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Epidemic Cholera in the Bengal Presidency.

REPORT

ON THE

GENERAL ASPECTS OF EPIDEMIC CHOLERA IN 1869:

A SEQUEL

TO

“A REPORT ON THE CHOLERA OF 1866-68.”

BY

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REPORT

ON THE

GENERAL ASPECTS OF EPIDEMIC CHOLERA IN 1869.

INTRODUCTION.

HITHERTO, in trying to explain the epidemic relations of the cholera of any year, the difficulty has constantly presented itself, that I have been compelled to make use of an unrecognised nomenclature, and to assume as fact what others have been unable to appreciate except as theory which has still to be substantiated. I have been compelled to speak of the age of the existing epidemic, of its distribution in space, of the dates of appearance of dormancy and of decadence in relation to geographical site, of the movements of different waves of the epidemic, and of the phenomena accompanying advance; and while doing so, I have felt that I was asking for credence where at every step I was liable to be called on for explanation of phenomena whose significance I had interpreted in accordance with a theory not yet accepted. In order that the generalisations which I held provisionally might be clearly understood, and that the facts upon which these were based might stand recorded, I tried in reviewing the epidemic history of 1866-68 to throw the narrative in all its bearings into such a shape that a standard of reference might not be wanting when the history of epidemic cholera in future years was being written. In advancing a system embodying not one but twenty unrecognised or half-appreciated theories, it need not be a matter for wonder that I should have failed in some instances fully to elucidate the acknowledged obscurities which surround the subject. In other instances, however, when I may but imperfectly have illustrated my proposition, the fault has been my own, in taking for granted without adducing the proof which might readily have been forthcoming, something less apparent to the reader than to myself accustomed in my own mind to pursue an argument for which all the data are present. Nor must it be forgotten that I have distinctly referred my generalisations to the test of future experience. I have been contented to produce many generalisations as suggestions, and I have not asked that these be received unless they shall have stood the tests indicated. For no proposition is of the value of a law unless the data upon which it is based are true for all time to come, and can be recognized as true by any one who has carefully studied the history of the past from which the deduction has been drawn. Many suggestions I have offered for my own study as well as for that of others; for the study is long, and those who would accuse me of having on insufficient grounds tried to divert the study of cholera as an epidemic in a wrong direction, will have reason for their objections, if I cannot show, or if those who trusting to my facts have undertaken to study this epidemic history in a definite direction fail to perceive, the parallelism of recurring phenomena and the fixed place in a system of the events which occur year by year.

I propose, therefore, to write the epidemic history of 1869 in relation to the propositions laid down in studying the history of the cholera of 1866-68. I shall show the facts of 1869 as parallels, and trace them in relation to the theories of revitalisation and decay, and of progression and limitation in space already defined; and the outbreak of communities I shall also study, following out the conclusions of the second section of my previous report. The data of 1869 will, in short, afford the first opportunity for testing the stability of the theories founded on experience ending with 1868.

I have said, that even in cases where occurrences may be forming themselves into true parallels, want of appreciation may be the cause of our overlooking the significance of events, and that upon a retrospect their true place and meaning become apparent, and we have then no difficulty in reinstating them in their position in epidemic history. Sometimes our anticipations in regard to coming events will be absolutely realised. At other times what might have been exhibited in substance is shown in shadow only. But the true student will not on this account allow the phenomenon to escape his notice or to pass unrecorded, and those who have most earnestly watched the phenomena occurring in the course of the advance of cholera know best how to rate even trifling indications at their true value. Month by month, the registration of deaths throughout the Central Provinces and Upper India is becoming more

complete and accurate, and the student of epidemic history will in the future enjoy advantages in his pursuit which have up to a very recent date been denied. We have, hitherto, been compelled to fall back upon recorded statements in place of statistical data in estimating the prevalence of epidemic cholera among the population of any province, and true as are the indications afforded by the types which we study in particular, the absence of an aggregate of figures has always been felt to be a serious drawback. Those who do not know how true are the indications afforded by types of a community as regards cholera cannot be expected to feel the same confidence in deductions from the statistics of these types as observers who employ them knowing them to be accurate indices. No one in following out the history of an epidemic can ignore the advantage of information derived from all sources. And speaking from experience I know that the wider the data, the more perfect will be the harmonies. It is not true, as some would allege, that the statistician theorises best from imperfect or inaccurate data. A rigorous system of statistical research will meet its reward in forming the ground-work of true theory. Accumulated experience sustained by a statistical record affords the best guarantee for the diminution of error and for the advancement of what is scientifically true.

The report which follows is to a very great extent a commentary on various papers communicated to Government during the progress of the epidemic of 1869. These documents being given in original, an opportunity is afforded for judging how far the anticipations formed were borne out by the course of events. I shall try to make clear the train of thought which led to the various suggestions offered; and whether the anticipations may have failed, or whether my appreciation of the significance of different occurrences during the year has been made after, and not during the time the events were in progress of manifestation, the lessons taught will be none the less worthy of study, with the view of fixing each in its proper place the manifestations of the past year.

Although my report on the cholera of 1866-68 was in the hands of the printer in February 1869, various causes delayed its publication, and I was able to a certain extent to add to the first section the results of my study of the cholera of 1868 as elucidated by the revitalisation and progress of the same cholera in the spring of 1869; and in the last paragraph, written and printed before the monsoon manifestation of the cholera of 1869, I was able to predict that advance on Northern India and beyond Hindostan was imminent. In my report and in the report of the Sanitary Commissioner for 1868, the area covered by the cholera which I traced epidemic within the endemic province, and invading to the west and south-west in April 1868, is most distinctly mapped, and its geographical limitation, and its intensity in relation to the population of the districts invaded are clearly defined. The behaviour of this cholera after its revitalisation in 1869 is the subject of the present report. We are called on to study its relation to the provincial areas covered in 1868 as regards appearance, culmination and decay, the phenomena attending the breaking through of the boundaries shown upon our map of 1868, the geography of this invading cholera, and the record of its dormancy or death in the last months of 1869. I trust that the greater facilities afforded to me in the collection of statistical facts may enable me to write the history of 1869 with clearness and precision, so as in some measure to lessen the difficulties which those who have undertaken to study the subject have felt in using my first report as their guide, from the intricacy of the arguments and from the extent of the data which I was of necessity obliged to incorporate in recording the results of a primary study. Had the study of the phenomena of cholera in India been free from difficulties, we should not now after an experience of fifty years have been compelled to bring forward propositions as fundamental in opposition to those of secondary import, alleged, notwithstanding many and insuperable objections, to be in themselves sufficient to constitute a system, nor should we now be trying to elaborate a system founded upon truths which all experience shall show to be fundamental. I have not asked that my statement of facts and my interpretation of their significance shall be accepted from what I have already written. I have offered to test by the occurrences of every day what I have proposed for acceptance, and it has been my wish to afford to every observer the means of judging of these facts for himself, and not of them as they stand interpreted by my sympathies or preconceived ideas. I do not hesitate to recognise that to one who is not thoroughly interested in the study of cholera my late report presents many intricacies; but those who have most carefully perused it have been enabled to grasp the plan of the work as far as it indicates the method in which a natural system may be built up, and having done so have had satisfaction in going back to review the facts in relation to the position which they are made to occupy in the system. Those can know little of the harmonies of epidemiology and of the rigid laws which govern these harmonies, who would accuse me of sitting down with this vast collection of facts before me and ambitiously distorting each into a place in a system, which as a system has no real existence. Different observers will interpret the same facts differently. The uneducated man has no difficulty in satisfying himself that the ice groovings on a boulder are the work of the stone-mason. In science there is a recognisable limit to diversity of interpretation, and he whose education is the more complete can go further in advance than the man who has no intimate knowledge of the subject of which he professes to treat.*

It has almost been demanded that the result of a study of the cholera of India should show one immediately remediable condition to be the cause of the outbreak; and the hope

* "So many of Dr. Bryden's facts are susceptible of explanations different from those assigned by him, that we might occupy an entire *Lancet* and fail to exhaust them."—*Lancet*, February 26th, 1870.

has been that when this exciting cause is removed, cholera shall no longer show itself. When I have maintained that the epidemic is an inevitable evil, and the outbreak although capable of being mitigated, also inevitable, it has been asserted that such doctrines obstruct the progress of sanitation as a science. I have nothing to add to what I said in the previous report, namely, that sanitary science attains perfection only when based on scientific truth. The constantly repeated assertions of individuals that the adoption of some one measure suggested by their particular theories will at once put an end to the manifestation of epidemic cholera in our cantonments receive no sanction from the history of cholera in 1869.

The proposition—that the geography of the cholera of any year is definite and can be mapped, I have held to be fundamentally true. If it be true that the area covered is a natural area, and that the limitation of the cholera of any year is defined by the causes which I have grouped as natural, it follows, that without the clear recognition of the geography of the cholera of any year as subordinate to the causes which have determined this geography, the local observer is not in a position satisfactorily to generalise as to the extent to which secondary causes may have affected the manifestations of cholera within the area exhibited in relation to the included population. So long as the doctrine of the distribution of the cholera of the year by natural agencies is rejected, so surely will there be found substituted for it, not one, but all of those propositions which when taken together and admitted for the sake of argument to be true to the fullest extent, I have maintained to be totally inadequate to explain the phenomena of cholera as an epidemic, and to be as the basis of a complete system, practically useless. We find the local observer driven to lay hold of the theories assuming the contagiousness of cholera, the communicability of cholera, the poisonous nature of the emanations of cholera patients, and the poisoning from this source of the water-supply; and even after having admitted all, still forced to allow that his theory of importation is incomplete unless the concession be also made, that a body of men among whom cholera has not appeared and shall not appear, may prove the agency by which a province is infected.

The cholera of which I now propose to write the history, is that of an epidemic in its second year after leaving its endemic home. The cholera of 1868 I have described as a cholera invading from within the endemic province in the early months of the year, and its geography as manifested up to the end of 1868 is delineated not obscurely in the map attached to the Cholera Report for 1866-68. I had the opportunity, while the report was passing through the press, of watching in its revitalisation the cholera dormant within the area so mapped out, and from the spring manifestations of 1869, the conclusion, that the value in epidemic history of the cholera of 1868 had been correctly appreciated, and that within the circumscribed area of the previous year the materials for a far-spreading epidemic were pent up, could not be avoided.

Never hitherto has it fallen to us in India to study on a basis of facts such as has been afforded in 1868 and 1869 the cholera of any epidemic. The anticipations regarding the chief events of the year were put on record in June 1869, and the Government of India, alive to the vital importance of the enquiry, urged the employment of all machinery that might tend to elicit the truth regarding what was about to happen. The efforts of the provincial Sanitary Commissioners to ensure an accurate registration of the statistical facts among the general population were in 1869 attended with most satisfactory results, and the death-tables of the year depict with precision what actually occurred over Central and Northern India. The reports of districts coincide with the facts as recorded in the registration tables, and the tables and reports for the armies and jail population repeat what is true for provinces and districts. This last fact has been true in all past epidemics, as is proved by a study of the types in relation to the general reports from districts; but, because the actual statistical data could not be produced for the population generally, room was afforded for the suggestion that the facts observed among the population as a body might not have been in accordance with the indications given by the type. Such an objection is not based upon the actual facts of epidemic history, and my knowledge of these facts enables me to affirm, that the objection is of no weight when urged as a reason for rejecting what I have maintained to be leading truths in the history of all epidemics.

The elaborate care bestowed by Dr. Townsend in the investigation of the cholera of his province of 1868, as recorded in his published report on the cholera of the year in the Central Provinces, places us in a position to affirm as a fact that the geography of the cholera of 1868, as well as the intensity of the epidemic over the different portions of the area covered, was actually as it was represented to be in the report of last year. It was upon the tract under the jurisdiction of the Sanitary Commissioner for the Central Provinces that the invading cholera of 1868 chiefly fell. The district mortuary registers show also that the cholera area of 1868 included the valley of the Ganges, and was defined by a curved line stretching from the Oude Terai to Malwa, or even further to the west.

It was the occupation of the tract which I have termed the southern epidemic highway which raised apprehensions for Western and Northern India. Knowing the extreme unwillingness of cholera to cross the Doab, I anticipated no danger of invasion in Rohilcund, Meerut, or the Punjab, until the tract south of the Jumna exempted in the invasion of 1867 was once more re-occupied; and when, in the spring of 1869, cholera settled over this tract, then we knew that the journey of the epidemic of 1868-69 on the northern epidemic highway was begun. The history of the advance on the two highways falls to be considered in this report.

I shall have to trace the two limbs of the epidemic, extending the northern into Russia, the southern into Eastern Africa. These two extensions are what, in my previous reports, I have called "limbs," in trying to show how the epidemics of the past fifty years have invaded beyond the limits of Hindostan. After the occupation of the southern highway in 1868 and the revitalisation of cholera over Central India in the spring, I suggested the probability of the invasion of Eastern Africa at the end of 1869 or in the early months of 1870 by the cholera epidemic over the Central Provinces, now nine months ago; and while I write, Eastern Africa is being ravaged by cholera, first announced by Dr. Kirk, of Zanzibar, in a despatch dated 24th November. The history of the journey on the northern highway ending in the cholera of Kieff, I shall not here anticipate. The Sanitary Commissioner for Burmah has been employed in studying the extension of this same epidemic eastward, from the eastern margin of the endemic basin; for his province, and also Assam up to the north-eastern frontier, have been stricken by the epidemic of 1868-69.

In the pages which follow, I shall, first, briefly recapitulate the leading facts in the history of the cholera of 1868 and of the spring of 1869, and place in connexion with this history the anticipations furnished to Government relating to the probable movements of this cholera in Upper India in the months succeeding; next, I shall try to frame into a narrative the cholera history of 1869, and show the extent to which the anticipations formed were realised; and, finally, I shall notice the aspects of the cholera of the year as displayed in relation to communities.

ARRANGEMENT OF THE REPORT.

Part I.—Recapitulation of the leading facts in the cholera history of 1868 and connected with the renewal of cholera in the spring of 1869, and the anticipations formed regarding epidemic movement between June and September.

Part II.—The history and general aspects of the epidemic cholera of 1869.

Part III.—The aspects of the cholera of 1869 as shown in the affection of communities.

PART I.

RECAPITULATION OF THE LEADING FACTS IN THE CHOLERA HISTORY OF 1868 AND CONNECTED WITH THE RENEWAL OF CHOLERA IN THE SPRING OF 1869, AND THE ANTICIPATIONS FORMED REGARDING EPIDEMIC MOVEMENT BETWEEN JUNE AND SEPTEMBER.

The map of 1868 was drawn up from the experience of the types of the population, and from the registered deaths of the general population as shown in tables at pages 148, 149, and 153 of the Cholera Report of last year. The registration of Oude was not available when this map was constructed, but since then I have received details for this province from September 1868 and a general estimate of the cholera deaths for the previous months of the year.

Taking the registration of the North-Western Provinces alone, the line bounding the epidemic cholera of 1868 on the west was clear and well defined. Out of a total of 16,192 cholera deaths in these provinces, 13,777 occurred in Allahabad and the districts lying to the east and north, and the remaining 2,415 were distributed over the whole area lying west of Allahabad. So sharply was this line defined that the district immediately to the west of Allahabad gave but 88 deaths, and Cawnpore, 145 miles to the west, 67 deaths; and passing further to the south and west, the vast tract comprising the districts of Etawah, Jaloun, Humeerpore, Banda, Jhansi, and Lullutpore, with a population estimated at 2,882,949, gave but 36 cholera deaths over the whole.

It was towards the foot of the Himalayas that the cholera of 1868 appeared in its greatest strength. The districts of Goruckpore and Bustee registered 4,559 cholera deaths, and it is in connection with the cholera of this tract that it is now necessary to refer to the cholera deaths registered in Oude in 1868. It is the tract in the north of Oude that shows the continuation of

Supplementary details regarding the province of Oude, and the corrections required in the map of 1868 in relation to these details.

the epidemic from the east. The districts of Southern Oude suffered as little as Futtehpoore, Cawnpore, and Futtehghur, the adjoining districts of the North-Western Provinces:—

Statement showing the epidemic connections of the Cholera of Oude of 1868.

CHOLERA DEATHS OF THE GENERAL POPULATION, 1868.

Allahabad and Districts to the North.			Northern and Eastern Oude.			Southern Oude.		
Allahabad	...	622	Sultanpore	...	883	Pertabghur	...	108
Jounpore	...	1,104	Fyzabad	...	941	Rae Bareilly	...	163
Azimghur	...	1,554	Gondah	...	774	Oonao	...	119
Goruckpore and Bustee	...	4,559	Seetapore	...	851	Lucknow	...	256
			Baraich	...	356	" City	...	150
			Kheree	...	40	Nawabgunge	...	110
						Hurdui	...	199

This cholera we now know from the events of 1869 to have been an invading cholera. The westward extension in the north of Oude is likely to be of importance in shaping out the

geography of future epidemics; and therefore it is right that the map of 1868 should be corrected in as far as it does not show this extension.

And this is to be observed. If the line of western extension in the north be placed further west, and if the results of the registration of the Central Provinces be at the same time carefully mapped, the eastern area covered by the invading cholera of 1868 will appear very little different from the areas mapped out in the corresponding years of invasion, namely, 1855, 1859, and 1863.

The curved line which on the map indicates the limit of the invading cholera of 1868 in the west, skirts the exempted tract south of the Jumna above referred to. Intensity of manifestation in this western limiting line ceased at Saugor, and even at this point the cholera which prevailed up to the end of 1868 was important rather as a proof of invasion and as a forerunner of a cholera about to appear in 1869, than in its effects upon the population, for in the Saugor and Dumoh Districts only 290 deaths from cholera were registered throughout 1868. It was in the monsoon season of 1868 that these districts were invaded, and it was not until late in December (20th) that attention was called to the occurrence of the first case in the Bhopal State, a few miles to the south and west of Saugor, which proved the forerunner of a great cholera developed in the spring of 1869. Clearly defined as was the margin of this line stretching from Allahabad to Saugor, it is of extreme interest in the history of this epidemic to note the fact that our indices marked cholera in single sporadic cases over an enormous area in the very week of 1868 in which the first European soldier was struck down in Saugor. In Chanda the first notice of cholera was on the 15th August, in Ellichpore on the 18th, and at Malligaum in Khandeish on the same day. At Morar a single fatal case occurred in the same week in which the case occurred at Saugor; on the 20th a case occurred at Meerut, and a few days before (14th) a case was reported from Agra. To the possible significance of this cholera I have alluded at page 152, and the sequel in 1869 seems to show that the suggestion then offered represented what actually did occur. In many, perhaps in nearly all districts of the Central Provinces, cases of cholera had occurred before this date, in connexion with the spring invasion from the east. It is most remarkable that after the south-west monsoon had set in, no progress was made by this eastern cholera except apparently in the one week indicated. Even up to the end of 1868, Hoshungabad, Baitool, and Nimar had registered but 34 fatal cases, while the tract of the Central Provinces invaded in the spring afforded during the same period 7,200 cholera deaths. Nor is it to be supposed that the tracts exempted were those least liable to cholera. There are not in India areas more liable to the ravages of cholera than Nimar and the Chutteesghur Division of the Central Provinces, and both were ravaged throughout their extent by the revitalised cholera of 1869.

If the line of the west was definite, not less clearly defined was the line cutting off the great cholera of Jubbulpore, Mundla, and Seonee from the exempted tract of 1868 lying immediately to the east,—the worst cholera tract in India. Eight cholera deaths is the sum of the registration of the Chutteesghur Division for 1868, which in 1869 afforded 20,000 deaths out of its sparse population. As cholera prevailed along the northern margin of the mapped area of 1868, and had no power to enter the tract south of the Jumna, which in 1868 afforded 36 cholera deaths and in 1869 eleven thousand (10,975), so on the southern and south-eastern margin, the efforts of this great cholera, sitting in all its strength from April to December, and with every opportunity afforded to it except the presence of what was actually essential to its progress in this one given direction, were harmless for evil. A year later, 11th May 1869, the season came round in which the essential was afforded, and the sessile cholera made its leap into the unoccupied and congenial area.

Reasoning from the fact of the arrival of a cholera recognised as invading, with the setting in of the north-east monsoon, on 15th October at Bombay, and on 15th November at Hyderabad in the Madras Presidency, I felt justified, although ignorant of the results of the registration of the included area, in covering with yellow the whole country lying to the south-west of the Central Provinces of the Bengal Presidency. The registration for the districts of this tract as given in the report of the Sanitary Commissioner for Bombay, 1868 bears out this anticipation in a wonderful manner, and when tacked on to that for the adjoining districts of the Central Provinces, the continuity of the geography of the cholera of the two Presidencies is perfectly demonstrated, and the history of the invasion is capable of being read.

The Sanitary Commissioner for Bombay writes—

“Ahmednuggur appears to have been the district primarily visited and most severely ravaged by the disease, which extended into, and caused large mortality in, the contiguous Khandeish District northward, and the Poona, Sholapoor, Sattara, Kulladghee and Belgaum Districts southward. August, September, October and November were the months in which the disease was most rife.

“An effort was made to track the disease in its epidemic course from its entrance into the Ahmednuggur Collectorate; but the circumstances of sporadic fatal cases of cholera constantly occurring in the Ahmednuggur and other districts, and the impossibility of obtaining trustworthy information, rendered the attempt totally futile.”

Geographical arrangement of the deaths from cholera registered in the Bengal and Bombay Presidencies.

The cholera deaths of 1868 seem to me to arrange themselves naturally as is shown in the table which follows:—

Cholera Deaths Registered among the General Population of the Bengal and Bombay Presidencies in 1868.

DISTRICTS.	Estimated population.	CHOLERA DEATHS REGISTERED IN EACH MONTH.												Total deaths of the year.	Death-rate per 10,000.
		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.		
EASTERN DISTRICTS OF THE N. W. PROVINCES.															
Ghazeeport	1,332,403	51	33	123	166	145	383	245	378	327	241	87	36	2,215	16.62
Benares	793,277	20	30	109	171	228	444	140	78	70	33	35	15	1,433	18.06
Mirzapore	1,054,413	27	17	601	342	675	434	123	19	29	4	16	3	2,290	21.72
Azimghur	1,385,872	48	27	23	55	188	102	258	248	264	219	46	76	1,554	11.21
Jounpore	1,015,427	5	7	41	169	195	111	120	335	77	35	6	2	1,104	10.87
Gorakhpore and Bustee	3,439,513	175	28	35	399	592	762	1,165	937	340	97	29	...	4,559	13.25
Allahabad	1,393,183	24	7	12	56	119	55	204	58	28	9	14	36	622	4.46
Futtehpore	680,786	40	3	4	2	9	20	4	1	2	...	1	2	88	1.28
Cawnpore	1,188,862	...	1	11	5	4	9	10	6	5	8	4	4	67	.56
Futteghur	915,943	7	11	13	6	23	8	7	13	11	...	2	1	102	1.11
DISTRICTS OF OUDE.*															
Sultanpore	930,023	...	...	...	...	...	...	...	...	...	...	...	...	883	4.42
Fyzabad	1,437,009	...	...	...	...	...	...	...	...	...	...	...	...	941	
Gondah	1,167,816	...	...	...	...	...	...	...	...	...	...	...	...	774	
Seetapore	509,224	...	...	...	...	...	...	...	...	...	...	...	...	851	
Baraich	774,437	...	...	...	...	...	...	...	...	...	...	...	...	356	
Kherree...	737,732	...	...	...	...	...	...	...	...	...	...	...	...	40	
Pertabghur	936,053	...	...	...	...	...	...	...	...	...	...	...	...	108	
Rae Bareilly	782,874	...	...	...	...	...	...	...	...	...	...	...	...	163	
Oonao	724,949	...	...	...	...	...	...	...	...	...	...	...	...	119	
Lucknow	697,499	...	...	...	...	...	...	...	...	...	...	...	...	256	
" City	273,126	...	...	...	...	...	...	...	...	...	...	...	...	150	
Nawabgunge	875,376	...	...	...	...	...	...	...	...	...	...	...	...	110	
Hurdul...	930,977	...	...	...	...	...	...	...	...	...	...	...	...	199	
DISTRICTS OF THE CENTRAL PROVINCES.															
Raepore	586,118	...	...	1	...	...	...	...	...	...	2	...	...	3	.06
Belaspore	530,541	...	1	...	2	1	1	...	...	...	...	...	...	5	
Sumbulpore	268,295	...	...	...	...	...	...	...	...	...	...	...	...	...
Jubbulpore	539,106	7	7	1	2	148	671	1,520	542	41	13	...	...	2,952	54.76
Seonee	421,650	2	2	5	4	150	414	742	291	17	5	5	1	1,638	38.85
Mundla	217,264	...	1	...	...	9	263	567	209	21	4	...	...	1,074	49.43
Nursingpore	340,356	2	...	...	...	78	250	175	63	2	3	...	...	573	16.84
Dumoh...	280,554	2	1	...	3	3	5	1	1	9	...	4	...	34	1.21
Saugor	490,636	...	3	1	...	2	3	22	68	128	23	6	...	256	5.22
Chindwarra	260,913	...	...	1	1	...	...	5	45	1	...	2	...	55	2.11
Basitool	254,915	1	3	...	...	...	...	...	14	...	...	...	1	19	.75
Hoshungabad	427,056	...	...	...	1	...	...	1	...	...	...	...	...	2	.05
Nimar	166,882	...	...	1	...	2	...	1	...	...	8	...	1	13	.78
Bhundara	608,480	...	...	...	...	...	...	55	86	1	...	...	...	142	2.33
Nagpore	558,119	...	...	...	4	3	92	120	50	14	8	...	...	291	5.21
Balaghat	173,121	...	...	...	...	7	21	27	46	5	4	...	1	111	6.41
Wardah	176,228	...	...	...	2	8	12	73	172	74	23	6	...	370	21.00
Chanda	414,869	...	...	...	...	...	...	30	19	...	...	...	...	49	1.18
SOUTHERN DISTRICTS OF BOMBAY PRESIDENCY.															
Ahmednuggur	995,585	12	2	7	7	7	27	346	529	405	308	122	30	1,802	18.10
Poona	623,940	...	1	2	1	9	6	4	69	276	215	109	3	686	10.99
Sholapore	552,926	2	...	1	1	4	...	3	1	145	489	113	29	779	14.09
Sattara	972,431	...	2	...	...	...	...	...	...	72	350	180	53	657	6.76
Kulladghee	691,425	1	4	4	4	...	...	...	...	7	176	116	8	320	4.63
Belgaum	780,358	...	...	...	...	...	...	...	...	209	69	85	363	4.65	.02
Dharwar	816,980	...	...	2	...	...	...	...	...	...	...	...	...	2	
WESTERN DISTRICTS.															
Khandeish	1,024,156	5	13	...	...	4	4	11	229	244	18	24	1	553	5.40
Bombay City	816,562	1	...	1	3	3	2	3	7	1	33	69	104	218	2.67
Tanna	864,621	...	1	...	4	...	1	...	12	10	159	218	64	469	5.42
Surat	492,684	...	5	11	2	2	2	15	2	...	4	18	60	121	2.45
Ahmedabad	236,782	...	...	2	4	3	1	...	...	...	...	...	...	10	...
Broach	164,893	1	3	...	2	1	...	...	2	...	...	...	1	10	...
SCINDE.															
Kurrachee Collectorate	1,896,765	23†	...	...	...	...	...	...	...	...	...	...	...	23†	None
Other Districts of Scinde		...	...	...	...	...	...	...	...	...	...	...	...	...

* The registers are incomplete for the first half of 1868; the monthly details are therefore omitted.

† The winding up of the cholera of 1867.

Cholera Deaths Registered among the General Population of the Bengal and Bombay Presidencies in 1868,—continued.

DISTRICTS.	Estimated population.	CHOLERA DEATHS REGISTERED IN EACH MONTH.												Total deaths of the year.	Death-rate per 10,000.
		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.		
DISTRICTS OF N. W. PROVINCES SOUTH OF OR BORDERING ON THE JUMNA.															
Banda	724,372	1	3	2	2	...	2	1	8	12
Humeerpore	520,941	1	...	...	...	1	...	1	...	...	...	...	...	5
Jaloun	405,272	...	...	...	...	...	1	1	...	...	8	1	...	11
Etawah	625,444	1	...	4	...	2	1	3	...	1	...	...	...	12
Jhansi	357,774	...	...	...	...	...	...	...	...	...	...	...	...	...
Lullutpore	248,146
DISTRICTS OF THE N. W. PROVINCES LYING WEST OF THE LINE OF 80° E. LONG.*															
Bareilly	1,464,199	28	18	46	88	62	41	28	56	27	88	40	9	531	158
Budaon	889,810	1	12	12	8	9	10	11	16	11	8	13	3	114	
Shahjehanpore	918,850	5	8	...	1	1	2	5	5	6	8	2	...	43	
Moradabad	1,095,306	13	12	10	10	20	20	7	5	10	12	8	10	137	
Etah	614,351	3	4	4	8	4	4	8	3	6	5	7	5	61	
Mynpoorie	700,220	3	8	4	16	2	21	9	2	5	5	3	2	80	
Allyghur	925,538	9	14	5	8	6	4	11	11	16	12	7	3	106	
Bolundshuhur	890,481	3	4	2	12	12	9	...	22	23	8	1	6	102	
Agra	1,028,544	1	8	5	10	12	12	6	8	5	7	4	...	78	
Muttra	800,321	4	3	6	10	13	14	50	10	5	6	4	3	128	
Meerut	1,199,593	8	8	9	12	13	40	33	18	153	7	8	9	318	
Mozaffernuggur	682,189	21	11	49	7	2	36	34	17	10	4	8	9	228	
Seharanpore	806,483	5	16	9	24	21	11	16	8	4	9	3	12	138	
Bijnour	690,975	1	1	2	2	...	8	4	5	3	3	5	4	38	
Dehra	102,831	...	...	...	...	2	1	2	...	...	...	...	...	5
Teral Pergunnahs	91,802	...	...	1	2	...	...	...	...	...	...	...	...	3
Kunaon	385,790	...	...	...	...	...	...	2	...	...	...	...	...	2
Ghurwal	248,742	11	6	...	2	1	...	...	...	...	...	...	...	20
PUNJAB.															
Goorgaon	690,522	2	4	7	5	1	...	1	2	...	1	23	30
Delhi	602,633	...	1	1	...	2	1	3	1	...	...	2	...	11
Rhotuk	536,995	...	...	...	1	...	1	...	...	...	...	1	...	3
Hissar	484,681	1	...	...	...	...	...	...	2	1	...	...	...	4
Sirsa	210,795	...	...	1	1	1	...	1	1	...	...	...	...	5
Karnaul	610,927	2	3	3	2	...	3	2	6	5	1	...	1	28	
Umballa	1,008,952	6	1	5	4	7	5	3	1	...	3	...	...	35
Simla	26,402	...	...	...	...	...	...	...	...	...	1	...	...	1
Jullundur	783,020	5	...	1	...	1	3	1	...	...	...	1	2	14
Loodianah	583,445	...	2	...	1	...	2	...	...	...	...	...	...	5
Hoshiarpore	938,800	5	1	1	...	6	2	1	...	1	...	...	...	17
Kangra	744,162	3	6	1	2	3	5	5	3	14	65	8	4	119	
Goordaspore	906,126	8	4	4	3	...	...	...	...	...	...	...	...	19
Sealkote	994,458	1	...	4	...	...	2	1	2	2	...	...	...	12
Unrisur	832,750	5	3	1	8	28	14	12	11	6	3	4	...	95	
Gojrat	616,347	2	...	3	4	3	5	1	5	2	5	2	5	37	
Gojranwalla	550,576	3	1	1	1	3	4	5	5	1	...	1	...	25	
Lahore	775,551	...	...	...	1	2	1	1	...	1	4	1	...	11
Ferozepore	533,416	...	...	2	2	1	2	1	1	2	...	1	1	13
Montgomery	359,437	...	...	...	...	1	...	1	...	...	1	...	...	3
Mooltan	459,780	...	...	...	...	...	...	...	...	...	...	...	...	...
Mozaffergur	295,547	...	...	...	...	...	...	...	...	1	...	...	...	1
Dera Ghazee Khan	305,903	...	...	...	...	...	...	...	...	...	...	...	...	...
Dera Ismael Khan	389,533	...	...	...	...	...	...	...	...	...	...	...	...	...
Jhang	348,027	...	...	...	...	...	...	...	...	...	...	...	...	...
Shahpore	368,796	2	1	...	...	...	2	...	...	...	...	...	...	5
Jhelum	500,988	...	...	...	9	1	1	2	...	...	...	1	...	14
Huzara	364,324	...	1	1	...	2	2	...	3	...	...	1	...	10
Rawul Pindie	699,647	...	...	...	...	...	...	...	...	...	...	...	...	...
Peshawur	498,479	3	2	2	1	3	3	2	...	...	...	1	2	19
Kohat	140,249	...	...	...	...	...	1	...	...	...	...	...	...	1
Bunnoo	287,547	...	...	...	...	...	...	...	...	...	...	1	...	1

* A large proportion of the deaths registered in this area are erroneously attributed to cholera. See the remarks by the Civil Surgeons of the districts regarding the registration of 1869, p. 23.

