April. Let us test this by the "Table Shewing the State of Vaccination at several stations of the Upper and Lower Provinces of the Bengal Presidency for 1839,-1848," to be found at p. 11 of the Appendix to Report of Small-Pox Commissioners in 1850.

It will be sufficient for the purpose to ascertain the rates per cent. of successful vaccinations for the months of January, March, July, and October, of each of the contained years, but with the view of avoiding fallacies from the greatest differences of climate, it will be well to divide the stations under inquiry into groups.

Table E.

Table shewing the Comparative Ratio per cent. of Successful Vaccinations during four selected months in the Lower, Upper, and Hill Provinces of the Bengal Presidency, based on six years' observations.

Lower Provinces.

Stations.		Bauleah.		Kishnagur.		Midnapore.		Moorshedabad.		Grand Total.		Ratio of Successful Vaccinations per cent.
		Total Vaccinated.	Number Successful.	Total Vaccinated.	Number Successful.	Total Vaccinated.	Number Successful.	Total Vaccinated.	Number Successful.	Vaccinated.	Successful.	
January,	1840	172	95	47	40	62	60	441	410	4163	3744	89.6
	1842	142	117	49	44	484	467	317	266			
	1844	125	111	102	98	461	447	0	0			
	1845	96	94	0	0	64	37	366	326			
	1846	241	205	16	8	182	171	330	317			
	1847	68	55	15	8	70	64	323	304			
March,	1840	82	76	62	46	52	49	467	452	5611	5303	94.5
	1842	130	110	128	119	930	901	404	445			
	1844	95	85	235	221	407	400	372	348			
	1845	75	75	275	265	72	25	327	317			
	1846	217	217	161	139	154	147	353	338			
	1847	111	96	143	114	50	40	309	288			
July,	1840	40	35	21	14	31	0	147	111	3287	2832	86.1
	1842	50	30	33	25	530	505	253	198			
	1844	35	30	34	31	266	236	363	327			
	1845	39	33	24	17	202	182	297	287			
	1846	41	41	15	9	65	58	335	314			
	1847	56	49	44	14	53	0	313	296			
October,	1840	80	72	18	13	26	23	165	129	3600	2343	90.1
	1842	90	80	28	22	129	124	315	278			
	1844	40	40	13	10	None.		357	318			
	1845	65	62	17	10	163	152	302	288			
	1846	27	27	24	15	53	48	305	288			
	1847	39	36	57	34	0	0	287	274			

Upper Provinces.

Stations.		Allahabad.		Agra.		Delhi.		Benares.		Grand Total.		Ratio of Successful Vaccinations per cent.
		Total Vaccinated.	Number Successful.	Total Vaccinated.	Number Successful.	Total Vaccinated.	Number Successful.	Total Vaccinated.	Number Successful.	Vaccinated.	Successful.	
January,	1840	40	9	14	0	23	10	136	106	2854	2168	75.9
	1842	35	5	36	1	63	52	165	139			
	1844	25	23	29	0	242	177	308	251			
	1845	22	8	121	89	103	80	244	215			
	1846	34	6	97	64	219	180	251	229			
	1847	32	4	123	99	147	131	345	290			
March,	1840	44	21	13	2	25	11	128	71	3524	2611	74.0
	1842	41	11	48	21	238	199	266	222			
	1844	14	14	49	12	89	54	452	425			
	1845	23	15	44	18	79	59	443	395			
	1846	15	77	70	47	230	202	295	250			
	1847	40	20	129	99	217	181	322	255			
July,	1840	7	0	0	0	5	0	9	0	106	10	9.4
	1842	12	0	5	0	0	0	0	0			
	1844	2	0	0	0	0	0	0	0			
	1845	6	0	0	0	0	0	0	0			
	1846	15	3	0	0	0	0	0	0			
	1847	11	0	0	0	0	0	34	7			
October,	1840	13	0	0	0	8	0	61	0	229	7	3.0
	1842	13	0	0	0	0	0	7	0			
	1844	5	5	0	0	28	0	11	0			
	1845	5	0	0	0	13	0	10	0			
	1846	11	0	0	0	0	0	22	0			
	1847	18	0	0	0	4	2	0	0			

HILL PROVINCES.

								Simlah.				
January,	1840	..	..	..	..	..	..	471	351	3073	2301	74.8
	1842	..	..	..	..	..	..	301	161			
	1844	..	..	..	..	..	..	667	537			
	1845	..	..	..	..	..	..	399	340			
	1846	..	..	..	..	..	..	497	377			
	1847	..	..	..	..	..	..	738	535			
March,	1840	..	..	..	..	..	..	82	59	2455	1740	74.9
	1842	..	..	..	..	..	..	335	235			
	1844	..	..	..	..	..	..	494	369			
	1845	..	..	..	..	..	..	456	360			
	1846	..	..	..	..	..	..	342	179			
	1847	..	..	..	..	..	..	746	538			
July, ..	1840	..	..	..	..	..	..	64	30	2342	1698	72.5
	1842	..	..	..	..	..	..	701	515			
	1844	..	..	..	..	..	..	139	103			
	1845	..	..	..	..	..	..	327	251			
	1846	..	..	..	..	..	..	974	707			
	1847	..	..	..	..	..	..	137	92			
October,	1840	..	..	..	..	..	..	438	370	2414	1728	71.5
	1842	..	..	..	..	..	..	116	0			
	1844	..	..	..	..	..	..	531	433			
	1845	..	..	..	..	..	..	739	550			
	1846	..	..	..	..	..	..	288	195			
	1847	..	..	..	..	..	..	302	180			

Although no implicit trust can be placed in the returns of the native vaccinators, as to the proportion of successful cases, which under any circumstance must be modified by the surgery of the operation, yet as the error arising from such source must be pretty equal throughout the country and year, we may fairly regard the above table as an exposition of the proportion of success attained, according to season and place. It demonstrates, that whilst in Bengal the maximum occurs in the month most favourable to the spread of variola, the remaining seasons are by no means unfavourable; that in the Upper Provinces, whilst the results in January and March are inferior to those obtained in Bengal, the remainder of the year is marked by almost total failure, thus assimilating, as far as we know, to the habits of small-pox; and, finally, that in the Hill Provinces no great change takes place throughout the twelve months.

These arithmetical results may fairly, in connection with other experience, especially that obtained by Table D., lead to the deduction that, whereas in Bengal small-pox exists, and vaccination is successful in varying degrees throughout

the year, both disappear between the early part of May and November in the Upper Provinces, and thence we may draw the practical inference, that in the latter all effort to propagate the vaccine disease, must be in vain, and should cease in this interval.

Now, as it has been remarked of table C., the numerical returns of the native vaccinators cannot command much confidence, unless a certain harmony exist between those of different officials. All that a medical officer can do, is to see that the vaccine disease be kept up. My own mode of procedure is personally to inspect about one-tenth of the cases. I would of course be better to see all, but the distance at which many reside, together with the want of leisure, renders this impossible. As it is of some importance however to test the truth of these documents, I have computed the rates of successful vaccinations for such stations of the Gangetic Delta as appear in the Table at page 11 of the Appendix to the Report of Small-Pox Commissioners, together with the proportion obtaining in England.

Table F.

Exhibiting the Comparative Proportion of Successful Vaccinations in England and Bengal.

England.*

Year.	Unions & Parishes.	Total Vaccinated.	Total Unsuccessful.	Total Successful.	Grand Total.		Ratio of Successful Vaccinations per cent.
					Vaccinated.	Successful.	
1844	542	290453	12261	278192	1309802	1247951	95.2
1845	580	362087	14322	347765			
1847	621	267895	20133	247762			
1848	626	389367	15135	374232			

* *Report of Poor Law Commissioners.*

BENGAL.

Year.	Stations.	Total Vaccinated.	Total Unsuccessful.	Total Successful.	Grand Total.		Ratio of Successful Vaccinations per cent.
					Vaccinated.	Successful.	
1840	Bauleah,	2542	389	2153	29765	28008	94.0
	Kishnaghur,	1728	237	1491			
	Midnapore,	5578	58	5520			
to 1848	Moorsheda-bad.	19917	1073	18844			

The similarity of results here shown is not a little remarkable, especially in reference to the ascribed greater proclivity to small-pox in India than England. From this it would certainly appear that in a native of this country, the tendency to the development of vaccinia in the system was in accordance with what prevails in England, and, if as the preceding tables seem to prove, the laws of vaccinia clearly accord with those of variola, the susceptibility to small-pox should be the same. However true this may be of natives, however, the enquiries of the Commission would tend to shew, that in vaccinated Europeans the disease was very easily set up. In 30 cases of confluent small-pox under Dr. Macpherson at the General Hospital, Calcutta, in 1850, 25 had been vaccinated, and 20 proved fatal. This frightful mortatility and susceptibility to the disease amongst those supposed to be protected, is not to be accounted for, but well deserves a most searching enquiry. A supposition was hazarded that the particular epidemic miasm of the time was so severe, as by it to overcome and destroy vaccine influence. This however cannot be admitted without impugning the value of vaccinia to a most alarming degree.

Having thus endeavoured to satisfy ourselves as to the proportion of successful vaccinations in the Bengal Presidency, it may not be without interest to ascertain, what ratio they bear to the population generally.

TABLE G.

Exhibiting the Ratio of the Mean Annual Number of Vaccinations based on 17 Years' Observation to the Population of the Bengal and Agra Presidencies.

Years of Observation.	Population of Bengal and Agra Presidencies.*	Mean Annual Number of Vaccinations in Bengal and Agra Presidencies.†	Ratio of Annual Vaccinations per cent of Population.
1827 to 1843	69,710,000	38,295	·054

We unfortunately possess no data enabling us to determine the amount of protection conferred by vaccination in Bengal, and more especially whether it is less in degree than that obtained in England. This is the more to be regretted, because, correctly or not, a vague opinion agitates society, that 1st, the original stock of lymph has deteriorated in protective power, and 2nd, that the protective influence, even when of the most perfect kind, is inferior to that of Europe, and even if originally conferred in that quarter of the world, loses its efficacy in the vicinity of the Tropics. The former opinion is practically of little importance, inasmuch as through the excellent arrangements of the present Superintendent-General of Vaccination we can yearly refresh our stock from England, but the latter is fraught with evil, leading to a general want of confidence in, and possible neglect of the prophylactic. This distrust is due partly to the irregular results of the operation which sometimes present themselves, and partly to the occasional occurrence of small-pox immediately after and in consequence of apparent vaccination. The primary results of the operation which have sometimes proved fatal, are deserving of the deepest study. They range from the varioloid eruption followed by death, which occurred in Messrs. Brown and Turnell's cases in Assam, subsequent to vaccinating with matter only one or two removes from the cow, to tedious unhealthy sores in the situation of the punctures, leading sometimes to fatal sphacelus. Many interesting illustrations of these conditions will be found in a paper by Dr. Wilson, of Bauleah.‡

* *The Statistical Companion*, 1848, page 26.

