

**Age and length of service as affecting the sickness and mortality of the European army : and aggregate of the statistics of the army for the ten-year period, 1860-69 / by James L Bryden.**

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Vital Statistics of the Bengal Presidency.

AGE AND LENGTH OF SERVICE

AS AFFECTING THE

SICKNESS AND MORTALITY OF THE EUROPEAN ARMY:

AND

AGGREGATE OF THE STATISTICS OF THE ARMY

FOR THE

TEN-YEAR PERIOD, 1860-69.

BY

JAMES L. BRYDEN, M.D., SURGEON-MAJOR, BENGAL ARMY,

STATISTICAL OFFICER ATTACHED TO THE SANITARY COMMISSIONER WITH THE GOVERNMENT OF INDIA.

*INDIA, Sanitary Commissioner*



CALCUTTA :

OFFICE OF THE SUPERINTENDENT OF GOVERNMENT PRINTING.

1874.



Annual Statistics of the Bengal Presidency.

AGE AND LENGTH OF SERVICE

ROYAL COLLEGE

SICKNESS AND MORTALITY OF THE EUROPEAN ARMY:

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## PREFACE.

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# REPORT

## AGE AND LENGTH OF SERVICE

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ON  
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REPORT  
ON  
AGE AND LENGTH OF SERVICE  
AS AFFECTING THE  
SICKNESS, MORTALITY, AND INVALIDING  
OF THE  
EUROPEAN ARMY.

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INTRODUCTION.

In this report I propose to study from a statistical basis the relations of the British soldier to climatic influences, as these affect him on first arriving in India and during the period of his Indian Service.

The statistics of two bodies of men who have served in the Bengal Presidency during the past thirteen years will be employed to illustrate the subject. The experience of the army of 1858, which, taken as a body, reached India towards the end of 1857, will place before us the results that may be expected to follow exposure in the field on first landing in India; and the subsequent history of the same body will furnish the contrast between the ratios of disease determined by the extreme of climatic influences and those which a body which has been subjected to what may be supposed to be acclimatising agencies affords during the period of its cantonment life. And again, I shall employ the statistics of the regiments which in the course of relief have taken the place of the regiments of 1857-58, to show in what respects a body new to India suffers, although placed during its first year of residence in the conditions deemed the most favourable for the maintenance of health.

These statistics will illustrate the manifestations of special disease brought about in relation to material of a certain constitution. The statistics of age and length of service will also be eliminated and contrasted with the general standards. For, speaking generally, we know that old men, whether new to India or not, die by one class of diseases and young men by another; and that under equal conditions of exposure the results are very different in the case of the old soldier from what they are in the young men.

Up to 1864, no regiments came from England to take the place of those whose period of Indian Service had expired. But annually, since 1864, several fresh regiments have been added to the army of the Presidency, and each of these has had a special history of its own, calculated to teach us what is consistently to be looked for, and to warn us of conditions to be avoided, so that regiments as bodies may be maintained in a state of efficiency during the period of their Indian Service.

The statistics of these new regiments I have carefully arranged, and from the aggregate of the figures I shall try to show the consistency of the history and the chief lessons to be deduced from the facts as they stand recorded.

Of late, various questions have been raised as to the character of the material best adapted to stand the climate of India, and a study of the statistics of the newly-arrived regiments of the past seven years, will, I believe, throw



much light, not only upon this special subject of inquiry, but also upon the general problem, how the British soldier may best be cared for under the circumstances necessitated by ten years of residence in India.

I shall treat the subject under three heads—

- I.—The general statistics of sickness, mortality, and invaliding in newly-arrived regiments contrasted with the statistics of the army generally.
- II.—The statistics of age and length of service in newly-arrived regiments contrasted with the standards for the army taken as a body.
- III.—The practical lessons taught by the study of the statistics contained in the preceding sections, and deduced from the medical history of regiments in their first years of Indian Service.

## SICKNESS, MORTALITY, AND INVALIDING

### EUROPEAN ARMY.

#### INTRODUCTION.

In this report I propose to study the relation of the British soldier to climate, diseases, and death, in India and during the period of his Indian Service.