In this table I have brought together the results of the registration of the Bombay Presidency and of Central and Upper India, maintaining the geographical arrangement of the different districts which I consider to be the natural one; and this table illustrates what I have written above regarding the geographical relations of cholera in 1868.

And before going further we may enquire what are the meteorological conditions under which an air-conveyed cholera, recognised even by those who attribute the introduction to human agency, as entering the invaded area of the Central Provinces from the north-east, makes its appearance and progress. I find that I have answered this question in notes at pages 154 and 155; and, judging from the history of the meteorology attending this and other

occasions on which epidemic cholera has crossed the continent, I have drawn the inference, that the capability of epidemic advance in the monsoon season from north-east to south-west, that is from Seonee, Mundla, and Jubbulpore towards Ahmednuggur, is exactly proportionate to the extent to what meteorological influences having as their base the north-east take the place of those having the Bombay coast for their base. That, in short, repression of the south-west monsoon will cause a cholera which we can recognise as epidemic in the north-east to descend towards the south and west to fill the vacancy left owing to the absence of the influences from the south-west normal for the season.* The line from north-east to south-west followed in 1868 was an aerial line, as the geography indicated in the table on the previous page clearly shows. The influences from the Bay of Bengal pressing steadily on the eastern flank of the cholera kept it entirely out of the Chutteesgurrh Division; the monsoon blowing up the valleys of the Nerbudda and Taptee pressed on it from the west; and hence resulted precisely the shape which we see on the map, or even in looking at the figures in the table below and knowing nothing of the geographical relations involved :—

Table illustrating how Cholera moves from North-east to South-west upon the Southern Epidemic Highway.

DEATHS OF THE GENERAL POPULATION, 1868.

Movement repressed by eastern influences from the Bay of Bengal.			Districts in the line of epidemic movement from north-east to south-west.			Movement repressed by western influences from the Bombay Coast.		
Raepore	...	3	Jubbulpore	...	2952	Bhopal	...	1
Belaspore	...	5	Mundla	...	1074	Nimar	...	13
Sumbulpore	...	None	Seonee	...	1638	Hoshungabad	...	2
			Saugor and Dumoh	...	290	Baitool	...	19
			Nursingpore	...	573			
			Nagpore Division	...	963			
			Ahmednuggur	...	1802			
			Poonah	...	686			

The cholera invading in the spring and making the further advances above described, lay thus in the invaded tract at the close of the monsoon of 1868. The devitalisation or dormancy of this cholera was then due, and it took place, as I have shown at page 155, over the whole area of the Central Provinces invaded in the first nine months. But even in October the head of the cholera invading the Bombay Presidency retained vitality, owing probably to its meeting the moisture derived from the Indian Ocean; and when the north-east monsoon set in, this cholera reached Poona and Bombay and showed itself also in the Nizam's territories at Hyderabad.† But even in the city of Bombay the mortality was trifling. The deaths of the city in the last four months of 1868 were as follows :—September 1, October 33, November 60, and December 104. There is, I think, little doubt that this cholera was in a great measure repressed, and prevailed at a season when, had its journey ended elsewhere, it would naturally have been dormant. This seems to me to have been a cholera which had for the time revived from finding itself at sea level and in a region bearing some resemblance to its endemic habitat. When I have spoken of a cholera reasserting vitality about the 20th February, it is with reference to a cholera of a region of certain physical attributes that I have spoken. When we arrive within about 200 miles from the western coast in the north of the Bombay Presidency, we expect to find cholera reappearing at the same seasons as in the valley of the Ganges, while further to the north the spring manifestation proper is repressed up to the end of April or the first week of May.

I have suggested the possibility (p. 87) that a dormant as well as a vitalised cholera may be actually distributed; or, in other words, that choleraic influence may generally pervade a region of any extent and manifest its presence by effects so trifling as to be recognised only when specially enquired after among the population, whose deaths are to be reckoned by units in place of by thousands, because of the moving epidemic being distributed at an abnormal season. I refer to this here that I may make mention of the cholera of our Presidency of the last days of November and of December in 1868. I have mentioned the single case observed by the Civil Surgeon of Bhopal, and, at page 151, I have spoken of the possible meaning of a single case observed at Morar on the 27th December. These, and the case of the 26th Regiment of Native Infantry which was attacked while marching south of Goonah, led me to draw the inference, that an offshoot of cholera was directed along the northern epidemic route at this time. This observation has been strengthened by the investigation of Dr. Moore of

* In connection, see remarks at page 44 of this report.

† Dr. Edward Balfour, Deputy Inspector General of the Hyderabad Force, informs me, that he distinctly recognised this as an invading cholera, coming after the setting in of the north-east monsoon. I believe that a strict parallel to the epidemic movement from North-east to South-west at this season in 1868, occurred in 1859. Following the invasion as mapped out in the appendix to the report of last year, a great cholera appeared in the Bombay Presidency towards the close of 1859. The epidemic relations of this cholera I indicated in a note, appendix p. lxxiv.

the Rajpootana Agency, who, guided by this remark, found that cholera did appear at this time in Rajpootana, near Beaur. And yet again, it is very important, in connection with the history of this cholera in Persia in 1869, to note that on 10th December the Medical Officer of the Persian embassy sends information that "several cases of cholera are reported to have taken place in Teheran during the last three weeks."

This rapid sketch will suffice to show the geography of the cholera of the new epidemic up to the end of 1868, and the degree of virulence manifested over the different parts of the area occupied. Virtually, Northern India was an exempted area in 1868; as, indeed, was the whole of the natural tract which I have described as the western division of the epidemic area, and also the pathway leading directly into it, which is the tract south of the Jumna. Two shadows had been thrown over this western epidemic area—the one of the third week of August, the other of the last weeks of the year confined to the south and west of the epidemic highway. But it was the dark shadow lying across the epidemic tract leading into Northern India that told of invasion to follow in 1869, and it was in anticipation of the consequences of this invasion that the following warnings were given to Government before the events occurred, or in explanation of the phenomena of epidemic progress in 1869.

From the imperfect information at my disposal regarding the cholera of Eastern Bengal and Assam of 1868, I was inclined to believe that an offshoot from the same endemic source which originated the epidemic of the Central Provinces had been projected from south-east to north-west as far as the Assam Frontier. In this conjecture I may have been wrong, and there is neither record nor registration to help us over the difficulty. But if the forerunners of invasion were not thrown out in 1868, invasion commenced at the earliest possible date in 1869, and cholera was epidemic in Lower Assam by the 20th February.

In the last three months of 1868, the general prevalence of cholera over Eastern Bengal indicated something beyond the manifestation usual at this season; for, from Akyab to Mymensing, cholera was universal at this time. This furnished the base whence the great invading cholera of Assam departed towards the north-east.

Throughout the report on the cholera of 1868, the cholera existing was asserted to be a new cholera and an invading cholera, destined to have a life period in Upper India beyond that of its present existence, and not likely to terminate in the year of primary invasion.

As regards the invasion of the Central Provinces, I wrote as follows (p. 147):—"We recall the invasion from the east of the cholera of 1863, and the gate by which we traced it entering to become the great cholera of the Central Provinces of 1864 and 1865. * * * The infection of these same districts early in 1868, added to the indications of the bursting forth of cholera from within the endemic area, leads me to believe, that in the phenomena we cannot but recognise the succession of a new invasion to that of 1863, and one not due to any portion of the cholera of 1866 and 1867." The invading cholera of 1868 of the Central Provinces furnished a register of 7,592 deaths; in 1869, the year succeeding the invasion—the year of revitalisation—the number of cholera deaths registered was 55,897. Very early in 1869, it was evident that the cholera from the east had finished its journey along the tract which I have called the southern epidemic highway. In Nimar and Hoshungabad cholera existed even in January, and 64 deaths were reported from these districts; and towards the end of February cholera became revitalised in many districts of the Central Provinces.

The statement on page 155 carries up the narrative to 3rd April 1869; and the parallel passage relating to the reappearance of the cholera of 1863 in February and March 1864 over the same area will be found at page 120, in which the state of the districts up to the 28th March 1864 is reported upon. At the very earliest date at which it could reappear, cholera became epidemic in the extreme west of the Presidency; thus, at Sirdarpore it was on the 10th March that the epidemic commenced. But a month earlier than this the Military Authorities at Goonah reported cholera to be prevailing in various gangs of labourers in the vicinity—a cholera derived probably from the invasion of December; for it is not to be overlooked that it was here that the 26th Regiment of Native Infantry got cholera on the last days of November in 1868. This was the first appearance of a great cholera which covered Central India Proper up to August. By the end of March cholera had begun to show itself in Gwalior. Major Thomson, writing regarding the drainage of Morar, says:—"As soon as rain fell, which it did towards the end of March, the ground began to steam, and the European troops were attacked with cholera." In relation to this observation, it is of importance to recall the single case of cholera at Morar in the end of December, and the anticipations founded upon the fact of its occurrence,—page 151. It was about the 12th April that cholera showed itself at Ajmere, and regarding the opinion which I offered as to the epidemic relations of this cholera, Dr. Moore observes:—

"If Dr. Bryden's theory is correct, the cholera of Rajpootana in 1869 must have been a 'revitalisation' of a former epidemic. And here I am bound to mention a fact apparently corroborative of his argument. At page 151 of his report, Chapter VII, headed

'Characteristics of the year 1868 on the northern epidemic highway,' the following note appears:—"The occurrence of cholera in Ajmere (in April 1869) might be considered by some only as caused by a northern extension of the cholera of Malwa of November and December, but I attribute to it a significance beyond this. I think it not improbable that an offshoot of southern or south-eastern cholera was directed into this route in December 1868, which is now becoming manifest." And a reference to the map shows cholera occurring in the Burr Pass in the month of November 1868, and this must be regarded either as a remarkable coincidence, or otherwise as directly supporting Dr. Bryden's opinions."

It is, I think, a point of vital importance in dealing with the history of the epidemic of 1869, to keep clearly in view the history of the movements of 1868 and the manifestations of the early months in the east, in the Central Provinces, and far to the west in Malwa and Rajpootana. These teach us how cholera skirting round far to the south found its way by the circuitous route of the southern highway to the extremity in our Presidency of the northern epidemic highway, leaving all the eastern portion of the same northern highway unoccupied for a whole season, from Ajmere eastward to the parallel of Allahabad. The occupation of the northern highway by the eastern cholera at the normal season in 1869 is to be studied as regards all its phenomena apart from this appearance of cholera at its western extremity. The invading cholera must be found entering the exempted area south of the Jumna from the east, and progressing along the northern highway until mingled inextricably with the cholera of November 1868, revitalised in March and April 1869. And intimate although the blending be, we shall, I think, be able by consulting the history of previous epidemics to show clearly that in dealing with both we are dealing with two things tangibly distinct.

The yellow patch of 1868 lay across the epidemic highway. The track of the cholera of 1868 must of necessity be crossed by influences from the Gangetic Provinces or from the Bay of Bengal seeking to reach the western division of the epidemic area; and we looked anxiously forward to the occurrence of cholera within the area exempted in 1868, knowing that the spring cholera was due in these districts, and that about the 20th May movement was to be dreaded, as in former epidemics, for an indefinite distance along the highway.

The Sanitary Commissioner for the North-Western Provinces was requested to forward intimation of the fact in the event of Jhansi, Lullutpore, Humeerpore, Jaloun, or Banda being invaded from the east in the spring. The event turned out as below tabulated:—

Occupation of the eastern portion of the Northern Epidemic Highway in the spring of 1869.

REGISTERED CHOLERA DEATHS AMONG THE GENERAL POPULATION.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
1868 { Jhansi	None.
1868 { Lullutpore...	None.
1868 { Humeerpore	1	...	...	...	1	2	1	...	...	...	...	...	5
1868 { Jaloun	1	1	...	...	...	8	1	11
1868 { Banda ...	1	3	2	2	...	...	...	...	...	...	...	...	8
1869 { Jhansi	1	...	35	163	1,438	152	5	...	...	1,794
1869 { Lullutpore...	20	1,186	779	479	219	13	6	...	2,702
1869 { Humeerpore	1	...	32	55	759	957	212	39	4	...	2,059
1869 { Jaloun	2	3	36	571	319	1,250	322	75	...	...	2,578
1869 { Banda	221	123	410	197	321	36	85	...	...	1,393

What followed in Northern India will be explained afterwards. Movement on the northern highway did occur as anticipated and at the date of our anticipation; and it became necessary for the Sanitary Commissioner to give warning of what was threatened in Northern India when the limiting line on the west of the yellow patch of 1868 was broken through.

On 18th June, the Sanitary Commissioner addressed the Government of India in the following letter, from which those parts only are omitted which had reference to special sanitary arrangements that might be required to meet the emergency:—*

"The occurrence of cases of cholera which have been reported during the last few weeks

Letter from the Sanitary Commissioner in anticipation of the movement of cholera over Northern India with the monsoon of 1869.

among the troops at the stations of Dinapore, Allahabad, Seetapore, Fyzabad, Agra, Morar, Saugor, Jubbulpore, and Jullundur shows that the area under epidemic influence is of wide extent, and leads to the most serious apprehensions that the disease may become more prevalent later in the season. When the facts of the case are

* This letter appears at length in the Proceedings of the Sanitary Commissioner for 1869, page 593.

compared with what took place in 1856 and 1861, these apprehensions become still more serious, and there is grave reason to fear lest the very great loss of life which occurred in those years may be repeated in 1869.

"In the accompanying memorandum Dr. Bryden has shown the parallel between the three years, and has pointed out the grounds on which he has reason to believe that a severe epidemic of cholera is to be dreaded. The point is also further illustrated in the annexed statement showing the daily number of deaths among European soldiers at the places attacked in 1856 and 1861.

"If the conclusions at which he has arrived after a patient study of the facts of previous years be correct, there is great reason to fear that the troops in the following stations will be invaded by cholera, and that in those of them where it has already appeared it will become more prevalent in the coming months of July, August, and September:—Allahabad, Cawnpore, Lucknow, Meerut, Delhi, Muttra, Agra, Morar, Jhansi, Saugor, Jubbulpore, Umballa, Ferozepore, Meean Meer.

"If this anticipation should prove correct, and if the disease should assume a virulence such as it showed in 1856 and 1861, the loss among European troops cannot fall far short of a full infantry regiment—not to speak of the casualties among women and children. In 1856, out of a strength of 21,304 British soldiers in the Bengal Presidency, 704 died from cholera. In 1861, out of 44,879, the deaths from the same cause were 1,065.

"Under these circumstances, I venture to bring the subject to the attention of the Government, in the hope that some measures for meeting the epidemic may now be devised, and that in the event of cholera attacking the stations indicated they may be carried into effect without delay.

"In the tables appended the statistics of cholera among European troops at ten different stations between the years 1859 and 1868 are given. From these it appears that at Allahabad, Cawnpore, Lucknow, Morar, Agra, Meerut, and Meean Meer cholera is invariably most prevalent in the months of July, August, and September; and that when a few cases (it may be but one or two) occur in the early months, they are almost always followed by an outburst later in the season, but that this outburst may occur even when no such premonitory cases have appeared.

"To these tables, which indicate some of the stations which suffer most persistently from cholera, I have added tables to show the remarkable immunity of Sealkote, Rawul Pindee, and Jullundur. To them may be added Roorkee, where there has been no fatal case among European troops since it was occupied; Mooltan, where there have been but two cases since 1859, both ending in recovery; and Campbellpore, in which no case has yet occurred among European troops.

"The benefits of moving into camp have, I believe, been sufficiently established, but the principle it involves might be carried out still further by endeavouring to move away from the infected area altogether. Our knowledge of the laws which govern cholera is not yet so exact as to enable us to say with anything approaching to certainty what the exempted area in any given case may be; but judging from the facts which are available, and setting all theories aside, there is good reason to hope that by moving troops into the neighbourhood of those places which have hitherto preserved such a remarkable immunity from the disease good results would follow. And I would therefore propose, for the serious consideration of the Government, that in the event of European troops being attacked at the stations in which an epidemic is anticipated, they should be moved to one or other of the localities indicated, in which experience has shown that they are more likely to escape.

* * * * *

"I make these suggestions fully impressed that it is very difficult, perhaps impossible, to say beforehand what course the cholera may take, and to what extent it may prevail, and, further, that the measures recommended may prove a failure. I have therefore placed all the facts before the Government for their anxious consideration. If the fears for the European soldiers during the next few months should happily prove groundless, no action will be required beyond preparing to meet the danger. Should cholera prove epidemic, it is best that measures should have been taken beforehand, and that a decided movement in a definite and predetermined direction may be tried as the best means calculated to avert a very heavy mortality."

Thus the Sanitary Commissioner wrote in the middle of June, and at this time the

Geographical position of the cholera of the epidemic as recognised at the time when this letter was written. printing of the first section of the Cholera Report was completed, and the following were the anticipations contained in the final paragraph:—

"The cholera history of 1868 teaches us clearly what we have not been taught hitherto with sufficient precision, namely, the method in which the southern epidemic belt is crossed from sea to sea and the time occupied in the journey. It teaches that in the year of its breaking forth (from within the endemic province) cholera may have extended indefinitely to the west in India, and without the affection of our Northern Provinces having taken place at all. * * * The great cholera now in progress in the Central Provinces, and which is epidemic also over Guzerat, is the exact counterpart of the cholera of 1864 following the invasion of 1863; and we shall wait to see whether or not it is destined at the close of this year or in the spring of 1870 to transgress the boundaries of Hindostan and to make its

appearance in Arabia or Syria or in Eastern Africa. The occupation of the northern highway has occurred in the spring of 1869; the forerunners have been thrown forward into Northern India as far as to Jullundur, Sealkote, Lahore, and Mooltan; and even those who know the phenomena of invasion only from personal and local experience recognise that the invasion of the Northern Provinces is imminent."

The printing of the second section of my report was not completed for some weeks later, and several months elapsed before it was submitted to Government; and during this period, in writing my anticipations, I was forced to quote at length several passages which I shall here omit, referring to them as they stand in the report itself.

The following is the memorandum which accompanied the letter of the Sanitary Commissioner of 18th June:—

"All anticipations regarding the epidemic progress of cholera must be drawn from parallel history. In India parallels occur in such a form and repeat themselves so constantly that we have no difficulty in coming to the conclusion that they occur in obedience to natural laws. We study the sequence of events therefore not as if the occurrences were mere contingencies, but in relation to their subordination to natural agencies.

"The nature of the agencies which regulate distribution and the data from which the laws of distribution are deduced I shall not allude to. I shall simply state the facts of the geography of the epidemic now in motion, and place beside them the parallel facts of previous epidemics of which we know the career subsequent to the date on which they had a similar and parallel geography."

* * * * *

Here followed a sketch of the progress of the epidemic of 1868 and the spring of 1869, such as I have given above.

* * * * *

"Cholera does not appear in Northern India either by invasion or when awaking from a state of dormancy before the 20th April in any year. In the south the revival takes place some weeks earlier; and this cholera of revival, commencing in March, has universally re-appeared over the tract affected in 1868.

"The cholera now prevailing over Jhansi, Agra, Gwalior, and parts of Rajpootana is immediately derived from the same emanation of endemic cholera; whether it be a portion of the south-eastern cholera of the Central Provinces, or a direct movement out of the countries lying south of the Ganges and Jumna, is a point of secondary importance. We want to know the significance of the invasion of Agra, Jhansi, and Morar in May with reference to the subsequent movement of the invading epidemic.

"I shall speak only of the invasion of our Presidency from 80° east longitude westwards, since this is the tract to which invasion is confined when cholera progresses to the north and north-west from the countries lying south of the Jumna. I do not say that invasion is not due this year in the Gangetic Provinces, in Oudh, and in the eastern half of the Doab; but the direction from which such a cholera invades is different, and the history of either provincial cholera must be separately considered.

"Invading cholera is repressed out of Northern India in May; and when invasion does take place in May it is represented in shadow merely. A cholera reappearing after invasion does occasionally appear in power as in May 1857 and May 1867; but with this question we have not to deal at present. I have to show, if the heralds of invasion have been thrown forwards, what may be expected in their rear.

"The following table illustrates the simple fact, that in the nine years 1858-66, 14 European soldiers died in the area now threatened with invasion in the six months from January to June; while in the three months following—July, August, and September—1,603 deaths occurred from cholera:—

European Army of Central India, Agra, Meerut, and the Punjab.

CHOLERA DEATHS, 1858-66.					Died per cent. of total deaths.
January	...	...	...	...	...
February	...	...	...	...	...
March	...	...	...	...	...
April	...	...	1	...	·06
May	...	...	8	...	·47
June	...	...	5	...	·30
July	...	...	339	...	20·08
August	...	...	1,007	...	59·66
September	...	...	257	...	15·22
October	...	...	61	...	3·62
November	...	...	10	...	·59
December	...	...	...	...	...
					100·00

"To take an illustration from the experience of a single cantonment. In the case of Meerut the shadow of the spring cholera and the substance of the monsoon cholera has been represented in former years as follows:—

YEAR.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1856	6	73	...	...	...	...
1857	1	6	...	...	...
1858	3	1	...	...	...	...
1861	1	1	...	88	27	...	1	...	...
1862	1	...	1	24	26	...	...	...	...
1867	16	106	1	...	...

"It is about the 20th May that a cholera destined for the invasion of Meerut and the Punjab generally appears south of the Jumna and invades the Agra District. This was the case in 1818 and 1856 and in many intervening epidemics; and it was at this season that in the same districts the invading cholera of 1860 was revitalised in 1861 preparatory to the invasion of July."

* * * * *

Here followed a sketch of the epidemic history of 1856 and 1860 in the southern districts.

* * * * *

"In 1867, the cholera of the year first appeared at Morar on 30th May, but we have no right to conclude that because the monsoon manifestation was so trifling in 1867 in this station, the same thing will occur in this year. In 1867, Morar was on the edge of the epidemic area of the year, Jhansi being altogether beyond the epidemic boundary. In 1869, however, Morar occupies the centre of the area of invasion, as in 1856 and 1861.* There is only one circumstance that may possibly give a more favourable aspect to the monsoon cholera in this region. It is this, that extension has taken place far to the westward—how far we cannot tell—but if Persia is invaded before the close of 1869, such invasion will be only consistent with previous history.† Nusseerabad and Ajmere have been reached; and this, on every occasion, implies the uninterrupted spread of epidemic cholera from Bengal Proper to the extreme western limit of our Presidency. Had this limit not been reached, I should have dreaded the location of cholera in a position adapted for invasion and violent manifestation with monsoon influences even more than I do. For when a natural barrier stops the progress of cholera, it is apt to sink behind it in epidemic strength, while, if the sweep of the cholera wave is uninterrupted, diffusion frequently occurs, in place of the settlement of the cholera. Thus a cholera progressing from the east in May, showing its advance on what I have termed the northern epidemic highway, having manifested its presence at the gate of exit in the west of our Presidency, is less likely to be found in power two months afterwards than if no evidence of advance up to the western limit had been shown; since the very *materies* of the epidemic may have been removed, which, if the progressing miasm had been stopped in its westward career in the Agra, Jhansi, or Morar Districts, would have followed out the exact course of the epidemics of 1856 and 1860.‡

"The cholera of 1850 was such a cholera as I have described. Here was shown the affection of the Central Provinces, as in 1868, in the year preceding the appearance of the cholera on the northern epidemic highway. But this cholera made no progress towards the North-West in 1850; it affected Agra in 1851, and then progressed and was heard of in the spring of 1852 as the cholera of Kumaon and Ghurwal, and in September as the great cholera of Deyrah and Umballa, after which the epidemic died. * * * This cholera reached Ajmere while repressed out of the north-west of India.§"

* * * * *

"The chances in favour of and against invasion in force stand thus (18th June):—

"1. The body of the cholera invading from the east may have passed on as a body to a geographical limit which renders its entrance into Northern India an impossibility, being out of the line of the essential vehicle.

"2. The cholera may not have passed beyond the gate of entrance, but the failure of the monsoon may, as in 1837, 1850, and 1860, cause the *materies* of the epidemic to become anchored for the year to the districts in which it has already appeared.

* See table, page 48, showing the monsoon cholera of 1869.

† See Part II, page 37.

‡ See the anticipations regarding the cholera of 1870 founded upon the significance of the same phenomenon, page 21.

§ But for the secondary movement in the first week of September 1869 the parallel here suggested would have been almost complete. No amount of foresight could predict the probability of such an occurrence; here it was noticed merely as an event that might possibly occur, because the same thing had occurred before.

"3. If before the beginning of July the districts south of the Jumna, which for the two past years have been an exempted tract, are re-occupied,* the chances are that the North-West will not escape. In making this statement the parallel of 1865 must not be overlooked, when the aura only of the great cholera of these districts passed to the North-West as far as to Ferozepore.†

"4. If invasion does occur we need not expect it to extend beyond monsoon limits. This cholera should not reach beyond the Jhelum, even with the most favourable meteorology, and Sealkote should also escape as in 1856 and 1861. The Jullundur Doab escaped on the occasion of both invasions, in 1856 and in 1861. Umballa was not reached in 1856 until the 5th September (the day on which the great epidemic of 1852 also broke out), and then five deaths in all occurred among the European troops. The hill stations escaped entirely in both invasions, and not a man died in September 1852, although choleraic symptoms showed themselves in all of the adjoining hill stations among the men.

"5. If the great area suffers as a province, cholera will continue to manifest itself up to the third week of September;‡ and there is no difficulty in predicting that if invasion becomes evident, every station of the area will be liable to attack between the date of invasion and the date of the decay of the vitality of the invading cholera.

"We scarcely require to be reminded of what the results are likely to be in 1869-70 in the event of the body of the epidemic being thrown into the present unoccupied area. The events of 1845 and 1846, of 1856-57-58, and of 1860-61-62, teach with precision what the sequence of events will be, and afford an estimate of the probable loss, which we ought not to regard lightly in looking to the chances of the next three months and in discussing the measures best adapted to meet the events of the epidemic."

* * * * *

Here followed the description of the areas generally exempted in primary invasion as given at pages 52 to 54; and attention was called in particular to the area west of 80° E. Long., lying between the eastern and western divisions of the epidemic area of the Presidency, as a tract of comparative exemption. The concluding paragraph of this memorandum was as follows:—

"If certain portions of the area threatened with invasion enjoy comparative immunity, others are marked with the blackest shades on the cholera map, where persistence in power is indicated up to the very latest date to which it is possible for monsoon cholera to survive. Meean Meer and Morar are stations of this class in such an invasion as that now in progress. Although there were no European troops at Morar in 1856, the description given of the character of the cholera by Dr. Kirk leaves in my mind no doubt that had this station then been occupied, the deaths would on this occasion have been reckoned by the hundred. But we must not overlook that over and above all general causes tending to increase the power of a local outbreak, there are causes inherent in the material which raise the ratio of attack in the case of the European regiment, which science has not yet taught us to remove, and, therefore, it is that the object of all measures should be as far as possible to remove the chance of infection."

On 28th June, the Quarter Master General of the Army, by order of His Excellency the Commander-in-Chief, addressed the Sanitary Commissioner as to the movements to be recommended suitable for the cantonments likely to be affected.

By this time the lull in the manifestation of cholera had taken place, which marked the interval between the cholera of the spring and the cholera of the monsoon. But in the third week of July, the sudden re-appearance of the cholera over a great area showed that the significance of the spring cholera had not been misapprehended. On the 13th August, the Government of India ordered the Sanitary Commissioner at once to proceed to visit the different stations affected, and at the same time a report on the progress of the cholera up to the latest date was called for. This I submitted to Government on 18th August. To save repetition, the facts regarding the epidemic spread of this cholera which have already been mentioned are here omitted; these formed the introduction to this special report.

I may, however, place here an extract from a report by the Sanitary Commissioner for the Central Provinces, which was included in this introduction, because it seems to me to indicate well the aspect of a cholera appearing over an invaded area by revitalisation in the year following invasion. Writing on 12th June the Sanitary Commissioner for the Central Provinces notices the epidemic outburst of the spring months thus:—"The disease has not spread from any one definite centre. In every district in which it is now epidemic, reports have been first received of outbreaks in small villages often at a distance from the large centres of population

* This had already occurred, although we were not at the time aware of the fact.

† On the day after this was written (19th June), the report of the prevalence of cholera in the hills beyond the Sutledge led me to make special inquiry into its origin. The result of my inquiry was, that I determined this as well as the cholera of Umritsur and Sealkote of the same period to be the manifestation of an offshoot from the cholera of Central India, which was scarcely felt in the intervening area. See Part II.

‡ See page 31 and table on page 48.

and the main lines of communication; and in some instances similar outbreaks have occurred almost simultaneously in different parts of the same district."

My report was continued as follows:—

"In the stations of the east, this cholera showed itself as early as March. The cholera of Her Majesty's 58th Regiment, stationed at Allahabad, commenced on 21st March. This is a very usual date for this locality. It was on the 22nd March 1867 that the outbreak commenced in the Jail at Allahabad, which indicated the epidemic movement from the east of the epidemic preceding that now in progress. As early as the 6th March a violent outbreak at the village of Akhoree in the Mirzapore District was reported. On 1st April the first death was reported from Jubbulpore; and on 22nd the Brigadier General Commanding at Gwalior announced three fatal cases between the 3rd and the date of his letter. Cholera was reported in the Nagode Cantonment on 15th April. On 29th April cholera appeared in the Seetapore Cantonment, having been epidemic among the native population from the 25th. In April the Mhow Cantonment also became affected.

"In May the only cantonment attacked was Saugor. On 14th two fatal cases of cholera were announced in the 7th Fusiliers, and on the evening of the 16th 13 fresh cases occurred, of which 7 had died at the date of the report (17th).

"The distribution of the cholera of the European army up to 31st May will be seen from the following statement* :—

January	...	Admitted	None.	Died	None.	May	...	Admitted	62	Died	36
February	...	"	"	"	"	Dum-Dum	...	"	1	"	...
March	...	"	26	"	14	Allahabad	...	"	15	"	8
Allahabad	...	"	25	"	14	Seetapore	...	"	6	"	4
Shahjehanpore	...	"	1	"	...	Saugor	...	"	29	"	17
April	...	"	44	"	35	Jubbulpore	...	"	2	"	2
Berhampore	...	"	1	"	1	Morar	...	"	5	"	3
Allahabad	...	"	14	"	11	Gwalior Fort	...	"	3	"	1
Chunar	...	"	1	"	...	Jullundur	...	"	1	"	1
Seetapore	...	"	2	"	1						
Jubbulpore	...	"	3	"	3						
Shahjehanpore	...	"	1	"	...						
Morar	...	"	22	"	19						
						Admitted to 31st May			132	Died	85

"The fatal case reported from Jullundur on 12th May has been regarded as doubtful. I look upon it as a true forerunner of invasion; the more so, because in 1860 similar cases were seen in the same month in stations of the Punjab, giving warning of the movement of cholera which was taking place in the Central Provinces.

"It is evident that about this date cholera was in motion over a wide area. It was on the evening of the 16th May that the 7th Fusiliers, stationed at Saugor, were so heavily stricken with cholera. Almost at the same time cholera re-appeared at Morar. The Brigadier General Commanding writes:—'In concluding my report up to 30th April, I expressed a hope that the epidemic had subsided, and that we might look forward to the disappearance of cholera. This hope was almost borne out during the first 17 days of May, as only 5 cases occurred. But on the 18th and 19th there were 3 cases in the fort, and on the 17th a case had appeared in the Heavy Battery.' The Officer Commanding at Seepree also reported that there were numerous cases of malignant cholera, and many deaths among the natives in the Bazaars and adjacent villages.

"In the last week of May cholera was again in motion, invading the country south of the Jumna, which was, in 1868, an exempted tract. From Banda 293 deaths were returned in May, and 115 between the 1st and 12th June; Lullutpore was entered in the week ending 29th May and 47 deaths were registered up to the 5th June. Among the native troops at Agra this cholera of the beginning of June showed itself, and it appears to have been universal along the tract which I have designated the northern epidemic highway. The Deputy Inspector of the Agra Circle writes to me, dating 14th June, as follows:—'There has been a great deal of cholera in the city and of a very fatal type. * * * I have cholera in almost all this circle. Yesterday I received a report announcing its advent at Jhansi, and its violence at Beaur and Deolee is very great.' When a moving cholera has reached so far to the west on this track, its limit is not generally found in Hindostan. Its appearance here is followed by the outburst of cholera in Scinde and Persia, at an interval of a very few weeks; this happened in 1860 and in 1867, and in July of this year the outbreak of cholera is again announced.