† Report on Small-Pox in Calcutta, 1833-34, 1837-38, 1843-44, by Dr. Duncan Stewart, page 177.

‡ *The Indian Register of Medical Science*, Vol. 1, page 541.

This officer's explanation was, that the purest vaccinia became so deteriorated by the rainy season, as subsequently to produce variola in an European child, thus assuming that one disease became transformed into the other. Many of the cases which he cites of apparent vaccination being followed by true small-pox are certainly full of difficulty. In my own experience, I have seen nothing approaching to them, although during the last three years in which my particular attention has been directed to the subject, I have on several occasions vaccinated children of pure European blood from a native, with lymph which had passed through the ordeal of the rainy season, and obtained the most satisfactory and perfect results.

It may not be without interest to trace the progress of vaccinia under my own inspection during the last two years and half since I have been in Civil charge of Zillah Rajeshye.

Table H.

Shewing the number of Vaccinations and Progress of Vaccinia in Rampore Bauleah from January, 1851, *to June,* 1853.

Year.	Month.	Number Vaccinated.	Number Successful.	Number Unsuccessful.	Number Doubtful.	Remarks.
1851	January, ..	66	55	11	0	On my arrival at Rampore Bauleah in January, 1851, I found vaccinia in existence. Throughout April and May the vaccinator was employed in a Temporary Cholera Hospital, and the vaccine disease lapsed in consequence. Towards the end of June, some crusts obtained in March were made use of to restore it, but without effect. In July crusts and glasses were sent from Calcutta, but failed to reproduce the disease. In August crusts were obtained from Moorshedabad, and proved successful. In September the disease was again lost, but again renewed in October by crusts from Moorshedabad.
„	February,	74	65	6	3	
„	March, ..	74	58	16	0	
„	April, ..	0	0	0	0	
„	May, ..	0	0	0	0	
„	June, ..	6	0	6	0	
„	July, ..	7	0	6	1	
„	August, ..	10	4	3	3	
„	September,	7	0	7	0	
„	October, ..	7	2	5	0	
„	November,	40	32	3	5	
„	December,	48	43	2	3	

Year.	Months.	Number Vaccinated.	Number Successful.	Number Unsuccessful.	Number Doubtful.	Remarks.
1852	January,..	86	80	4	2	From October, 1851, up to August of this year vaccinia continued, but towards the close of the month disappeared. On 1st September the vaccinator was despatched with a child to Berhampore, who returned on the 15th with a very fine crop of vesicles, which supply has furnished us with lymph up to present date.
„	February,	149	124	8	17	
„	March, ..	277	258	6	13	
„	April, ..	112	66	4	42	
„	May, ..	55	50	3	2	
„	June, ..	42	39	3	0	
„	July, ..	33	2	29	2	
„	August, ..	24	18	3	3	
„	September,	37	34	1	2	
„	October, ..	49	48	1	0	
„	November,	136	131	5	0	
„	December,	314	304	0	10	
1853	January,..	182	180	2	0	A large number of these unsuccessful cases in February occurred in the practice of a native doctor, with one of the "Survey Camps" in the interior of the district, whose vaccine returns were incorporated with my own.
„	February,	257	194	63	0	
„	March, ..	234	233	1	0	
„	April, ..	123	123	0	0	
„	May, ..	66	65	1	0	
„	June, ..	123	123	0	0	

As I make a point of inspecting about 10 per cent. of the cases, I have perfect confidence in the continued perfection of the vaccine disease whose progress is thus shown, and tolerable faith in the numbers exhibited. The numerical falling off in the hot and rainy season is partly to be attributed to the greater difficulties in moving about the town at those times. The fact of vaccinia continuing unimpaired during the rains is well illustrated in the success attending the despatch of the child to Moorshedabad (distant 30 miles) in September, 1852, to renew my stock of lymph. She travelled partly in boat, by cart, and on foot, thus exhibiting the successful development of the vaccine disease, in spite of the most detrimental circumstances at a commonly supposed unfavourable season.

Now although the number of vaccinations is small, I think the above table may satisfy us, that vaccinia can continue in Bengal unimpaired throughout the hot weather and rains —that it by no means necessarily or usually produces those

ulcerous sores which have been attributed to it—and, lastly, that European children may be safely operated upon, without the extraordinary results which Dr. Wilson imagined he could trace. I would of course wish to speak with great diffidence upon these points, as it may by possibility have happened that the years embraced in the Table H were particularly favourable to the progress of vaccinia. It should not be forgotten, however, that 1851 was distinguished by its continued heat, and that, although my own vaccinia was lost, I obtained a fresh supply from Berhampore, where I believe the stock is old. During this period, too, I vaccinated six children of pure European blood from natives, producing in all the most satisfactory vesicles.

The recorded anomalous results of vaccination in this country in European children are difficult to be explained, but I would venture an opinion that they may be referred to three sources, 1st, The employment of a lymph from a child who has been vaccinated by a mixture of small-pox and vaccine matter by a fraudulent vaccinator. 2nd, The employment of lymph from a child who is suffering from skin disease, and, 3rd, the unhealthy constitution of the European child itself.

That the first of these causes may, occasionally, be in operation we possess probable evidence, in the cases cited by Dr. Wilson above referred to, in which supposed vaccine matter produced unmistakeable small-pox. Moreover, the strong desire, on the part of Bengali parents, to see a decided eruption follow vaccination, may well tempt the native vaccinators to use a lymph compounded of vaccine and small-pox matter. This is an ever present evil, which nothing but great enlightenment of the masses can remove. The second cause is well illustrated by the following cases, which the parents brought to me complaining of the vaccinator having used impure lymph, and in which I ascertained that some pustular disease had been present at the time of vaccination, which had probably thus become exaggerated. 'On April 20, 1853, Anund Bewah, an inhabitant of Mohella Sergacha, brought three children to my house aged two, five, and six, all of whom were vaccinated about 15 days ago. The eldest presents one large aggregated scab in each arm, besides one on the left side, and one on the back of the right thigh; the middle child presents the marks of healthy vaccination; the youngest a large unhealthy scab on each arm one inch in diameter, besides many others on the trunk and limbs. At this time several pustules appear to be forming, but the very different course of developement essentially

distinguishes them from small-pox. It is stated that, previous to vaccination, they were suffering from some eruption." The third cause to which I have attributed the deterioration of vaccine matter, is its passage through a child of unhealthy diathesis. A very remarkable illustration of this occurred within my experience four or five years ago. A family at a station some distance from my own, but who had formerly been my patients, procured a supply of vaccine lymph from England, in an hermetically sealed glass globule. It arrived in the cold season, and a healthy child was vaccinated from it. Perfect vesicles (I was informed) resulted, and the crusts were sent to me. From these I vaccinated two children of a family of strumous tendency, and the results were most unsatisfactory, the vesicles degenerating into sores after going through their regular preliminary course. Before this irregularity appeared, I had revaccinated some adult members of the same family, in whom large suppurating ulcers, confined to the points of puncture, ensued, which did not heal for three or four months.

In 1851, I was consulted by a lady also of strumous diathesis regarding herself and infant. They had both been vaccinated about six weeks before, and both were suffering from unhealthy and unhealing sores upon the arm at the point of puncture. Under constitutional treatment, they were restored to health. In the following year an infant of the same lady, subsequently born, was vaccinated, and after undergoing much suffering in consequence, died of mortification of the arm.

These results of vaccination must be regarded as entirely due to the idiosyncracy of the individual, and not to any deterioration in the nature of the lymph; for, in the first case noted, it had been selected in England with peculiar care, and had only passed through one system, with the healthiness of which I was well acquainted.

The mutual relations of variola and vaccinia are full of interest, and deserve to be sedulously studied. Experience would seem to shew that, if the system be occupied by either disease, the other may be set up in it, and both pursue a modified course.

It is not a little remarkable that Dr. Gregory, who must be at once conceded to have paid as much attention to the subject as any living physician, should have enunciated an opinion.* 1st. That vaccination is a certain preventive of

* Meeting of the Royal Medical and Chirurgical Society, February 25, 1851.

small-pox up to the age of puberty only; and, 2nd, that after puberty, the liability to small pox is again developed in the constitution, a tendency which revaccination is powerless to nullify, but which is only to be met by inoculation with small-pox matter, an operation resulting in a disease neither pustular nor vesicular, but papular, and distinct from both vaccinia and variola, as innocent as the former, and perfectly protective for the remainder of life.

This extraordinary proposition, so opposed to general medical opinion was unsupported by facts, although Dr. Gregory assured his hearers, that experiments upon the subject had been made in Italy, and that his own experience entirely supported it. Now putting all statistical argument on one side, it certainly appears opposed to all physiological probability, that vaccinia should exercise a protective influence at one period of life and not at another. It is of course quite possible that the changes undergone at puberty may revolutionize the system, and thus the protective power of vaccinia may be lost, but it is most difficult to understand that a constitution so renewed should be unsusceptible of a fresh application of the influence. Dr. Gregory renewed discussion of the subject in a paper read before the Medical and Chirurgical Society in March of last year,* in which, although he hesitates to declare as much, there is an evident inclination to recommend that inoculation should be employed instead of vaccination, or at all events in conjunction with it. He bases his reasoning upon the asserted facts that the proportion of cases of small-pox after vaccination is increasing, whilst inoculation is a certain preventive of the recurrent disease. He certainly appears to fail in proving either. In regard to the former, his figures are few in number, and extend over a limited period of years, whilst the alleged perfect impunity from small-pox on the part of the inoculated is totally destitute of numerical support. We ought to be able in India to offer some decided evidence upon this question, but medical and vital statistics are in too crude a state to furnish it. One or two speakers asserted, that small-pox happened as frequently after inoculation as vaccination. This, however, would scarcely seem to be borne out by facts.

It is universally admitted that vaccination does not absolutely prevent a subsequent attack of small-pox, but the

* *Vaccination Tested by the Experience of Half a Century*, March 9, 1852.

statistical tables adduced by Mr. Grainger on the part of the Epidemiological Society at the same meeting, together with those of Dr. Balfour brought forward at another meeting of the same Society on June 8th, prove its great value. The latter quoted the following returns from the records of the Royal Army, which seem incontestably to show the great conservative power of vaccination, as well as its persistent influence up to and beyond middle age.

TABLE I.

*Exhibiting the Ratio of Deaths to Strength from Small-Pox in the British Army.**

Ages.	Aggregate strength at each age.	Died by small pox.	Ratio of Deaths per 1,000 of strength.
Under 20	43,833	15	0.342
20 25	90,041	28	0.311
25 30	49,285	3	0.061
30 35	37,151	8	0.216
35 40	25,017	1	0.040
40 and upwards	9,270	0	„
Not known,	„	1	„
	254,957	56	220.0†

Another Table obtained from the records of the Royal Military Orphan Asylum by the same officer, is still more favourable.

TABLE K.