The statistics of two bodies of men who have served in the Indian Army during the past fifteen years will be compared to illustrate the subject. The experience of the year of 1895, which, taken as a body, marked India towards the end of 1895, will serve as the basis of the study. The object of the following chapters is to show in what respects a body new to India differs from a body which has been in India for some years. The object of the following chapters is to show in what respects a body new to India differs from a body which has been in India for some years. The object of the following chapters is to show in what respects a body new to India differs from a body which has been in India for some years.

These statistics will illustrate the influence of climate, diseases, and death upon the European soldier in India. The statistics of the European soldier in India will be compared to the statistics of the European soldier in India. The statistics of the European soldier in India will be compared to the statistics of the European soldier in India.

Up to 1895 no regiments were sent to India to take the place of those whose periods of Indian service had expired. The statistics of the Indian Army from 1895 onwards will be compared to the statistics of the Indian Army from 1895 onwards. The statistics of the Indian Army from 1895 onwards will be compared to the statistics of the Indian Army from 1895 onwards.

The statistics of these new regiments I have carefully examined, and from the statistics of the Indian Army I shall try to show the relation of the Indian Army to the Indian Army. The statistics of the Indian Army from 1895 onwards will be compared to the statistics of the Indian Army from 1895 onwards.

## SECTION I.

THE GENERAL STATISTICS OF SICKNESS, MORTALITY, AND INVALIDING IN  
NEWLY-ARRIVED REGIMENTS CONTRASTED WITH THE STATISTICS  
OF THE ARMY GENERALLY.

It is a mistaken belief that the death-rate of the army of India is apt to fluctuate greatly, without the intervention of any cause sufficient to explain the increase or decrease of the mortality.

The death-rate of the Army of India fluctuates, within limits, from causes which are appreciable.

So long as cholera accounts for one-third of the deaths of the European Army, no standard for the comparison of one year with another can be formed without excluding the deaths from this epidemic cause. This, however, is a cause of variation readily appreciable, and, therefore, I place it on one side before showing to what extent diseases more purely climatic enter into the composition of the death-rate of any year:—

*Fluctuation in the death-rate due to Cholera.*

	Cholera deaths out of each hundred deaths from all causes.	Died from Cholera per 1,000 of Strength.
1860	32.74	12.04
1861	51.65	23.73
1862	34.19	9.61
1863	16.96	4.09
1864	12.09	2.55
1865	12.86	3.12
1866	6.82	1.37
1867	44.72	13.84
1868	8.98	1.81
1869	38.39	16.46
1870	2.87	.63

I shall have occasion subsequently to exhibit the exaggeration of the death-rate caused by exposure in the field, when comparing the statistics of the new army of 1858 with those of recently-arrived regiments; and the figures of the ten years, 1860-69, afford two examples of the increase of mortality which is caused by the persistence of generally prevailing climatic or epidemic agencies, the presence of which stamp the character of the year as one of general sickness, and distinguish it from others in which disease shows itself according to a standard or little above it, or is limited in its geographical distribution. The latter reservation is important, because the area of increased prevalence of both climatic and epidemic disease is in almost every epidemic year provincially defined, although the tract affected may be so extensive as to cover several natural provinces.

But with such limitations of disease I have no concern in the present chapter. The aggregate figures for the army as a body, will here be placed against the aggregate produced under ordinary or peculiar conditions in bodies of a special constitution. In the aggregate of the statistics for new regiments, no allowance need be made for exaggeration due to epidemic agencies, after cholera is excluded; for, as the new regiments have been cantoned, they have been beyond the area of exceptional sickness, and the statistics represent most fairly the average results of climatic, and not of epidemic, agencies, as exhibited in relation to a body of men brought for the first time in contact with the influences detrimental to health special to the climate of India.

New regiments have, as the rule, been cantoned in stations which have a good reputation, and have not suffered from exceptional causes of mortality except, perhaps, from cholera.

The composition of the death-rate of the Army as a body for the years from 1860 to 1870.