"The distinction between the cholera of the spring and of the monsoon was perfectly marked in the European army taken as a type. Not a single case, in a man, woman, or child, was announced in the week ending 15th July; and the Inspector General, Her Majesty's British Forces, intimates that his weekly reports will be discontinued. In the return for the week ending the 8th July the case of one woman only was entered, who had been attacked in that week (in the Battery at Agra). The return up to 25th June showed

* This statement had reference to men only, and was drawn up from casual returns. The totals are deficient by 5 admissions and 9 deaths.

that, including men, women, and children, 209 persons had been attacked, and that 124 deaths had occurred. In the six weeks between the 1st June and the middle of July 40 cases and 26 deaths occurred.

"The last case of spring cholera appeared among the European troops in the stations mentioned at the following dates:—

Allahabad	...	...	...	...	June 21st	(58th).
Jubbulpore	...	...	...	...	" 24th	(2-12th).
Saugor	...	...	...	...	" 5th	(1-7th).
Cawnpore	...	...	...	...	" 18th	(19th Hussars).
Seetapore	...	...	...	...	May 29th	(2-60th).
Morar	...	...	...	...	June 16th	(103rd).
Lucknow	...	...	...	...	" 18th	(62nd).

"Experience teaches us that a bad cholera of the spring is followed as the rule by a worse cholera during the prevalence of the monsoon, commencing about a fortnight after the rains have set in and terminating throughout the monsoon area about the 20th September.

"In the table which follows the stations affected and the dates of the commencement of the monsoon cholera are shown:—

MONSOON CHOLERA OF 1869.

(European Army).

Station.				Date of commencement.	Deaths.
Jubbulpore	...	...	...	July 18th	4
Saugor	...	...	...	" 28th	15
Morar and Gwalior	...	...	...	August 2nd	24
Jhansi	...	...	...	" 8th	3
Seepree	...	...	...	July 31st	2
Allahabad	...	...	...	" 22nd	30
Cawnpore	...	...	...	" 19th	15
Lucknow	...	...	...	" 28th	72
Fyzabad	...	...	...	August 6th	10
Subathoo	...	...	...	" 5th	4
Total					179*

* * * * *

In the pages which followed, a summary was given showing the daily progress of cholera at each affected station from the date of the re-appearance of the cholera, derived from the reports of Officers Commanding and from the intimations received at head-quarters by telegraph. These are here left out as having no special bearing on the general history of the epidemic.

Roughly estimated, the European army lost up to 16th August 300 individuals, including men, women, and children.

The report of 18th August ended thus:—

"I may, in conclusion, show what has been up to the present the geographical distribution of this cholera, and try to state what are the anticipations in regard to its career during the remainder of the cholera season of 1869, which the study of parallel epidemic history suggests.

"In the first place, it is obvious that the epidemic line which I have found constantly to separate eastern from western influences has not been overstepped. Every station east of 80° E. Long. has suffered, while as yet Meerut and Rohilcund has remained an exempted area.

"But as soon as we pass to the south of the Jumna, the cholera sweeping the great northern highway has no western limit. From Chota Nagpore to the western limits of Rajpootana the invasion of 1869 has been universal; no station has been exempted. As in all previous epidemics, the stations of this tract have proved index stations. From the cholera history of these stations we can tell the exact date at which the cholera of each succeeding epidemic has traversed the continent from east to west. In the study of all epidemics this is a tract which furnishes a consistent history; and when the cholera of this tract and of the southern epidemic highway (which I have described as the epidemic route through the Central Provinces, entered through the Jubbulpore, Seonee, and Mundla Districts) is studied at the same time in relation to the occupation or exemption of either tract, we shall not fail accurately to interpret the geographical phenomena of any epidemic. In tracing backwards into India the cholera invading beyond Hindostan, it is the history of the epidemic upon these highways that is to be enquired into.

"I have said that the line separating eastern from western influences in the Doab has not yet been overstepped. The east has been as usual a natural province in relation to the meteorology of the early months of the year.

"The Superintending Surgeon Major, in his report on the cholera of Allahabad up to 21st June, indicates the absence of the steady westerly hot winds. The phenomena which he

* The deaths cannot be accurately estimated from Telegraphic Reports.

describes are those characteristic of an epidemic season in the east. The heat to which he alludes is not the dry healthy heat of the seasonable hot winds, but the moist and relaxing heat which always accompanies the prevalence of the east wind. He writes:—"Throughout the epidemic the heat was extreme, and, I believe, unprecedented. The atmosphere was thick, lowering, and oppressive. The wind was very variable, chopping from west to east; *tatties* were seldom of any service." This last observation indicates to us at once the character of the season; for it is only during the persistence of the moisture-bearing east wind that *tatties* are rendered useless.

"The invasion of Meerut, Rohilcund, and the Punjab is secondary to invasion in the east and south. As far as I can judge from a study of all previous epidemics, the line of 80° in the Doab is never passed by cholera from the east, and the history of every invasion of Northern India points to invasion from the south-east and south from the districts lying south of the Jumna. Invasion is always imminent when cholera is in motion on the northern highway. The invasion may occur in epidemic strength or it may occur in shadow only.

"The cholera of 1850 (a cholera exactly parallel with that of 1869) left no mark on our European army of Meerut or the Punjab; the cholera of 1860 (also a parallel cholera) threw forward its indices in May, but was utterly repelled from the eastern and southern boundaries of this tract. The year 1860 was in Northern India one of the most healthy years ever known as far as the European army was concerned; but as an offset to this, we must not forget that the cholera repelled in 1860 invaded the area when the opportunity offered in 1861.

"Were the cholera of 1869 now to be stopped in its geographical distribution, the epidemic of the year would present throughout the Bengal Presidency the precise distribution of the cholera of 1860. Powerful epidemic advance from the east has occurred up to 80°, and the northern and southern epidemic highways have been universally occupied. The meteorology of 1850 within the exempted tract very much resembled that of the monsoon season of 1860 within the same limits; and Meerut, Rohilcund, and the Punjab have remained as yet an exempted area. It is an unpleasant reflection that the exempted cholera-area of 1860 became, on account of its exemption, the famine-area of 1861. The geography of the exempted cholera tract of 1860 and of the famine part of 1861, will be found to be absolutely identical. Even now within the uninvaded cholera tract of 1869, the rains have been extremely deficient, and for a fortnight they have ceased altogether.*

"It will be said that cholera exists within this area as the cholera of the Simla Hills and of Umritsur. I have said that when cholera is in motion on the northern highway, there is always the danger that an offshoot may be thrown towards the north-west. This is very different from what we understand by the epidemic movement which results in the universal occupation of a natural province.

"I have elsewhere alluded to such an offshoot as having precipitated a sheet of cholera over the Simla Hills, and the whole tract between the hills and the districts south of the Jumna in the last ten days of May 1865.

"The cholera of the Simla Hills and of Umritsur was, I believe, distributed during the movement which I have noticed as occurring in the first days of June. Deolee in Rajpootana was struck by this cholera on 2nd June, and I allude to this cholera again to recall the fact that the affection of the population was evidently caused by a cholera *in motion*, as I judge from the aspect of the outbreak which resulted, which was exactly what we know to follow poisoning by cholera on an ascertained day.

"We find the 40th Native Infantry at Agra affected on the same day, and on the 4th June, an officer of the 38th Regiment at Sealkote was struck down. I believe that at this time the cholera of the Umritsur District was distributed; and if this is the case, I reckon that the results of this movement will now be confined entirely to localities affected in the advance. In the epidemic history of Hindostan, we know of no such phenomenon as that of the radiation of cholera as an epidemic from an affected centre, and, therefore, we have no fear for neighbouring stations becoming affected from Umritsur as a focus. What we dread is the evidence of a new movement, knowing that when movement occurs, every station of the natural area will become liable to attack within a few days.†

"Subathoo was attacked on 5th August. If we are to regard this outbreak as an evidence of a new movement of cholera, we cannot but reckon the absence of the vehicle of moisture in the plains in this week but as a most fortunate occurrence. The 6th and 7th August will never be forgotten in epidemic history as the days on which the great outbreaks at Meean Meer began in 1856 and 1861. Had the same vehicle of moisture been afforded, the probability is, that Meean Meer would have been struck a third time on the very same day. The Civil Surgeon of Lahore, dating August 15th, informs me that there is no rain and no cholera at Lahore, and that great hopes are entertained that the critical day is past.‡

"There is, however, no certainty of the exemption of any area from invasion so long as the vitality of the cholera of any reproduction lasts. The vitality of the cholera now epidemic will continue up to about the 20th September,§ and movement may occur at any

* See in Part II, page 33, the anticipations of the Lieutenant-Governor, North-Western Provinces, at this date.

† This anticipation was exactly fulfilled. There was no radiation from this affected area.

‡ See p. 31 and 33.

§ See Table p. 48.

time before this date. I have already called attention to the enormous extent of the area affected by the invading aura of the cholera of 1868, showing its effects on and about the 21st August. It was on the 4th and 5th September that Umballa became affected in 1852 and 1856, and although the cholera of 1852 was dead in the first week of October, 147 Europeans were attacked, of whom 73 died. In three other epidemics I have noticed the renewal of epidemic strength in this same first week of September—in 1860, 1861, and 1862.*

"Over the area at present occupied the cessation of the cholera now epidemic is not to be looked for before the middle of September, and whether the area now exempted is to remain unoccupied, or is to be invaded, will be determined within the next three weeks."

Three weeks later, another report on the progress of cholera from the middle of August up to the first week of September was called for. The detail of the events of these weeks need not be reproduced here. But the concluding paragraph and the postscript have a special interest in the cholera history of the year. In concluding this letter, for the third time, I mentioned the chance of epidemic movement in the first week of September:—

"It would be premature to conclude that cholera has disappeared for the season in the stations in which it has ceased for the present to show itself. The possibility of re-appearance is important in relation to the maintenance of the cholera camps now established. As far as reported, the general health of the camps seems at present to be good; and as the result of all experience shows that the permanent disappearance of cholera cannot in any epidemic year be counted upon before the 25th September, the necessity for maintaining these camps until late in the current month seems to be clearly indicated. Illustrations showing the maintenance of cholera beyond the middle of September, re-attack commencing after the beginning of September, and even the primary invasion of epidemic cholera in the first week of September, might be quoted for very many of the stations which have lately been affected; it is, therefore, improbable that in all of these stations the cholera of 1869 has come to an end."

Without the slightest warning, cholera appeared in the Peshawur valley in the first week of September; and after the letter from which the above quotation is taken was closed and ready for despatch, a telegram was received in which the General Commanding announced that a few cases of cholera of a mild type had appeared in the city of Peshawur. The letter was opened and the following postscript added:—

"A telegram, dated 7th September, reports the appearance of cholera in the city of Peshawur. This is the first time that the Peshawur valley has been entered in the primary invasion of an epidemic. The course of the present invasion cannot be traced without a knowledge of the epidemic history of the past few weeks. In 1861 cholera was violently epidemic in Cabul in October, but in that year the epidemic passed the frontier much to the south of Peshawur, and its passing was indicated by the attack of the outposts lying below the hills beyond Dera Ismail Khan. The Bhawalpore State lying to the east was at the same time suffering heavily.

"There is great danger to be apprehended from a cholera invading the Peshawur valley at this season. Cholera does not die here as it dies over the monsoon province. The cholera of 1858 died in the first week of November, having invaded the Peshawur and Kohat valleys on 26th October; and the cholera of 1862 maintained its vitality up to the same day in November, although invasion occurred in July of that year. The 93rd Highlanders suffered from four distinctly repeated attacks between July and the first week of November in 1862. The cholera of the invasion of 1856 did not reach the Peshawur valley, but it prevailed in October at Mooltan, and at the same time in the Rawul Pindee District, where the 1st Sikh Regiment was attacked. Even although the districts lying to the east of Indus may have become to some extent affected, European troops will in this Doab run a much greater chance of escape than in the Peshawur valley, and it should not be forgotten that, in 1867, the 42nd Highlanders, from the day after the occupation of Cherat, were placed above the choleraic influence which continued to prevail in the Peshawur valley for a month afterwards."

The telegram from the General Commanding at Peshawur, dated 7th September, was as follows:—"Epidemic cholera of a mild type has appeared in the city of Peshawur. Two cases—natives—one fatal, have occurred in the suddur bazaar. None among the troops. Communication between the city and the station is being stopped as much as possible."

On 9th September, the Lieutenant-Governor of the Punjab telegraphed urgently as follows:—

"Three cases of cholera have occurred in Peshawur Cantonment—a sowar of 18th Bengal Cavalry and two other natives. In the city, cases have been occurring for four or five days. Lieutenant-Governor has authorized General Browne, at his request, to make arrangements at once for occupying Cherat as on last outbreak. His Honor trusts this will be approved."

The Government of India telegraphed in reply that if the Lieutenant-Governor thought it necessary, a portion of the garrison might move to Cherat.

But great difficulty followed in getting together carriage, for fever was prevailing generally among the native population, and a fortnight afterwards only one wing of the

* This anticipation is here a second time repeated. How far it was realised will appear in the sequel.

104th had marched out of the valley. The results in this case will be noticed in the next part of this report. On the 11th it was evident that the cantonment had become affected, and on the 18th every corps in the Peshawur valley was simultaneously stricken. The movements that followed upon these attacks were confined to the valley of Peshawur. The following quotations from a letter to the Quarter Master General of the Army, written on 22nd September, after the occurrence of this outbreak, and while troops were being moved from one place to another within the Peshawur valley, shows that I anticipated good effects only from removing the men to an elevation within the valley or into the Doab lying to the east.* I wrote:—

"The remarks which I made in my note forwarding on Dr. Cunningham's letter of instructions to me had a specific object, which was to point out the danger to the troops so long as they were moved about in the Peshawur valley. The evacuation of the Peshawur Cantonments has in no epidemic been attended with satisfactory results, and you will find the remarks of His Excellency the Commander-in-Chief to this effect in your office letter No. 3C of 2nd January 1868, paragraph 4, in which comment is made on the results of the movements of 1867. The experience of 1862 showed the same thing in the strongest light. From the day in June in which cholera entered the valley until the first week of November cholera continued steadily to show its presence. Four distinct attacks were recognized in the 93rd; and in the last, which commenced in the middle of October, it was while the regiment was in camp that it was stricken as a body. Dr. Munro believes that *every man* in camp was affected on a certain night, and the phenomena admit of no other interpretation.

"The fact that the epidemic of 1858 which preceded that of 1862, died out in the same week in November, teaches that there is the probability of persistence or recurrence between the present time and that date, should the primary effects of the invasion now cease, or should the attacks decline in frequency. This I mentioned in my progress statement, dated 8th instant, before a single case had shown itself in cantonments. Had it not been for the fact that the Lieutenant-Governor of the Punjab seemed alive to the dangers of the Peshawur valley, I should have written more strongly than I did then. You will find that it was my belief that great danger was to be apprehended from the entrance at this season of the monsoon cholera into such a situation; and it is my opinion that the movement into camp in the neighbourhood of cantonments is not sufficient, although a step in the right direction."

While speaking of the comparative capabilities of the stations of this part of India to localise an epidemic cholera (note p. 226), I noted the remarkable fact that in each of the three occasions on which cholera had appeared, Nowshera, the first cantonment to the east of Peshawur, had, out of the regiment cantoned there, but two fatal cases of cholera among the men. And on this, the fourth occasion, the very same thing occurred, for two men only of the 88th died in 1869. The shadow of this great cholera passed to the south of the Rawul Pindee District. The registration of the general population gave 11 deaths in all in September and October, and not a case of cholera was shown among our troops in any portion of the Doab between the Jhelum and the Indus.

The anticipations of the 18th June do not include Peshawur within the area likely to be affected in 1869. I was of opinion that as in 1856 and 1861, the districts lying to the east and beyond the immediate influence of the monsoon would, on this occasion, provide a belt of width sufficient to prevent the passage of cholera from the south-east to the frontier; but, although this belt escaped almost entirely, wide as it was it proved powerless to prevent the sweep of the air-borne cholera into the regions of the frontier and far beyond. This is the parallel of such a case as I have described in May 1865—the manifestation far to the front at the point attained by the head of the epidemic, while in districts passed over scarcely a trace is apparent. The exemption of the belt enclosing the frontier was thus shown:—

Cholera deaths of 1869 in the exempted belt beyond direct monsoon influences, which usually protects the North-Western Frontier from the attack of Cholera during primary invasion.

DEATHS OF THE GENERAL POPULATION, 1869.

Jhelum	...	...	...	7	Ferozepore...	...	...	...	20
Jhung	...	...	...	1	Mooltan	...	...	...	2
Shahpore	...	...	...	1	Montgomery	...	...	...	16
Rawul Pindee	...	...	...	13	Mozufferghur	...	...	...	None
Huzara	...	...	...	12	Dera Ghazee Khan	...	...	...	2
					Dera Ismael Khan	...	...	...	2

This registration was spread over the whole year, and in the month of the invasion of the frontier, 5 only of these 76 deaths were reported.

But to one accustomed to such phenomena, such a fact as the above is not so startling as to those who are less able to comprehend it in its full significance. Knowing nothing of what was actually in progress, with simply the first telegraphic information regarding the Peshawur valley at my disposal, in forwarding on

Explanation of the phenomenon and the anticipations formed as soon as the fact of the appearance of cholera on the frontier was reported.

* The Sanitary Commissioner was still engaged in visiting the cholera-stricken cantonments of the North-Western Provinces.

to the Sanitary Commissioner the intelligence, I wrote, that it would probably be affirmed, seeing that cholera had existed since May in the Umritsur and adjoining districts, that by some means the cholera had been conveyed from these districts into the Peshawur valley. But I asserted my belief that the parallel of 1856 and 1861 would not be found broken; that no cholera would be found between the Jhelum and Indus, and that we were to look far to the south for movement over a great area, such as had occurred in September 1860 (page 24) and October 1861 (page 25). I looked, in short, at this frontier cholera as the result of the movement of the first week of September predicted in my various letters; and as soon as the Sanitary Commissioner returned, at my request he wrote (October 22nd) to the Sanitary Commissioner for Bombay, asking whether in this week the movement of cholera had been observed in Scinde.

The general results of this movement of September and October are contained in the following letter addressed to the Secretary to Government, in the Home Department, during the absence of the Sanitary Commissioner in England, dated 3rd February 1870:—

“Referring to letter from the Sanitary Commissioner with the Government of India to your Department, No. 394, dated 31st May 1869, in reply to your No. 174 of 27th idem, with enclosures from the Secretary of State for India, forwarding, for the consideration of His Excellency the Governor General in Council, the suggestion that the British Delegate to the Board of Health

Movement of cholera in the first week of September and later in the year in countries beyond the limits of Hindostan.

at Constantinople should be supplied periodically with correct information regarding the state of the public health in India in anticipation of the possibility of the introduction of epidemic disease into the Ottoman ports of the Red Sea and thence into Europe,* I have the honor now to invite your attention to the contents of a despatch from the Political Agent and Her Majesty's Consul at Zanzibar, dated 25th November last, and transmitted to this Office with Foreign Department docket of 27th January.

This despatch announces the appearance of epidemic cholera towards the end of October on the eastern coast of Africa and an outbreak at Zanzibar which commenced on 20th November.†

2. I believe it to be a matter of great importance that the epidemic relations of this cholera should be clearly comprehended, in order that the sequence of the events that may follow in the current year and in 1871 may not be misunderstood.

In the last paragraph of the first section of my lately published report (page 157), written in June last, you will find the appearance of this cholera on the eastern coast of Africa at this time anticipated in relation to the history of the epidemic cholera of India of 1868 and the spring of 1869, and its significance defined. At this time no advance of the epidemic cholera of 1868-69 beyond the limits of Hindostan had occurred, although the movement was regarded as imminent.

3. Following the epidemic movements of cholera in the Bengal Presidency of June and July, it was reported to the Government of India that cholera invading Persia had committed great ravages at Shiraz and Ispahan, and while still existing in Northern Persia had entirely ceased elsewhere about the middle of August. The cholera of this advance appears to have been felt also in Southern Russia, and in July a few cases occurred at Kieff. The disappearance of this cholera in August is, I believe, the homologue of the disappearance which towards the end of August occurred over an enormous tract in our Presidency in the Gangetic and Central Provinces.

In my progress statement bringing up the epidemic history of 1869 to a late date in August, I remarked on the probability of a further epidemic movement of cholera over Northern India in the first week of September, my anticipation being founded on a parallel event in the epidemics of 1856 and 1861, which will be found noticed in my printed report. The movement did occur, and its extent to any one unaccustomed to regard cholera as air-conveyed will appear almost incredible.

It might be argued that in Persia and Russia the cholera of the first week of September was a revitalisation under a special meteorology of the invading cholera of July. But to us in Northern India, the epidemic history of the previous months proved, that this cholera of the first week of September was a cholera truly invading an unoccupied area, and, therefore, I am disposed to believe, that the invading cholera, which in the Meerut District and in Southern Russia dates from the same week, was the cholera of one and the same movement. Be this as it may, both manifestations were beyond question due to the cholera of the same epidemic. In the same week the Sirsa District was occupied, and the southern border of the Bhawalpore State touched; Upper Scinde was covered, and the Peshawur valley filled with cholera; Astrabad, on the Caspian, was struck on the 8th September, and in the same week the cholera broke out in Kieff.

In a postscript to a progress statement dated 8th September, written on receipt of the first telegram reporting cholera in Peshawur City, it will be found that I stated my belief that

* Proceedings of the Sanitary Commissioner with the Government of India, No. 138 of 1869.

† It is most interesting to note that it was on this very day fifty-one years ago, 20th November 1818, after the setting in of the north-east monsoon, that cholera first appeared at the Mauritius. Even after the lapse of all these years, the evidence of importation, which appeared to Sir Gilbert Blane to be conclusive, requires to be reviewed in the light thrown upon it by the parallel invasion of Zanzibar in 1869. The age of the epidemic was in both cases the same; it was the cholera of the invading epidemic of 1817 that appeared at the Mauritius on 20th November 1818, and it was the cholera of the epidemic of 1868 that arrived at Zanzibar on 20th November 1869.

this appearance of cholera would be found coincident with epidemic advance on Northern Scinde and not upon the Punjab generally, and the sequel showed that my conjecture was correct.

4. This cholera of Northern India, of Northern Persia, and of the Caspian Provinces, will be found described in my report as the northern invading limb of an Indian cholera. It progresses along the track which I have called the northern epidemic highway, and has its termination in Russia and Northern Europe.

5. It is the southern invading limb of the same Indian epidemic which has reached the eastern coast of Africa, and which is the subject of Dr. Kirk's despatch.

As early as June some cases of cholera were reported in the eastern districts of Lower Scinde; but it was in the end of August and in the same first week of September that the invasion of the province actually occurred. This cholera wave appears to have extended to the Southern Provinces of Persia, and of this the effects are detailed in a report forwarded by the Government of Bombay, dated 11th November.

As on our North-Western Frontier, so in Lower Scinde this invading cholera was still in epidemic vigour up to the first week of November. At the end of October many people were dying daily at Kurrachee. From my notes I find that I again anticipated the appearance of cholera on the African coast, towards which the north-east monsoon was now steadily blowing. In the last week of October Her Majesty's transport *Euphrates*, when 550 miles west of Bombay, passed through an immense cloud of locusts, blown from the Indian shores, the wind being N. N. E. The steamer *Krishna*, which left Aden on 30th October, "experienced fine weather to Longitude 53° E., but then there was a very strong north-east monsoon and heavy head sea to about 68° E."

It is just at this time that Dr. Kirk's narrative reports the appearance of cholera on the mainland north of Zanzibar, indicating the progress to the west of the southern limb of our Indian cholera of 1868-69.

6. Invasion beyond Hindostan has in various epidemics progressed on both the northern and southern highways; but in other epidemics one highway only has been occupied and the epidemic journey has been continued along one only of the routes. The termination of the journey begun on our northern highway is Russia and Northern Europe; when our Indian cholera moves on the southern, Arabia, Eastern and Northern Africa, and the shores of the Mediterranean generally, are threatened.

7. In the light in which I read parallel history, the epidemic now in progress has still before it a vital existence of at least two years, since it was in April 1868 that its movement from out of the endemic area occurred.

* * * *

The fact that the cholera of the current epidemic has already reached Russia and Eastern Africa may, perhaps, be considered of good import as regards the prospects of Central India and our Northern Provinces in 1870, showing, as it does, that a certain amount of the materics of the epidemic is certainly lost to us; for in relation to this diminution the material of the fresh invading waves, which we have still to fear in Northern India, may have been to a great extent pushed on beyond the frontier.*

8. It is important that we should consider what is the parallel in the history of the last invading cholera of Europe of this Zanzibar cholera of November 1869.

At page 356 of the Indian edition of the proceedings of the Constantinople Conference will be found mention of the invading cholera of the end of 1864, upon which I grounded my anticipation of a parallel cholera on the African coast in the end of 1869. Indications of the presence of cholera in Southern Arabia should now be carefully enquired after; and even the most trifling number of cases may be true forerunners of epidemic invasion. I should be inclined to accept the mere empirical fact of the parallel occurrence of 1864 as indicating the probability of the appearance of a great cholera in the districts now occupied, and in Arabia in May, and in Egypt in the same month, or more probably at the usual season of invasion in July from the evidence which the event affords of epidemic progress on the southern highway.†

9. Under any circumstances it is right that the warning should be given. We may never again hear of this Indian cholera when driven so far to the south. But whether Arabia and Europe is invaded or not, there can be no question as to the significance of this cholera of Zanzibar in epidemic history. Two years of vitality remain to the cholera of the current epidemic; and in the event of the spread to Europe of this cholera and that now present in Southern Russia, persistence throughout 1870 and 1871 may be expected."

These papers contain the anticipations formed regarding the cholera of 1869. Those only who have carefully studied cholera by the history of previous epidemics can realise how vast is the field which in a single year is opened up for our study. The events as they occur month by month and over the different natural provinces of the invaded area call for an intimate

* Above was placed my idea as to the sequence of events likely to happen should it have proved that with the advance of the head of the cholera of 1869 beyond Hindostan, the general body of the materics of the epidemic had not disappeared. Neither in the spring of 1870 nor up to date, has epidemic cholera shown itself in Upper India.

† See page 39, where the latest despatch from the Resident at Aden is quoted, in which is mentioned the rumour of the appearance of this July cholera to the west of the Red Sea. See also postscript, where the appearance of cholera in the ports on the Black Sea in July 1870 is noticed.

knowledge of past epidemics that their significance may be read aright. No superficial knowledge will suffice in attempting to predict what is yet to be revealed in the after months of any year of invading cholera. It cannot but be discouraging to the earnest student of Indian cholera that those who know nothing of what cholera is in India should be ready to maintain that these events happen not by laws but by coincidences, and that the facts, as they occur, are distorted in order to be made subservient to a theory. Those who know most intimately what cholera in India means will be the least anxious to give to others anticipations in advance of coming events, from being aware of the difficulty in many cases of making even a guess as to what is about to happen. But when I have been required to put my opinion on record, I have not hesitated to do so, judging that any blame that might attach to me for a false interpretation of passing events is not to be reckoned in the scale against the benefits that may possibly arise from a warning given in time. I consider that these anticipations hold a position apart from that in which others would place them. At the beginning of the cholera season of 1869, I deduced that from the geographical situation of cholera, a certain sequence of events would happen at certain dates; and since the sequence of the events did occur as anticipated, I recognise that what was then recorded is entitled to a place not in the province of theory but in that of legitimate deduction. It must not be expected that when two alternatives are suggested both shall come true. It is the one or the other that may be realised; or the phenomena may so be mixed that a parallel half way between either may clearly be shaped out. When on the 18th June I wrote the parallels of 1850 and 1860 and again those of 1856 and 1861, I did not anticipate that both parallels would be realised in 1869; but to any one knowing the entire history of the four epidemics, the consistencies of what was suggested are now abundantly apparent. Notably these anticipations failed in the one point of having excluded the Peshawur Frontier from the area likely to be affected in 1869. Unless I had taken the parallel of 1844, I know of no other in recent times that would have suggested the advance beyond the frontier in the case of invasion in the first year, and of the epidemic relations of this cholera of 1844 I have no exact knowledge; and yet, perhaps, the fact of the invasion of Scinde in 1860, above alluded to, might have taught us that the frontier was not safe from the attack of air-borne cholera. The events of these two months upon the frontier will always hold an important place in the epidemic history of Hindostan; and when it is admitted that the invasion was not anticipated, it should not be forgotten that what did happen subsequent to the invasion proved the correctness of the opinions expressed at the time of the occurrence.

PART II.

THE HISTORY AND GENERAL ASPECTS OF EPIDEMIC CHOLERA IN 1869.

All the country south of the Jumna, from Allahabad to Scinde, was at some period or other of 1869 covered with one universal sheet of cholera. Not one district in all of this vast tract claims to have been exempted from the invasion of 1869. From Northern Oudh to the Chutteesghur Division of the Central Provinces, the report of the universality of the great cholera of 1869 is the same; there was not one district in the whole tract that was not severely visited.

But as soon as enquiry is made regarding the population of the districts lying north of the Jumna and west of 80° E. Longitude, we find that the

margin of the invading cholera has been reached; that here cholera found no footing in 1869, and that from Shahjehanpore and Futtebghur to Umritsur there existed an enormous tract of country traversed by every means of human communication, which repelled the invading cholera of the year, although it marched up in strength to the very confines of the area. This was the tract of possible exemption indicated to Government on 18th June. The eastern portion was indicated as an area likely to be free from cholera; in the western, the chance that the cholera of 1869 would follow the course of the epidemics of 1850 and 1860, and show itself in the south only or in a sporadic manner only over the area as a whole, was weighed against the possible occurrence of an invasion corresponding to that of 1856 and 1861.

As far west as Cawnpore, the force of the epidemic coming from the east was felt. Cawnpore shows a register of 2,798 deaths among the population. This mortality tails off to the west; thus—Futtebghur, 325; Shahjehanpore, 257; Etah 242. To the north, Bareilly registers 935 deaths and Budaon 1,141, probably in continuation of the cholera of Northern and Western Oude, in which all districts suffered severely; Gondah, Baraich, Fyzabad, and Seetapore having in 1869 registered upwards of 9,000 cholera deaths.

The Civil Surgeons of these districts report as follows, the same questions having been put to all by the Sanitary Commissioner:—

BAREILLY.—“There has been no outbreak of epidemic cholera in the city or district of Bareilly during 1869.” Deaths registered 935.*

* An exaggerated statement from imperfect registration; in 1868 the same exaggeration was evident.

BUDAON.—"The statistics greatly exaggerate the prevalence of the disease. All sudden deaths, one may say, are put down to cholera. Possibly as many as 200 were really attacked by cholera (up to 1st October)."

SHAHJAHANPORE.—"A very small portion only of the district was affected. There have been no cases of cholera in the city or civil station. No measures of quarantine have been attempted." Registered deaths 257.

MORADABAD.—"Not a single case of cholera has occurred either in this station or in the district during the present year." Registered deaths 195.

ETAH.—"There has been no cholera epidemic in this district during the year. A sporadic case of the disease in a boy was admitted into the dispensary and proved fatal." Registered deaths 242.

BIJNOUR.—"There has been no cholera either in this station or district during the current year." Registered deaths 68.

SAHARUNPORE.—"Without doubt the statistics given are not to be relied on at all. In fact I do not believe that one of the cases so registered was cholera. Not a single case has come under my observation; and on the most careful enquiry from the chief Native Hukeems I could hear of no one case." Registered deaths 182.

MOZUFFERNUGGUR.—"This station and district have been free from epidemic cholera during the present year." Registered deaths 166.

From Umballa, Loodianah, Hoshiarpore, Kurnaul, and Delhi in the east of the Punjab, we have no reports from Civil Surgeons, because their districts remained free from cholera during the year. From Jullundur there is a report, although the Civil Surgeon remarks that but 12 cases in all came under observation during the year.

Quarantine was maintained at the Beas from 9th August to 14th September, and during this time it is extraordinary to find that four travellers from Umritsur only were found to have cholera, of whom one died. When we consider that Umritsur had been suffering for two months and a half from cholera before the quarantine was established on the Beas, and that all districts east of Jullundur continued free from cholera throughout 1869, we conclude that Jullundur was also portion of the same area, and we are prepared to learn that the cases which did occur were with one or two solitary exceptions travellers from the west on the Trunk Road. But that the quarantine was the cause of the exemption of the Jullundur District there are no reasonable grounds for maintaining. Dr. Warburton writes:—"I do believe these measures were effective. I think the fact that only 12 cases occurred in the whole district is a sufficient proof, that is, if we look upon cholera as a contagious or infectious disease, which I believe it to be." I think it right to mention this case here, as it may at some future time be brought forward in illustration of the efficiency of quarantine on this occasion.