Exhibiting the Number of cases of Small-Pox, and consequent Mortality occurring amongst Boys of the Royal Military Orphan Asylum during 48 *years.*

Period of observation.	Aggregate strength.	Number of cases of small-pox.	Numbers of deaths from small-pox.	Ratio of cases per 1000 of strength.	Ratio of deaths per 1,000 of strength.
48 years,	31705	39	4	1.23	0.12

* *Lancet*, June 19, 1852.

† I do not understand the meaning of the 220.0 in the fourth column. If the figures be intended to represent the total ratio of deaths to the total aggregate of strength, the entry should have been .219, representing the total proportion of small-pox deaths per thousand men.

"Another return," Dr. Balfour says, "displayed the comparative amount of protection afforded by vaccination and previous small-pox. The ratio per 1,000 of the latter was 6·15, and the deaths 2·05; while, of those previously vaccinated, the ratio of cases was 7·06 and the deaths 0. All the deaths were thus from secondary small-pox."

The following table is from a paper of Dr. Gregory's in the *Medical Times* for 1849, the data being obtained from the Small-Pox Hospital.

TABLE L.

*Exhibiting the per centage of deaths in the Small-Pox Hospital, London.**

	Total cases.	Deaths.	Per centage of deaths to cases.
Unprotected cases, ...	254	103	40
Vaccinated, { with cicatrices, ..	365	38	10
Vaccinated, { without ditto, ..	63	25	39
Total vaccinated, ...	428	63	14
Previously inoculated, ...	3	1	33

This is by no means so favorable to vaccination as Dr. Balfour's table, but Mr. Grainger gives the following evidence taken without selection from thirty returns received from Medical practitioners, which shows a very different result.

TABLE M.

*Exhibiting the Experience of thirty Medical men in Deaths from Small-pox.**

	Cases.	Deaths.	Percentage of deaths to cases.
Natural small-pox, ...	1,731	361	20·85
Small-pox after small-pox, ..	58	22	37·92
Small-pox after vaccination, ..	929	52	3·44

Now the figures of Dr. Balfour and Mr. Grainger, deduced from a number of facts sufficiently large to give them conclusive weight, agree in attributing a much smaller proportion of mortality to small-pox after vaccination, than is afforded by Dr. Gregory. The fatality exhibited by the latter may have been due to the residence of his cases in the atmosphere of the Small-Pox Hospital, as Mr. Grainger

* Meeting of the Royal Medical and Chirurgical Society reported in *Lancet*, March 29, 1852.

remarks of them that, in 28 out of 168 deaths, there were symptoms of superadded hospital disease, especially "Erysipelas Facialis."

Now with such great and satisfactory results obtained, where vaccination is perfectly carried out, I cannot but think it most unwise of Dr. Gregory to have re-agitated the question of Inoculation in Europe. At the same time I am far from asserting that, under certain social conditions, the latter may not be the most desirable system of the two. It has been urged that no notable diminution of deaths from small-pox took place in England, subsequent to the introduction of Inoculation, in apparent proof of which the following table is cited by the Calcutta Small-Pox Commissioners, at page 40 of the Report:

TABLE N.

Exhibiting the ratio of Mortality from Small-pox in England during the prevalence of Inoculation.

	Total Mortality.	Mortality from small-pox.	Proportion in 1,000 who died of small-pox.
Average of 9 years from 1701 to 1710	21,110	1,045	49
" 10 " 1710 to 1720	23,826	2,123	89
" 10 " 1720 to 1730	27,361	2,257	82
" 10 " 1730 to 1740	26,047	1,978	76
" 10 " 1740 to 1750	26,060	2,002	77
" 10 " 1750 to 1760	20,849	1,957	94

This undiminished, or even increased mortality may easily have been the case because, upon the first introduction of inoculation, it probably spread with great slowness, and so large a portion of the nation being left unprotected, any good which it effected was more than counterbalanced by its acting as a focus of contagion amongst the unprotected. By the time vaccination was introduced, the minds of parents had become accustomed to the employment of prophylactic measures, and the proportion of "protected" amongst the population gradually increased. It appears to me that the cause of diminished mortality lies more in increase of "protection," than in the exchange of vaccination for inoculation. Upon this point Dr. Copeland, no mean authority, made the following observations at a meeting of the Royal Medical

and Chirurgical Society held on March 9th, 1852, and reported in the *Lancet* of March 20. He said, "He would only detain the Society a short time, and was not sorry that Mr. Grainger had objected to the statement he had made in his 'Dictionary,' as he was desirous that the opinion therein expressed should receive attention and elicit further investigation. The opinion which he had expressed, notwithstanding the remarks made upon it by Mr. Grainger, had been derived from some experience on the subject, and from conversation with many who had ample opportunities of coming to a conclusion upon the matter. His view had not, however, been recently taken; he had advanced a similar one thirty years ago, from his own experience in this and other countries. He adhered to the opinion which he had expressed on the point in 1823, and this opinion confirmed the results arrived at since by Dr. Gregory and others. If he had to choose, in the case of the nearest and dearest to him, between inoculation and vaccination, he should hesitate which to choose. He believed, however, that if all children between the third and sixth months were inoculated with the proper precautions, small-pox, as a secondary disease, would soon be unheard of. With respect to the 480 medical men who had supplied the Epidemiological Society with information, he would inquire what proportion this number bore to the great mass of the profession? He was aware that it required a certain degree of moral courage to come forward and express doubts on the benefits resulting from the practice of vaccination, and to assert that on many points connected with it a further or more minute investigation was required. Such however, was the case. Vaccination had been so received as if it were a heresy to question its value in any way. Now, he doubted its efficacy to a certain extent, and on conviction had expressed his doubts This question should be discussed on its merits, and not with views blinded by philanthropy. His remarks had applied to the subject of vaccination in all countries."

I can quite understand that had Inoculation been extensively diffused, and made compulsory upon the whole population of England, at the commencement of the eighteenth century, we might have been as free from the ravages of small-pox as at present; but vaccination having been so extensively introduced, and having been proved to possess such conservative power, we are not justified in attempting to make any alteration. If England, however, had been, as I have said, thoroughly protected by inoculation at the time

of Jenner's discovery, it might have been a question whether it would be wise to displace the former by the latter. The only consideration then remaining would have been the comparative danger to life of the two operations, and the comparative immunity from small-pox and its fatal results conferred by them.

The value of inoculation, under certain conditions, is well illustrated by the following extract from the *New-York Medical Times* reported in the *Lancet* of January 3, 1852. "An interesting instance of the value of inoculation under certain circumstances, has just occurred among the Sac and Fox Indians. The Small-pox, which is usually so fatal to the aboriginal race, and which sometimes sweeps away whole tribes at once, recently appeared in the Sac and Fox community, and they were induced to diet, encamp together, and be inoculated with small-pox virus. Fifteen hundred, out of twenty-six hundred, submitted to the operation, and not one died that was not previously affected with the disease. About 110 had died before this measure was adopted. None took the disease who had been previously vaccinated."

Now Bengal, at the present time, is much in the condition which I have assumed as the basis of the argument for England. As I have shewn by Table A, the population of three zillahs at least enjoys protection at the rate of 85 per cent. If further statistical investigation should prove that this amount obtains throughout Bengal, it certainly will become a question for the consideration of Government whether it would be more judicious to render the present system perfect by providing for the compulsory Inoculation of the remaining 15 per cent, by which Small-pox would be just as effectually banished as in any other way, or by prosecuting our present efforts to urge vaccination upon an unwilling people. Even in spite of this unwillingness, however I doubt not that perseverance in a judiciously enlarged system, by which the whole country may be perambulated by official vaccinators, would in time replace the present proportion of inoculated by vaccinated persons; but, if the Government be not prepared to do this, I am disposed to think that the next best arrangement is systematically supervised inoculation, which may doubtless be carried out more easily, and at less cost. This question, as I have said, must be determined not only by taking into account the comparative amount and kind of protection already established, but by accurately weighing the danger of inoculation, and its subsequent protective power, compared

with vaccination, as it exists under Indian social circumstances and climate. In doing so, I would entirely limit my observations to Bengal, as we have seen, by extracts from the Report of Small-pox Commission, that in the Hills, and North-West Provinces, Inoculation is comparatively unknown, and the population consequently "unprotected."

The only objections to inoculation lie in the asserted dangers attendant upon the operation, and its acting as a focus of contagion. Before attempting to advocate its legalized performance in Bengal, it becomes essential therefore to examine by the light of statistical data into the truth of these assumed facts. If it can be shewn that inoculation is dangerous to life beyond a small fraction per cent., or that it is followed by injurious consequences to present or future health, no amount of argument, founded upon the ignorant prepossession of the inhabitants of Bengal, should suffice to influence our opinion. But, if on the other hand it can be approximately demonstrated that the mortality is infinitely small, and the evil influence upon health extremely light, it may be worthy of consideration, as I have above asked, whether, under the peculiar social circumstances of the people, it might not be desirable to carry it out under Government supervision. I am anxious to be distinctly understood as offering no positive opinion upon the subject in the present stage of inquiry. All I propose to do, is to present such numerical facts bearing upon it as I have collected, merely as contributions to a knowledge of the question, with a hope that future and fuller information may set it at rest.

In considering this subject, I cannot do better than quote evidence from the Report of the Small-pox Commission of 1850, as contained in answers from various European and native gentlemen, who had been addressed on the subject. It must be premised however, that in almost every case the answers were vaguely given, being founded upon rumour and memory, instead of accurate notes and returns.

The most astounding evidence which meets us in an early part of the Appendix to the Report, (page 36) is that of Baboo Gowreesunker Bottacharjee, who asserts that 300 lives were lost out of 1000 persons inoculated at Hooghly in the current year. Surely some enormous fallacy must lurk here, for by Mr. Grainger's Table, emanating from the Epidemiological Society, March 9, 1852,* the per centage of

* *Lancet*, March 20, 1852.

deaths from natural small-pox only amounts to 20.85 per cent., which would give a little in excess of 200 per 1000, whilst it is the result of universal experience, that the difference of mortality between natural and inoculated small-pox is very greatly in favor of the latter.

The Magistrate of the Twenty-four Purgunnahs, at page 37 of the same Report, states from the report of his Darogahs, that 2,586 persons had been inoculated, and 19 had died in his jurisdiction.

Again Dr. Sheridan, writing from Serampore, (Appendix page 82,) "the exact amount of mortality I have not been able to ascertain, but I should suppose it to have exceeded 400 throughout the district; one Ticcadar admits that he inoculated 400, and that 200 of the number died." Now here again we have an asserted mortality far exceeding that of natural small-pox, as shown above on Mr. Grainger's authority, whilst the proportion of deaths attendant on the imperfect management of the operation during the first eight years of its introduction into England, was only 17 in 897,* whilst they consequently fell at the inoculation hospital to 3 in 1,000.

Baboo Ramesher Awasthee (Appendix, page 145,) estimates the mortality of inoculated small-pox at 20 per cent, and supports his opinion by a table of deaths from that cause occurring within his own observation, and which amounted to 10 in 3 years.

Such are the most prominent points of evidence contained in the "Report," in regard to the fatal results of inoculation, and were their accuracy undeniable, not a moment's doubt could exist as to the imperative necessity of abolishing it by legislative enactment, for as I have shown, they make it appear that artificial is more fatal than natural small-pox. It would therefore be far better to let the latter take its course unrestricted. But this proportion is so opposed to all experience that I must be permitted, in default of more rigid evidence, to believe in the existence of some great error.

I now submit the result of my own inquiries, which though limited in extent, were all executed with care, and every precaution taken to avoid fallacy.

In the statistical examination of the 1,000 convicts in Chittagong Jail, noted in table A, I had enquiries made from each man as to how many of his family or friends had died after inoculation. The total number recorded was 7,

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* *Cyclopædia of Practical Medicine*, Vol. 3, page 749.

now assuming each man to be the head or member of a family consisting of 5, (the average number of a household,) with the events of whose life he must have in all probability been intimately acquainted, we get a total of 7 deaths in 5,000. But as I have shewn by table A, that the Chittagong general population under observation contains 293 unprotected persons, we must subtract this number proportionally from the 5,000 total inoculated, comprising convicts' families, which will leave 4,414, and thus we get a true ratio of deaths to inoculation of 1.5 per 1,000, or less than what occurred in the Inoculation Hospital in London as previously shewn. I do not put this proposition forward as very reliable, but merely as an approximation to the truth, and possibly not a very near one, but it offers so enormous a contrast to the statements contained in the report, as to claim for the subject renewed investigation.

Since writing the above, however, I have felt so dissatisfied with the looseness of the computation, that I determined to prosecute a similar inquiry amongst 500 convicts in Rajeshye Jail, on the more rigid principle of ascertaining the exact amount of the inoculated population subjected to inquiry. With this view I constructed a rough table, and filled it in with the total number of each prisoner's brothers, sisters, and children. I selected these relations as being the ones with the circumstances of whose life the questioned man must of necessity be familiar. The inquiry was conducted with rigid care, and I satisfied myself that each man's answer was free from any guess-work. The result appears in the following table.

Table O.

Exhibiting the Ratio per Thousand, of Deaths to Inoculations amongst the Relatives of Convicts in Rajeshye Jail.

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
Date of observations.	Class under observation.	Number under observation.	Number inoculated.	Number vaccinated.	Number unprotected.	Number who have had natural small-pox.	Number who have had small-pox after Inoculation.	Number who have had small-pox after vaccination.	Total number of brothers, sisters, and children of prisoners inoculated.	Total deaths among inoculated.	Ratio per 1,000 of deaths after inoculation.
29th Aug. 1853.	Convicts in Rajeshye Jail,	500	451	3	20	26	0	0	2148	7	3.25

This affords the remarkable result of a mortality after inoculation almost identical with that obtained in London at the Inoculation Hospital,* a circumstance leading to the habit that such must be the general law of mortality in inoculated small-pox.

Column 4 affords an additional check upon column 5 of Table A, viz., the proportion of inoculated to population, when Dr. Wilson computed the ratio in 1850, it was 86.5 per cent, whilst we ~~never~~ now find it 90.5.

In prosecution of the same inquiry, the following table shews the result of my personal observation of inoculated villages in the vicinity of Rampore Bauleah, and here I would "par parenthese," remark, that whilst on several previous occasions, inculcating a wholesome caution as to Indian statistics, I would be understood as doing so only where they have been obtained by native agency, personally made by an European, who exerts himself to check fallacy, I believe them to be as trustworthy as any others, inasmuch as the average intelligence of the Bengali mind, *when aroused*, is, I am inclined to think, above that of the purely agricultural labourer in England.

* *Cyclopædia of Practical Medicine*, Vol. 3, p. 749.

TABLE P.

Shewing the Result of Inoculation with Small-pox Matter amongst 79 children in Mohellas Luckheepore and Allygunge, belonging to the Town of Rampore Bauleah, in February, 1852.

Date.	Name of Children Inoculated.	Age.	Sex.	Region of Inoculation.	Numbers of days' fever.	Number of Pustules appearing on body about.	REMARKS.
26th Jan., 1852.	Tamur, ...	7	Male,	2 Arms,	3 Days,	3 or 4 Pustules,	
„	Khoolye, ...	7	Female,	„	5 „	100 or 125 „	
„	Pujur, ...	3	„	1 „	5 „	10 or 12 „	
„	Mekooree, ..	4	„	1 „	5 „	20 or 25 „	
„	Khooshu, ...	5	Male,	2 „	5 „	20 or 25 „	
„	Shookee, ...	4	Female,	2 „	7 or 8 „	10 or 12 „	
„	Dashu, ...	5	„	2 „	2 „	2 „	
„	Dookoon, ...	3	„	1 „	4 „	5 or 6 „	
„	Doolliah, ...	6	„	2 „	5 „	5 or 6 „	
„	Puncha, ...	7	„	1 „	6 „	100 „	
„	Sooktee, ...	4	„	2 „	3 or 4 „	3 or 4 „	
„	Bhollah, ...	12	Male,	2 „	3 „	3 or 4 „	
„	Okhoy, ...	8	„	2 „	3 „	3 „	
„	Mookoondo, ..	9	„	2 „	3 „	3 or 4 „	
„	Woottun, ..	8	„	2 „	5 or 6 „	2 „	
„	Jutnee, ...	6	Female,	1 „	3 „	4 „	
„	Chottoo Jutnee, ..	8	„	1 „	6 „	28 „	
„	Puttony, ...	10	Male,	2 „	3 „	12 „	
„	Shomu, ...	2½	„	1 „	3 „	4 „	
„	Roghoo, ...	5	„	2 „	4 „	4 „	
„	Rosso, ...	5	Female,	2 „	3 „	4 „	
„	Patanee, ...	5	„	2 „	4 „	5 „	
„	Somitah, ...	5	„	1 „	4 „	4 „	

Date.	Name of Children Inoculated.	Age.	Sex.	Region of Inoculation.	Number of days' fever.	Number of Pustules appearing on body about.	Remarks.
26th Jan., 1852.	Neemye, ...	4	Male,	2 Arms,	4 Days'	7 Pustules.	
,,	Amengo, ...	2	Female,	1 ,,	3 ,,	2 ,,	
,,	Ramloll, ...	3	Male,	2 ,,	4 ,,	5 ,,	
,,	Chotto Mokoondo,	7	,,	2 ,,	6 ,,	10 ,,	
,,	Borah, ...	1	,,	1 ,,	6 ,,	10 ,,	
,,	Fukeer Chund, ..	5	,,	2 ,,	4 ,,	6 ,,	
28th ,,	Dossorut,.. ..	7	,,	1 ,,	5 ,,	10 ,,	
,,	Wottoo, ...	4	,,	1 ,,	5 or 6 ,,	5 ,,	
,,	Nattoo, ...	5	,,	1 ,,	5 ,,	2 ,,	
,,	Fukier, ...	9	,,	2 ,,	5 ,,	5 ,,	
,,	Jemoo, ...	1½	,,	1 ,,	5 ,,	100 ,,	
,,	Foodun, ...	1	Female,	1 ,,	5 ,,	30 ,,	
,,	Assan, ...	1	Male,	1 ,,	5 ,,	5 ,,	
,,	Foodun, ...	1½	,,	1 ,,	5 ,,	3 ,,	
,,	Gadhoo, ...	3	,,	1 ,,	4 ,,	5 ,,	
,,	Juarut, ...	2	,,	1 ,,	4 ,,	15 ,,	
,,	Toreeput,.. ..	5	,,	2 ,,	5 ,,	8 ,,	
,,	Assalut, ...	6	,,	1 ,,	6 ,,	5 ,,	
,,	Mooleerungo, ..	13¼	,,	1 ,,	5 ,,	15 ,,	
,,	Emarut, ...	8	,,	1 ,,	5 ,,	3 ,,	
,,	Damnee, ...	2	Female,	2 ,,	5 ,,	7 ,,	
,,	Kookree, ...	4	,,	1 ,,	5 ,,	15 ,,	
,,	Gooluck, ...	1	Male.	1 ,,	5 ,,	15 ,,	
,,	Mupoorah, ..	3	,,	1 ,,	5 ,,	12 ,,	
,,	Dookhie, ...	3	,,	2 ,,	5 ,,	15 ,,	
,,	Sooree, ...	6	,,	1 ,,	5 ,,	5 ,,	
,,	Bajoo, ...	10	,,	1 ,,	5 ,,	5 ,,	
,,	Olly, ...	6	,,	1 ,,	4 ,,	4 ,,	

Date.	Name of Children Inoculated.	Age.	Sex.	Region of Inoculation.	Number of days fever.	Number of Pustules appearing on body about.	Remarks.
28th Jan., 1852,	Muksud,.. ..	2	Male,	1 Arm,	6 Days,	5 Pustules.	
„	Joana, ...	1½	Female,	1 „	5 „	5 „	
„	Monee, ...	3	„	1 „	5 „	5 „	
„	Monsud, ...	9	Male.	2 „	6 „	8 „	
„	Moohoo, ...	6	„	1 „	3 „	20 „	
„	Piaree, ...	1½	Female,	1 „	5 „	5 „	
„	Joga, ...	9	Male,	2 „	4 „	7 „	
„	Deepoo, ...	3	Female,	2 „	4 „	4 „	
„	Mohobut, ...	2	Male,	2 „	4 „	5 „	
„	Miajun, ...	9	„	2 „	3 „	7 „	
„	Goopee, ...	6	„	1 „	5 „	12 „	
„	Jhoorah, ...	4	Female,	2 „	3 „	5 „	
„	Patanee, ...	1½	„	1 „	1 „	no pustules,	
„	Woothem, ..	1½	„	1 „	4 „	12 „	
„	Bhoobun, ...	2	„	1 „	5 or 6 „	100 „	
„	Elait, ...	3	Male,	1 „	5 „	5 „	
„	Bama, ...	1½	Female,	1 „	no fever,	no pustules,	
„	Bongo Rasoo, ..	25	Male,	2 „	4 days,	5 „	
„	Shama, ...	3	Female,	2 „	4 „	4 „	
„	Anjore, ...	2½	„	1 „	3 „	4 „	
„	Ram Chunder, ..	3	Male,	2 „	4 „	10 „	
„	Khoodhoo, ..	5	Female,	2 „	5 „	50 „	
„	Rasmoney, ..	5	„	1 „	4 „	50 „	
„	Khema, ...	4	„	2 „	3 „	4 „	
„	Michoo, ...	1⅓	Male,	1 „	no fever,	no pustules,	
„	Munee, ...	4	Female,	2 „	3 days,	„	
„	Comul Doss, ..	16	Male,	2 „	no fever.	20 pustules,	

I visited the villages in question, when the disease was declining, and particularly ascertained that no death had previously occurred from the operation. That none happened subsequently I feel assured, from the silence of my vaccinator, who accompanied me, who was instructed to report any which might occur, and whose constant wish to throw discredit on the operation, would have made him a safe authority. Lastly, the Registration of deaths kept up under my constant supervision makes no mention of such from small-pox during February or March of that year.