But having traced the exemption of the country in every district from the line of 80° to the Beas bounding the Umritsur District, it is necessary to turn back again towards the east, to call attention to an intrusion from the south into an area adjoining the exempted tract, to which I have not yet alluded,—an offshoot of cholera from the northern epidemic highway, having for its base the cholera of this highway, and for its apex a portion of the Meerut District, in which it died away in the north. It was of no power, as the statements which follow show. But to us, viewing it in its epidemic relations, it has a value above what its mere aspect suggests. This offshoot comprehends the cholera of the Meerut, Bolundshuhur, Allyghur, and Etawah Districts, and it may be studied in connection with the cholera of the Agra and Muttra Districts. The Civil Surgeons report as follows:—

MEERUT.—The Civil Surgeon of the Meerut District thinks that the mortuary registration, which shows 565 cholera deaths, exaggerates the extent of cholera in 1869, but he recognises the prevalence of cholera as in excess of that of ordinary non-epidemic years.

BOLUNDSHUHUR.—"The statistics are not reliable, because they exaggerate the prevalence of the disease." Registered deaths 155.

MYNPOORIE.—"I consider the statistics pretty correct. The deaths are perhaps more from the fact that during cholera seasons every death is noted as cholera." Registered deaths 349.

ALLYGHUR.—"I do not consider the statistics reliable. They err in exaggerating the prevalence of the disease. About 1 in 8,000 of the population may have died." Registered deaths 429.

Passing to the east, the Etawah District bordering on the exempted area, and which was indicated in June as a district likely to escape invasion, gives 449 deaths in the registration. But the report of the Civil Surgeon, who has evidently taken every care to verify his statements, shows that Etawah was actually a portion of the exempted tract in 1869. And the same fact was affirmed by the Civil authorities in the end of July, when they objected to receive the troops from Allahabad into their district, on the ground that to do so was to introduce an infecting material into an uninfected area. The Civil Surgeon writes:—"To the best of my belief there were only 26 cases of cholera. Of these 12 recovered and 14 died. If there is any error, it is, I believe, in exaggerating this number."

Exempted area of the North-Western Provinces continued into the Punjab.

Intrusion into the exempted tract from the south reaching as far as the Meerut District.

Etawah, a portion of the exempted area.

Nothing can be more definite than the geography which the reports and registration of

Definition of the exempted tract in the North-Western Provinces and Punjab.

these districts assign to the cholera of 1869. The natural province west of 80°E. Longitude is as definitely marked as I have shown it to be in 1818 and in all succeeding epidemics.

The great cholera of the east marched up to its eastern margin, and the great cholera of the northern epidemic highway skirted its southern margin in all its strength, and yet was powerless to pass to the north, even into the Etawah District immediately adjoining. The pyramidal offshoot affecting Allyghur, Bolundshuhur, and Meerut was hemmed in on the east, the north, and the west by districts absolutely exempted. And the cholera of the Punjab extending from the Beas to the hills had no power to turn back and invade even the districts lying immediately to the east.

Before going further, I may note here what I take to be the significance of the intrusive offshoot from the northern highway and the exemption of Delhi, Umballa, Loodianah, and Jullundur, while the districts south and west and east of Delhi and those west of Loodianah and Jullundur suffered.

Significance of the exemption of these tracts and of the offshoot which reached the Meerut District.

At pages 19, 25, 53, and in other portions of the report of last year, I have shown from the facts of several previous epidemics that the body of cholera moving from the south-east towards the north-west is apt to become divided into two, the one column pursuing its course uninterruptedly towards the north-west, while the second is turned into a diverticulum and shoots sharply towards the north, towards Deyrah Dhoon and the Terai; and that between these two limbs lies a triangular space, which is exempted from invasion, having for its base the hills and the Umballa, Loodianah, and Jullundur Districts, and probably the Roorkee District to the east, and as its apex the point at which these two invading limbs diverge. From this exempted space on most occasions the Delhi District is excluded; but in 1869 the division took place further to the south than usual, and in connexion with this fact the weakness of the limb invading into the Meerut District was evidently associated. We find cholera in Goorgaon, Hissar, and Sirsa, to the south and west of Delhi, and abundant manifestation in Muttra and Agra; and indefinitely beyond, to the south and west, the great cholera sheet of the year covered all Central and Western India. The pyramidal offshoot of Allyghur, Bolundshuhur, and Meerut I regard as the homologue of the northern invading limb of the cholera of the western division of the epidemic area of 1856 or 1861; and the pyramid-shaped exempted area of 1869, having for its base the hills and the adjoining districts, and for its apex the Delhi District, I take to be the same which was left for the time, or, permanently, a blank in the geography of former epidemics.

Before speaking of the history of the invasion of the invaded area of 1869, which com-

Exempted tract in Northern India, the districts lying immediately beyond the usual limits of monsoon influences.

prehends the history of the cholera of the districts of the northern epidemic highway, the cholera diverted into Allyghur and Meerut, the cholera of the districts lying west of Delhi, the cholera of Lahore and Umritsur and the districts immediately

to the north, and the cholera of the Peshawur Frontier, I shall complete here what is to be said regarding the exemption of tracts within the general area covered by noticing the exemption, so often spoken of in my previous report, of the region beyond the limit of the monsoon, that is, of the districts in the north of the Punjab between the Jhelum and the Indus and the country lying to the south, comprehending Mooltan and the districts adjacent.

Knowing nothing beyond the bare fact that cholera had appeared in the Peshawur valley, at once I drew from previous epidemic history the inference that no geographical continuity would be found between this cholera of the first week of September and the cholera which had existed from the end of May up to the same date in the Umritsur and adjoining districts, and that if cholera appeared at all in the Rawul Pindee District, it would be but the shadow of what was likely to occur in the valley of Peshawur. It is unnecessary to go back to epidemic history to show that quarantine has nothing to do with the exemption or occupation of the districts between the Jhelum and Indus; here again in 1869 we have repeated simply the illustration of 1856, 1861, and 1862 of exemption in relation to a certain geographical position (see note, page 226 of the report of last year). The Sanitary Commissioner for the Punjab reports that there were 11 deaths from cholera during the epidemic period, of which two were seen by the Civil Surgeon of Rawul Pindee and one by the Garrison Surgeon of Attock; and that the others were alleged to have occurred at a village on the Indus, but that their genuineness was questionable. Immediately to the west the inhabitants died by the thousand in the valleys of Peshawur and Kohat.

I shall reserve what I have to say regarding indices afforded by the aura of the cholera of invasion within the area actually uninvaded until I come to speak of the phenomena attending the various movements of cholera in 1869. The registration of the general population shows very beautifully the fact of exemption, and any statements that might have been here added would have reiterated the same thing. The districts of the Punjab shown as exempted, were truly exempted in 1869.

With reference to the facts stated in the paragraphs which follow, the results of the registration of cholera deaths throughout Central and Upper India in 1869 are shown in the table here annexed:—

Cholera Deaths registered among the General Population of the Bengal Presidency in 1869.

Districts.	Estimated population.	CHOLERA DEATHS REGISTERED IN EACH MONTH.												Total deaths of the year.	Deaths per 10,000.
		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.		
Eastern Districts of the N. W. Provinces.															
Ghazepore	1,332,403	10	5	11	176	694	1,343	2,422	4,194	818	75	6	14	9,768	7331
Benares	793,277	8	24	98	233	332	702	729	1,090	262	25	7	6	3,527	4446
Mirzapore	1,054,413	...	30	253	296	607	977	901	883	543	327	12	26	4,855	4605
Azimgur	1,385,872	6	12	10	52	200	1,018	2,204	3,196	1,155	691	203	9	8,816	6361
Joanpore	1,015,427	9	7	79	381	509	606	491	597	104	62	7	11	2,863	2820
Goruckpore	1,283,816	1	2	39	468	673	1,496	2,451	2,128	947	350	36	2	8,593	4332
Bustee	1,455,697	7	2	141	786	688	1,339	1,004	223	105	54	...	...	4,349	2988
Allahabad	1,393,183	16	52	179	283	642	290	290	1,089	47	10	6	...	2,864	2056
Futtehpore	680,796	...	1	281	8	25	474	163	136	122	66	24	...	1,300	1910
Cawnpore	1,188,862	2	3	5	21	72	183	175	1,281	598	452	56	...	2,798	2354
Futtehghur	915,943	3	...	10	8	6	25	37	121	42	63	10	...	325	355
Districts of Oude.															
Sultanpore	930,023	142	52	43	17	49	339	326	656	217	237	118	59	2,355	2425
Fyzabad	1,437,009	89	14	89	485	453	528	196	205	143	119	31	24	2,376	1653
Goudah	1,167,816	2	5	5	225	763	1,015	707	392	335	95	10	...	3,554	3043
Seetapore	930,224	21	67	336	825	392	144	66	23	10	78	44	12	2,018	2169
Baraich	774,437	...	...	4	247	635	232	30	60	58	2	...	...	1,274	1645
Kheroe	737,732	...	4	...	17	5	38	7	...	...	...	...	...	71	96
Pertabghur	936,053	25	27	192	472	315	196	58	224	81	132	63	17	1,762	1882
Rae Bareilly	782,874	4	1	4	213	468	1,018	1,239	997	288	274	165	88	4,779	6104
Nawabgunge	875,378	41	...	...	31	118	142	279	210	109	319	14	9	1,372	1453
Oonao	724,949	...	3	10	13	63	340	523	1,119	341	119	25	47	2,603	3591
Lucknow	697,499	2	...	3	36	115	115	40	194	106	33	11	3	658	943
" City	273,126	1	...	2	1	10	18	5	123	13	...	...	...	173	634
Hardul	930,977	...	4	1	32	8	64	52	30	24	113	10	1	339	364
Districts of the Central Provinces.															
Raepore	588,118	...	...	...	...	1,037	4,471	2,202	1,081	558	...	...	...	9,349	15951
Belaspore	530,541	...	...	62	199	1,029	2,938	3,586	1,154	224	28	...	...	9,220	17378
Sambulpore	268,295	...	...	...	...	...	6	87	277	278	62	...	...	710	2647
Jubbulpore	539,106	1	4	...	487	1,580	2,034	410	135	23	...	...	...	4,684	8688
Seonee	421,659	...	...	151	176	358	1,040	265	58	11	...	...	...	2,069	4883
Mandla	217,204	1	...	29	30	708	2,089	621	467	173	211	11	3	4,343	19900
Narsingpore	340,356	...	...	...	395	1,330	2,074	321	5	...	...	...	...	4,325	12707
Dumoh	280,554	...	...	...	159	968	1,354	242	399	74	...	...	...	3,196	11392
Saugor	490,636	12	2	...	62	1,041	4,366	2,852	929	112	...	...	...	9,376	19110
Chindwarra	260,913	...	...	...	52	14	26	6	...	5	...	...	...	163	338*
Baitool	254,915	...	11	42	4	61	111	78	51	43	4	3	3	411	1612*
Hoshangabad	427,056	37	10	12	72	666	1,181	328	67	6	...	...	...	2,379	5571
Nimar	166,882	17	80	211	117	12	29	42	59	50	...	...	...	617	3697
Bhindara	608,499	...	...	...	...	...	121	141	521	171	...	...	...	964	1568
Nagpore	558,119	...	...	16	102	67	134	64	610	235	64	...	...	1,292	2315
Balaghat	173,121	...	...	...	...	25	303	70	40	6	...	...	...	444	2565
Wurdah	176,228	...	...	...	103	254	223	437	613	165	22	2	...	1,759	9981
Chanda	414,869	...	...	...	...	...	1	82	485	153	...	...	...	721	1738
Districts of the Berars.															
Banda	724,372	...	...	...	221	123	410	197	321	36	85	...	...	1,393	1923
Humeerpore	520,941	...	...	1	...	32	55	759	957	212	39	4	...	2,059	3952
Jaloun	405,272	...	...	2	3	36	571	319	1,250	322	75	...	...	2,578	6361
Etawah	626,444	1	...	2	6	6	3	14	30	60	252	67	8	449	747
Jhansi	357,774	1	...	35	163	1,438	152	5	1,794	5014
Lullutpore	248,146	20	1,186	779	479	219	13	6	...	2,792	10889

* Elevated tracts.

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Cholera Deaths registered among the General Population, &c.,—(continued.)

DISTRICTS.	Estimated popu- lation.	CHOLERA DEATHS REGISTERED IN EACH MONTH.												Total deaths of the year.	per 10,000.
		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.		
<i>Districts of the N. W. Pro- vinces lying west of the line of 90° E. Long.</i>															
Bareilly	1,464,199	20	14	22	32	19	19	14	204	188	275	123	5	935	639
Budaon	889,810	3	2	7	15	11	9	10	92	350	562	72	8	1,141	1282
Shahjehanpore	918,850	...	...	...	24	13	2	2	2	4	174	35	1	257	280
Moradabad	1,095,306	12	9	17	15	19	21	23	13	20	17	19	10	195	179
Etah	614,351	8	1	6	9	8	30	37	36	22	64	20	1	242	394
Mynpoorie	700,220	2	4	5	9	9	7	28	51	87	136	9	2	349	498
Allyghur	925,538	10	5	2	12	12	53	41	185	76	14	12	7	429	464
Bolundshahur	800,481	3	7	4	12	12	14	6	16	50	22	7	2	155	194
Agra	1,028,544	3	5	3	11	39	336	797	568	104	26	7	14	1,913	1860
Muttra	800,321	3	2	7	8	13	122	284	337	144	110	23	7	1,060	1324
Meerut	1,199,593	7	7	5	17	9	21	12	45	152	240	34	16	565	471
Mozuffernuggur	682,189	10	14	10	18	10	32	7	15	13	13	8	16	168	243
Seharunpore	806,483	6	5	83	14	9	18	13	6	1	12	5	10	182	210
Bijnour	690,975	1	3	2	9	9	7	6	8	4	9	5	5	68	98
Deyrah	102,831	...	...	...	...	...	...	...	1	...	...	...	...	1	...
Teral Pergunnahs	91,802	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kumaon	385,790	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ghurwal	248,742	...	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>Punjab.</i>															
Goorgaon	690,522	1	2	7	6	15	35	59	141	143	216	11	...	636	921
Delhi	602,633	1	1	...	2	10	16	11	1	1	3	...	1	47	78
Rhotuk	536,995	...	1	...	...	15	20	7	3	...	...	...	...	46	86
Hissar	484,631	...	1	...	2	1	3	45	142	69	38	...	...	301	621
Sirsa	210,795	...	...	...	...	1	...	...	6	20	38	1	...	72	342
Kurnaul	610,927	1	2	5	6	2	8	3	3	5	2	1	1	39	64
Umballa	1,008,852	3	2	2	6	10	8	4	3	4	6	...	...	48	48
Simla	26,402	...	...	...	...	...	...	...	1	1	...	...	...	2	76
Jullunder	783,020	...	...	4	...	...	...	1	4	...	...	...	...	9	11
Loodianah	583,445	...	2	2	2	3	1	1	2	1	3	1	1	19	33
Hoshiarpore	938,890	1	1	1	7	6	2	...	3	2	4	...	...	27	29
Kangra	744,162	2	5	5	4	9	13	9	6	9	5	3	8	78	105
Goordaspore	906,126	1	...	2	6	2	5	1	92	45	...	...	1	155	171
Sealkote	994,458	...	1	3	3	3	3	2	6	7	3	...	...	31	31
Umrutur	832,750	5	6	6	8	21	44	613	2,653	224	23	4	1	3,608	4333
Goojrat	616,347	...	2	3	11	14	9	9	7	...	1	2	3	61	99
Goojranwalla	550,576	2	5	6	2	6	...	11	24	22	6	1	4	89	162
Lahore	775,551	1	1	2	2	10	8	12	133	121	6	1	...	297	383
Ferozepore	533,416	...	...	...	...	4	1	7	1	...	7	...	...	20	38
Montgomery	359,437	...	...	...	...	...	...	16	...	...	...	...	...	16	45
Mooltan	459,780	...	...	...	...	...	...	...	...	2	...	...	...	2	...
Mozufferghur	295,547	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dera Ghazee Khan	305,903	...	...	...	...	2	...	...	...	...	...	...	...	2	...
Dera Ismael Khan	389,533	...	...	...	...	1	...	...	1	...	...	...	...	2	...
Jhung	348,027	...	...	...	...	...	...	...	...	...	...	...	1	1	...
Shahpore	308,796	...	...	...	...	1	...	...	...	...	...	...	...	1	...
Jhelum	500,993	...	...	...	2	2	1	1	1	...	...	...	...	7	...
Huzara	364,324	...	...	2	1	...	...	1	3	1	2	1	1	12	33
Rawul Pindie	699,647	...	...	...	...	2	...	...	...	2	9	...	...	13	19
Peshawur	498,479	...	...	1	6	4	1	...	2	1,704	1,155	99	13	2,985	5988
Kohat	140,219	...	...	...	...	...	...	...	...	1	499	8	...	508	3623
Bunnoo	287,547	...	...	...	...	...	...	...	...	1	7	71	45	124	431

Returning once more to the east, to the western margin of the yellow patch of 1868, we have to trace the occupation of the districts south of the Jumna, the occupation of the northern highway, and the links joining on this cholera with that of the endemic basin. The invasion of Scinde and the North-Western Frontier, and so to link on the cholera of Lower Bengal of 1868 with the cholera of Persia and the Caspian Provinces of 1869.

That the cholera manifestations of the end of March and first weeks of April of the Banda District, of Gwalior, of Ajmere, and Malwa were immediately connected together as portions of one epidemic leap accomplished at this season by the reviving cholera from within the invaded area of 1868 there are no grounds for concluding. The features of the cholera in these months epidemic over Western India suggest that the cholera found in the Nerbudda valley in January and February was but an earlier exhibition of revitalisation of the same materies which became evident in Malwa in March, in Ajmere and Bhopal in April, and in Saugor in May. But that the boundary line in the east was so far transgressed in March and April as to admit of the appearance of the epidemic cholera as far to the west as Banda is also true; as much of the northern epidemic route as lies in the natural province under eastern influences was certainly entered early in 1869. Thus for some portions of the Banda District the register gives in April 221 deaths; and the Civil Surgeon remarks that the death reports of the Banda District are generally correct. The first case occurred in the district on 3rd April, and then cholera spread widely and rapidly. But in Banda itself the first case did not occur until the 4th May, and this case was imported. The first resident was attacked on the 8th,* and from the 10th of May until August 28th cholera continued to make its appearance. And, again, in the eastern portion of the Futtehpore District cholera appeared as early as the 16th February (a single case), and in March 281 deaths were registered.

The general table for 1869 is a sufficient index of the universality of the revitalised cholera throughout the Gangetic Provinces, Oude, and the Central Provinces in April and May. And what I have now to endeavour to show is one of the most important links in the chain of the history of this epidemic. It is the fulfilment of the anticipation founded on the history of the epidemics of the past fifty years, that the cholera of the yellow patch of 1868 would, about the 20th May, make its epidemic movement, *per saltum*, into the western division of the epidemic area. The history of the appearance of a cholera invading at this time in Jhansi, Lullutpore, Oraie, Humeerpore, Agra, the districts of Central India and Rajpootana not affected in the earlier months, and also in Meerut and the Punjab, is required. Such movement is not a mere empirical fact. When it does occur it occurs along with the aerial commotion which follows the approach of the south-west monsoon to the western coasts of India, where it is expected to arrive about 25th May.

General occupation of the Northern Epidemic Highway. The opening paragraph of the section of Dr. Moore's report on the Dispensaries of Rajpootana relating to the cholera of the year is as follows:—

"The history of the cholera epidemic in Rajpootana during the past year presents various points of great interest and importance. The general and almost simultaneous appearance of the malady over such an extensive area is altogether opposed to the theory of communication by human intercourse being the only means by which cholera is disseminated. In May and June the disease showed itself in many widely distant localities. In the former month, Rutlam and Jaura in Central India were affected, as also Jeypole and Balmere in Mullanee at the opposite or western extremity of Rajpootana. In the north of Rajpootana, Rajgurbh in Ulwar was affected on the 28th May, while on the 2nd June, the disease commenced so far south as Morwarra in Palanpore. The place mentioned may be seen on the map attached, being on the extreme frontiers of the province, and, as if to render the theory of dissemination by human intercourse still less worthy of credence, we have cholera reported in Persia on 1st July."†

From the map which accompanies Dr. Moore's report, I have extracted the following dates showing the first appearance of cholera in different localities in the vast territory comprised within the region known as Rajpootana. It is wonderful to find that out of 44 dates entered, in 23 instances the outbreak commenced between the 25th May and 15th June:—

Simultaneous commencement of the outbreak of Cholera in different parts of Rajpootana in 1869.

Kerowlie	... June 7th	Pallee	... First week of June
Bhurlpore	... June 12th	Soojut	... May 29th
Hindown	... June 15th	Kankrowlie	... June 10th
Boondee	... Middle of June	Kherwarrah	... June 8th
Chidawa	... June 14th	Dongurpore	... May 24th
Rajghur	... May 28th	Pertabghur	... May 25th
Jeypore	... June 12th	Erinpoorah	... June 23rd, but in neighbourhood before this date.
Doodoo	... May 26th	Oodeypore	... June 4th
Kishenghur	... First week of June	Abco, Villages around (6)	... June 3rd
Deolee	... June 2nd	Deesa	... June 2nd to 24th
Nusseerabad	... June 12th	Morwarra	... June 2nd
Joudpore	... June 12th		

* Compare the history of invasion in 1867. On 11th and 12th May the Banda District became affected in 1867 (pages 130 and 131).

† The outbreak commenced on 18th June. (Proceedings, Sanitary Commissioner, 312 of 1869).

Thus in the first week of June, one vast sheet of invading cholera appears covering Central India from Bhurtpore to Deesa. We can trace the same cholera even further to the west. For when writing regarding the cholera of Scinde of September, the Commissioner relates that in the Thurr and Parkur Division cholera appeared in four villages in June. The Political Superintendent reports this cholera to the Commissioner in Scinde in a letter dated 15th June. From merely casual information and details regarding one or two localities, I concluded very soon after the occurrence that a great movement had taken place, and I was enabled to incorporate this anticipation in my previous report (note to page 199).

The date of the outbreak in Bhopal is not mentioned, but in his report for July (*Gazette of India*, page 1205), the Residency Surgeon says, that throughout June cholera prevailed to a great extent in the city of Bhopal, while in July there were 678 deaths. The dates on which cholera appeared among the troops may help to supply this date. On 26th May a man of the Bhopal Battalion died, and on the 30th a man of the 1st Central India Horse who was at Sehore on escort duty. On 31st May and 5th June the first men of the Central India Horse died at Goonah. On 6th June two men of the Bhopal Battalion escorting prisoners were seized on the road and were taken into Augur, where they died.

Cholera of the same period in the Bhopal State and the neighbourhood.

I have already quoted the letter of the Deputy Inspector of the Agra Circle, dated the 14th June, which states that cholera has broken out at Jhansi and throughout his circle.

The registration of the city of Agra shows deaths daily from the 5th to 20th June, and the first actual break occurs after the 8th September, seven deaths only appearing between the 9th and 30th. Before the 5th June three deaths only were noted in Agra—on 11th and 25th May and 3rd June. In the 40th Native Infantry the first fatal case occurred on 31st May, the second on the 9th, and the third on the 12th June.

ALLYGHUR.—“No case of cholera occurred in the Allyghur District before June. The first case occurred on the 3rd June and the last on the 20th September.”—Civil Surgeon's report.

MYNPOORIE.—The first case occurred in the district on 8th June and in the city on the 12th.—Civil Surgeon's report.

MEERUT.—In May nine deaths were registered and in June 21. I think it extremely probable that some cholera appeared in Meerut at this time; the history of all former epidemics at Meerut shows how apt to appear is this spring cholera in advance of the monsoon manifestation. The Civil Surgeon, however, remarks:—“There were said to be some cases in the early months of the year, but I doubt this.”

JHANSI.—Continuing from west to east the history of the districts of Central India, we find the same dates still holding good:—“The first case was reported on 28th May at Muttunia on the north-east of the district, distant from Jhansi 45 miles. On the 10th June cholera broke out in Jhansi in the poor house.”—Civil Surgeon's report.

LULLUTPORE.—“Not a single death was reported from cholera for some years past. On 25th May 1869 the first case reported appeared at Mehrownie, a town midway between Lullutpore and Saugor.” Great as was the mortality registered, the Civil Surgeons of Jhansi and Lullutpore state that the deaths are far underrated.

HUMEERPORE.—The Civil Surgeon gives no details for his district, and makes no reply to the seventeen questions which stand first in the list proposed by the Sanitary Commissioner. He notices, however, the fact that the first case appeared in the station on 13th June, and the registration teaches that the history of invasion was here not different from that of the adjacent districts:—

	April.	May.	June.	July.	August.	September.	October.	November.	December.
Cholera deaths registered	...	32	55	759	957	212	39	4	...

ORAIE.—The registration of the Oraie District is exactly parallel with that of Humeerpore:—

	April.	May.	June.	July.	August.	September.	October.	November.	December.
Cholera deaths registered	3	36	571	319	1,250	322	75	...	...

The Civil Surgeon, however, gives no account of the deaths registered in May and June, and says that in his belief cholera did not break out before the middle of July. I find, however, on turning to his Jail Return of June the following:—“Pernicious intermittent, remittent, and ardent fevers suddenly broke out in the district from the excessive heat of the season, and have assumed an epidemic form since the 31st May, and have prevailed with more or less severity throughout the month. Five cases occurred in the jail, of which three died.”

The first of these cases was admitted on the 5th and died on the 6th June. The death report in this case is as follows, and I shall quote this case only:—“The man had been unwell during the night with symptoms of indigestion and fever, but informed no one of it until the following morning. On admission there was nausea and inclination to vomit with a hot and dry surface and quick pulse. There was a rumbling in the bowels unattended with pain. He looked anxious. As soon as the bowels commenced to act the vomiting again began. The stools were at first liquid and feculent, but gradually changed to a watery fluid.

Thirst also became unquenchable and the patient rapidly collapsed. The surface became cold and clammy and all the symptoms of cholera became apparent." The report goes on to state that the man rallied, but twelve hours after became suddenly comatose and died before the Surgeon could reach the hospital. It is evident that the cholera of the Oraie District dates from 31st May.

This, then, is what occurred in the stations on the northern epidemic highway. Were it not for the fact that the simple question was put to Civil Surgeons—when did cholera appear in your district in 1869? one would almost be inclined to imagine that the leading question

General conclusions regarding the cholera of the epidemic highway of the first week of June.

had been put—did cholera appear in your district towards the end of May or in the first week of June?—and that each had written up to the theory involved. As the case stands, these reports are the pure expression of a fact in epidemiology which cannot be explained except by the admission that, universally and at the same time, the choleraic influence of the same epidemic was in motion from the banks of the Jumna to the Runn of Cutch (Thurr and Parkur). I have placed here these statements as the medical officers have written them, and I may safely assert that not one of these statements has been influenced in its direction by anything which I may have written in my report of last year.

I am well aware that no portion of my late report has been received with greater suspicion than that in which I affirmed that the great cholera of the Punjab universally manifested from Delhi to Peshawur between the 12th and 19th May 1867 was a cholera air-borne and distributed at a normal season; and the fact that months before I had formed the anticipation weighed little against the palpable fact that the roads from Hurdwar to Umritsur were lined with dying pilgrims in the third week of April. One reviewer writes:—"In this allegation we have either the expression of a very remarkable fact, or a most ingenious instance of special pleading." No suspicion of the possible effects of human intercourse can attach to this illustration from the history of 1869, and we are fortunate in having such an illustration following at so short an interval.

The Civil Surgeons of Muttra and Goorgaon, south of Delhi, are unacquainted with the origin and progress of cholera in their districts; but the registration of the adjoining districts seems to show that in the last week of May, or early in June, they were slightly affected by the same cholera wave:—

Modified influence of the cholera of the same movement in the districts beyond the northern margin of the epidemic highway.

Deaths of the General Population.

		May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Muttra	...	13	122	284	337	144	110	23	7
Goorgaon	...	15	35	59	141	143	216	11	...
Rohtuck	...	15	20	7	3	...	...	...	...
Delhi	...	10	16	11	1	1	3	...	1
Hissar	...	1	3	45	142	69	38	...	...
Sirsa	...	1	...	...	6	26	38	1	...

Thus this cholera is traced up to the edge of the desert. From Bikaner we have no information beyond the fact mentioned incidentally by the Civil Surgeon of Sirsa, that in August, six cases of cholera appeared at a town of his district bordering on Bikaner, and that two months before cholera had appeared in that State.

But I have many times remarked that in tracing an invading wave of cholera, we should not fail to look to the opposite and terminal margin of the natural province, where we may find the very same cholera precipitated in strength, although the indications over the province itself may be of very slight importance. This is what appears to have taken place in the

Punjab in the last week of May in 1869. While aerial commotion is occurring over the vast tract in the south, in the north the cholera of the same movement is being precipitated in strength at the terminal extremity of the monsoon province and far up among the Himalayas close to the snowy range. It was at this time that the great cholera of Umritsur which, as elsewhere, culminated in August first appeared. The report of the Committee appointed to inquire into the causes of this cholera states:—"A few cases of a doubtful character occurred in May, but it was not until the 27th that the Civil Surgeon was satisfied that genuine cholera existed in the city." * * * "On the 10th June it broke out in the northern quarter of the city."

Even beyond Umritsur, this cholera wave extended, for on 4th June at Sealkote an officer of H. M.'s 38th Regiment was struck down. This was a very severe and characteristic case of cholera, but the patient survived.

In the first week of June there was a distinctly marked tendency to cholera in Simla; and I was able to append notes at pages 165 and 166 of the second section of my report of last year mentioning this, although at the time ignorant of the general epidemic connection. On the 19th, the report was sent to Simla, but cholera was prevailing in strength fourteen

marches beyond in the interior of the hills; and even up to October accounts continued to be received of its existence in the hills beyond the Sutledge.

Such is the history of this vast movement of cholera as far as I am acquainted with it. There exists not one iota of evidence which might tend to show that this was a cholera revitalised from that of a previous epidemic. The cholera of this area was beyond doubt derived from the cholera of 1868 as defined on the map for that year, and the movement, as I have now described it, is only what has occurred in previous epidemics, and will occur as often in the future, when this description may be taken as a standard of reference.

I may note again here, that a despatch from Persia, dated 8th July, announces that since 18th June several cases of cholera had taken place in Teheran, and that in the town the number of deaths had increased from 8 to 27 daily.

Cholera in Persia in the middle of June.

Meteorology accompanying the movement of cholera in the last week of May and the beginning of June.

It was in the last week of May that the monsoon appeared on the western coast, and in the first week of June rain was general throughout the Bombay Presidency and in Southern Scinde.

In the Central Provinces the wind had set in from the south-west, and in all districts the promise of the monsoon appeared.

District Reports for week ending 5th June.

NAGPORE.—Nights cloudy, and there is every indication of rain.

BIJANDARA.—Prevailing wind west by south-west; clouds bank up daily.

CHANDA.—Weather cloudy and windy.

WURDAH.—Cloudy daily; wind south-westerly; a small drizzle fell in Wurdah, and a heavy shower in Hingunghat.

BALAGHAT.—Cloudy sky towards evening.

SAUGOR.—South wind; on the 4th and 5th slight showers of rain.

BAITOO.—Wind from west and south-west.

CHINDWARA.—Wind variable; in the morning north, and in the evening veering round towards south-west.

NURSINGPORE.—Wind steady from the south-west, till the afternoon, when it veers to south. Heavy clouds hang about.

NIMAR.—Heavy clouds have been hanging about all the week.

RAIPORE.—Prevailing wind at the beginning of the week mostly from the south, but latterly more constant from the west.

Associated probably with the aerial disturbance in the south, nearly every district of the Punjab got the first rain of the season on the 8th and 9th June.