Now if it be granted, on the authority of the above data, that inoculated small-pox is not so severe as has been represented, we have still to consider whether, failing to destroy life, it may not yet inflict some constitutional injury, I think I may venture to assert that the skin and eye are the organs upon which natural small-pox expends its force. This being conceded, we shall not be far wrong in looking to the same ~~facts~~ parts as a test of the constitutional influence of the inoculated disease. What do we find in Bengal? Pitting is almost unknown, except as the result of variola, whilst the following table kindly furnished me by Mr. Martin, the able Superintendent of the Calcutta Eye Infirmary, and drawn up under his personal supervision, exhibits the proportion and nature of Eye diseases, resulting from the inoculated and natural disease, which were seen at the Infirmary in the Epidemic year 1849-50, and which I give in detail as possessing an additional interest from the light it throws upon the Ophthalmic sequelæ of small-pox.

TABLE Q.

Table shewing the Proportion of Ophthalmic Cases, resulting from Natural and Inoculated Small-pox, admitted into the Calcutta Eye Infirmary, in the years 1850-51.

OUT-PATIENTS.

No. of Case.	Date of Admission.	Age of Patient.	Disease.	Whether arising from Natural or Inoculated Small-pox.	REMARKS.
1	January 1850,	5	Interst. abscess. of Cornea, ...	Natural.	
2	„	17	Prolaps. Iridis, ...	„	
3	„	4	Slough of cornea, ...	„	
4	„	11	„ „	„	
5	February, 1850,	4	Ulcer of cornea, ...	„	
6	„	32	„ „	„	
7	„	3	„ „	„	
8	„	3	Slough of cornea, ...	„	
9	„	6	„ „	„	
10	„	25	„ „	„	
11	„	3	Ulcer of cornea, ...	„	
12	„	5	Slough of cornea, ...	„	
13	„	12	„ „	„	
14	„	13	Acute conjunctivitis, ...	„	
15	March, 1850,	7	Ulcer of cornea, ...	„	
16	„	2	Slough of cornea, ...	Inoculated.	
17	„	14	Ulcer of cornea, ...	Natural.	
18	„	7	Slough of cornea, ...	„	
19	„	26	Ulcer of cornea, ...	„	

No. of Case.	Date of Admission.	Age of Patient.	Disease.	Whether arising from Natural or Inoculated Small-pox.	Remarks.
20	March 1850,	5	Slough of cornea, ...	Natural.	
21	,,	40	Inflammation of internal tunices, ..	,,	
22	,,	4	Ulcer of cornea, ...	,,	
23	,,	20	,, ,, ...	,,	
24	,,	10	,, ,, ...	,,	
25	,,	20	Inflammation of internal tunices, ..	,,	
26	,,	15	Ulcer of cornea, ...	,,	
27	,,	9	,, ,, ...	,,	
28	,,	7	,, ,, ...	,,	
29	,,	22	Opacity of cornea, ...	,,	
30	,,	11	Slough of cornea, ...	,,	
31	April, 1850,	17	Staphyloma, ...	,,	
32	,,	5	Inflammation of globe, ...	,,	
33	,,	4	Variolus pustules, ...	,,	
34	,,	3	Ulcer of cornea, ...	,,	
35	,,	3	Inflammation of globe, ...	,,	
36	,,	11	Ulcer of cornea, ...	,,	
37	,,	4½	,, ,, ...	,,	
38	,,	1	Inflammation of globe, ...	,,	
39	,,	13	Slough of cornea, ...	,,	
40	,,	25	,, ,, ...	,,	
41	,,	10	Ulcer of cornea, ...	,,	
42	,,	7	Slough of cornea, ...	,,	
43	,,	4	Ulcer of cornea, ...	,,	
44	,,	8	,, ,, ...	,,	
45	,,	2	Inflammation of globe, ...	,,	

No. of Case.	Date of Admission.	Age of Patient.	Disease.	Whether arising from Natural or Inoculated Small-pox.	Remarks.
46	April, 1850,	7	Ulcer of cornea, ...	Natural.	
47	„	5	Inflammation of globe, ...	„	
48	„	4	Ulcer of cornea, ...	„	
49	„	7	„ „	„	
50	„	3	Interst : abscess of cornea, ...	„	
51	„	14	Ulcer of cornea, ...	„	
52	„	5	„ „	1 Inoculated.	
53	„	5	„ „	Natural.	
54	„	2½	Interst : abscess of cornea, .. — ..	„	
55	„	3½	Acute ophthalmia, ...	„	
56	„	9	Ulcer of cornea, ...	„	
57	„	2	„ „	„	
58	May, 1850,	2	„ „	„	
59	„	1½	Inflammation of globe, ...	„	
60	„	30	„ „	„	
61	„	35	Ulcer of cornea, ...	„	
62	„	11	„ „	„	
63	„	11	Interst : abscess of cornea, ...	„	
64	„	7	Inflammation of globe, ...	„	
65	„	19	Slough of cornea, ...	„	
66	„	16	Acute ophthalmia, ...	„	
67	„	5	Inflammation of globe, ...	„	
68	„	4	Ulcer of cornea, ...	„	
69	„	30	Inflammation of globe, ...	„	
70	„	12	Ulcer of cornea, ...	„	
71	„	13	Inflammation of globe, ...	„	

No. of Case.	Date of Admission.	Age of Patient.	Disease.	Whether arising from Natural or Inoculated Small-pox.	Remarks.
72	May, 1850,	7	Ulcer of cornea, ...	Natural.	
73	"	20	Prolaps Iridis, ...	"	
74	"	7	Ulcer of cornea, ...	"	
75	"	7	Slough of cornea, ...	"	
76	"	3	" "	"	
77	"	11	Ulcer of cornea, ...	"	
78	"	4½	" "	"	
79	"	10	" "	"	
80	"	16	Staphyloma, ...	"	
81	"	12	Ulcer of cornea, ...	1 Inoculated.	
82	"	11	Interst. abscess of cornea, ...	Natural.	
83	"	12	Ulcer of cornea, ...		
84	"	3	" "	1 Inoculated.	
85	"	20	" "	Natural.	
86	"	6	" "	"	
87	"	2½	Slough of cornea, ...	"	
88	"	6	Interst : abscess of cornea, ...	"	
89	"	8	Interst : of cornea, ...	"	
90	"	10	Ulcer of cornea, ...	"	
91	"	6	Slough of cornea, ...	"	
92	June, 1850,	12	Opacity of cornea, ...	"	
93	"	30	Prolaps. Iridis,..	"	
94	"	40	Closed pupil, ...	"	
95	"	10	Inflammation of globe, ...	"	
96	"	40	Ulcer of cornea, ...	"	
97	"	2	Corneitis.	"	

No. of Case.	Date of Admission.	Age of Patient.	Disease.	Whether arising from Natural or Inoculated Small-pox.	Remarks.
98	June, 1850.	12	Ulcer of cornea, ...	Natural.	
99	"	25	Opacity of cornea, ...	"	
100	"	4	Ulcer of cornea, ...	"	
101	"	7	Opacity of cornea, ...	"	
102	"	7	Ulcer of cornea, ...	"	
103	"	10	" "	"	
104	"	6	Corneitis, ...	"	
105	"	10	Ulcer of cornea, ...	"	
106	"	1½	" "	"	
107	"	6	" "	"	
108	"	40	" "	"	
109	"	6	" "	"	
110	"	18	Opacity of cornea, ...	"	
111	"	4	" "	"	
112	"	6	" "	"	
113	"	25	Interst : abscess of cornea, ...	"	
114	"	21	Staphyloma, ...	"	
115	"	20	Ulcer of cornea, ...	"	
116	"	30	Closed pupil, ...	"	
117	"	4½	Inflammation of canals, ...	"	
118	"	10	Interst : abscess of cornea, ...	"	
119	"	10m.	Ulcer of cornea, ...	"	
120	"	25	Opacity of cornea, ...	"	
121	July, 1850.	16	Ulcer of cornea, ...	"	
122	"	3½	" "	"	
123	"	28	" "	"	

No. of Case.	Date of Admission.	Age of Patient.	Disease.	Whether arising from Natural or Inoculated Small-pox.	Remarks.
124	July, 1850,	6	Ulcer of cornea, ...	Natural.	
125	,,	50	,, ...	,,	
126	,,	13	,, ...	,,	
127	,,	10	,, ...	,,	
128	,,	8	Prolaps Iridis, ...	,,	
129	,,	4	Ulcer of cornea, ...	,,	
130	,,	11	Opacity of cornea, ...	,,	
131	,,	9	Ulcer of cornea, ...	,,	
132	,,	9	Opacity of cornea, ...	,,	
133	,,	16	Closed pupil, ...	,,	
134	,,	31	Chronic ophthalmia, ...	,,	
135	,,	6	Ulcer of cornea, ...	,,	
136	,,	22	,, ...	,,	
137	,,	4	Staphyloma, ...	,,	
138	,,	14	Slough of cornea, ...	,,	
139	,,	25	Ulcer of cornea, ...	,,	
140	,,	20	Opacity of cornea, ...	,,	
141	,,	11	,, ...	,,	
142	,,	12	Inflammation of canals, ...	,,	
143	,,	13	Staphyloma, ...	,,	
144	,,	41	Opacity of cornea,..	,,	
145	October, 1850,	3½	,, ...	,,	
146	,,	10	Obstruct: nasal duct, ...	,,	
147	,,	28	Staphyloma, ...	,,	
148	,,	7	Ulcer of cornea, ...	,,	
149	,,	3	Staphyloma, ...	,,	

No. of Case.	Date of Admission.	Age of Patient.	Disease.	Whether arising from Natural or Inoculated Small-pox.	Remarks.
150	October, 1850,	18	Corneitis,	Natural.	
151	December, 1850,	4	Staphyloma,	”	
152	”	20	Opacity of cornea,	”	
153	”	20	” ”	”	
154	January, 1851,	24	Inflammation of cornea,	”	
155	”	17	Opacity of cornea,	”	
156	”	21	” ”	”	
157	February, 1851,	10	Ulcer of cornea,	”	
158	March, 1851,	11	” ”	”	
159	April, 1851,	13	Variolous pustules,	Inoculated.	
160	May, 1851,	10	Acute ophthalmia,	Natural.	
161	”	9	Inflammation of cornea,	”	
162	June, 1851,	26	Opacity of cornea,	”	
163	”	15	Ulcer of cornea,	”	
164	July, 1851,	11	” ”	Inoculated.	
165	”	20	Slough of cornea,	Natural.	
166	August, 1851,	12	Ulcer of cornea,	”	
167	November, 1851,	6	Inflammation of cornea,	”	

In-Patients.

No. of Case.	Date of Admission.	Age of Patients.	Disease.	Whether arising from Natural or Inoculated Small-pox.	Remarks.
1	8th April, 1850.	11	Ulcer of cornea, ...	Natural,	
2	29th „	30	Slough of cornea, ...	„	
3	26th „	10	Corneitis, ...	Inoculated,	
4	22nd „	20	Slough of cornea, ...	Natural,	
5	9th May, 1850,	10	Suppur. of cornea, ...	„	
6	1st „	16	Ulcer of cornea, ...	„	
7	25th „	25	„ „	„	
8	29th June, 1850,	10	Corneitis, ...	„	
9	14th July, 1850,	37	Ulcer of cornea, ...	„	
10	26th „	40	Inflammation of internal tunices, ..	„	
11	3rd „	35	„ „	„	
12	9th „	16	Ulcer of cornea, ...	„	
13	16th June, 1850,	30	„ „	„	
14	24th „	28	Corneitis, ...	„	
15	15th „	12	Inflammation of globe, ...	„	
16	6th Aug., 1850,	45	Ulcer of cornea, ...	„	
17	17th Sept., 1850,	16	Staphyloma, ...	„	

Now here we have a total of 184 cases of the sequelæ of small-pox, of which only seven were produced by inoculation. This fact in itself goes far to show that the danger of inoculation to the individual has been much overstated, for, were the ensuing mortality such as has been described, the injurious sequelæ of the disease would probably exist in like proportion, and yet, at an Institution in the heart of Calcutta, which naturally attracts all ophthalmic sufferers, we only get seven cases throughout the last severe epidemic, when inoculation may fairly be supposed to have been carried on with unusual vigour.

I have thus endeavoured to investigate the amount of danger accruing to the inoculated individual himself, but it remains to throw light upon the far more important sanitary question, as to the effect which the person so diseased may exercise upon the surrounding community.

That any one infected by small-pox, whether by natural or artificial means, acts as a focus of contagion, and probably in an equal degree of intensity, is a pretty well determined truth, but it is equally true that by a proper system of seclusion, and an universal practice of protection at an early period of life, say within the sixth month, the probability of contagion would be reduced to a minimum. We have already seen that the inhabitants of several districts in Bengal voluntarily secure a protection extending to 85 per cent of the population, whilst the habit of rural communities, always resident in detached villages, within a line of umbrageous circumvallation,is to exercise a kind of quarantine* during the existence of inoculated small-pox within their precincts. Such an arrangement is more difficult to effect in towns, but even there I think it will be found in a modified degree. It has been argued by some writers* that the diffusion of variolous contagion takes place only in certain epidemical states of the air, and that when such a condition of atmosphere prevails, the disease would propagate itself quite as widely, independent of all cases artificially excited, and that when it was not present, inoculation would be perfectly harmless. Now I am not prepared to yield assent to either of these propositions, but taking statistical data for our guide, it must be confessed that, in non-epidemic years, the number of deaths from small-pox in Calcutta is out of all proportion small, compared with the number of 70

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* *Cyclopædia of Practical Medicine*, Vol. 3, p. 750.

inoculators, who are said by Mr. Law,* to be resident there, and all of whom, it may fairly be supposed, pursue their occupation continuously, but of course with much greater vigour during epidemic seasons.

Let us compare the following (Table from the Small-pox Commissioners' Report, p. 9,) with the number of inoculators.

TABLE R.

Shewing the Comparative Number of Deaths from Small-pox in Calcutta in 18 *years.*

	1832.	1833.	1834.	1835.	1836.	1837.	1838.	1839.	1840.	1841.	1842.	1843.	1844	1845.	1846.	1847.	1848.	1849.	1850.
Total of small-pox deaths. . .	673	2548	36	53	16	266	1507	81	22	56	25	336	2840	67	78	33	107	1724	
			†					†						†					†

Now, with the exception of the epidemic years bracketted together, the total of deaths in any one, with the exception of 1839 and 1846, does not equal the number of inoculators, and all these deaths may have arisen from natural small-pox.

Let us endeavour to ascertain the difference of small-pox mortality between the population of London and Calcutta in non-epidemic years.

By the census of Great Britain taken in 1851, I find that the London division contains a population of 1,257,910. The Eighth Annual Report of the Registrar-General of England assigns to London, which I assume to be conterminous with the London Census Division, 909 deaths in 1845, and 257 in 1846 from small-pox, thus giving a respective ratio of 7.2 and 2.8 "small-pox deaths" to every 10,000 of the population.

The last Calcutta census on the other hand, taken in May 1850, gives a total population of 413,182, from which, if we deduct 10,848 for Europeans and Eurasians, we get a remainder of 402,334 natives. Now, adding together the total deaths by small-pox in the non-Epidemic years, to be found in Table A. of Report of Small-pox Commissioners (p. 9), we get a mean mortality of 52 small-pox deaths per annum, or 1·2 per 10,000 of the population. So that, if these calculations be correct, we obtain the remarkable result of there being a lower small-pox mortality in Calcutta with 70 inoculators assiduously at work, than exists in London, where

* *Appendix to Report of Small-pox Commissioners,* page xxviii.
† Epidemic years.

such an individual is not to be found. There are some slight elements of fallacy, inasmuch as the years of observation are distinct from those of the census, and the population of London probably increases more rapidly than that of Calcutta. Allowing for these, however, it still seems to leave the broad fact untouched, that the average mortality from small-pox in Calcutta does not exceed that of London. If this be conceded, it at once appears that the system of inoculation in non-Epidemic years, exerts no influence in spreading small-pox. Let us investigate the question still further by the aid of the following table constructed from records which I carefully supervise.

Table S.

Shewing the Total Number of Deaths from all Diseases, and those from Small-pox in the Town of Rampore Bauleah, from March 1st, 1851, to June 30th, 1853.

Month.	Total Number of Deaths.	Total Number of Small-pox.	Names of Mohallas in which Small-pox occurred.	Names of Mohallas in which Inoculators were at work.
1851.				
March, ..	87	1		
April,....	202	1		
May, ...	106	1		
June, ...	80	0		
July, ...	67	0		
August, ..	57	0		
September,	90	0		
October,..	112	0		
November,	120	0		
December,	97	0		
Jan., 1852,	81	0		
February,	54	0		
March, ..	102	0		February 15,16,17.—79 children inoculated in Luckheepore and Allygunge.
April,....	128	0		
May, ...	49	1	Sagurpara.	
June, ...	62	1	Cossyepara.	
July, ...	65	0		
August, ..	70	0		
September,	107	0		
October,..	110	0		February 19th.—9 children were inoculated in Mohallas Adareepara, & Coondoopara. March 1st, 3 children were inoculated in Mohalla Sercarpara. March 20th, 3 children were inoculated in Mohalla Coondoopara.
November,	240	0		
December,	123	0		
Jan, 1853,	83	0		
February,	40	0		
March, ..	103	0		
April,....	145	1	Kajlah.	
May,....	130	1	Cossyepara.	
June, ...	67	2	Ditto. Mallanpara.	April 20th—4 children were inoculated in Rampore Bazar.

I made no record of the amount of inoculation which was proceeding in 1851; but, as Dr. Wilson asserts at page 93 of Appendix to Report of the Small-pox Commission, that Bauleah contains 19 resident inoculators, we may assume they were not idle during the period in question, and yet we obtain only 3 deaths from small-pox.

In February, 1852, a large focus of contagion is seen to be established in Mohallas Luckheepore and Allygunge, yet no deaths are noted in my registration returns. In February, March, and April, 1853, children were inoculated in certain Mohallas, but the simultaneous cases of small-pox occurred in other and distant parts of the town. The probability is that much more inoculation occurred which escaped my observation, but I am pretty confident that no other deaths from small-pox happened in the town, than those which I have noted.

I would now direct attention to Mohallas Cossyepara and Mallanpara, where I saw every case of small-pox which occurred, tracing it from house to house. According to the detailed census papers, it appears that in these two divisions of the town, there are 78 unprotected persons, who must have been in more or less contiguity to these small-pox cases, and yet were not affected by the disease.

That the danger of inoculation has been over-stated, we have further evidence in the Report of Small-pox Commission (Appendix, page 58) from Mr. George, Apothecary of the Park Street Dispensary, who writes as follows:—

"Regarding the origin of the present epidemic, I am of opinion that it was spontaneous, and is to be attributed to some unknown atmospheric cause. Some persons have entertained the belief that it was set up by Ticcadars, but this is an erroneous opinion. Inoculation is only performed between the middle of January and the middle of March, and as the epidemic commenced before this period, the Ticcadars cannot be justly charged with having originated the disease.

"But there is, I am informed, good reason for believing that the Ticcadars have been instrumental in diffusing and maintaining the disease. This is, however, not borne out by my own experience, for the majority of the cases that have come under my observation have not been inoculated, at least none of those lately brought to the Dispensary, on account of sloughing of the cornea, suppuration of the joints, and other distressing sequelæ. The densely crowded and ill-ventilated condition of the Native part of the Town is, I conceive, the principal cause of the special spread and continuance of the contagious poison."

From this gentleman's evidence it would appear that the epidemic commenced before the inoculators were in the habit of beginning their work. On the other hand we find Mr. Naylor (Report of Small-pox Commission, page 71,) giving this opinion:

"I feel confident in asserting that the practice of inoculation is one of the principal causes of the great ravages lately committed by the disease, and that it has been the chief means of diffusiug the contagion throughout the whole of the Native part of the town, to such an extent, that there has scarcely been a house left untouched during the recent epidemic.

"In this neighbourhood, the proportion that Small-pox, induced by inoculation, has borne to the spontaneous cases, has been at least as twenty to one, taking the aggregate number from the commencement of the epidemic to the present time, and the fatality of the induced form has been far from inconsiderable, while the sequelæ have always been the most distressing.

"When this epidemic first displayed itself, and only a few cases were seen here and there, the Ticcadars were actively engaged, in taking the virus, and inoculating the unprotected on all sides, till they diffused the contagion so fearfully, that every house almost has had some cases of small-pox, either spontaneous or induced."