<i>Districts of the Punjab.</i>				<i>Rain-fall in Inches.</i>			
		8th.	9th.			8th.	9th.
Jullundur	...	...	3	Mooltan	...	5	...
Loodianah	...	...	5	Mozufferghur	...	...	10
Hoshiarpore	...	3	3	Montgomery	...	...	1
Kangra	...	...	1	Dera Ghazee Khan	...	8	1
Goordaspore	...	...	1.5	Dera Ismael Khan	...	5	1.5
Sealkote	...	...	7.3	Huzara	...	2.0	4
Umritsur	...	...	4.4	Rawul Pindie	...	2	7
Goojrat	...	...	1.3	Peshawur	...	7	...
Goojranwalla	...	1.4	4	Bunnoo	...	1	...
Lahore	...	...	1.7				

But this was not the burst of the monsoon proper. The Punjab got no more rain until the first week of July, and it was on the 15th that steady rain set in. In the North-Western Provinces the change towards the monsoon began in the last week of June. The Reporter for the North-Western Provinces says:—"About the 17th the indication of a change took place, but in many places it was so unimportant as not to attract notice. When it was noticed the wind had become more or less easterly and clouds appeared, and it felt cooler when slight rain fell. The change of weather was more decided on the 23rd and 24th, and on the latter day rain fell in nearly all the stations, and especially in the more eastern districts. * * The monsoon may be said to have commenced a day or two past the middle of June, but its effects were not very apparent till the last seven or eight days of the month."

The following report of the Government of the North-Western Provinces to the Government of India on the prospects of the season, dated 10th July, is of extreme interest to us, as showing how true is the natural province west of the line of 80° E. Long.—the limit of natural influences from the east, and the limit of cholera progressing from the east:—

"There was a good fall of rain in Goruckpore on the 24th June, but the first approach of the regular monsoon was on the 29th and 30th of that month. On the 30th it rained heavily and continuously throughout the Benares and Allahabad Divisions, the storm passing steadily from the east and reaching to Etawah, and through Oudh as far as Bareilly and Shahjehanpore; west of that line it did not pass." * * * West of Mynpoorie no regular fall has yet occurred. There have been showers in some places of tolerable quantity; but the setting

in of the rains is not reported from any place in this quarter. * * On the whole, the intelligence is good as far west as Furruckabad (Futtehghur). * * Bundelcund has also fared on the whole well. The fall in Banda was good. * * In Humeerpore the average fall was $2\frac{1}{2}$ inches. * * At Agra there is reported a heavy fall on the 5th, and there have been showers in Muttra. * * No regular setting in of the rains appears to have taken place in the Meerut Division. There have been showers of more or less intensity and duration, * * but it is to be feared that west of Mynpoorie and Etawah there has yet been no regular monsoon."

Again, in the week ending 22nd July, the Lieutenant-Governor of the North-Western Provinces reports,—that during the week that has passed, rain has fallen sufficient to remove for the present all apprehension of agricultural failure.

Now, it is a matter of observation that about a fortnight or three weeks after the setting in of the rains, the strength of an epidemic cholera begins to re-appear in Upper India. From the registration of the general population the interval between the cholera of the spring and monsoon is scarcely apparent, although when studied in the type, which gives a true representation of the fact, it is readily seen. In the first part of the present paper, page 16, I have shown how, throughout the stations of the European army, the cholera of the spring died and was succeeded at an interval by the cholera of the monsoon. The same fact is apparent in the table at page 48.

The repression of the manifestation of the spring-distributed cholera was beautifully illustrated in the case of Umritsur, where, although localising causes were at the maximum, the cholera distributed in the last week of May was repressed up to the 13th July, when it began to show itself in power. The Umritsur Committee write thus:—"Throughout June the deaths in one day never rose above four, and the total deaths in June were 38; the disease was confined to no particular quarter, but isolated cases occurred in all directions. During the early part of July the number of casualties was small. On the 13th and 17th and 27th there was rain, and cholera increased rapidly, the deaths being on the 13th, 10; 15th, 16; 16th, 27th; August 2nd, 35; 3rd, 52. From this date the disease was universally diffused, and reached its climax in the death of 118 persons upon the 16th. Its fall was more rapid than its rise, and the last reported case was on the 8th October." This will always remain on record as a perfect and standard history of cholera in relation not to a population but to a locality. No localising conditions could maintain this vital cholera in life; on the 6th September it began to die, and it was dead absolutely on 21st September.*

Compare the winding up of the epidemic of 1856 in the Lahore and Ferozepore Districts, as given at page 165, to show how rigidly the law of extinction is enforced, and that the same law holds good, whether types of the population only be taken, or the population as a whole:—

"In the 70th Regiment at Ferozepore the last cholera case occurred on 22nd September, in the Artillery on 17th September, and among the Native troops on 18th September. The last case in Her Majesty's 81st Regiment at Meean Meer was on 23rd September; among Native troops between the 14th and 21st (8th Cavalry, 21st; 16th Native Infantry, 14th; Police Battalion, 14th; 26th Native Infantry, 16th). This shows what is meant by the end of the reproduction. It is the date up to which outbreaks can occur in consequence of the presence of vitalised cholera over the area."

Before leaving the history of cholera in Umritsur, it is of interest to notice the dates at which the cholera of the monsoon season affected our types of the population, with reference to the anticipation of the possible appearance of cholera at Meean Meer on the 7th or 8th August following the parallel of 1856 and 1861. Meean Meer entirely escaped, and also the Central Jail at Lahore. But in the female jail a woman died of diarrhoea on 8th August, a second died on the 13th, whose case also was returned as diarrhoea, and on the 18th and 19th two cases proved fatal, recognised as malignant cholera of one day's duration. In Umritsur, "cholera appeared in the jail for the first time on the 10th August; and in the fort of Govindghur, distant a quarter of a mile from Umritsur, the first case was that of a gunner on the 6th August, followed by eight more cases up to September 3rd." How nearly the parallel of the past was realised may be gathered from indices such as these.

Indices in types of the community which show that the parallels of 1856 and 1861 in this locality might readily have been repeated in 1869.

Meer entirely escaped, and also the Central Jail at Lahore. But in the female jail a woman died of diarrhoea on 8th August, a second died on the 13th, whose case also was returned as diarrhoea, and on the 18th and 19th two cases proved fatal, recognised as malignant cholera of one day's duration. In Umritsur, "cholera appeared in the jail for the first time on the 10th August; and in the fort of Govindghur, distant a quarter of a mile from Umritsur, the first case was that of a gunner on the 6th August, followed by eight more cases up to September 3rd." How nearly the parallel of the past was realised may be gathered from indices such as these.

But I have spoken of the same cholera which was localised here in June as having passed over the Simla Hills, and not less wonderful is the parallel which holds in this locality. That the cholera of Subathoo was localised somewhere in the hills is, I think, shown by the fact, that at this very date it became manifest in power, while the history of a far spreading cholera is wanting. No cholera appeared at Kussowlie, Dugshaie or Simla for the additional 1,500 feet of elevation, and the fact that these stations are not

Significance of the Subathoo cholera of the same period, commencing on 6th August.

* I observe no notice in the returns of the case of 8th October; the register ceases on 21st September, up to which date a total of 3,026 cholera deaths were registered in the city.

overtopped and surrounded by neighbouring hills was sufficient on such an occasion as this to secure immunity. There is reason to believe that at Subathoo also the choleraic influence which pervaded the hills early in June was felt.* Be this as it may, the parallel holds, that in the regiment cholera broke out on 6th August, and that the termination of the cholera occurred almost to a day with that of the Umritsur cholera, for the last man died on 18th September.

What I have shown in the case of the European army, I illustrate again from the history of the jail population, namely, the awaking into epidemic life throughout the monsoon area, from the Behar Provinces to Umritsur, of the cholera of the spring as soon as the monsoon had fairly set in.† Below are given the dates of jail outbreaks, distinctly belonging to the monsoon season, and cut off from the spring cholera of 1869. The deaths of the same area were in June 12 and in July 105 :—

*Dates of the jail outbreaks of the epidemic area in the monsoon season of 1869.
(Compare Table for European Troops, page 16.)*

Ranee, 20th to 27th July.	Oonao, 4th August.	Lullutpore, 17th to 25th August.
Purneah, 20th July.	Nagode, 27th July.	Jhansi, 17th to 26th August.
Arrah, 16th to 23rd July.	Allahabad, 18th July to 2nd August.	Ajmere, 20th to 26th August.
Chumpran, 15th to 30th July.	Shahjehanpore, 10th July.	Agra, 25th July.
Chupra, 18th to 26th July.	Bareilly, 14th to 21st August.	" 23rd to 27th August.
Benares, 1st to 7th August.	Belaspore, 8th July.	" District, 13th to 27th August.
Jounpore, 3rd August.	Bandhara, 24th July to 2nd August.	Umritsur, 6th to 22nd August.
Goruckpore, 10th to 31st July.	Chanda, 17th July to 13th August.	Lahore Female, 14th to 18th August.
Rae Bareilly, 12th July.	Jubbulpore, 12th to 28th July.	

Looking at this table the curious fact is observed, that the dates are clearly divisible into two. While the prevailing dates in the eastern division of the epidemic area range from the middle of July to the first days of August, in Lullutpore, Jhansi, Agra, and Ajmere, all the jails were attacked between the 17th and 23rd August, the outbreak ceasing on the 25th, 26th, and 27th August. Now, this is precisely the time that we register the invasion of the Meerut District. The Civil Surgeon of

Meerut writes :—"The first case came to notice at Ghazeeabad on 19th August, and in a few days cholera appeared at Meerut and its neighbourhood." A workman employed on the Delhi Railway between Ghazeeabad and Meerut was seized with cholera on 20th and died on 21st. Two cases, however, had appeared in the Sudder Bazaar at Meerut on 18th August. "The first case in the city occurred on 24th August. Cholera appeared at Ghazeeabad, in the Bazaars, and in the city, all in the course of a week." Here is a definite statement, and a clear history of a further movement of cholera, if cholera moves aërially and not by human intercourse. It was at this date also that cholera made its appearance in Allyghur, and it was reported that up to the 20th, 20 cases had terminated fatally.

We may, then, try to trace whether this movement of 17th August was accompanied with meteorological phenomena that can be recognised.

Meteorology causing the repression of movement in the end of July and first week of August, and attending the movement of 17th August.

The Secretary to the Lieutenant-Governor, North-Western Provinces, addressing the Government of India, in the Home Department, dating 23rd August, writes as follows :—

"Everything is still prosperous in the eastern districts (those corresponding to our natural province), where the harvest promises to be unexceptionably good. But the western districts have, during the past two or three weeks, been the subject of renewed anxiety.

"Early in the present month there was a general cessation of rain, accompanied by a hazy dry west wind, which continued so long in the upper districts as to occasion apprehension, and in some quarters injury to the crops.

"About the 16th or 17th this passed off, and cloudy weather re-appeared, bringing with it heavy falls of rain, which in most places have proved sufficient for the present. The greater part of the Agra Division (especially the eastern portion) has been plentifully watered; and in eastern Rohileund enough has fallen for present necessities. There has also been rain in western Rohileund, but more partial. The Meerut Division has fared worse; but a heavy fall of three inches is reported this morning at Mozuffernuggur, and there have been showers in Seharunpore, Bolundshuhur, and Allygurh sufficient to revive the crops. The Meerut District has, excepting a few showers on the north-east, received none of this fall as yet.

* Nineteen children out of 130 belonging to this regiment died in May and June. The Surgeon of the 41st died soon after the termination of the cholera outbreak of August and September; but Assistant Surgeon Gallwey, who was with the regiment at the time, informs me that he has no doubt of the presence of cholera at this season among the children, and that many cases which were rapidly fatal were attended with coldness and collapse.

† Dr. Ambrose of Her Majesty's 58th Regiment, who has published an account of the great outbreak in the regiment, recognises this interval between the spring and monsoon cholera as follows :—"From the 11th of June to the 23rd of July, the 58th was totally exempt from cholera, and the epidemic was supposed to have worn itself out. But it was merely a respite. Why the respite should have occurred is simply unaccountable, but nevertheless well worthy of notice."

"The accounts from the Jhansi Division and Ajmere are good.

"The latest accounts from the Muttra District and western parts of Agra are not favorable. There has been very little rain in that quarter, and the crops are consequently poor and precarious."

Was the hazy dry west wind of the first week of August the cause of the immunity of Meean Meer and Lahore in 1869?

How narrowly Meean Meer escaped a repetition of the calamities of 1856 and 1861 in this first week of August 1869 has not been sufficiently appreciated. Escape was not attributable to any precautionary measures that may have been employed, as the Sanitary Commissioner has shown. No foresight could have predicted the occurrence of such a series of natural phenomena as would divert the miasm from the region in which it normally settles; the most that could be foretold was, that the parallel of 1850 and 1860 might be repeated. And up to the end of August the parallel did hold, and the meteorology of the month held the advancing cholera in check.*

The following was the state of the Punjab in this same week (23rd August), showing that the dry west wind was devastating the country while cholera was utterly repelled. *The Englishman* of 27th August contains the following:—

"We are sorry to see that the latest account of the condition of the Punjab Provinces is stated to be 'critical in the extreme.' Rain was much wanted; in fact, unless it fell within one week the crops would be most seriously injured. Prices were still rising and would rise still higher unless rain fell, and fresh applications were being forwarded to Government for money for relief works. At Hissar, during the first week in August, 62,710 infirm persons received relief, and only 49 were employed on relief works. The crops that had been sown were drying up, and the Deputy Commissioner writes that 'the prospect of another year of famine becomes every day more distinct.' The canals also do not appear to supply sufficient water for the irrigation wanted. In Rohtuck 22,876 persons received relief, but there were no special relief works in hand. From Loodianah, where no relief operations had hitherto been required, an urgent appeal for assistance has been forwarded to the relief committee at Lahore. In Karnal, 1,558 persons were employed on relief works, and 49,050 were fed, and unless rain fell at once it was said that the crops would perish. Relief operations will have to be resumed in Lahore, and have been already sanctioned in Umritsur. An application for money has been sent in from Ferozepore for relief purposes, but it is stated that there is no cause for anxiety at present. At Sirsa, 7,664 persons were employed and 12,874 fed at the expense of the relief funds."

But in the Punjab as well as in Meerut the influence of the weather of 16th and 17th August was beginning to be felt. Cases of cholera began to appear here and there where no cholera had been shown before; and in the districts into which the spring cholera had intruded fresh vigour was imparted to the latent miasm.

In the report for Lahore we are told that on 22nd July a man from Umritsur was found at the Railway Station suffering from cholera; but the death register for the city begins on 11th August, and up to the 17th only 7 deaths were recorded. The 22nd is the date of the general appearance of cholera, for on this day 7 deaths were reported and on the 23rd 14. From this time up to the 21st September deaths were reported daily, and the last death recorded was on 8th October.† In all, however, the register for the city of Lahore shows only 184 deaths.

Our indices show at this very date in August choleraic influence abroad over other

Shadow of the cholera of the second and third weeks of August in the southern districts of the Punjab.

JULLUNDUR.—"One case of cholera was admitted and died on 23rd. He had all the worst symptoms very marked. He became collapsed, and died 11 hours after admission. Up to the present no other case has been reported on this side of the Beas."—Weekly Report, 92nd Highlanders, 27th August.

FEROZEPORE.—"A man was admitted at 2 p. m. on 17th August with vomiting, cramps, coldness of extremities, clammy perspiration, and sunken features. He stated that his bowels had not been open for three days, and that the day before he had spent four hours in one of the baths for the purpose of cooling himself, and afterwards slept in the open air with only a pair of wet drawers on. Before visit on the morning of the 18th his bowels had acted after a castor-oil enema, and he had passed water; but after visit he sank rapidly, and died at 9 a. m. All the symptoms were undoubtedly choleraic, but the case being a solitary one and clearly to be traced to his having acted as above described, I did not think I was warranted in calling it cholera."—Report from Surgeon 1-5th Regiment.

SIRSA.—"The first case of cholera reported in the Sirsa District was from Ellenabad, and here cholera appeared on 17th August. There were in August six deaths only in the Sirsa District."

But I have now to show the cholera of the Punjab under a new phase and as a cholera in motion. When I gave the warning, that, following parallel history, further movement might be anticipated in the first week of September (pages 14 and 18 of this report) I certainly did not apprehend the vast extent and importance of the

Movement of the first week of September. The meteorology which accompanied the movement of cholera over the invaded area.

* See page 17.

† Note the absolute coincidence of these dates with the dates of the disappearance of cholera at Umritsur.

movement which actually did occur. We had a perfect appreciation of the geography of the epidemic up to August, and what I am going now to detail shows that within one week the cholera cloud descended upon a vast and unoccupied area.

I have shown how critical was the state of matters in Northern India up to a late date in August. The following is the report of the 8th September from the North-Western Provinces:—

"In continuation of last week's report, the Lieutenant-Governor, North-Western Provinces, has much satisfaction in informing the Right Hon'ble the Governor General in Council that the prospects of the coming harvest continue to brighten. After a short break in the weather, a heavy rain storm burst on the Upper Doab on the 4th instant, and there has since been abundant rain everywhere. From all quarters the accounts of the crops are cheerful and promising. Even at Ajmere the prospect is encouraging. Rain fell early in the month, and on the 6th the following telegram was received:—'the last rain-fall has been general, and sufficient to secure a good harvest.'"

Much further to the west this same rain was felt. On 17th September the *Pioneer* writes:—

"We hear from Mount Aboo that the weather there is intensely disagreeable—almost incessant rain, and the few intervals filled up with dense mist. For Marwar generally the weather is most beneficent. The rain-fall has been general and the crops are looking healthy."

The northern limit of this rain was the desert, and this was probably the cause of the exemption of Bhawalpore and Mooltan and the districts to the west beyond the desert, while all districts to the south of the desert and all districts to the north suffered from cholera in one and the same week.

This limit is indicated in the continuation. "Jodhpore has been the least favoured; there the tanks are still dry and famine prices rule, as indeed they do, notwithstanding the elsewhere sufficient rain, throughout the Marwar territory."

On the 4th and 5th September the same rain was general over the Punjab.

Indian Public Opinion says:—"We are glad to note that abundant rain has fallen during these last two days in and round Lahore. The rain this week has been most providential, and may be said to have saved the crops and ensured a good harvest. The fall of rain appears to have been very general. Hissar, Goorgaon, Rohtuck, Delhi, and the districts most in need have received a plentiful supply, from two inches to five inches. Nor has the rain ceased. Yesterday and to-day have been wet days at Lahore, and the prospects of the country are now tolerably bright."

Immediately upon this followed the telegram of the 7th from Peshawur, announcing the appearance of cholera in the city. Mr. Ince writes in his report on the epidemic:—"The first authenticated death occurred on 1st September." But I am well assured that the aura of the movement between 17th and 23rd August was felt even as far as Peshawur.* Dr. Watson, of the 19th Bengal Cavalry, returned during August amongst the Native troops under his care three cases of choleraic diarrhoea unattended with a fatal result, and there can be no doubt of the correctness of his observation.

The city register for Peshawur shows deaths daily from 1st September up to the 4th November, except on 3rd September. Mr. Ince writes:—"From the 7th to 26th September the daily average number of deaths was over 52; the greatest number took place on the 13th September, and it was 92. From 1st September to 31st October, the total number of deaths was 1,450; in November 15 occurred, and in December 1, making the total 1,466, or 2.59 per cent. of the population." Thus the anticipation contained in my letters of 8th and 22nd September that this cholera would die at Peshawur in the first week of November was exactly realised.

Immediately after the outbreak of cholera in the city was reported, a great rain-fall took place, abnormal for the season, for Peshawur is beyond the normal monsoon limits. Seven inches of rain fell between the 9th and 11 A. M. of the 11th, and on the 12th the outbreak in cantonments was telegraphed as follows:—

"Cholera has assumed an epidemic form amongst the troops here. A man of 36th Regiment seized yesterday morning died last evening. Two men and one woman, 104th Regiment, seized yesterday evening; one died last night. Two men of Royal Artillery attacked last night. The Battery and a Wing of 104th move into camp to-morrow."

The following notice by a correspondent of the *Delhi Gazette*, dated 12th September, shows very well the state of matters immediately before the outburst:—

"I am sorry to announce that cholera has been raging in the city amongst the natives since the 5th instant; the daily average number of victims supposed to have been carried off is 30. Several similar cases have occurred in the cantonment, and a Committee, composed of military authorities of the station, having assembled on the 7th instant, a resolution was passed that visits to the city should be avoided as far as practicable during its prevalence. The Committee, having concurred with the opinion, have established a cordon through which no natives, except those who are provided with a pass from the Deputy Commissioner, Cantonment Magistrate, or Brigade Major, are allowed to pass. The Officiating Brigadier-General Commanding the Peshawur District has already issued orders for the British troops to be in

Appearance of cholera in the city of Peshawur and the subsequent history of the outbreak.

The outbreak in the Peshawur Cantonment.

* The universality of the sparse rain-fall at this date is beautifully shown in the daily rain chart at page 46.

readiness to move into camp, and the Executive Commissariat Officer has been ordered likewise to keep the moveable column in attendance to assist the forces in the conveyance of their luggage, &c., &c. We had a heavy fall of rain from the night of the 9th instant up to the 11 A. M. of the 11th; this will very probably put a stop to the prevailing cholera, which has carried off hundreds since the 5th."

The dates of the outbreaks in the different corps in the Peshawur Cantonment were as under:—

EUROPEANS.		NATIVES.	
36th Regiment	... 11th September.	Sappers and Miners	... 18th September, 10 A. M.
104th Regiment	... 11th September, 4 A. M.	18th Cavalry	... 8th September, 4 A. M. *
A. Brig., B. Bat.	... 18th September, 2 A. M.	19th Cavalry	... 6th September, 5 P. M.
A. Brig., E. Bat.	... 12th September, 2 A. M.	3rd Native Infantry	... 19th September.
XIX Brig., B. Bat.	... 12th September, 7 P. M.	19th Native Infantry	... 11th September, 6 A. M.
XXII Brig., 4 Bat.	... 13th September, 1 A. M.	25th Native Infantry	... 19th September, 3 P. M.
		28th Native Infantry	... 11th September.

This table recalls at once the phenomenon which I have described in various parts of the report for last year, namely, the sprouting of the cholera after an interval from the time of its being precipitated over any locality. The outbreaks are distinctly divisible into two, those following the invasion of 11th September and those consequent upon a renewed manifestation of cholera on the 18th. A second storm burst over Peshawur on the 18th, and coincidentally with this storm the universal occupation of the Peshawur valley by the cholera occurred.

In the 36th Regiment four men only died up to the 18th, and on this day the terrible outbreak began, in which 111 men were lost; and in the 104th Regiment seven men only were lost up to the 18th, and on this day began the outbreak, in which 66 men died. The wing of the 104th which left the cantonment for Cherat on 13th entirely escaped the great outburst of the 18th, showing that the men had not become affected as a body even at this date. To this phenomenon of the re-appearance of this cholera a week after evident invasion, I shall return in speaking in the next section of the aspects of the outbreaks of 1869.

Before tracing further this cholera of the first week of September invading beyond the Indus, I shall go back to the east of the Punjab, to show that here also the cholera of the first week of September was an invading cholera. I tabulate below instances which seem to have arisen under one common influence at this time:—

Cholera outbreaks of the Punjab of the first week of September, which appear to come forward with the same meteorology which determined the outbreak in the Peshawur valley.

Invading cholera in the Eastern Districts of the Punjab of the first week of September.

DATE.	HISSAR CITY.†		SERSA CITY.‡		LAKHORE LUNATIC ASYLUM.‡		GOORDASPORE CITY.§		EUROPEANS, UMBITSUR.¶	
	Deaths.		Deaths.		Admissions.		Deaths.		Admissions.	
September 1	.....	.....	.....	.....	.....	.....	1	.....	.....	.....
" 2	.....	.....	.....	.....	.....	.....	.....	.....	2	.....
" 3	.....	.....	.....	.....	.....	.....	1	.....	2	.....
" 4	.....	.....	1	.....	.....	.....	.....	.....	.....	.....
" 5	.....	.....	1	.....	8	.....	.....	.....	.....	.....
" 6	1	.....	.....	.....	3	.....	2	.....	.....	.....
" 7	1	.....	2	.....	1	.....	1	.....	.....	.....
" 8	.....	.....	3	.....	5	.....	.....	.....	.....	.....
" 9	.....	.....	1	.....	6	.....	.....	.....	.....	.....
" 10	2	.....	1	.....	.....	.....	.....	.....	.....	.....
" 11	.....	.....	.....	.....	2	.....	.....	.....	.....	.....
" 12	.....	.....	.....	.....	3	.....	1	.....	.....	.....
" 13	.....	.....	2	.....	1	.....	2	.....	1	.....
" 14	.....	.....	4	.....	4	.....	.....	.....	.....	.....
" 15	2	.....	3	.....	2	.....	.....	.....	.....	.....
" 16-30	20	.....	6	.....	9	.....	1	.....	.....	.....

In reply to an enquiry as to whether cholera had appeared in the Bhawalpore State at this time, the Civil Surgeon, Mr. Deane, writes to me:—"There was no appearance of cholera within the limits of the Bhawalpore State in September of this year. But, curiously

* Not fatal. First fatal case admitted on 19th.

† Not fatal. Cholera suddenly re-appeared in this regiment in strength on 19th.

‡ No cholera in any previous month.

§ One case on 27th July.

¶ Break from 13th August, with exception of a case on 21st.

enough, an outburst of cholera was reported on the southern end of the State in the last days of August and first week of September." Mr. Deane, however, is of opinion that this was not true cholera, but fever with gastric and intestinal irritation.

But the fact of the invasion of the districts of Scinde immediately adjoining Bhawalpore at this very date is opposed to Mr. Deane's conclusion. At my request, the Sanitary Commissioner addressed to the Sanitary Department for the Bombay Presidency the enquiry whether in this first week of September the districts of Northern Scinde had been invaded.

In reply, several papers of great interest were forwarded from the various districts of Scinde, and from these I make the following notes:—

The Magistrate of Shikarpore, addressing the Commissioner of Scinde, and writing on 4th October, says:—"Cholera first made its appearance in the town of Sukkur on 2nd ultimo, on which date three men fell victims to it. * * The scourge has been pretty general throughout the district, but it has nevertheless greatly abated in the neighbourhood of Sukkur, and is now, I trust, abating also in Kotree, where it showed itself in rather a virulent form. * * In Shikarpore one case occurred on the 19th September, and a similar case on the 20th in a small village adjacent."* From this district 683 deaths were reported.

Further to the south the cholera appeared at the same time. At Kotree the first case was observed on 8th September. I make the following quotation from the report of the municipal committee, dated 16th October:—"No remedial measures were of any avail to check the progress of the epidemic. Each day the number of cases increased and the death-rate rose higher. By the 20th the population was panic-stricken, and numbers fled from the place. The disease raged with the greatest severity for a period of 11 days, from the 18th to the 28th inclusive.† During this time 503 people were attacked and 399 died. After the 28th it rapidly abated, and on the 12th instant the last cases and the last deaths occurred."

The localisation of this cholera appears to have been due to the following conditions. The second paragraph of the municipal report is as follows:—

"On the 14th a large body of water, an overflow from the Barun Stream, swept down upon Kotree, flooding all the low-lying land between the European station and the hills as well as a considerable portion of the south and south-eastern quarters of the native town. The greater part of this water rapidly drained off into the river, but pools of stagnant water for which there was no outlet remained in various parts of the town for several days, while all the low country to windward of the town which had been flooded for many hours became exposed in a muddy state to the action of the sun. These most unfavorable sanitary conditions were intensified by an extreme and sultry heat which prevailed during the latter half of September, and which would no doubt of itself go far to explain the extraordinary mortality which has characterised the epidemic in Kotree."

Regarding the cholera of Kurrachee the *Sindian* reports as follows:—"Cholera is still at work in the town of Kurrachee. During the past week, namely, from 25th to 31st October, there were 71 individuals sick; of these 25 succumbed and 46 remained on the sick list. The report of 1st November shows eight more taken sick, of whom three died." The first case of cholera appeared in Kurrachee on 21st September and the last on 23rd November.

The cholera of the northern limb did not stop short on the Peshawur Frontier in the first week of September. Immediately we hear of it above the Khyber at Jellalabad, and before the middle of September its appearance in Caubul was reported. The latest intelligence received in the Foreign Department regarding the cholera of Caubul is dated 23rd November; and in this report it is stated that cholera after prevailing for a month and a half had almost entirely disappeared.

But far beyond, from the shores of the Caspian, the arrival of the cholera of the first week of September is announced. The Agent at Astrabad writes:—

"From the 8th of the month the cholera has made its appearance here. It first broke out among the soldiery and irregular cavalry. These being dispersed it spread in the town and is very virulent. Those who can afford have left for the country. The epidemic is also at Auzan, one of the villages of Astrabad."

And on the 21st September the Agent at Meshed writes to announce the same thing:—

"It is now some days since the cholera has appeared; and there are from 50 to 60 cases a day."

But this cholera finds its termination neither at Astrabad nor Meshed. The *Lancet* of 13th November supplies data which show that the cholera of this week was carried on into Russia:—

"The *Medical News* of St. Petersburg gives some interesting particulars relative to the outbreak of cholera in Russia. It attributes the outbreak to the extraordinary heat and drought

* These dates are to be noted as corresponding with the date of the appearance in strength of the cholera of the Peshawur valley.

† Precisely the dates of the great outburst in the Peshawur valley; see table page 49.

which prevailed this summer in Central Russia, and which was in striking contrast to the frequent rains in North-Western Russia and Western Europe generally. Several cases of diarrhoea and summer cholera, some of which were fatal, occurred at Kieff in July, but there was no epidemic until the middle of September. At first it was supposed that the cholera had reached Kieff from Persia, but it appears this year Tiflis has been unusually healthy, and that there is no communication between Kieff and the Persian districts where cholera prevailed. The disease appeared indiscriminately both in the poor and the rich quarters of Kieff, and carried off several victims in the higher classes. In September the number of patients was 65, of whom upwards of 40 died. How many persons were attacked in October is not known, but there were upwards of 30 deaths from the epidemic."

The drought referred to was in all probability due to an extension of the same influences which prevailing in Hindostan gave origin to the terrible famine of Rajpootana, Central India, and the districts bordering upon the desert, and caused such grave apprehensions for famine throughout the Punjab and in the western half of the North-Western Provinces.

Even in the last week of August the Lieutenant-Governor of the North-Western Provinces wrote thus:—

"The apprehensions, repeatedly expressed, as to the continued rise of prices and consequent distress, are being too surely realized. * * * It will be readily understood that the prices quoted imply increasing dearth and severe distress. Even in the more fortunate districts to the east, as in Benares, the city population is beginning to demand relief. In Jhansi and Ajmere the heavy pressure still continues, and throughout Rohilkhand it is rapidly advancing."

On 17th August Colonel Keatinge writes regarding the condition of Marwar:—

"Within the last few days, crowds of people in a partially starving condition have flocked into Erinpoora, and from reliable information given to me by European travellers, I learn that great destitution is observable on all the high roads from thence to the Ajmere District. A considerable number of people have quite lately left the country for Malwa. Prices continue as high as they ever have been in Ajmere. Wheat is selling at five seers, and barley at six seers per rupee."

But with the rain of the last week of August and the first week of September all apprehensions of famine were removed, and the rain and the cholera advanced *pari passu*. It would be of extreme interest to learn whether the same rain clouds, which from the 9th to 11th September precipitated seven inches of rain into the Peshawur valley, relieved the drought of the Caspian Provinces, and whether in Southern Russia the same meteorology ushered in the cholera of 1869. If so, this meteorology of the first week of September realises well what Victor Hugo, when he wrote, implied that the monsoon winds sweep over the Bay of Bengal to pillage the booths of Nijni Novogorod.*

I have said (p. 109 of report of last year) that I consider Persia a portion of one of our natural areas of Hindostan. What has since occurred seems to confirm this. Cholera appears by invasion in Malwa and Rajpootana in December 1868, and immediately its appearance in Persia is reported. In the first week of June cholera moves throughout Central India, and within a week Persia is visited anew.†

The cholera of Sukkur and Southern Scinde was probably carried forward simultaneously into the districts of Persia bordering on the Persian Gulf. Judging by the history of the cholera of Scinde and Northern India, I regard the Persian cholera of September as a cholera invading from without, and not a mere extension of the cholera of June, July and August. In fact, just as the cholera of June died at Umritsur on 21st September, so also in Persia decay is reported at the very same date. The Political Resident in the Persian Gulf writes on 25th September—"Reports from the interior of Persia are to the effect, that cholera after destroying many thousands of human beings at Shiraz and Ispahan is gradually disappearing."

But along with the disappearance in the north comes the burst of the beginning of September. On 14th September the Political Resident suggests to the Persian authorities the necessity of establishing quarantine for the protection of Bushire. He writes—"The Residency Cossid, just arrived, reports that cholera prevailed all along the Shiraz road, and had approached as far as Dalikee and Borasgoon, and that in passing the latter place he heard that four deaths had occurred there that very day."