Could accurate statistical data as to the exact period when the inoculators commenced their practice, together with the number inoculated, have been obtained, we should have been in a condition to pronounce much more decidedly upon the danger of the operation. It is certain that a very large majority of the officers whose replies to the circular letter of inquiry are cited in the Appendix to the Report of the Small-pox Commission, entertain an opinion of the extensive danger of inoculation, both in a contagional and individual point of view. But it must be confessed that, with a few exceptions, the supporting facts which they cite, are but few and vague. The same witnesses are unanimous in recommending Government to put down inoculation by legislative enactment, entirely forgetting that under such circumstances, and in the absence of an equally wide-spread system of vaccination, the population would be almost entirely unprotected, and exposed to the unmitigated ravages of small-pox. It would ill become an ardent advocate of sanitary progress to recommend inoculation in preference to vaccination, but if the government be not prepared to carry out the latter on an enlarged scale,

commensurate with the desire of the people for protection, there cannot exist a doubt of the impropriety of the former being prohibited. If this be true of the public in general, it must be so of particular sections of it. It may be questioned then if local officers are, in the present state of the case, acting with judgment in prohibiting inoculation. At page 127 of the Appendix to the Report of the Small-pox Commission, in a letter from the Civil Surgeon of Bhaugulpore, we read, "During the past month, at least a dozen Ticcadars made their appearance in the Bazaars of this station, and were duly reported by my vaccinator. A report was immediately sent to the Magistrate, requesting that they might be turned out, or a stop put to their malpractices. The Magistrate immediately complied with my request; since which time, no others have made their appearance." And, again, the Civil Surgeon of Tirhoot, at page 131, "The inoculated seldom die themselves, but those infected from the inoculated die in great numbers. We have ascertained upwards of three hundred cases of inoculation during the spring; there have been deaths from small-pox induced, and many cases of spontaneous small-pox. The authorities here come down upon the inoculators very quickly. I have just prosecuted two men and proved the crime against them; they are sentenced to three months' imprisonment, and to find securities (moochulkah), or rather give a bond not to inoculate again in this district."

It is quite probable that, during the existence of an epidemic, these men only increase the mischief; but, if they be driven away and punished by the authorities, they will scarcely venture to reappear in non-epidemic years; and, in default of means being taken to supply vaccinators as extensively, the population must be left utterly unprotected; this is a circumstance well deserving the serious attention of Government. I think the figured statements contained in the foregoing pages, must render it highly probable that in non-epidemic years the operation of inoculation is attended by danger to private or public health in an exceedingly small ratio. In epidemic years it probably becomes increased. But this exists only amongst the unprotected 15 per cent. Viewing the social habits and prejudices of the people of Bengal, might not the more simple plan of dealing with them be, to secure the inoculation of the remaining portion, and thus afford a perfect protection to the whole community. Before decidedly advocating such a measure, it becomes desirable to ascertain how

this portion of the population is composed. It would appear to consist of three classes: 1. The very young who have not attained an age sufficient (according to their parents' ideas) for the operation. 2. Adults who from apathy or poverty have failed to undergo it. 3. The families termed "Itsha" who are devoted to Hurree or Seetula, and offer themselves willing victims to small-pox. Were the individuals composing these three classes universally inoculated, all pabulum for small-pox would be removed, and the disease would cease to exist, except when artificially excited. Now, in this instance, legislation might advantageously step in, and insist upon the protection being afforded to all, and at an early period of life. The only decided opposition to this would be found amongst the "Itsha Families," whom we find thus described in the Report of the Small-pox Commissioners, by Baboo Gobind Pursad Bose.

"It behoves here also to notice a false prejudice, under which some of the Hindu families totally refrain from having recourse to any kind of protection whatsoever, on a tradition, that in the days of yore their ancestors were visited by small-pox without inoculation, which they interpret Itsha, or a favourable visitation of the Goddess Situla, and have thence made it a family rule never to adopt any kind of protection, by which they apprehend that the goddess will be incensed, and it is chiefly in these families that the malady first appears, till it becomes general in the manner I have related in the first part of this answer.

"This last evil, therefore, I beg to say ought to be the first to call for the interference of the authorities, to be put down by compelling all such families to break through this foolish rule of their own making. Enquire in every Mohalla where the disease is now awfully raging, and it will be found out that more than three-fourths of the population, already carried of by small-pox, were from the Itsha families I have above described."

Again Baboo Urnoda Pursad Banerjea:—

"A large class of the people of this country, most of the Buneeahs and Tauties of Calcutta, neither vaccinate nor inoculate; and I consider that the true cause of this disease propagating itself may be traced to them. Some of them first catch it from people inoculated in their neighbourhood, and then spread it among themselves, till it assumes an epidemic shape. The disease rages virulently in the most thickly populated localities. The defective treatment of the sickness, and utter negligence or ignorance of the natives

to adopt measures to neutralize the infectious influence of the disease, may be also reasons for its extensive propagation."

These families then would seem to be the focus from which during epidemics disease may widely spread. We have no clue to their number in Calcutta, but in the Census of Rampore Bauleah before adverted to, I found the total Itsha population to amount to 153 souls. Now here I would venture to express on opinion that the Government might exert its power with justice and success. Not a moment's doubt can exist as to their dangerous state, both in regard to themselves and neighbours, whilst their isolated condition and small number, would effectually prevent much, if any, social sympathy.

It has already been said that the great majority of opinions contained in the Report, are in favor of penally interdicting inoculation. But the views of several who have devoted much thought to the subject are opposed to this. Dr. Mackinnon for instance in his admirably suggestive work, "Public Health, Climate, and Diseases, &c. of Bengal and North-West Provinces," says, when speaking of the mode in which our present establishments might be made most effective in the spread of vaccination. "If I say we had done all this, what have we done towards the general spread of vaccination among the people, nothing, absolutely nothing; and it is this consideration which justifies us in alluding to inoculation, as a means of lowering the present ratio of mortality, and dealing with the question, whether inoculation should be legalized and enforced, or put a stop to altogether. Most of our readers must be aware that the practice of inoculation prevails extensively in all parts of the country, and that in this way the disease is widely diffused; and though those who are inoculated have a mild disease* in comparison, the general mortality is greatly increased by it† as was clearly proved in England by numerical statements. The practice in England is now forbidden; but whether here (where we have not the substitute to offer, we could in justice suppress it, and thus deprive the individual of the power of protecting himself in the only way he

* I state on the authority of Dr. Watson, that about 3 in 500 die of those inoculated. See his Lectures, page 732 and 3 Vol 2.

In America it was calculated that 1 in 400 died. Of the natural disease about 1 in 5 is said to perish.

† This increased mortality, as I have shewn, is to be explained in another way. s. h. b.

can, is a delicate question, and leads us next to consider whether a legalized system of inoculation might not be the best adapted for this country. To treat this great question at full length, involving the practicability of the measure, as well as its advantage, would occupy more time and space than I can at present devote. It does seem to me, however, on a hurried consideration of it, that we would here have the prejudices of the people co-operating with us; that we should be able to avoid the difficulties and uncertainties, attending upon vaccination in India; that we have the establishment made to our hand in every country, town and village, and that it is perhaps possible to frame rules for inoculation, which would ensure its universal adoption, and at the same time avoid the danger of spreading the disease in future."

Again at page 187 of the Appendix to Report, we find Dr. Chevers saying:

"I feel diffident in venturing to give a decided opinion, founded upon limited experience, upon the very important question as to the safety or necessity of putting down inoculation in this country by Legislative Enactment. It however appears to me that, for several reasons, the adoption of such a course would be attended, at present, if not with positive evil, assuredly with a very uncertain prospect of benefit to the Native community at large. The only substantial attendant evil exists in the fact that the inoculated person becomes a focus of contagion to those around him who are not protected. The only advantage which vaccination has over inoculation is, that no deaths and no contagion occur from this cause. It is therefore evident that, could the patients be properly isolated at the time the infection was in operation, inoculation would only be rendered less preferable than vaccination, by the fact that some 0·20 or 0·25 per cent., of the patients might die in consequence of the operation. Whether this risk might not be diminished, or removed, under proper management, and whether it is in itself at all equal to that of death from infection, after apparently successful vaccination with deteriorated lymph, are certainly questions which should be duly weighed."

"I must venture to submit that the prevention of inoculation in this country must at present be regarded as the removal of the only essential safeguard against small-pox which the great mass of the native inhabitants possess, and must therefore be viewed as a measure which, not being sanctioned either by precedent or by medical reasoning, is

to be regarded with the utmost distrust and apprehension." And, again, Dr. Wilson, at pages 90 and 91, of the same.

"That the suppression of inoculation would be looked upon as a harsh measure, was the unanimous opinion of the natives I conversed with, and these were not a few. The spirit of the Bengallees here is altogether adverse to any such forcible change. Inoculation is well known, extensively, and skilfully practised, protects nearly 90 per cent. of the population, the remnant unprotected are partly so from custom or religious prejudice. Thus some parents will not have it, because from father to son it has always been so; and a few because at their birth having been devoted to Hurry, trusting in him, they defy the laws of nature. The poor have confidence and pay for it, which as yet they will not for vaccination. On the contrary, exertion is required to get subjects for it; and however desirable it may be to introduce vaccination, if such is the general feeling over the country, most certainly it could not be done by any enactment of the government; for there is no enactment on the face of the earth could make the entire parents of a district abandon an operation, so long as they believed it to be effectual in saving the lives of their offspring, for one, which was known or believed to be ineffectual for the end proposed; and if the system of inoculation is actively interfered with, before we convince the natives generally of the superior, or equal efficacy of vaccination, undoubtedly there is a possibility of our changing what now is little more than indifference, into opposition."

The thing is not to be got rid of by forbidding it, and we dare not forbid it before having provided the substitute. Whenever a Ticcadar is removed, government must place a vaccinator, otherwise we increase the evil; for, if we wholly or partially suppress inoculation, and fail to introduce vaccination to a like extent, we must leave a larger proportion unprotected; and, when an epidemic does come, it will be with a vengeance. Inoculation is not a curse, it is a blessing, and was so considered in England till vaccination superseded it, and it is so here, till the people understand and take to its substitute. Let the schoolmaster go abroad a little longer, and when the spirit of the age calls for a change, when we have convinced the people generally that what we recommended will indeed secure them from small-pox, and when we have supplied men who will really vaccinate and not inoculate; in short, when we have made it a want of the people, then we can carry vaccination on the rising

tide of popular belief to any extent, and then, if it is thought proper, let us have an enactment forbidding inoculation, to finish the business; but to begin thus, with a chance of success, appears impossible."

I find some very similar observations made by Dr. Gregory, at a meeting of the Royal Medical and Chirurgical Society, January 28, 1845,* thus reported.

"When women, in the commencement of life, were, after vaccination, liable to an attack of a disease by which their beauty or eyesight might be destroyed, it was necessary to consider the most efficient mode of preventing such a calamity. He recommended that inoculation should be combined with vaccination. He did not consider that in all cases inoculation was the best measure, but he felt satisfied that in India nothing better could be devised, and he recommended that it should be adopted by the East India Company; placing inoculation under the superintendence of the Government, and directing it to be performed by medical men, would be the wisest step they could pursue. A plan of this kind, somewhat modified, might be introduced with advantage into this country."