The despatches do not show the date of the outbreak at Bushire. But on 16th October we learn that the ladies and establishments had been sent away, that cholera was increasing rapidly, and that a panic was setting in. The Residency Surgeon, addressing the Resident on 15th October, says—"Nothing being done, the march of death proceeds at a rapid pace, and such is the alarm amongst the people that they are now showing signs of reluctance to bury their dead."

At this time the country around Bagdad seems also to have been entered; for a fresh outbreak at Divanié, a town on the Euphrates, south of Bagdad, which ceased on 5th

* *Tollers of the Sea*. Original Ed. III, p. 24. The cholera of September 1869 did appear at Nijni Novogorod.

† It was estimated that up to 16th August 5,000 persons had died at Shiraz and in the neighbourhood.

January 1870, was reported by the Board of Health at Constantinople to the Foreign Office on 22nd January.

My letter regarding the epidemic relations of the cholera of Zanzibar was written on the receipt of Dr. Kirk's first despatch of 25th November. This cholera was heard of first on the continent of Africa. Dr. Kirk writes—"It is now more than a month since the first rumour reached us of the approach of cholera from the west; now it is my painful duty to record its presence among us. Two distinct centres of the disease have appeared in town, in one of which there have been three deaths, while nine have fallen in the other. It is but three days since cholera first appeared here, and there are twelve well authenticated cases already." This was Dr. Kirk's first report.

Cholera of Zanzibar—October 1869 to February 1870.

Five weeks later, on 1st January, he writes—"The mortality in town may be estimated at 9,000 or 10,000. The Arab estimate of the mortality over the island is from 25,000 to 30,000; but this I consider too high. In five weeks we have lost upwards of 12 per cent. of the population of the town. The disease is still raging in the interior of the island and along the African Coast. Northwards it makes slow progress against the strong monsoon, which set in early this year. South of Zanzibar, cholera has already passed Quilon, and all the coast villages have suffered dreadfully.

"The first epidemic of cholera in Zanzibar, of which we have any knowledge, occurred about thirty years ago. In December of 1858, and in the beginning of 1859, it returned, and carried off 7,000 or 8,000 in this town. It is said to have come along the coast from the north and to have reached as far south as Mozambique, but it did not pass to the Zambezi Provinces, where I was then stationed.

"In June and July of 1865, cholera again came down the African Coast, but did not pass Jamoo, as the south-west monsoon had set in strongly, and with the ocean current stopped all trade southwards."

On 26th January and 4th February, Dr. Kirk reports that cholera still hangs over the island, and that five men from the shipping in port have died; that it is still raging up and down the coast, and has again been reported from the interior of Africa.

What will become of this cholera it is impossible to predict; but should a cholera anywhere appear which we may conjecture to have had this African cholera for its base, it will be of extreme interest to watch its geographical connections. Europe escaped the great cholera of 1858 of the Red Sea, Aden, and Zanzibar, and it is to be hoped that the cholera of 1869 may follow this parallel; but it is worth calling to mind that the cholera of 1858 was a cholera in its fourth year of epidemic life, while the cholera of 1869 was in its second year when the invasion of Africa occurred. This much is certain, that without a definite and intimate knowledge of the cholera of every month in Hindostan we grope helplessly for a knowledge of the epidemic relations of a cholera which suddenly springs up, it may be thousand of miles away. Whether it be at the Mauritius in 1818, in Central America in 1837, the Cape de Verdes in 1856, or Gibraltar in 1860, we fail utterly to comprehend the place in epidemic history of the cholera of such outbreaks until the base and origin of each epidemic is traced in the Bengal Presidency; and it is from future history and not from the history of the past that we shall learn to appreciate what it is that is meant when we speak of the arrival of cholera in foreign lands.

I have often said that no palpable manifestation realised to my mind the idea of the diffusion of the impalpable agent cholera except a locust flight. At one time leaving not a trace behind, at another dropping individuals only from the locust cloud, at a third

The meteorology accompanying the invasion of Eastern Africa.

sending down powerful offshoots, the locust flight darkening the sky overhead, traverses the widest tracts until it alights at the extremity of a natural province, because the flight has struck against the aerial wall of obstruction which I have described. It broods thick upon the terminal area over which the locusts have settled, rising and falling on the same area as meteorological influences bear upon the localised body. It sows seed to be developed when the proper season comes round and not before, and it dies when the date of death arrives.

As at Simla in 1869, numerous individuals of the locust flight will be found on the tops of the highest hills, and other detached bodies can be seen as clouds of more or less density in the valleys around. But the main body from which these locusts were detached was far away—in Central India. As the cholera of May 1865 of the districts south of the Jumna suddenly projected over the Himalayas a detached body (p. 25 of last year's report), or as the cholera of Central India of the first week of June 1869 sent out its offshoot almost to the snows, so did the locust swarm of 1869 project over these hills the detachment of which I have spoken.

The particular section of the locust swarm of 1869 in which we are now interested is that which settled over the cholera area in Central India and Rajpootana. At the end of August the Lieutenant-Governor, North-Western Provinces, writes—

"The flights of locusts appear to have deposited their eggs, and the larvæ are described as covering the country from Aboo to Ajmere."

At the same time the Agent for the Governor General in Rajpootana reports—

"Locusts are out over almost the entire western portion of Marwar, in Serohi, and in the country around Deesa. They are now doing little harm; but great apprehensions are entertained for the result in October when the young crops are produced."

This was the base of departure of the flight met by the *Euphrates* in the last week of October between Bombay and the African Coast. They left India with the north-east monsoon. In the first week of November the *Krishna* reported, as already quoted, that she experienced fine weather from Aden to long. 53°E., but then there was a very strong N. E. monsoon, and heavy head sea to about 68°E., and the *Euphrates* which arrived at Bombay in the same week; that while about 550 miles from Bombay, the wind N. N. E., she met an immense cloud of locusts. They were visible for about three days, great numbers of them falling on the ship and in the sea around.

Here is palpable evidence that at this date air-borne influences from Western India were being directed towards Eastern Africa, and immediately follows Dr. Kirk's report of 25th November, that about a month before, that is, towards the end of October, cholera had begun to show itself on the mainland of Africa.

Delay in printing this report enables me to append the most recent intelligence regarding

Monsoon cholera of 1870 in Eastern Africa.

the cholera of Africa. That the monsoon cholera of 1870 has made its appearance in some part of Africa is evident from the correspondence which follows.* This is the July cholera alluded to in my letter of 3rd February (page 20). Should Egypt escape, it will still be of the greatest interest to watch the future of this African cholera of July.

The following is an extract from a letter addressed to the Government of Bombay by the Political Resident at Aden, dated 14th July 1870:—

"There is a report that the cholera is in the Dunkelli country, and that vessels and boats from that coast are placed in quarantine at Mocha. I have made every enquiry, but cannot find that there is any disease on the coast of Dunkelli country. Vessels and boats from Aden are also made to undergo quarantine at Mocha. I trust, therefore, the report of the disease may be incorrect. The Dunkelli coast extends from south of Annesley Bay to Jajura Bay. I keep as strict a watch as I can on all boats from the African Coast."

A week later, however, the Political Agent again writes to say that he is disinclined to believe in the truth of the report, and he thinks that the rumour may have been caused by reports of cholera prevailing much further to the south. He concludes—"One term, Bir Azim, is used for the whole African Coast; hence the mistake."†

I was inclined to believe that the great wave of this same epidemic progressing towards the north-east had reached the Assam Frontier and Burmah as early as June 1868. From the want of specific information and of a general registration, a positive opinion cannot even now be offered on this point. At the earliest date of revitalisation in the spring we have the district records which follow, and the facts may be indicative either of the re-appearance of the cholera of 1868 or of an invasion at the end of February and the beginning of March:—

DURRUNG.—"The first case was reported on 20th February. Cholera was confined to the same neighbourhood for some days, but in March it appeared to spring up simultaneously in several divisions of Durrung all apart from each other."

NOWGONG.—"About the middle of March last, it was reported that cholera had broken out in a village about 20 miles from Nowgong. It spread through the whole of that part of the district. In the immediate vicinity of the station it has been worse than in any part of the district. The police have reported 2,300 deaths from cholera in the station and neighbourhood in little more than a month, and I greatly doubt whether the number of deaths is not very much underrated."

SEEBSAUGOR.—"The first appearance of cholera among the Assam Company's coolies occurred on the 27th and 28th February, but these two cases were Assamese who had just arrived from their village. In Seebaugor itself the first case occurred on the 31st March. But reports had been received of cholera in various parts of the district for about a month before the disease made its appearance in the town."

LUCKIMPORE.—"On 2nd April, information was given by the police of deaths having occurred from cholera in three villages. It cannot be accurately ascertained when cholera first broke out in the Khowang Division, but there is evidence to show that it was early in April."

As usual when cholera is in full vigour from the Sunderbuns to Lower Assam, the steamers conveying coolies had cholera on board, and as early as February, steamers had arrived in Upper Assam in which native passengers were suffering. Such cases naturally lead to the conclusion that this importation formed the focus of the great cholera of the year. But the evidence of Mr. White, the oldest medical officer in Assam and an accurate observer, shows how little such inferences are to be trusted. He writes—

"In 1864, when the tea speculation was at its height, the numbers of laborers who arrived, amounting to upwards of 600 a month, was so great, and nearly every steamer having cholera

* This conjecture has since been confirmed. A letter from the Political Agent at Zanzibar, dated 17th August, announces the re-appearance of cholera on the African Coast opposite Zanzibar. He states that the deaths are from thirty to forty daily, chiefly among natives coming from the interior.

† The conclusion arrived at may be correct, or it may not. My experience of such reports regarding cholera is that they are almost invariably true. The very presence of cholera in the interior of the Simla Hills, and in the south of the Bhawalpore State in 1869, was denied, although the fact was afterwards authenticated. The severity of the cholera of the hills of June 1869 is attested by the enquiries of recent travellers; and the people recognise this as the only epidemic which has struck the hills beyond the Sutledge since the outbreak of the mutiny year, 1857 when these same localities suffered to an extreme degree.

on board, it was found impracticable, and it would have been inhuman, to prohibit their landing. I then observed that, although patients were removed actually suffering from cholera to the various factories in the neighbourhood, it was never communicated to the old coolies. So complete was this immunity from contagion that in 1866 and 1867, when acting as Debarkation Officer, I never once prohibited the removal of cholera patients from the steamer to the several tea gardens to which they were consigned. As I incurred no little responsibility in doing so, I followed up and watched the results attentively, and I never heard of an instance of any of the old laborers on the garden to which the cholera patients were taken being seized; at times some of the new party of coolies who disembarked in health would be attacked on arrival at the garden, but never any of the coolies who had been previously there.

"Being much interested in the matter, I from time to time in former years enquired from the medical officers of the Assam and Jorehaut Companies, the two other principal centres of immigration, and their experience was similar to mine, that cholera was never propagated by fresh arrivals to either Cinnamara or Nazirah. There have been epidemics at both those places, but they could not be traced to introduction by recently arrived coolies."*

The Commissioner of Assam says substantially the same thing—"I am very decidedly of opinion that if the importation of laborers ended to-morrow we should have as much cholera as we have now."

Mr. White, however, goes on to state that from their social and domestic habits, the Native Assamese are naturally much more liable to the attacks of cholera than the imported Bengalee laborers, and he appears to think that among them individual cases may possibly become foci. But the general population of Upper Assam is not under immediate observation, and Mr. White's idea is not consistent with the specially observed facts which he records as occurring among the Bengalee population, among whom the facts can be noted with greater accuracy.

The registration of the Berars given in the death table for the general population shows how here, as in the Central Provinces, the cholera of 1868 renewed in power its epidemic existence in 1869. In the Berars, 10,947 cholera deaths were registered in 1869. In the Nizam's Territories, the cholera invading Hyderabad on 15th November 1868 re-appeared with the monsoon of 1869, and by the end of August 700 deaths had occurred in the city alone.

The invasion of the Chutteesghur Division of the Central Provinces, which resulted in so great a loss of life, took place in the second week of May. In the Raipore District not a case of cholera had been reported up to this date, although in March cholera had prevailed epidemically in nine districts out of the eighteen of the Central Provinces, and in April in twelve. Sumbulpore, Bhundara, Balaghat, and Raipore remained unoccupied, and Belaspore alone of the exempted tract of 1868 got cholera in March and April. This is not to be forgotten in trying to ascertain under what conditions invasion occurred.

On the 12th May the explosion took place, and in this week 34 villages were attacked in the Raipore District. It is necessary to look abroad to see whether any general choleraic influence prevailed about this time, along with which invasion may have occurred. Without direct proof of importation we are not warranted in assuming that importation took place indirectly, that is, without even the fact of the arrival of men suffering from cholera, or who subsequently suffered from cholera, having been recognised. We should not overlook that in the city of Banda the death register begins on the 10th May; that on the evening of the 11th the great outbreak of the 7th Fusiliers began at Saugor; that in the city of Saugor, where in the after months of the year 561 lives were lost, two cases of cholera only, and these not fatal, occurred before the 9th May; that in Dumoh, the first death was recorded on 13th May; or that in the town of Mundla it was on the 9th May that the first man died. All of these cases are indices of a certain value in weighing the evidence for and against direct importation by human agency.

At page 139 of my previous report, I pointed out how fifty years ago the Kurnaul Cantonment was struck on the 11th May; and I showed that the fact of forty villages of the Delhi District having become affected on this same day in 1867 was a fact strictly parallel in epidemic history. And so also is this epidemic invasion of the Raipore District. Although the Civil Surgeon evidently has no conception of epidemic diffusion beyond that by human intercourse, the simple fact which he states, that on the 12th May cholera became generally epidemic, is not the less valuable. I have no difficulty in recognising the perfect parallelism of these facts of 1820, 1867, and 1869, although the illustrations are so widely separated in time, and occurred in localities lying widely apart.

In this week the breaking up of the great and persistent heat appears to have occurred. The district reports are as follows:—

District Reports, Central Provinces, 9th to 15th May.

BELASPORE.—Weather unusually sultry and clouds about.

SUMBULPORE.—Rain again threatening.

RAIPORE.—No return.

* In the face of this deliberate statement made by Mr. White, we find in the same collection of documents a Report by the Protector of Laborers, in which he suggests that the cholera of 1869 spread from various tea gardens of Upper Assam after its introduction by Bengalee laborers in February and March.

NIMAR.—Slight shower on evening of 9th.
 NURSINGPORE.—Evening cloudy, with a few drops of rain.
 HOSHUNGABAD.—A few drops of rain fell.
 BAITOOL.—Weather cloudy.
 MUNDLA.—No return.
 SEONEE.—There has been a slight shower of rain.
 WURDAH.—The weather has been cloudy every morning.
 BHUNDARA.—Sky cloudy.

In the reports from Nagpore, Chanda, Jubbulpore, Saugor and Dumoh mention is not made of the state of the atmosphere. At page 105 of the report of last year, I have stated that I consider the cholera of the Central Provinces nearly allied in its meteorological relations to the cholera of the endemic area, which finds its maximum in the months which are the hottest. There does not, however, exist in these provinces, as in the endemic area, the condition which entails extinction during the monsoon, and hence in this situation the monsoon cholera is as powerful or more powerful than the cholera of the spring.

The dates of the decay of the cholera of the Central Provinces may be gathered from the following statements from the different districts. The parallel statement for 1868 is given at page 155 of last year's report.

Dates of decay of the great cholera of the Central Provinces.

Weekly reports from the different Districts of the Central Provinces, indicating the decay and dying out of the Cholera of 1869.

September 18th, Chanda.—Cholera has almost disappeared.
 " Wurdah.—Cholera almost disappeared.
 " Saugor.—Cholera on the decline.
 " Baitool.—Cholera has again shown itself.
 " Chindwarra.—Cholera reported, but the type seems mild.
 " Nimar.—Twelve cases of cholera and three deaths reported.
 " Sumbulpore.—Cholera decreasing.
 " Belaspore.—Cholera still in the Saragaon Circle, but abating.
 September 25th, Wurdah.—No fresh cases of cholera since 10th instant.
 " Saugor.—There is still a little cholera.
 " Baitool.—Cholera has again disappeared as suddenly as it came.
 " Chindwarra.—Cholera has almost disappeared.
 " Nimar.—Four cases of cholera reported during the week.
 " Sumbulpore.—Cholera fast disappearing.
 " Belaspore.—Cholera still hanging about the eastern portion of the district.
 October 2nd, Wurdah.—No cholera.
 " Saugor.—Only a little cholera.
 " Baitool.—Cholera still occurs at times.
 " Nimar.—No cholera cases reported.
 " Sumbulpore.—Cholera has almost disappeared.
 " Belaspore.—Cholera has disappeared.

In the week ending 9th October there are only two notices of cholera. It is noted that there is still cholera in the Baitool District, and that choleraic diarrhoea has appeared in a pergunnah of the Balaghat District.

No mention of cholera in any district is made in the report for the week ending 16th October.

In these same weeks from the 18th September to the 8th October, when the monsoon broke up, rain was persistent and universal. Had the cholera of the season been developing, in place of falling naturally into decay, such a meteorology would have been favourable to the highest degree of manifestation. But there is no lengthening out of the reproduction manifested out of sympathy for this favourable meteorology; decay and death occur because the season for decay has come round, as we have seen the appearance to occur because the season for re-appearance has come round. In every district of these same provinces fever prevailed during these same weeks, owing to the prevalence of the meteorology favourable for its appearance. But the same influences had no effect in reviving or prolonging the cholera of the same tract.

The Kohat valley was invaded on 29th September, and the last case occurred, as in the

Peshawur valley, in the first week of November. The loss of the troops in this invasion will be considered in speaking of the aspects of outbreaks in the last section. Cholera did not appear in the Bunnoo District before this same week in

November. In all, 124 of the inhabitants were carried off, and 10 men only were lost out of a garrison of 1,650.

Within the monsoon area, so late as the 8th November, a woman of the 4th Hussars was attacked at Meerut.

General characteristics of the year and the aspects of disease generally in relation to these characteristics. The alliances of the epidemic malarial with the cholera of 1869.

The general features of the year 1868 I have sketched at page 150 of my previous report, and the characteristics of years of a similar constitution were treated of at page 69. In this year I have to show the opposite side of the picture, namely, the characteristics of an epidemic year in Northern India.

It must not be assumed that in speaking of the aerial relations of malaria and cholera, I am speaking of one and the same phenomenon, and that where cholera is conveyed there and then also is malaria conveyed. I restrict myself to the statement, that the motions of the air favourable to the manifestations of malarious influences may prove the vehicle of the cholera miasm. There was no special manifestation of malaria with the great movement of cholera in the first week of June; the monsoon cholera of Oude, Cawnpore, and Allahabad was not accompanied by any outburst of malarious fever, nor did a single case of cholera accompany or follow the great fever of Meean Meer and Rawul Pindee; and the great cholera of the Central Provinces was dead when late in the year the population were dying from fever by the thousand. Rohilcund and Meerut was as regards both cholera and malaria an exempted province in 1869; the stations of the Gangetic Provinces and Oude suffered universally from cholera, and were, with the exception of Allahabad, nearly free from the epidemic of malaria. In short, I wish to be understood that the natural history of cholera is to be studied as the natural history of an individuality; and that the epidemic phenomena of the two miasms are not of such a nature that their manifestation must necessarily be shown side by side.

The natural provinces of cholera are the natural provinces of malaria, because the geographical limits of natural provinces are defined by recurring aerial phenomena precise as regards their limitation in space. It may be too that malaria is as much an individuality as the cholera miasm. This much is certain, that its distribution in any year is distinctly provincial; and I am inclined to believe that something beyond the mere peculiarity of the distribution of the rain-fall of the season in any province is required to determine a minimum or maximum of the development of fever from August to November. That rains lasting up to the first week of October foster fever there can be no doubt, and the cold of the nights in Northern India in November maintains the fever in power for yet a month later. But in such cases as that of the epidemic malaria of 1869, there will, I think, generally be found, early in the monsoon, the evidence of the existence of something over and above the mere climatic phenomena of the season.

It matters not which type of the population we select to show that in a certain week malarious fever became universally developed over Central and Northern India. I have placed here a table showing the admissions from fever among the native troops; and this tells us that from Roorkee to the Peshawur Frontier one common

influence prevailed in the week ending the 13th August, which in every station of the area caused the development of fever among the inhabitants; that from this week up to the middle of November this influence continued in force, and that it reached its maximum in the month of October.

The extreme suddenness of the appearance of this fever is worthy of notice. Mr. Eteson, of Roorkee, quoting from his diary, says, that, on going to hospital on the morning of the 12th August, he found that during the night an epidemic had appeared and that many men had been struck down, and the fever was general throughout the station on the same day.

Punjab, Native Troops. Statement showing the commencement and progress of the Epidemic Malaria of 1869.

STATION.	Strength of July.	FEVER ADMISSIONS, MALARIOUS SEASON OF 1869.										Fever rate for the year per cent. of strength.
		July.	Week of August ending				August.	September.	October.	November.	December.	
			6th.	13th.	20th.	27th.						
Bannoo	1,648	50	9	33	80	45	213	580	926	964	398	204.62
Kohat	2,285	94	20	131	268	160	695	1,236	1,002	563	259	171.69
Peshawur	3,245	317	66	124	317	201	1,049	1,279	1,611	1,135	367	193.19
Mardan	840	25	9	17	11	19	76	74	219	163	33	78.55
Nowshera	1,013	46	14	35	62	29	166	205	407	325	111	132.72
Abbottabad	1,263	83	27	54	93	110	353	583	709	427	135	175.16
Attock	172	2	...	4	8	6	28	70	119	117	33	239.77
Rawul Pindee	1,132	44	6	21	35	20	112	221	350	290	47	97.71
Jhelum	1,555	43	15	41	35	39	153	156	473	419	110	94.75
Sealkote	921	39	3	7	10	6	31	38	72	103	22	43.01
Dharmasala	489	42	13	28	33	17	104	137	131	59	25	106.87
Bukloh	604	37	7	14	10	8	49	79	37	28	6	45.82
Meean Meer	1,261	28	9	19	71	75	210	277	869	750	219	201.65
Unrisur	162	2	2	2	4	2	10	26	57	21	9	91.28
Mooltan	919	34	2	3	46	35	115	161	278	199	68	100.53
Perozepore	585	14	6	8	13	16	62	49	133	33	7	59.93
Jullundur	373	28	1	5	14	18	49	105	115	113	4	108.82
Leodiana	90	2	...	5	11	7	34	26	78	28	...	214.94
Phillour	82	17	2	2	11	16	37	58	8	10	5	159.04 (six months.)
Unahalla	852	34	4	6	7	12	38	35	96	73	13	45.24
Delhi	607	9	1	5	31	29	83	93	180	177	49	118.97
Roorkee	198	8	2	18	31	8	72	120	117	50	9	167.96
	20,389	999	218	582	1,201	878	3,716	5,508	7,978	5,959	1,950	.....

Throughout Central India universally this great epidemic of malaria extended. Here

Fever of 1869 universal from Allahabad to Kurrachee.

I do not trace its existence in strength until the second week in September; and, as at Allahabad, in some places the invasion did not occur until October at the date at which

the monsoon rains, which lasted up to 10th October, began to dry up. As in Northern India, the fever epidemic of the Central Provinces reached its climax in October and November, and its geographical spread was as wide as that of the cholera of 1869, namely, from the Jumna to Scinde; the fever of the 58th at Allahabad of October and November was the same fever from which the Fusiliers at Kurrachee were suffering at the same time, and between these points the geographical continuity of the fever wave was unbroken.

Meerut and Rohileund, which I have described as a natural province, and lying out of the

The distribution of this fever was distinctly provincial. Statements illustrating the geography of the epidemic, and giving the ratios for a non-epidemic year in contrast to those of 1869.

line of influences proceeding from south-east to north-west, escaped this great fever of the south and west, just as it escaped the cholera of 1869; Roorkee towards the hills and Delhi on the extreme west of the province alone suffered.

With the exception of Allahabad, no station of the east suffered to any extent from the epidemic malaria, and Oude absolutely escaped. In the statement which follows, the maintenance of the numbers affected up to November indicates the presence of fever in Allahabad, and the very slight affection of a few other stations. But for the province, as a whole, the statement is a striking one, showing, as it does, how entirely provincial was the aspect of the malaria of the year. It should be read in contrast to the two statements which come after.

1869, a non-malarious year in Oude and the Valley of the Ganges.

EUROPEAN TROOPS, GANGETIC PROVINCES AND OUDE, 1869. STRENGTH 8,308.

EUROPEAN FEVERS, GASTRIC FEVERS AND CHOLERA, 1866. STRENGTH 6,900.							
					Fever Admissions.		Ratio per cent. of Strength.
January	57	} Spring months 5.85
February ...	...	...	...	...	74
March ...	...	...	...	...	152
April ...	...	...	...	...	223
May	241	} Hot months 11.55
June ...	...	...	...	...	521
July ...	...	...	...	...	234
August ...	...	...	...	...	348
September	322	} Malarious months 17.20
October ...	...	...	...	...	352
November ...	...	...	...	...	360
December ...	...	...	...	...	115
					2,999		36.23

A ratio of 17 per cent. against a ratio of 71 indicates the comparative escape of the Gangetic Provinces, and the intensity of fever in Central India and the Punjab.

As both provinces in the west were affected alike in 1869, so in 1868 both formed part of one non-epidemic tract, and no illustration of the parallelism of the results in epidemic and non-epidemic years could be more beautiful than that here exhibited:—

The non-epidemic year 1868 and the epidemic year 1869 in Central India and the Punjab contrasted by the fever ratios of the European Troops.

PUNJAB.					AGRA AND CENTRAL INDIA.				
STRENGTH OF 1868, 12,576; OF 1869, 13,998.					STRENGTH OF 1868, 4,170; OF 1869, 4,371.				
	Fever Admissions.		Ratio per cent. of strength.			Fever Admissions.		Ratio per cent. of strength.	
	1868.	1869.	1868.	1869.		1868.	1869.	1868.	1869.
January ...	364	219	10.08	7.43	January ...	181	107	12.81	9.91
February ...	192	181			February ...	114	73		
March ...	250	234			March ...	105	118		
April ...	367	390			April ...	134	164		
May ...	934	1,175	22.73	21.85	May ...	167	164	16.60	13.59
June ...	1,357	1,008			June ...	271	291		
July ...	723	970			July ...	261	144		
August ...	795	1,723			August ...	211	372		
September ...	763	1,910	22.55	71.44	September ...	270	531	20.79	70.77
October ...	693	2,923			October ...	200	1,009		
November ...	694	3,452			November ...	170	1,107		
December ...	605	1,355			December ...	142	334		
Total ...	7,737	15,543	60.27	110.86	Total ...	2,226	4,414	53.45	103.90

It is very interesting to

Rain-fall of the monsoon season in the different districts of Central and Upper India, and the natural arrangement of areas in relation to the amount of rain which they receive.

trace the effects of the monsoon in determining the rain-fall of different parts of Upper India between June and the first week of October. The Statement annexed shows the rain-fall of districts in 1869.

The districts of Western India lying east of the Western Ghâts seem to have received not one-half of the rain-fall

of the Central Provinces. Even the stations of Khandeish had in 1869 a rain-fall little over 20 inches. But leaving the western coast the rain-fall increases; Nimar shows from 30 to 33 inches, Hoshungabad 42, and Nursingpore 47. Baitool gives 29 inches, and Nagpore 35. All of these districts have the western coast as the base of their rain system; and it is curious to observe that in proportion as they are distant from this base, so much the greater does the fall become. This is a very important observation in relation to the passage of cholera from north-east to south-west, of which I have spoken at page 8 of this report. If in an epidemic season like 1869 direct influences from the south-west show themselves so weak, it is not to be wondered at that in a year like 1868, when they died away almost entirely, influences from the north-east should step in to fill the vacancy in the manner I have there described. The greater rain-fall of the north-eastern districts of the province of the south-west monsoon proper, I consider to be owing to the rain from the western coast meeting the line of the influences from the Bay of Bengal, and falling after striking upon this aerial wall. The line of this wall is beautifully marked in the cholera map for 1867, when it formed the line of separation between the epidemic and non-invaded areas of that year.*

The districts in the centre of the peninsula show throughout a rain-fall of 50 inches, which is 10 inches in excess of the rain-fall of the Gangetic Provinces. From Banda to the Behar Provinces the rain-fall varies from 35 to 43 inches, and the average between these extremes holds good for nearly all stations of the great natural province, until we approach the western margin, the line of 80°. Here Cawnpore and Futtehghur give each 31 inches, and the western districts of Oude from 20 to 23 only.

In the natural province lying west of 80°, the great consistency of the rain-fall is well seen. In the north, probably from its proximity to the hills and the frequency with which eastern influences extend so far, Bareilly gives 39 inches,—an exceptional rain-fall. In the south, Etawah falls in with the districts lying south of the Jumna and gives a rain-fall of 36, and Mynpoorie bordering on Etawah gives 32. With these exceptions, the rain-fall of the eastern districts of this province is 25, and of the western 17 to 19 inches.

The latter rain-fall holds good for the region around Delhi, and it gradually dies off towards the desert, although even here the fall is that of an exceptional year, notably in the Montgomery District, which gives 24 inches.† The districts of the east of the Punjab west of Umballa, and all the districts under the hills as far as Huzara, show a rain-fall of from 25 to 30 inches. But in the Punjab, from Lahore to the Frontier, the effect of the cessation of monsoon influences is at once perceived, and the rain-fall is the same as is seen in the districts bordering on the north-western desert. The fall on the Frontier of the 9th, 10th and 11th September was an exceptional occurrence, such as is recorded only at long intervals.

Monsoon Rains of 1869, 1st June to 10th October.

RAIN-FALL OF DISTRICTS IN INCHES.

Districts of Western India.		Districts to the east and north of the preceding.		Districts of the Gangetic Valley and Oude.	
Poona	... 19.3	Raipore	... 64.8	Chyebassa	... 46.2
Ahmednuggur	... 26.0	Belaspore	... 50.3	Hazareebaugh	... 41.2
Nassick	... 22.4	Seonee	... 55.3	Gyah	... 41.8
Malligaum	... 22.8	Mundla	... 59.6	Patna	... 43.0
Dhoolia	... 20.8	Chindwarra	... 50.6	Ghazeepore	... 39.0
Asseerghur	... 30.5	Jubbulpore	... 62.1	Benares	... 38.4
Khurdwa	... 32.7	Dumoh	... 50.0	Allahabad	... 45.3
Baitool	... 29.0	Saugor	... 51.3	Futtehpore	... 39.8
Wurdah	... 28.6	Lullutpore	... 49.2	Humeerpore	... 38.2
Chanda	... 43.2	Jhansi	... 59.9	Banda	... 35.4
Hingunghat	... 38.2			Oraie	... 29.2
Nagpore	... 35.4			Cawnpore	... 31.6
Bhundara	... 45.5			Futtehghur	... 31.6
Nursingpore	... 47.1			Goruckpore	... 40.6
Hoshungabad	... 42.3			Fyzabad	... 46.7
				Baraich	... 32.7
				Rae Bareilly	... 34.6
				Lucknow	... 35.6
				Oonao	... 37.7
				Seetapore	... 22.7
				Hurdui	... 20.0
				Kheree	... 23.3

* It is very instructive to note how the western limiting line of the cholera of 1868 and the southern limiting line of the cholera of 1867 cross each other at an angle. The line of 1867, stretching from south-east to north-west, extends straight from Chota Nagpore to Caubul, while the line of 1868, directed from north-east to south-west, curves round from Northern Oude to Malwa. Such facts in geography, even when standing alone, teach that it is by aerial agencies that limits are so defined.

† Contrast with this the rain-fall of the same districts in 1868, p. 150.

Districts west of 80° E. Long.		Districts of the Punjab.			
Etawah	... 33.7	Goorgaon	... 18.4	Goindaspore	... 26.2
Mysoree	... 31.8	Delhi	... 21.7	Sealkote	... 34.0
Agra	... 26.7	Kurnaul	... 16.2	Georawal	... 22.5
Shajehanpore	... 25.9	Umhalla	... 20.7	Huzara	... 23.5
Bareilly	... 38.0	Rohituck	... 18.3	Umritsur	... 29.1
Bijnore	... 26.8	Hissar	... 9.4	Lahore	... 11.8
Moradabad	... 25.0	Sirsa	... 10.7	Jhung	... 9.2
Budan	... 25.5	Mooltan	... 8.3	Shahpore	... 10.9
Dah	... 24.5	Moradpur	... 5.5	Jhelum	... 11.3
Muttra	... 19.4			Rawul Pindie	... 14.0
Allypore	... 22.7			Peshawur	... 8.5
Kotah	... 19.3	Leodanah	... 30.4	Kohat	... 12.8
Morat	... 16.4	Jullundur	... 22.7	Bimsoo	... 6.4
Moradnagar	... 17.9	Pratapnagar	... 23.3	Dera Ismael Khan	... 6.2
Saranpore	... 16.9	Montgomery	... 23.8	Dera Ghazee Khan	... 9.9
		Hoshanpore	... 23.7	Rajanpore	... 7.2

The Table showing the rainfall over the different districts of the monsoon area on each day from the 1st June to 10th October, is placed here to teach how, although differing in degree in different parts, the general influence is one and the same, and how local peculiarities are of secondary importance in comparison with that subjection to general agencies which is common to every portion of the monsoon area.

* Seven inches between 9th and 11th September.

PART III.

THE ASPECTS OF THE CHOLERA OF 1869 AS SHOWN IN THE AFFECTION OF COMMUNITIES.

I have in the previous section spoken of the cholera of 1869 as all-pervading within an area covered, as shown sometimes in shadow, sometimes in substance, as having substantial geographical limits, and as influenced in its manifestation by the prevailing meteorology and by what cholera is in itself when viewed as an object of natural history. Whether the included population be taken as a whole, or whether a type only be selected for illustration, the general phenomena of the epidemic are identical, because the same general laws control cholera in its relations to a body of men which come into operation in determining the manifestations within an area of any extent which has been covered by cholera.

While I have been speaking of the cholera of Central and Upper India, and showing how within each portion of the monsoon area cholera has behaved at different dates, our proper indices have taken up the same story and repeat it to us. When cholera ceases as in the interval between the spring and monsoon, it ceases also in our types from one end of the Presidency to the other; when an area is suddenly invaded, our types are as suddenly and generally struck; and when cholera dies in any area, it dies among our types.

The table which follows shows beautifully what I have described as occurring within the monsoon area in 1869. In this table is shown every admission from cholera among the men, women, and children of the European Army throughout the monsoon area, from Dinapore to Umritsur. It begins on 1st July, and shows a blank up to the 12th, and but one case appeared in the whole army between the 1st and 17th. Next follows the universal culmination in August, and then the disappearance before the end of September, except at Meerut and Morar, where six cases were carried into October. This table almost exactly reproduces the relations of the cholera of 1856, 1860, 1861, and 1862, as given at pages 169—173 of the report of last year. And selecting Morar as a typical station, the monsoon cholera of 1869 takes its place precisely as an addition to the table at page 174, which shows the cholera of Morar in 1860, 1861, 1862, 1865, and 1867.

The general aspect of the monsoon cholera of 1869 as exhibited among the European Regiments cantoned within the monsoon area.

Monsoon Area. Cholera Admissions of each day. European Regiments—Men, Women, and Children.

DATE OF ADMISSION.		STATIONS OF THE MONSOON AREA FROM DINAPORE TO UMRITSUR.																
		Dinapore, Strength 1,065.	Benares, Strength 906.	Fyzabad, Strength 1,257.	Lucknow, Strength 3,107.	Cawnpore, Strength 1,310.	Allahabad, Strength 1,141.	Morar, Strength 1,071.	Gwalior Citadel, Strength 278.	Sagore, Strength 157.	Jhansi, Strength 769.	Nowgong, Strength 221.	Saugor, Strength 1,072.	Jubbulpore, Strength 500.	Subathoe, Strength 1,010.	Jallandhar, Strength 1,002.	Ferozepore, Strength 1,145.	Umritsur, Strength 125.
July 1st to 12th		None.	None.	None.	None.	None.	None.	None.	None.	None.	None.	None.	None.	None.	None.	None.	None.	None.
13	13th	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...
14	14th	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	15th	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	16th	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	17th	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	18th	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	19th	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	20th	...	...	...	...	...	3	...	...	...	...	...	...	...	...	...	...	...
21	21st	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	22nd	...	1	...	...	1	3	...	...	...	...	...	...	...	...	...	...	...
23	23rd	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	24th	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...
25	25th	...	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...
26	26th	...	1	1	...	4	...	...	...	...	...	...	...	...	...	...	...	...
27	27th	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...
28	28th	...	...	...	...	1	2	...	...	...	...	...	...	...	...	...	...	...
29	29th	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...
30	30th	...	...	...	...	7	2	...	...	1	...	...	...	...	...	...	...	...
31st	31st	...	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...
August	1st	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	2nd	...	...	...	...	7	...	1	...	1	...	...	1	...	...	...	...	...
3	3rd	...	...	...	10	9	...	3	6	1	...	...	...	...	...	...	...	...
4	4th	...	...	...	...	...	...	3	...	...	...	...	...	...	...	...	...	...
5	5th	...	...	...	...	8	...	5	...	...	...	...	...	...	...	...	...	...
6	6th	...	...	1	6	1	...	3	...	...	...	...	...	...	...	...	...	1
7	7th	...	...	...	9	2	...	7	2	1	...	...	...	...	1	...	...	...
8	8th	...	...	4	8	1	...	5	...	...	...	...	...	...	1	...	...	...
9	9th	...	...	2	6	...	1	8	...	5	...	...	1	...	1	...	...	1
10	10th	...	1	4	4	...	4	1	...	1	...	...	...	...	...	...	...	...
11	11th	...	...	3	4	1	...	2	...	4	...	...	...	...	...	...	...	...
12	12th	...	...	2	3	...	2	5	...	1	...	...	2	...	1	...	...	3
13	13th	...	...	3	6	...	2	5	...	...	...	...	1	...	...	...	...	1
14	14th	...	...	...	7	3	...	1	...	3	...	...	1	...	3	...	...	...
15	15th	...	1	1	3	2	...	1	...	9	...	...	2	...	1	...	...	...
16	16th	...	...	...	3	...	...	4	...	6	1	...	...	...	...	...	...	...
17	17th	...	...	...	1	...	1	7	...	3	...	...	2	...	...	...	1	...
18	18th	...	...	2	1	...	...	10	...	1	...	...	...	...	...	...	...	...
19	19th	...	...	...	2	...	...	...	...	4	1	...	2	...	...	...	...	...
20	20th	...	...	...	1	...	...	2	...	1	...	...	1	...	...	...	...	...
21	21st	...	...	...	1	...	...	3	...	2	1	...	...	...	...	...	...	1
22	22nd	...	...	...	2	...	...	2	...	...	...	...	...	...	...	...	...	...
23	23rd	...	...	...	2	...	1	3	...	...	...	...	2	...	...	1	...	...
24	24th	...	...	...	3	...	...	1	...	...	...	...	...	...	...	...	...	...
25	25th	...	...	1	1	...	...	...	...	1	...	...	...	...	...	...	...	...
26	26th	...	...	...	...	1	...	4	...	2	...	...	...	...	...	...	...	...
27	27th	...	...	...	2	...	...	1	...	1	...	...	...	...	2	...	...	...
28	28th	...	...	1	1	...	...	3	...	...	...	...	1	...	4	...	...	...
29	29th	...	1	...	1	...	...	3	...	...	...	...	1	...	...	...	...	...
30	30th	...	...	...	...	...	...	1	...	...	...	...	...	...	2	...	...	...
31st	31st	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...
September	1st	...	...	...	...	...	...	...	...	2	...	...	2	...	3	...	...	...
2	2nd	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	2
3	3rd	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	4th	...	...	1	...	...	...	1	...	...	...	...	...	...	5	...	...	...
5	5th	...	...	...	...	...	...	...	...	1	...	...	...	...	1	...	...	...
6	6th	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...
7	7th	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	8th	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	9th	...	...	1	...	...	...	...	...	2	...	...	...	...	...	...	...	...
10	10th	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	11th	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...
12	12th	...	...	...	...	...	...	2	...	1	...	...	...	...	...	...	...	...
13	13th	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	14th	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...
15	15th	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	16th	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	17th	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...

Morar had four admissions after this date on 23rd and 29th September, and 3rd and 14th October. At Meerut, as at Peshawar, the cholera of the same movement originated an outbreak in which 19 admissions occurred. It began on 6th September, and between this date and 28th, 14 cases appeared; there were 4 cases in October, and one in November.

Beyond the monsoon area, the parallels of 1858 and 1862 held good, and the anticipation formed in the first week of September, that in the Peshawar valley the invading cholera would not become extinct until the first week of November, was exactly realised.

All statements made by local observers regarding the introduction of cholera by human intercourse are of no permanent value until reviewed in relation to the general epidemic phenomena of the year.

All statements made by local observers, which give a narrative of the introduction of cholera into their districts by means of human intercourse, must be reviewed in relation to the general aspects of cholera during the year. In the epidemic of 1869, the attempts to connect the cholera of districts or communities with imported contagion have been few, and most observers here contented themselves with simply stating that the evidence of introduction is

After the general history of the epidemic which I have sketched, it is scarcely necessary to add that this cholera followed no lines of human communication, or that lines of human communication were powerless to modify its geography.

wanting. With these statements the Sanitary Commissioner will deal, as well as those which would connect the localisation of the cholera of the year with a cholera-poisoned water-supply.

The importance of recognising the standard typical for the cholera outbreak does not seem to me to be sufficiently apprehended. And yet it is by

Illustrations from the cholera history of 1869 of outbreaks which conform to the shape indicated as typical in the previous report.

this standard that the effect of practical measures, as well as the significance of many points on which a clear understanding is essential before the history of a local or general outbreak can be accurately written, must be determined.* The following are illustrations which conform more or less in shape to what I have described as the type of the outbreak (p. 180) :—

Outbreaks of 1869 conforming more or less closely to the typical standard.

ADMISSIONS OF EACH DAY OF THE OUTBREAK.

Her Majesty's 35th Regiment, Peshawur. †	Her Majesty's 16th Regiment, Peshawur. †	Native Troops, Peshawur. Strength 3,544.	Native Troops, Kohat. Strength 2,200. (Deaths.)	Her Majesty's 7th Fusiliers, Saugor. †	Her Majesty's 62nd Regiment, Lucknow. †
Sept. 8 0	Sept. 8 0	Sept. 8 1	Oct. 1 0	May 12 2	July 29 1
" 9 0	" 9 0	" 9 0	" 2 0	" 13 1	" 30 3
" 10 0	" 10 0	" 10 0	" 3 0	" 14 0	" 31 6
" 11 1	" 11 2	" 11 4	" 4 1	" 15 0	August 1 0
" 12 0	" 12 3	" 12 4	" 5 2	" 16 13	" 2 7
" 13 1	" 13 1	" 13 3	" 6 9	" 17 6	" 3 10
" 14 0	" 14 1	" 14 1	" 7 9	" 18 4	" 4 9
" 15 2	" 15 2	" 15 1	" 8 21	" 19 1	" 5 8
" 16 0	" 16 1	" 16 2	" 9 18	" 20 1	" 6 6
" 17 1	" 17 3	" 17 2	" 10 10	" 21 0	" 7 5
" 18 29	" 18 23	" 18 8	" 11 13	" 22 1	" 8 2
" 19 34	" 19 31	" 19 25	" 12 7	"	" 9 1
" 20 21	" 20 9	" 20 9	" 13 10	"	"
" 21 9	" 21 4	" 21 22	" 14 7	"	August 10 1
" 22 22	" 22 2	" 22 8	" 15 4	"	" 11 3
" 23 6	" 23 5	" 23 13	" 16 2	"	" 12 2
" 24 12	" 24 1	" 24 18	" 17 2	"	" 13 2
" 25 36†	" 25 1	" 25 15	" 18 1	"	" 14 4
" 26 11	" 26 6	" 26 8	" 19 2	"	" 15 1
" 27 1	" 27 0	" 27 4	" 20 2	"	"
" 28 1	" 28 1	" 28 1	" 21 1	"	August 27 2
" 29 0	" 29 1	" 29 10	" 22 4	"	" 28 1
" 30 2	" 30 1	" 30 2	" 23 5	"	"
Oct. 1 1	Oct. 1 1	Oct. 1 6	" 24 1	"	"
"	"	" 2 9	" 25 0	"	"
Oct. 13 5	Oct. 4 1	" 3 0	" 26 0	"	"
" 14 6	"	" 4 1	" 27 1	"	"
"	Oct. 7 1	" 5 0	" 28 0	"	"
Oct. 20 1	"	" 6 1	" 29 2	"	"
"	Oct. 23 1	"	" 30 1	"	"
"	"	"	" 31 0	"	"
"	"	"	Nov. 1 1	"	"

A few cases at intervals up to 9th November.

Such a table as this, and

All phenomena connected with the manifestations in communities are subordinate to the laws which control the manifestations over areas.

indeed the history of all outbreaks in communities, must be read with reference to the statistics showing the persistence of cholera throughout the period for which it is vitally manifested. Various successive outbreaks, as well as individual cases, may show themselves at any time between the date of manifestation and decay. A notable example of this in 1869 was the cholera of Her Majesty's 58th Regiment, which beginning on 22nd March ended on 14th August. During this time four distinct outbreaks occurred. This case singularly repeats the history of the 70th Regiment in 1853, as given at page 203, with the exception that the outbreak of the earlier spring months was superadded in the case of the 58th.

The phenomena of movement and quiescence I have illustrated in various parts of the previous sections; the two tables at pages 16 and 32 show the decay of the spring cholera and the commencement of the monsoon cholera of the year to be a phenomenon of general significance; and the winding up of the cholera of this year, as of all others, has been shown to be a phenomenon depending essentially on what cholera is in itself, and bearing no essential relation to conditions of communities, which might be theoretically regarded as adapted for the prolongation of epidemic vigour.

In this year, the distinction between the localisation and gradual growth of cholera and the sudden descent of cholera in strength upon a locality, is

illustrated by the cases of Umritsur and the Peshawur valley. On 27th May the first case of cholera was recognised at Umritsur; in all the month of June there were but 38 deaths in the city; in the early part of July the number of casualties was small; and then when the monsoon cholera appeared everywhere else in strength, it appeared

The cases of the population of the cities of Umritsur and Peshawur taken in contrast, show how cholera may gradually develop in a locality after its original dissemination, or may appear in its utmost strength in a very few days after its precipitation.

* The application of the test of conformity to the typical standard in the case of the Hurdwar cholera of 1867 is made at page 102.

† Men, women, and children.

‡ With 11 exceptions, these were re-admissions, not fresh cases.

here also, certainly not by invasion, and on 16th July there was a sudden increase to 27 deaths. The great cholera then went on and culminated on the 16th August, when 118 persons died. It was at an end on 21st September; and by this date 3,026 persons had died in the city alone.

The full manifestation of this localised cholera of Umritsur was thus delayed for seven weeks. The aspect of the Peshawur cholera was entirely different. The first case of cholera recognised in Peshawur city was on 1st September; on the 7th it began to make way, and on the 13th 92 persons died.

On the 11th September, the area of the Peshawur valley occupied by the cantonment was visibly affected, and suddenly on the 18th every corps in cantonment and in camp was struck by cholera. The General Commanding reports,—“It burst as a storm over the station.” I have shown how in Scinde, far to the south, the cholera of the same invasion culminated on the very same day. This is, I think, an instance of what I have described under the figure of the sprouting of the cholera seed, and a parallel to what occurred in the Peshawur valley in the first week of June 1867, following the invasion of 19th May. The cholera of the invasion of the 19th May 1867 descended in force on the city and cantonment, and was reproduced in power in the first week of June; in 1869, cholera descended upon the valley in the first week of September, and, after the same interval as in 1867, there came the sudden and universal onset of the 18th.

I pointed out (p. 181) how in 1867 the aspects of the outbreak of the 42nd Highlanders and that of the 77th Regiment were quite distinct, and that the distinction was owing to the fact that the Highlanders, terribly as they suffered in the first days, had no second attack due to the coming forward of the cholera of the first week of June, because by removal to Cherat they were placed at an elevation beyond the reach of the cholera brooding in the Peshawur valley. The parallel was beautifully repeated in 1869. Although cholera showed itself generally in cantonments about the 11th, the actual outburst took place on the 18th and 19th, not in cantonments only, but throughout the valley generally; for the villages and the camps of the 104th and artillery in different places were all simultaneously attacked. One body of troops only had the opportunity of escape—a wing of the 104th which marched on the 13th for Cherat. This wing did not actually get to Cherat until the 30th, but the move out of the valley was sufficient, for three men only were attacked on the march, of whom two died. The wing left behind, although moving about in the valley, had 99 admissions and 63 deaths. This is sufficient to show how inefficient as a prophylactic measure is mere movement in such a locality. (See Part I, page 19). Such facts as these teach, too, how valuable may be the time intervening between the first manifestation and the actual outburst. We have no difficulty in recognising that, had the valley been evacuated between the 8th and 17th, few out of the 234 individuals who were lost need have died.

I may finish here what remains to be said regarding the effects of elevation. Into the Kohat valley the cholera descended in enormous power. One regiment of native infantry, the 2nd Punjab Infantry, lost the unprecedented number of 67 men; and, altogether, out of a native force of 2,200, 136 men died. The aspect of this outbreak I have tabulated above. This Kohat valley is the very locality which I selected in last year's report to illustrate what is meant by the localisation of cholera, and what I have there described (p. 212) as occurring in 1858 was exactly reproduced in 1869. This cholera entered the Kohat valley, or at least began to show itself, on 4th October, at the time when the immediate outburst in the Peshawur valley ceased. But the aura of the cholera of the first week of September was probably felt here, for throughout September a choleraic tendency was clearly to be noticed in many fever cases.*

But while cholera was falling thick into these valleys, the distance of a few miles sufficed to dissipate the force of the miasm, and, as in 1858, 1862, and 1867, the European regiment at Nowshera lost but two men out of its strength; and east of the Indus, Attock, Abbottabad, Campbellpore, Rawul Pindee, and the new station of Tullagunge, showed not a trace of cholera among the troops.

I have said that many districts of Upper India got this great cholera of 1869 in shadow only; this contingency necessarily goes far towards determining whether the outbreak of a cantonment shall be shown in strength or not. An officer is struck down with deadly cholera on 4th June at Sealkote, and nothing more is heard of cholera in the Sealkote District throughout the year; this cholera is said to have followed immediately after a large draught of water had been swallowed. At Ferozepore a single man of the 5th Fusiliers dies from cholera induced by an apparent exciting cause; and again, at Jullundur

The sprouting of the seed sown on a certain day. Parallel of 1867 and 1869 in the Peshawur valley.

Value of the lesson taught by this parallel, as showing that there may be an interval during which escape from the localised cholera is possible.

Localisation in the Kohat valley, in continuation of the description given of the same phenomenon in the report for last year.

The garrisons of Nowshera and the stations east of the Indus escaped, because of the geographical situation and physical aspects of these stations.

The aspect of the outbreak as determined by the passage over a district of the aura of an air-conveyed cholera.

* Report by Assistant Surgeon Kelly, quoted by Sanitary Commissioner, page 42 of his Report for 1869.

a single man is picked off by cholera when not a case is reported in all the district. These instances are parallel with those given at pages 165 and 176, and again noticed at page 218 of the report of last year. Both at Kohat and Peshawur the epidemic fever was very prevalent at the time of the outbreak, and the intensity may in some measure have been influenced by the depression caused by the malaria miasm. In the 36th Regiment it was particularly noticed that the invalids of the season and weakly men suffered.

Taken throughout the monsoon area, the loss of the European troops was seven times greater than that of the native troops occupying the same area; in the case of the Europeans the death-rate was 13·62 per 1,000, and in the case of the natives 1·97 per 1,000.

And even this great disparity was lessened by the fact of the almost entire exemption of the Meerut and Lahore Districts, which tells in favour of the rate for the Europeans. In the Peshawur valley the ratio of loss of European soldiers was three and a half times in excess of that of the native troops; the European force lost 115 per 1,000 of the actual strength, and the native force 33 per 1,000. No station occupied by Goorkhas lay within the epidemic area of 1869.

A sad instance of the vast disparity in the liability to cholera was exhibited in the course of the cholera of 1869 in the case of Lucknow. This great city with a population of 270,000, afforded to an accurate registration but 173 deaths in 1869, while the cantonment with a population of 3,100 Europeans, men, women, and children, yielded 97 deaths during the outbreak.

At page 230, I have shown that an unacclimatised regiment is apt to suffer far more from cholera than an acclimatised regiment when placed in parallel circumstances. In this year, the 102nd, stationed at Lucknow, lost 11 men, while the 62nd in the same cantonment, which arrived from England in February, lost 33 men out of an equal strength.

The intensity of the disease cholera has not been less than in previous epidemics. Out of each 100 Europeans attacked there have died, of men 63·55, of women 62·77, and of children 76·06. The ratio for the Regular Native Army has been 57·48, and for the Punjab Force 71·36. For prisoners the ratio has, as usual, been very much less, namely, 42·39 per cent. of those attacked.

It is remarkable to find how little the jail population throughout Upper India suffered from this epidemic cholera. In the invasion of July all the jails of the Behar Provinces were attacked; but to the west of the Behar Provinces the Goruckpore Jail alone suffered heavily, losing 34 prisoners. The distribution, however, was typical, and the geography of the cholera of the year is as truly indicated by the sparse cholera of the jails as by the outbreaks of the European army. The intensity, as regards the jail population, I consider to have been modified by the conditions which in the case of the same type determine a ratio of liability to malarious influences much lower than that of the general population. These are the height of the walls by which they are surrounded, and the exclusion of aerial influences immediately after sunset, when the prisoners are locked up for the night.

Lunatics as a class are singularly susceptible to the attack of cholera. While Lahore generally suffered so little, 17 per cent. of the lunatics in the asylum died. Of the female lunatics 36 per cent. died. There were altogether 34 deaths in the asylum.

It would appear that young children at the breast are wonderfully exempted from the attack of cholera. I found this statement upon the figures for the year 1869 only; but it is right that the fact should be noticed here, in order that the results of future observation may be recorded. Even for 1869 the returns are very imperfect in regard to the ages of children who have died; but as far as these show, the immunity of very young children was all but complete. In 45 cases the ages are not stated; but in a register of 63 cases in which the age is given, the death of one child only below 12 months old appears.

I find that the same observation was made in St. Petersburg on the occasion of the original invasion of Russia—that while in the Foundling Hospitals many of the nurses died, the children entirely escaped.

Throughout the epidemic area of the year, quarantine failed signally in every case in which it was attempted; and the absence of quarantine did not determine the invasion of tracts naturally exempted. A cordon of sentries placed around the cantonment of Peshawur failed to avert the universal outburst. The occupation of the passes between Peshawur and Kohat did not secure the Kohat Valley against the catastrophe of October. When the Magistrate of Shikarpore claims that this district was protected by quarantine against the cholera of Sukkur, we require to take into account the fact that no district to the east or north had cholera, and that the country from Bhawalpore to Hazara, and the corresponding districts lying west of the Indus, constituted one great exempted tract in 1869. We have no difficulty in concluding that the quarantine at Attock had nothing to do with the exemption of the country lying to the east, since this area was exempted in

accordance with laws taught by all previous epidemic history. The claim that the Jullundur District was exempted from cholera as a consequence of the establishment of quarantine on the Beas, could be advanced only by a local observer unacquainted with the general relations of epidemic cholera in 1869. When in answer to the query—was quarantine successful? the local observer appeals to the simple fact of the exemption of his district as evidence of success, his statement is of no scientific value until its weight is determined after the local fact is placed in its position among the occurrences which go to make up the general history of the year.

The failure to connect local outbreaks with a polluted water-supply has been general throughout the epidemic area. That the great outbreaks such as those above tabulated were unconnected with the local water-supply is proved by the shape which they assumed (see page 199 of previous report). That moisture is a localising cause as well as a vehicle for cholera, the natural history of the outbreak over an area teaches; and that the cholera which was being propagated at Umritsur from the 27th May to 16th July in order to become the materies of the great outbreak of July and August, may have been grown in the pools and tanks which afforded a water-supply to the population and moisture to the surrounding air, is not at all improbable. But that this same materies was derived from the excreta of those suffering from cholera, there is no evidence whatever to show. From one end of India to the other the poisoning of water from such a source is denied to be the originating cause of the cholera of the year. And well it may be when we reflect that the area covered by cholera extended from the frontiers of China to Russia and Central Africa.

Again in 1869, we have had the illustrations from previous epidemics which have already been employed to prove the contagious nature of cholera, the infection of hospitals, and the spread of cholera by common latrines, brought up to prove that previous observers who held such views were in error, and that a cholera-polluted water-supply was the real cause of the phenomena of these outbreaks. It is sufficient to remark that not one additional fact has been added to those at hand at the time of the occurrence, when the theory in question was weighed and found wanting.

The Sanitary Commissioner for the Central Provinces places a very high value upon a pure water-supply as a means of averting the outbreak of cholera. He reckons the liability of the individual to suffer from cholera during an epidemic as exactly proportioned to the purity of his water-supply; and he thinks, from the facts of the year that have passed under his notice, the conclusion is warranted "that, with respect to the general population of the country, the imbibition of water containing animal organic impurities is the most common means by which personal susceptibility to the effects of the special cholera contagion is induced." But his views are liable to be misrepresented, and therefore it is right that I should quote his own words on this most important subject. He writes:—

"Regarding the relation between the use of impure water and the development of cholera, there is no reason to believe that water impregnated with impurities of the kind above described, is ordinarily the exciting agent in the production of cholera, or the immediate cause of the disease. It is, indeed, not improbable that the excreta of patients suffering from the disease contain the infecting matter of cholera, and that the disease may be sometimes directly communicated by such matter being introduced into the drinking water; but that cholera can be rapidly diffused over a wide area by such means is scarcely possible; it is altogether improbable that in the large number of villages attacked during the dry weather of the present year, choleraic excremental matter can have been introduced into the water-supply; and the pollution of wells or other sources of supply by means of the vessels used in drawing water, I believe to be an accident that very rarely occurs."

In the Central Provinces alone 4,200 villages and towns were attacked, and 49,000 people died in the few months during which the cholera persisted. This single fact standing alone is sufficient to prove how little direct poisoning through the evacuations of cholera patients could have had to do with the general aspects of cholera in the Central Provinces in 1869.

In reply to the direct questions put by the Sanitary Commissioner—Is the water-supply of good quality?—Is there any evidence to lead to the suspicion that the water may have been the medium of communicating or spreading the disease?—Is it probable or possible it may have been contaminated by simple, and especially by cholera discharges?—sixty-seven medical officers of the European corps which suffered in 1869, the total furnishing replies, one and all answer that the water was of fair quality, and that it could not have been contaminated, nor have proved the medium by which cholera was spread. One officer alone suggests that the water used for watering the tatties of the married quarters of the artillery at Morar may have had a bad effect, as it was drawn from a well which is not used for drinking purposes on account of its impurity.

The outbreaks of 1869 were not in any instance attributed to the use of the regimental latrines.

Not one of these medical officers suggests that the regimental latrines may have proved a source of cholera, or may have spread cholera among the men.

The Sanitary Commissioner will consider the special questions of the effects of the employment of European soldiers as orderlies in hospitals during cholera outbreaks, and the apparent infection of attendants on the sick generally. Nothing is more

The question of the effects of attendance on the sick will be treated of by the Sanitary Commissioner.

difficult than to come to a satisfactory conclusion from the mere fact that some out of those so employed are attacked. When 19 per cent. of the whole garrison of Peshawur suffered, we may be quite certain that not less than 19 per cent. of those employed in attendance on the sick were attacked; and yet such an instance is one which, mentioned without reference to the ratio of attack for the garrison generally, is startling, and might be employed unthinkingly towards proving the contagiousness of cholera, when no such significance can be attached to it. Here and there, in different reports, mention is made of individual instances in which it would seem that an attendant on a cholera patient was attacked because of his proximity to the individuals already affected. Thus, when, at Lahore, an American missionary was attacked, a Native Christian who attended on him was seized, and also his wife. But such cases require to be carefully looked to. The fact that the wife also was attacked does not strengthen the case, since it points to the probability that the two, the man and wife, and perhaps the whole three, suffered from one common influence operating on all.

The term "importation of cholera" is employed very differently by different observers.

The term "the importation of cholera" as used by different observers. Cases in which it has been asserted that the epidemic cholera of 1869 of districts was due to importation.

The question is asked, whether cholera was imported into Meerut, and a medical officer replies, that cholera was imported, because on 7th August a sepoy of a Morar regiment was taken moribund from a railway carriage, and was carried to the lines of the 36th Native Infantry, where he died.

Now, not a case of cholera occurred among the Native Troops at Meerut during 1869, nor did a case of cholera show itself until nearly a fortnight afterwards, when Meerut and the surrounding districts were invaded. The idea seems to be present in the mind, that first cases necessarily become foci, and that around such cases the cholera of a city or district clusters. Were this the case, we should have no difficulty in determining it for a fact. But this belief coincides with the theory so generally accepted, that human intercourse alone is the cause of the dissemination of cholera; and hence, when we find a medical officer holding this theory, we invariably find him also writing as if importation were a fact, and a thing which occurs as a matter of course, and perhaps promulgating as true a statement made to him by some second, and probably uneducated, person, whose opinion is valueless for purposes of scientific research. If there be any truth in what I have written of cholera as an air-borne miasm, the truth is primary; and while granting that many secondary manifestations of cholera may occur in relation to human intercourse, not one instance in which a district generally is alleged to have been infected from a focus, should be allowed to pass without the strictest scrutiny.

When we are told that in 1869 cholera radiated from Umritsur as a centre, we do not

ask whether or not it was a fact that persons fleeing from Umritsur into the districts around were seized with cholera, but whether these individuals formed the foci from which cholera spread in the districts into which they fled. Whether they did or did not in this instance I cannot tell, because I have no data which show that such persons did become foci. I look at the case in its general aspects, and I find that this cholera culminates in the Umritsur district, in Lahore, in Goordaspore, and in Goojanwalla, exactly at the dates at which it culminated elsewhere over the epidemic area; and I perceive that the limit of the affected tract in the west, the north, and the east is the same as in the epidemic of 1861—that Jhelum, Goojrat, and Sealkote enjoy complete immunity, and that not a case of cholera finds its way into the Hoshiarpore, Ludianah, or Jullundur districts lying immediately to the east.

Regarding the method by which the cholera invading the Ahmednuggur district from the north-east entered, the Sanitary Commissioner for Bombay says simply, that the impossibility of obtaining trustworthy information rendered the attempt totally futile.*

The evidence in favour of the importation of the cholera of 1868 and 1869 into the different districts of the Central Provinces is not satisfactory.

As the result of his enquiry, the Sanitary Commissioner for the Central Provinces comes to the conclusion, that the evidence is in favour of the contagion of cholera having been brought into his province from without, and he considers that the subsequent diffusion of the cholera was effected solely by means of human intercourse. The fact of introduction in 1868 he failed to trace, and his conclusion that cholera was brought in from the north is deduced from the circumstance that the coolies, among whom the epidemic of the year first showed itself, were huddled within 300 yards of the Nagpore Road. His conclusion regarding diffusion is founded on the facts of epidemic spread, and of its appearance in the different towns and villages of the epidemic area. His opinion is, that isolated cases became focal centres; "but," he adds, "there are on the other hand many instances in which the arrival in a town or village of persons suffering from cholera was not followed by an outbreak of the disease among the population." And again he writes—"The accounts given of the outbreaks of cholera at Kyra, Soonwarra, Gokulkara, and Bhodooa afford evidence that the disease may be imported into a place by persons in whom no symptoms of the disease are apparent; and in other instances, as at Sehora and Rana, the importation of the disease into one village was so closely followed by an outbreak in another, with which it is in frequent communication, that, though the actual transmission of the choleraic

* Report for 1868, page 177.

influence cannot be proved, the presumption in favor of its having been effected by means of personal intercourse, and by persons not evidently suffering from the disease, is very strong."

Raipore, perhaps the worst cholera tract in India, had had no cholera since 1866. In 1868, when the adjoining districts, Jubbulpore, Seonee, and Mundla, suffered, no cholera appeared in Raipore. The Civil Surgeon writes—"On 12th May the disease may be considered to have broken out in an epidemic form, and to have been scattered throughout the district." The invasion in one instance is made to cluster round the fact that two cartmen, coming from the Belaspore district, returned to their villages in the Raipore district on 29th April and got cholera, and that these same villages suffered in the first week of May. Whether or not these men had cholera on arriving at their homes we are not told, but they died with the rest of the villagers. Now at a distance of 18 miles there is a village called Baheera, and here was collected a body of 3,400 coolies, who were joined by another body of 66 from the Belaspore district on the 7th May. When these 66 coolies left the Belaspore district cholera was epidemic or was becoming epidemic. The Sanitary Commissioner thinks that cholera broke out on the day they left, or the day before. These men also are alleged to have introduced the cholera which became universal after the 12th May. The attack illustrates the fact of a body being struck—"About 2 P. M. on the 12th May," the date assigned by the Civil Surgeon for the general diffusion of cholera, "after the midday meal, when the coolies were just going to recommence work, 23 persons were seized. By the evening of the same day 160 persons had been seized, and of these 52 died." This is the report of the Deputy Commissioner, written on the 17th, and he died from cholera a few days afterwards. In this letter it is distinctly stated that not one of the 66 men abovementioned got cholera. Captain Twyford, who was on the spot, remarks—"It is ascertained that none of them have died, and they have remained to the last." This is contrary to the statement of the Civil Surgeon of Raipore, who says that they got no cholera until the 13th of May, when several fatal cases occurred amongst them. The Sanitary Commissioner remarks that this is perhaps the most noteworthy instance of importation that he has to record; and to make the history complete, it requires the bridge to which I have referred at page 237 of my former report.*

The general assertion of the spread of cholera from foci is not to be accepted merely because the occurrence is theoretically regarded as possible. I have shown clearly that, studied on a basis of statistics, the shape of the outbreak of cholera is *diametrically* opposite to that of a contagious disease. And nowhere is the spread of contagious disease from foci more dreaded than in India. The histories attached to our jails and emigrant ships warn us how the germ introduced weeks, and it may be even months before, leavens insidiously day by day the whole body; and how hundreds are dead before the fire of the outbreak burns out, generally months from the date at which it has appeared.