The object of these remarks, it must be distinctly understood, is not to institute a comparison between vaccination and inoculation, in regard to a community in which it is proposed to institute a sanitary prophylactic against small-pox for the first time, but in relation to one in which the latter is already adopted by 85 per cent of the population, amongst whom a social system for its propagation exists. The value of the former in Europe, especially when made compulsory by law, has just been most triumphantly established by the Report of the Epidemiological Society, based on the most extensive statistical data, by which it appears that "taking the average of 21 European countries, the ratio of variolous mortality has been reduced by vaccination from 66.5 per thousand deaths to 7.26," and again, "In Upper Austria and Saltzburg, where vaccination has been made compulsory, in the ten years ending 1786, the average deaths from small-pox were 46 per thousand deaths, whereas the average deaths during the 7 years ending 1850 were only about 3.50 per thousand.†

One great drawback to the successful prosecution and progress of vaccination in Bengal, consists in the large proportion of unsuccessful cases, which in the minds of so ignorant

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* *Lancet*, February 8th, 1845, p. 165.

† *Report on Vaccination by Committee Epidemiological Society*, 1853.

and unreasoning a community, leads either to a full belief of security and consequent unhesitating exposure to small-pox, or to total distrust of the measure.

Now the probability is, that each of these failures constitutes a focus of contagion, from the belief that the operation is successful, or a centre of distrust in its efficiency. These evils are not attendant upon inoculation, which, as far as I am aware, exhibits few or no cases of failure. It might be hoped that the growing intelligence of the people would lead them to prefer the English practice, but the following table, taken from Dr. Stewart's Report on Small-pox in Calcutta, in 1833-34, 1837-38, 1844-45, does not shew this satisfactory result, as no permanent progress is observable.

Table T.

Exhibiting the Total Number of Vaccinations in the Bengal Presidency for Seventeen Years.

Years.	1827.	1828.	1829.	1830.	1831.	1832.	1833.	1834.	1835.	1836.	1837.	1838.	1839.	1840.	1841.	1842.	1843.
Number of vaccinations.	37,958	60,449	52,769	61,910	21,394	15,119	20,891	13,914	12,043	22,836	38,706	42,120	30,250	50,270	49,211	52,511	68,680

Now selecting the most successful year, that of 1843, and comparing the numbers vaccinated with the assigned population of the tract of country embraced in the returns, viz. the Presidency of Bengal and Agra, which is 69,710,000* we get a ratio of .98 vaccinations for every thousand persons in one year.

In Bauleah, the proportion of total vaccinated to population in the year 1852, amounted to 4.1 per cent.

It has been hoped, as I have said, that education and intelligence would induce the discontinuance of the old practice for the new. The following table, however, constructed from the detailed returns of my vaccinator, will shew that, in Bauleah at least, the Candidates for vaccination, consist of the poorest and most ignorant class of society, who probably select it on account of economy.

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* *The Statistical Companion*, 1848.

Table U.

Exhibiting the Occupation of the Fathers of 1976 *Vaccinated Children at Rampore Bauleah in the years'* 1851-52-53.

Ryots.	Silk-makers.	Day-laborers.	Graindealers.	Thatchers.	Oilmen.	Servants.	Carters.	Shop-keepers.	Barber.	Fishermen.	Wood-sellers.	Gardeners.	Private Bengalee teacher.	Brick-layers.	Silk-worm Breeder.	Coolies.	Policemen.	Beggars.	Milkmen.	Blanket-makers.
200	18	49	16	9	4	82	11	11	1	10	2	3	1	30	1	44	20	5	4	2

Dancer.	Rice-seller.	Bearer.	Land-holders.	Tailors.	Carpenter.	Boatmen.	Money-lender.	Book-binder.	Sheep sellers.	Ornament makers.	Flour-seller.	Musicians.	Washermen.	Flower-sellers.	Weavers.	Cane makers.	Caste of children vaccinated.	
																	Hindu.	Mussulman.
1	1	1	2	16	1	2	1	1	3	3	1	3	1	3	26	1	883	1093

I trust I have shown, in the foregoing pages, that the vaccine disease *per se* may be propagated with great success throughout the year in the hills and Bengal, and probably all climates south of the terminal line of the North-West Provinces, unattended by those alarming modifications which some authors have mentioned; and that, were the people well inclined towards it, might become universal. But it is equally clear that an infinite majority of the people are passively opposed to its introduction, through prejudice, custom, superstition, and other causes. Much of this might doubtless be overcome by spreading active and intelligent vaccinators over the country, as has been suggested by the Commission, and more particularly considered by myself on a former occasion.* Such a course is understood to have been attended with marked success at Bombay. But, if the Government be indisposed to this, I think it may be a question whether it would not be wiser to organize a system of inoculation in Bengal, entrusting the duty of its local superintendence to the present Deputy-Superintendents of vaccination, and authorizing them to license the perambulating inoculators.

* *Suggestion for the Extension and Perfection of Vaccination in India*, Calcutta, 1851.

This arrangement should only be made in Bengal proper. In the North-West, as we have seen, inoculation does not exist, and vaccination may in the favourable season be pushed forward without difficulty. It is, however, of the deepest importance that the measure should be taken resolutely in hand, for at the present moment the great mass of people of the North-West must be "unprotected" in any way, and small-pox once springing up would be most destructive. It does not admit of doubt that, in these provinces, trustworthy European vaccinators, as at Bombay, should without a moment's unnecessary delay be sent into the interior in sufficient numbers to operate upon the whole population. I am not acquainted with the condition of Orissa, but the inhabitants of Arracan and Pegu, will possibly be found as much unprotected as the inhabitants of the North-West Provinces, and amongst them also vaccination should be pushed forward with zeal and determination. It is an urgent requirement of the Public Health, that protection against small-pox should be afforded to the bulk of the people, and not confined to the immediate residents of sudder stations, who constitute mere units in the population. Protection of some kind should be imperatively conferred by the State, and not left to the free choice of the people. The difference in results between the voluntary and compulsory system, is well shewn in the following remarks by the Committee of the Epidemiological Society, in their recent Report on vaccination before quoted.

"On looking at these tables, we cannot fail to be struck with the fact, that the proportionate mortality from small-pox in England and Wales, is considerably more than double what it is in any country in which vaccination is compulsory. So likewise, as will be seen by reference to the tables printed at the end of this Report, the proportion of deaths from small-pox in London to the total mortality is three times, and in Glasgow as much as six times, what it is in Brussels, Berlin, or Copenhagen."

Although I have ventured an opinion that legislative compulsory vaccination is at present most unfitted for Bengal, I hold quite the contrary in regard to those parts of the country in which the inhabitants fail to afford themselves any protection. Here it may fairly be insisted on. But, if any hesitation still exist as to the active employment of the law, measures less stringent, but still effective, may be resorted to, such as the refusal of all Government employ to unprotected persons.

Still limiting my observations entirely to Bengal, and on the supposition that government is not yet prepared to carry out vaccination in that comprehensive way which alone can ensure success, the question naturally arises, whether it might not be judicious to abolish vaccination altogether, and direct the present establishments to turn their whole attention to inoculation. The good at present done is very slight. The conflict of the two systems is full of evil. The unsuccessfully vaccinated, either from apathy or misplaced faith in the efficacy of the fruitless operation, fall victims to small-pox, and the vaccine disease is regarded by the neighbours as useless, or the native vaccinators urged on by interested motives, mingle the two lymphs, and those hybrid cases are produced which have caused much ill-founded depreciation. It seems essential for the public health, that vaccination and inoculation should not be permitted to co-exist in the same part of the country, but that we should elect between them. In all parts of the empire but Bengal, as we have seen, such election is easy, but here it is rendered difficult by the fact of a most extensive system of inoculation being already in operation. This being granted, it only remains to determine whether the dangers of inoculation are such as to impose upon us the difficult task of uprooting a social system so thoroughly established, or whether they may not, by organization, be so limited as to justify us in retaining it. To bring forth facts elucidatory of this has been the object of my present inquiry. If the amount of private and public danger attending inoculation be such as stated by many respondents to the inquiry of the Small-pox Commissioners, the question is virtually decided; but if, as I cannot but suppose from analogical reasoning, and the statistical facts I have brought forward in the foregoing pages, the evils have been much overstated, it is still open. In such a difficulty numerical arguments alone can be received, and I have employed them as far as available; although it must be confessed that our Indian statistics are not yet in a very reliable state. The want of a body of vital statistics is severely felt in such an inquiry. Without them no broad or comprehensive sanitary inquiries or legislative measures can be carried out or determined on. If India is to share in the improvements in Public Health, now accorded to European nations, such statistics must be framed; they alone form the key of the whole edifice. It is not possible to obtain them throughout the country, but an order from the Magistrate of every Sudder Town, a moderate

attention from the Medical Officer, and a writer on Co.'s Rs. 20 per month, would suffice to procure some very reliable records, in the absence of which all real sanitary progress must be deferred.

The legitimate deductions from the foregoing premises would seem to be as follows:—

1. That certainly in three zillahs, viz., Rajeshye, Chittagong, and Dacca, and probably throughout Bengal proper, the adult population enjoys a protection from small-pox, by the self-organized practice of inoculation, in the proportion of 85 per cent at least (vide table A.)

2. That of the remaining 15 per cent., the smaller fraction remains unprotected from superstitious reasons and the larger from poverty, both of which might be brought within the circle of protection, by a combination of legal compulsion with gratuitous inoculation.

3. That no means of protection are voluntarily resorted to by the inhabitants of the North-West Provinces.

4. That,—whilst the vague answers incorporated in the Report of the Small-pox Commissioners assign an immense mortality, exceeding that of small-pox itself, to the operation of inoculation,—the numerical facts carefully collected and embodied in tables O. and P. in the foregoing pages, make it appear almost identical with the ratio which obtained at the Inoculation Hospital in London, viz., 3 per 1,000. This great discrepancy may perhaps arise from the former statement having been based upon the results of an epidemic season, whilst the latter had reference to non-epidemic years. Viewed in this light, the great mortality of inoculation asserted in the Report may have been due to the fact of inoculated persons having previously contracted small-pox, and, inoculation being superadded to this, a greater intensity was given to the disease.

5. That the average mortality from small-pox in Calcutta during non-epidemic years, in which inoculation is steadily practised by 70 inoculators, does not exceed that of London (vide table R.)

6. That the remotely injurious effects of inoculation appear to have been much overstated (vide table A.)

7. That the proportionate success of vaccination in Bengal and the hills throughout the year, appears to equal that of England (vide table F.,) and that no satisfactory evidence of its being less powerfully protective, has yet been shewn.

8. That vaccination is impracticable in the North-West Provinces during the hot season (vide table E.)

9. That it is an urgent requirement of the Public Health, that protection of some kind should be universally diffused, and made compulsory, for which purpose it is essential that well-instructed vaccinators, superintended by European officers, should personally visit every town and village in the North-West Provinces, during the cold-season; whilst, taking the peculiar circumstances of Bengal into account, it may be more desirable to omit vaccination altogether in that province, and to substitute systematic inoculation properly superintended.

10. That no effectual sanitary progress can be made in India, until the government establish a system of Death-Registration for the principal towns of each zillah.