But in the case of emigrant ships, where the spread of cholera from foci in its fullest development should be looked for, judging from the illustrations which have been afforded in the case of contagious fevers, and where community of condition suggests the probability of numbers suffering from the operation of one common agency, the shape of the outbreak is identical with what I have shown it to be in all our types (see pages 178, 188, 191, and 192). The facts of the introduction of cholera into districts in India as well as into countries beyond sea, must be studied in relation to the results which I have tabulated below, from data supplied, at the request of the Sanitary Commissioner, from the Office of the Protector of Emigrants in Calcutta. The return as furnished shows the dates on which cholera cases appeared in the emigrant ships leaving Calcutta for Mauritius and the West Indies between 1850 and 1865 in the first case, and between 1861 and 1869 in the second. There are confessedly great difficulties in dealing with the registers of deaths, and that portion referring to the Mauritius for the years from 1861 onwards is so evidently erroneous and at variance with the experience of 1850 to 1860, and of the entire table for the West India emigrants, that I have struck it out in arranging the figures below given:—

Statement showing the Aspect of the Outbreak of Cholera on board Emigrant Ships leaving Calcutta for Mauritius and the West Indies.

EMIGRANTS.	DEATHS OF EACH DAY AFTER LEAVING CALCUTTA.																				TOTAL.	
	1st.	2nd.	3rd.	4th.	5th.	6th.	7th.	8th.	9th.	10th.	11th.	12th.	13th.	14th.	15th.	16th.	17th.	18th.	19th.	20th.		After 20th.
Mauritius, strength ... 22,077	19	28	28	21	33	26	13	13	10	10	11	9	8	10	5	1	5	1	3	1	9	264
West Indies, strength ... 8,284	...	4	10	2	12	3	10	6	6	9	7	2	1	2	...	2	...	...	...	...	5	81
TOTAL ... 30,361	19	32	38	23	45	29	23	19	16	17	18	11	9	12	5	3	5	1	3	1	14	345

Besides these deaths, 32 occurred of which the dates could not be ascertained.

* Read in connection remarks at page 40 of the present report, where I have shown the general epidemic connection of the cholera of Raipore.

During the period to which this table refers, there were despatched to Mauritius 105,382 emigrants, and to the West Indies 72,681. Of these, a strength of 30,361 was rendered immediately liable to the attack of cholera by its appearance on board of 82 ships after leaving port. The average number lost in each outbreak was under 5 ($4\frac{2}{3}$), and that the disease was not perpetuated nor propagated is shown by the aspect of the above table. In the case of the West India ships the type is perfect; and there is every reason to believe that errors in diagnosis have to some extent damaged the facies of the figures in the first line. Out of 20 ships bound for the West Indies, two only show a mortality exceeding 10; one ship shows 11 deaths, and the second 16. But this last was the unfortunate *Fusilier*, and these were no doubt sudden deaths from typhus, from which the vessel lost 50 per cent. of her emigrants before she was lost at the Cape.

CONCLUSION.

In these pages I have very hastily sketched the general outlines of the history of cholera in 1869. I have given the views which presented themselves to my mind during or before the occurrence of the events, as well as the results of my study of reports and statistics furnished after the occurrences of the year were completed. The special and secondary aspects of the cholera of the year have received due attention, and the sanitary officers of provinces will relate the history of the year as they have recognised it among the communities which have suffered. The records in which the secondary aspects of epidemic cholera are treated of do not immediately come under my cognisance as statistical officer; and such instances as I have noticed here have been brought up in connection with representations which vitally affected the integrity of the general epidemic history of the year.

In my report of last year I affirmed that the history of the cholera of the epidemic area could for any year be written as a history or as a narrative—tangibly one story throughout, with all the links of the chain complete. And the grounds upon which I made the statement were, that the cholera of India has aspects which are primary, due to what cholera is an individuality, and to the obedience which it pays to the natural influences which in every year prevail in Hindostan. Maintaining this view, I have sketched the history of 1869 as I have done, and tried to show the controlling laws under which the leading events have taken place. If in some respects the anticipations formed failed of accomplishment, in others they were as signally fulfilled. At the end of the experience of another year I would willingly write again all that I have written in the conclusion of last year's report. Of this the sum is, that for many years to come we shall be as often wrong as right in the anticipations which we may form, but that accumulated experience will year by year teach us better what we may expect, in accordance with the age and geography of the epidemic in progress. I have distinctly said that we are not to dogmatise, and to assume that because we find cholera epidemic, it shall follow one definite course or show one definite history. In the future many epidemics will undoubtedly shape themselves after the type of the epidemics of 1817, 1855, and 1859; but, just as certainly, we shall find others which will have as their counterparts the epidemics of 1863, 1866, and 1868. As they occur we shall recognise the resemblance, and we may then be able to appreciate better than we have done in the past the laws under which they assume the form which they present.

POSTSCRIPT.

WHILE the head of the moving cholera of 1869 passed on beyond the limits of the Bengal Presidency, and, judging by the epidemic history of 1870, left scarcely a trace behind it in Central and Northern India, in regions in which the movement ended in the later months of 1869, reproduction has been general.

The Madras Presidency, first invaded after the setting in of the north-east monsoon in 1868, has retained the epidemic throughout 1870, and this cholera has also reached Ceylon; and Bombay is at the present time suffering heavily from cholera. The great spring cholera of Africa of 1870 has renewed manifestation with the appearance of the monsoon; far in the north, Herat is being stricken; and the latest intelligence from Europe tells of the arrival of the epidemic in the ports of the Black Sea and also in the north of Russia.

APPENDIX.

EPIDEMIC OF 1868-69.

TABLES SHOWING THE DISTRIBUTION OF CHOLERA IN EACH MONTH OF 1869 IN THE EUROPEAN AND NATIVE ARMIES AND AMONG THE JAIL POPULATION OF THE BENGAL PRESIDENCY.

GENERAL INDICATIONS OF DISTRIBUTION AFFORDED BY THE TABLES OF 1869.

Cholera universal over the Eastern and Central Provinces, and invading from the south-east towards the north-west to beyond the Peshawur frontier. Rohilkund, the Eastern Districts of the Punjab, and the tract situated beyond immediate monsoon influences with the exception of the districts lying under the hills on the frontier, the exempted area of 1869.

The cholera of 1869 appeared universally in the spring in the area covered by invasion in 1868.

In the first week of May, invading cholera occupied the Banda and Raepore Districts. In the last week of May and first week of June, cholera became universal throughout Central India from the Jumna to the Runn of Cutch, and at the same time appeared on the opposite margin of the natural province at Umritsur and in the Simla Hills.

After the lull marking the interval preceding the appearance of the monsoon cholera, the cholera of the epidemic re-appeared in power over the Districts already covered; and about 17th August, the indications of a further movement were shown. In this movement the Meerut District was entered, and the aura of cholera was felt even in the Peshawur Valley.

The great moving cholera of the first week of September, having the cholera of the centre of India for its base, filled the frontier valleys and the region lying beyond the boundaries of Hindostan in the North-West, Sinde, and the Southern Provinces of Persia.

The cholera of 1869 was dead at the normal seasons in every district occupied during the year.

EUROPEAN ARMY IN THE EPIDEMIC OF 1868-69.

CHOLERA OF 1869.

STATIONS.	AVERAGE STRENGTH DURING THE PERIOD OF OCCUPATION.	NUMBER OF ADMISSIONS INTO HOSPITAL IN EACH MONTH.												TOTAL ADMISSIONS OF THE YEAR.	ADMITTED PER CENT. OF THE AVERAGE STRENGTH.	NUMBER OF DEATHS.	DIED PER 1,000 OF THE AVERAGE STRENGTH.
		Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.				
Chinsurah Depôt ...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	4	...
Fort William ...	904	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dum-Dum ...	500	...	...	...	...	1	...	...	...	1	...	...	...	2	...	...	...
Barrackpore ...	395	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Berhampore (8 months) ...	154	...	...	...	1	...	...	...	...	...	...	...	...	1	...	1	...
TOTAL ...	1,903	...	...	...	1	1	...	...	...	1	...	...	...	3	16	1	53
Darjeeling ...	68	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Darjeeling Depôt (8 months) ...	105	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hazareebaugh ...	725	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dinapore ...	867	...	...	...	...	...	1	1	1	...	...	...	1	4	...	1	...
Benares ...	732	...	...	...	...	...	...	1	2	...	...	...	...	3	...	2	...
Chunar ...	56	...	...	...	1	...	...	...	...	...	...	...	...	1	...	...	...
Fyzabad (10 months) ...	924	...	...	...	...	...	...	...	22	2	...	...	...	24	...	17	...
Roy Bareilly (10 months) ...	77	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lucknow ...	2,279	...	...	...	...	...	...	4	74	...	...	...	...	78	...	62	...
Seetapore ...	532	...	...	...	2	6	...	...	...	...	...	...	...	8	...	5	...
Futtehghur ...	192	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cawnpore ...	1,040	...	...	...	...	...	1	9	10	...	...	...	...	20	...	12	...
Allahabad ...	879	...	1	27	9	14	15	11	40	...	...	...	...	117	...	87	...
TOTAL ...	8,308	...	1	27	12	20	17	26	149	2	...	...	1	255	3.07	186	22.39
Shahjehanpore ...	455	...	...	1	1	...	...	...	...	...	...	...	...	2	...	...	...
Bareilly ...	783	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Moradabad ...	312	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Raneekhet Roads (7 months) ...	198	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Nynce Tal Depôt (8 months) ...	422	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Landour Depôt (7 months) ...	212	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Chuckrata (8 months) ...	839	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Roorkee ...	372	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Meerut ...	1,421	...	...	...	...	...	...	...	...	8	4	3	...	15	...	10	...
Delhi ...	362	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Muttra ...	420	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
TOTAL ...	5,249	...	...	1	1	...	...	...	...	8	4	3	...	17	3.2	10	1.91
Agra ...	895	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Morar ...	760	...	...	...	35	9	1	...	57	3	...	...	...	105	...	63	...
Gwalior Citadel ...	268	...	...	...	...	3	...	...	8	...	...	...	...	11	...	7	...
Seepree ...	132	...	...	...	...	...	...	...	2	1	...	...	...	3	...	3	...
Jhansi ...	611	...	...	...	...	...	...	...	49	5	...	...	...	54	...	6	...
Nowgong ...	170	...	...	...	...	...	3	...	3	1	...	...	...	7	...	4	...
Saugor ...	892	...	...	...	1	28	1	2	20	...	...	...	...	52	...	38	...
Jubbulpore ...	646	...	...	1	2	2	1	3	4	...	...	...	...	13	...	11	...
TOTAL ...	4,374	...	...	1	38	42	6	5	143	10	...	...	...	245	5.60	132	30.18

CHOLERA OF THE EUROPEAN ARMY OF 1869,—*continued.*

STATIONS.	AVERAGE STRENGTH DURING THE PERIOD OF OCCUPATION.	NUMBER OF ADMISSIONS INTO HOSPITAL IN EACH MONTH.												TOTAL ADMISSIONS OF THE YEAR.	ADMITTED PER CENT. OF THE AVERAGE STRENGTH.	NUMBER OF DEATHS.	DIED PER 1,000 OF THE AVERAGE STRENGTH.
		Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.				
Umballa ...	1,332	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dugshaie (9 months)	848	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kussowlie Depôt (7 months)	412	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Subathoo (10 months)	800	...	...	...	...	...	...	...	18	6	...	...	...	24	...	16	...
Jutogh (7 months)	81	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Jullundur ...	778	...	...	...	...	1	...	...	1	...	...	...	...	2	...	2	...
Ferozepore ...	893	...	...	...	...	...	...	...	1	...	...	...	...	1	...	1	...
Mooltan ...	863	...	...	...	...	...	1	...	...	...	...	...	...	1	...	1	...
Dera Ismael Khan...	99	...	...	...	...	...	...	...	...	...	...	1	...	1	...	1	...
Sealkote ...	1,106	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Road-making De- tachments, Dal- housie Hills (6 months)	503	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dhurnasalla Depôt (7 months)	107	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kangra ...	66	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Govindghur and Umritsur ...	117	...	...	...	...	...	...	...	8	...	...	...	...	8	...	6	...
Fort Lahore ...	81	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Meean Meer ...	974	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Rawul Pindee ...	1,567	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Campbellpore ...	409	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Attock ...	166	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Road-making De- tachments, Murree Hills (7 months) ...	609	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Murree Depôt (6 months)	351	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Nowshera ...	531	...	...	...	...	...	...	...	3	...	...	...	...	3	...	2	...
Peshawur ...	1,723	...	...	...	...	...	...	...	307	15	1	...	...	323	...	207	...
Troops marching (Punjab) ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Recruits, &c., march- ing (Punjab) ...	...	...	...	...	...	...	...	...	...	...	1	...	...	1	...	1	...
TOTAL ...	13,998	...	...	...	...	1	1	...	28	316	16	2	...	364	2.60	236	16.86
Troops on the march in Bengal and N. W. Provinces ...	...	...	1	...	...	...	...	...	...	...	...	...	...	1	...	1	...
Bengal Presidency...	34,624	...	2	29	52	64	24	31	320	337	20	5	5	889	2.57	570	16.46

NATIVE ARMY IN THE EPIDEMIC OF 1868-69

CHOLERA OF 1869.

STATIONS.	AVERAGE STRENGTH DURING THE PERIOD OF OCCUPATION.	NUMBER OF ADMISSIONS INTO HOSPITAL IN EACH MONTH.											TOTAL ADMISSIONS OF THE YEAR.	ADMISSION RATE PER CENT. OF STRENGTH FOR EACH PROVINCE.	TOTAL DEATHS OF THE YEAR.	DIED PER 1,000 OF AVERAGE STRENGTH IN EACH PROVINCE.
		Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.			
Fort William	620	...	2	...	1	1	4	3	4.43
Alipore	797	...	2	...	2	...	1	...	...	...	...	...	...	5	2
Dum-Dum	420	...	...	...	...	1	...	...	...	...	...	...	...	1	1
Barrackpore	826	...	...	1	...	...	...	...	1	...	...	...	...	2	1
Berhampore	147	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dacca	331	...	2	2	1	2	3	...	1	...	...	1	1	13	7
Cachar	319	...	...	...	1	...	...	...	...	...	...	...	...	1	1
Shillong, 10 months	818	...	...	...	4	1	3	1	...	...	...	...	1	10	3
Gowhatti	531	...	...	...	...	...	1	...	...	...	...	...	...	1	1
Tezpur	188	...	...	...	1	...	...	...	...	...	...	...	...	1	...
Nowgong	86	...	...	...	10	9	...	...	...	...	...	...	...	19	8
Debrooghur and Upper Assam	845	1	1	1	3	...	1	...	1	8	5	2.65
Buxa	611	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Julpigoree, 11 months	633	...	...	...	1	...	...	...	...	...	...	...	...	1	1
Bhaugulpore	468	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dinapore	532	...	6	3	1	3	...	...	2	...	...	...	...	15	5
Segowlie	306	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Chunar	64	...	...	...	...	...	...	...	1	...	...	...	...	1	1
Benares	569	...	...	1	...	1	...	...	...	...	...	...	...	2	1
Goruckpore	667	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Fyzabad	686	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lucknow, 11 months	1,767	1	...	2	3	3	...
Seetapore, 11 months	427	...	...	...	3	...	...	...	...	...	...	...	...	3	1
Futtehpore	164	...	...	1	...	...	...	...	...	...	...	...	...	1	...
Cawnpore	987	...	...	...	...	...	...	...	2	...	...	...	...	2	1
Allahabad	901	...	...	...	1	2	2	4	6	...	...	...	...	15	7
Nagode	146	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Shahjehanpore	337	...	...	...	...	...	...	1	...	...	...	...	...	1	...
Bareilly	939	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Roorkee	237	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Chuckrata Road	408	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Almorah	665	7.25
Deyrah	784	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Moradabad	408	...	...	...	...	1	...	...	...	...	...	...	...	1	...
Meerut, 10 months	970	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Allyghur	84	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Delhi	638	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Agra	950	...	...	...	...	...	6	3	5	...	...	...	...	14	7
Morar	1,410	...	...	...	1	4	1	...	16	...	...	1	...	23	18
Jhansi	619	...	...	...	...	...	...	...	1	...	...	...	...	1	1
Seepree, 10 Months	245	...	...	...	...	...	...	...	1	...	...	...	...	1	1
Nowgong	267	7.33
Lullutpore	77	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Deolee	197	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Umballa	913	...	...	...	...	...	...	...	...	...	1	...	...	1	...
Simla, 7 months	142	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Loodianah	87	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Phillour, 9 months	83	...	...	...	...	...	...	...	...	1	...	...	...	1	...
Jullundur, 11 months	476	...	...	...	1	...	...	...	...	...	...	...	...	1	...
Ferozepore, 10 months	594	...	1	...	...	...	...	...	...	...	...	...	...	1	...
Mooltan	946	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sealkote, 10 months	1,002	4.89
Dhumsalla	582	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bukloh	670	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Umritsur	149	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mecan Meer	1,269	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Jhelum	1,599	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Rawul Pindee	1,138	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Attock	171	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tullagunge, 11 months	587	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Murree, 8 months	102	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Nowshera	1,042
Peshawur	3,380	...	...	...	...	...	...	...	3	158	17	1	...	179	111
Out-posts of Peshawur	...	...	...	...	...	...	...	...	...	...	2	...	...	2	1
Troops on march, Punjab	...	...	1	...	...	...	...	...	...	...	...	...	...	1	1
Troops on march, Bengal and N. W. Provinces.	...	...	3	1	...	...	...	...	...	...	...	...	2	6	4
	40,080	1	17	9	29	26	21	9	42	159	21	3	4	341	196	4.89

CHOLERA OF THE NATIVE ARMY OF 1869,—*continued.*

STATIONS.	AVERAGE STRENGTH FOR THE YEAR.	NUMBER OF ADMISSIONS INTO HOSPITAL IN EACH MONTH.												TOTAL ADMISSIONS OF THE YEAR.	ADMITTED PER CENT. OF AVERAGE STRENGTH.	TOTAL DEATHS OF THE YEAR.	DEED PER 1,000 OF AVERAGE STRENGTH.
		Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.				
Augur and Out-posts	228	...	...	...	...	1	...	...	3	...	...	...	...	4	...	5	...
Goonah and Out-posts	330	...	1	...	...	...	4	...	...	...	...	...	...	5	...	4	...
Sehore and Out-posts	812	...	...	...	1	1	3	...	...	...	...	...	...	5	...	7	...
Sirdarpore	380	...	...	3	2	1	1	2	1	...	...	...	...	10	...	7	...
Kherwarrah and Kotrah	673	...	...	...	...	...	7	6	1	...	...	...	...	14	...	6	...
Erinpoorah and Out-posts	869	...	...	...	...	...	1	4	...	...	...	...	...	5	...	4	...
Deolee and Out-posts	717	...	...	...	...	...	15	3	2	...	...	...	...	20	...	5	...
	4,010	...	1	3	3	3	31	15	7	...	...	...	...	63	1.57	38*	9.47
Murdan	867	...	...	...	1	...	...	...	...	...	...	2	...	3	...	1	...
Abbottabad	1,421	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kohat	2,395	...	...	...	...	...	...	...	...	...	188	2	...	190	...	136	...
Bannoo	1,688	...	...	...	...	...	...	...	...	...	...	6	...	6	...	5	...
Dera Ismael Khan...	1,657	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dera Ghazee Khan...	1,591	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Rajanpore	405	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bhawulpore	193	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	10,217	...	...	...	1	...	...	...	...	...	188	10	...	199	1.95	142	13.90

* In several instances sudden deaths occurred among the men on out-post duty, and for these cases no Admissions are shown.

JAIL POPULATION IN THE EPIDEMIC OF 1868-69.

CHOLERA OF 1869.

STATIONS.	AVERAGE STRENGTH FOR THE YEAR.	NUMBER OF ADMISSIONS INTO HOSPITAL IN EACH MONTH.												TOTAL ADMISSIONS OF THE YEAR.	ADMITTED PER CENT. OF AVERAGE STRENGTH.	TOTAL DEATHS OF THE YEAR.	DEED PER 1,000 OF AVERAGE STRENGTH.
		Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.				
Alipore	2,450	...	11	22	28	2	18	5	4	5	1	3	5	104	...	33	...
Baraset	204	...	...	1	...	...	...	...	...	...	...	...	...	1	...	...	...
Jessore	726	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kishnaghur	415	...	...	2	...	...	...	...	...	...	...	...	...	2	...	...	...
Moorshedabad	186	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Howrah	133	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hooghly	526	4	...	...	3	2	...	...	...	...	1	...	...	10	...	4	...
Serampore	42	1	...	...	...	1	...	...	...	...	...	...	...	2	...	1	...
Burdwan	311	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bancoorah	422	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Purulea	187	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Raneegunge	36	...	...	...	...	...	7	...	...	...	...	...	...	7	...	4	...
Sooree	217	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Rajmehal and Pakour	101	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Deoghur and Sub-Divisions	118	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Malda	93	...	...	...	10	...	...	...	...	...	...	...	3	13	...	5	...
Dinagepore	408	...	...	...	...	2	...	...	...	...	...	...	...	2	...	1	...
Rajshahye	490	...	...	...	1	...	...	...	...	...	...	...	...	1	...	...	...
Rungpore	391	...	...	...	2	51	...	...	...	...	...	...	...	53	...	20	...
Bogra	158	...	...	...	1	4	...	...	...	...	...	...	...	5	...	4	...
Mymensingh	527	...	...	1	...	1	...	...	1	...	...	...	...	3	...	1	...
Pubna	180	2	...	1	...	...	...	...	...	...	...	...	...	3	...	2	...
Furreedpore	342	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Backergunge	527	...	...	6	6	...	2	...	...	2	...	16	...	32	...	19	...
Noacolly	249	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Chittagong	244	1	...	1	...	...	...	...	...	...	...	...	...	2	...	2	...
Tipperah	346	...	...	...	2	...	...	...	...	...	...	...	...	2	...	1	...
Dacca	468	...	2	1	...	1	...	...	1	...	...	...	2	7	...	1	...
Sylhet	385	...	...	...	1	13	...	...	...	...	...	...	...	14	...	4	...
Shillong	58	...	...	...	...	...	...	11	...	1	...	...	...	12	...	11	...
Cachar	124	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gowalparah	98	...	...	...	...	...	7	...	...	...	...	...	...	7	...	3	...
Gowhatti	196	...	...	...	1	...	...	2	...	...	...	...	...	3	...	2	...
Seetgaugur	118	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Nowgong	61	...	...	...	5	7	...	...	...	...	...	...	...	12	...	4	...
Tezpor	182	1	...	...	2	1	...	1	...	...	...	...	...	5	...	4	...
Debrooghur	86	...	...	...	...	...	...	2	1	...	...	...	...	3	...	2	...
Midnapore	723	...	...	12	...	...	...	1	...	...	...	...	...	13	...	4	...
Balasore	160	1	...	2	...	...	...	1	...	...	...	...	...	4	...	1	...
Cuttack	327	...	...	...	...	...	...	1	...	...	...	...	...	1	...	1	...
Poorce	130	...	...	...	...	...	2	3	...	...	...	...	...	5	...	4	...
Sumbulpore	97	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Chyebassa	104	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ranchee	312	...	...	1	...	...	...	3	2	...	...	...	...	6	...	4	...
Hazareebaugh, Central	706	...	...	...	3	...	...	...	1	...	1	...	...	5	...	1	...
Hazareebaugh District	277	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...
Monghyr	356	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bhaugulpore	299	...	...	...	...	...	...	...	...	...	...	1	7	8	...	5	...
Purneah	310	...	...	...	1	...	...	1	...	...	...	...	...	2	...	1	...
Darjeeling	52	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	15,658	10	13	50	66	85	36	31	11	8	3	20	17	350	2.24	149	9.52
Gyah	490	...	...	...	...	1	...	...	6	...	...	...	...	7	...	3	...
Patna	438	...	...	2	14	...	...	...	...	18	4	20	...	58	...	15	...
Deegah	776	...	...	1	2	...	...	...	...	...	...	1	1	6	...	...	...
Arrah	398	...	...	...	...	1	1	16	...	...	...	...	...	18	...	6	...
Chumparan	260	...	...	...	...	...	...	24	10	...	...	...	...	34	...	15	...
Mozufferpore	310	...	...	...	...	1	5	7	2	...	...	...	...	15	...	6	...
Chuprah	269	...	...	...	...	...	3	51	2	...	...	...	...	56	...	18	...
Ghazeeopore	552	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Benares, Central	1,157	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
" District	544	...	...	...	...	...	...	...	2	...	...	...	...	2	...	2	...
Mirzapore	271	...	...	...	...	...	...	2	1	...	...	...	...	3	...	...	...
Azinghur	446	...	...	...	...	...	...	...	...	14	...	...	...	14	...	8	...
Jounpore	317	...	...	...	...	...	...	...	6	...	...	...	...	6	...	2	...
Goruckpore	706	...	...	...	...	...	...	64	10	...	...	...	...	74	...	34	...
Bustee	130	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gonda	654	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Baraich	176	...	...	...	...	1	...	...	...	...	...	...	...	1	...	...	...
Fyzabad	1,180	...	...	...	...	...	...	...	3	...	...	...	...	3	...	1	...
Sultanpore	472	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Rae Bareilly	322	...	...	...	...	2	...	5	...	...	...	...	...	7	...	3	...
Carried over	...	...	...	3	16	6	9	170	42	18	18	21	1	304	...	113	...

CHOLERA OF THE JAIL POPULATION OF 1869,—continued.

STATIONS.	AVERAGE STRENGTH FOR THE YEAR.	NUMBER OF ADMISSIONS INTO HOSPITAL IN EACH MONTH.												TOTAL ADMISSIONS OF THE YEAR.	ADMITTED PER CENT. OF AVERAGE STRENGTH.	TOTAL DEATHS OF THE YEAR.	DIED PER 1,000 OF AVERAGE STRENGTH.
		Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.				
Brought forward ...	...	...	...	3	16	6	9	170	42	18	18	21	1	304	...	113	...
Pertabghur ...	181	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hurdul ...	314	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kheree ...	238	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lucknow, Central ...	1,715	...	...	...	...	...	...	...	...	2	...	...	...	2	...	2	...
" District ...	1,110	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Seetapore ...	1,008	...	...	...	1	3	...	...	...	...	...	...	...	4	...	1	...
Nawabgunge ...	105	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Oonao ...	243	...	...	...	...	...	...	...	6	...	...	...	...	6	...	1	...
Etah ...	212	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Humeerpore ...	192	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Oraie ...	174	...	...	...	...	...	2	...	...	...	...	...	...	2	...	2	...
Futteghur, Central ...	821	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
" District ...	402	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cawnpore ...	412	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Futtehpore ...	271	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Banda ...	414	...	...	...	...	...	1	...	...	...	...	...	...	1	...	1	...
Allahabad, Central ...	1,833	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
" District ...	543	...	...	...	...	...	...	8	11	...	...	...	...	19	...	7	...
Nagode ...	116	...	...	...	...	...	...	1	2	...	...	...	...	3	...	2	...
	20,172	...	...	3	17	9	12	179	61	20	18	21	1	341	1.69	129	6.40
Raepore ...	414	...	...	...	...	...	1	...	...	...	...	...	...	1	...	1	...
Belaspore ...	88	...	...	...	2	...	...	2	...	...	...	...	...	4	...	3	...
Bandhara ...	132	...	...	...	...	...	...	22	2	...	...	...	1	25	...	12	...
Chandah ...	149	...	...	...	...	...	...	24	4	...	...	...	...	28	...	13	...
Nagpore ...	820	...	1	...	...	...	...	...	...	...	...	...	...	1	...	...	...
Chindwarra ...	85	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Wurdah ...	45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sironcha ...	14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mundla ...	70	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Jubbulpore ...	851	...	...	...	...	1	1	12	2	...	2	...	...	18	...	13	...
Dumoh ...	108	...	...	...	...	2	...	...	...	...	...	...	...	2	...	1	...
Saugor ...	242	...	...	...	...	...	9	...	...	...	...	...	...	9	...	3	...
Nursingpore ...	142	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lullutpore ...	208	...	...	...	1	...	6	...	6	...	...	...	...	13	...	7	...
Jhansi ...	264	...	...	...	...	...	...	...	2	...	...	...	...	2	...	2	...
Seonee ...	123	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Baitool ...	73	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sohore ...	80	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hoshungabad ...	299	...	...	...	...	1	...	...	...	...	...	...	...	1	...	1	...
Nimar ...	79	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ajmere ...	398	...	...	...	...	2	...	...	7	2	...	...	...	11	...	3	...
Beaur ...	111	...	...	...	...	32	2	1	...	...	...	...	...	35	...	9	...
	4,795	...	1	...	3	38	19	61	23	2	2	...	1	150	3.13	68	14.18
Muttra ...	223	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Agra, Central ...	1,839	...	...	...	...	...	...	5	4	2	...	...	...	11	...	4	...
" District ...	497	...	...	...	...	...	...	...	6	...	...	...	...	6	...	5	...
Etawah ...	233	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mynpoorie ...	365	...	...	...	...	...	...	...	...	...	...	...	1	1	...	1	...
Allyghur ...	381	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bolundshahur ...	155	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Shahjehanpore ...	295	...	...	...	...	...	...	1	...	...	...	...	...	1	...	1	...
Bareilly ...	1,893	...	...	...	...	...	...	...	8	...	...	...	...	8	...	6	...
Budaon ...	394	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Seharunpore ...	203	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bijnore ...	198	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Deyrah ...	57	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Almorah ...	132	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mozuffernuggur ...	136	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Moradabad ...	363	...	...	...	2	...	...	...	...	...	...	...	...	2	...	2	...
Meerut, Central ...	1,257	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
" District ...	371	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	8,992	...	...	...	2	...	...	6	18	2	...	...	1	29	32	19	2.11

CHOLERA OF THE JAIL POPULATION OF 1869,—continued.

STATIONS	AVERAGE STRENGTH FOR THE YEAR.	NUMBER OF ADMISSIONS INTO HOSPITAL IN EACH MONTH.												TOTAL ADMISSIONS OF THE YEAR.	ADMITTED PER CENT. OF AVERAGE STRENGTH.	TOTAL DEATHS OF THE YEAR.	DIED PER 1,000 OF AVERAGE STRENGTH.
		Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.				
Delhi	348	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Rhotuck	214	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hissar	260	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sirsa	315	...	...	...	...	...	...	...	...	...	1	...	...	1	...	...	...
Kurawal	145	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Umballa	669	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
" Jhugger Gang	312	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Loodianah	225	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Jullundur	397	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ferozepore	428	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unrisur	583	...	...	...	...	...	...	...	7	...	...	...	...	7	...	6	...
Lahore, Central	2,089	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
" Female Jail	145	...	...	...	...	...	...	...	2	...	...	...	...	2	...	2	...
Sealkote	374	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dhumsalla	123	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Goordaspore	321	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Goojranwalla	496	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Goojrat	314	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Shahpore	367	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Jhelum	358	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Montgomery	527	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mooltan	751	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Jhung	344	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dera Ghazee Khan	368	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dera Ismael Khan...	327	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kohat	144	...	...	...	...	...	...	...	...	1	...	1	...	2	...	1	...
Bunoo	83	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Rawul Pindee	943	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Peshawur	411	...	...	...	...	...	...	...	24	3	4	...	...	31	...	13	...
	12,381	...	...	...	...	...	...	...	9	25	4	5	...	43	35	22	1.78
BENGAL PRESIDENCY	61,998	10	14	53	88	132	67	277	122	57	27	46	20	913	1.47	387	6.24