The average death-rate for the army as a body is shown in the Table which follows: the details for



the eleven years, 1860-70, are given, and also the composition of the standard derived from the aggregate statistics of the ten-year period, 1860-69:—

*Composition of the Death-rate of the Army in each year of the eleven years from 1860 to 1870, Cholera being excluded.*

CAUSES OF DEATHS.	Standard of the 10 years 1860 to 1869.	1860.	1861.	1862.	1863.	1864.
Hepatitis ...	3.31	3.52	2.89	3.03	3.64	2.95
Remittent and Continued Fevers ...	2.92	4.26	3.21	2.76	2.10	2.13
Dysentery ...	2.72	4.68	3.67	2.66	2.94	1.63
Heat Apoplexy ...	2.15	2.56	1.34	1.19	1.09	1.46
Phthisis pulmonalis ...	1.73	1.70	1.85	1.86	2.15	1.61
Injuries and deaths from violence out of hospital ...	1.39	1.42	1.32	1.45	1.94	1.81
Heart diseases ...	.98	.51	.47	.46	.61	.87
Respiratory diseases ...	.99	.92	1.36	1.00	.94	1.01
Diarrhoea ...	.75	.96	1.69	.91	.79	.67
Intermittent Fevers ...	.66	.59	.76	.58	.72	1.01
Delirium tremens ...	.48	.77	.45	.44	.48	.40
All other causes ...	2.66	2.84	3.19	2.16	2.63	3.00
Died per 1,000 from all causes ...	20.74	24.73	22.20	18.50	20.03	18.55

CAUSES OF DEATHS.	1865.	1866.	1867.	1868.	1869.	1870.
Hepatitis ...	3.49	2.71	2.57	3.42	4.94	3.71
Remittent and Continued Fevers ...	2.99	2.43	1.93	2.66	4.33	4.19
Dysentery ...	2.23	1.68	1.97	1.52	3.23	2.07
Heat Apoplexy ...	2.98	1.57	2.40	2.78	3.78	1.62
Phthisis pulmonalis ...	1.38	1.57	1.36	1.55	2.11	1.47
Injuries and deaths from violence out of hospital ...	1.45	2.09	1.30	1.62	1.62	1.83
Heart diseases ...	1.02	1.00	1.16	1.36	1.59	1.50
Respiratory diseases ...	.97	1.23	.84	.79	.69	1.53
Diarrhoea ...	.64	.49	.40	.19	.32	...
Intermittent Fevers ...	.72	.80	.70	.22	.38	.09
Delirium tremens ...	.35	.37	.40	.38	.64	.27
All other causes ...	2.90	2.80	2.08	1.81	2.80	2.99
Died per 1,000 from all causes ...	21.12	18.74	17.11	18.30	26.43	21.27

*Deaths from different causes out of each hundred deaths in each year of the eleven years from 1860 to 1870, Cholera being excluded.*

CAUSES OF DEATHS.	Standard of the 10 years 1860 to 1869.	1860.	1861.	1862.	1863.	1864.
Hepatitis ...	15.96	14.21	13.04	16.35	18.11	15.89
Remittent and Continued Fevers ...	14.06	17.19	14.44	14.97	10.51	11.47
Dysentery ...	13.14	18.93	16.55	14.34	14.61	8.81
Heat Apoplexy ...	10.55	11.65	6.12	6.67	6.40	8.54
Phthisis pulmonalis ...	8.33	6.86	8.32	10.06	10.75	8.68
Injuries and deaths from violence out of hospital ...	6.47	3.55†	5.92	6.54	7.49	8.41
Heart diseases ...	4.80	2.98	2.11	3.52	4.23	5.34
Respiratory diseases ...	4.75	3.72	6.12	5.41	4.71	5.48
Diarrhoea* ...	3.63	3.89*	7.62*	4.91	3.99	3.60
Intermittent Fevers ...	3.20	2.40	3.41	3.14	3.62	5.48
Delirium tremens ...	2.31	3.14	2.01	2.39	2.42	2.14
All other causes ...	12.80	11.48	14.34	11.70	13.16	16.16
ALL CAUSES ...	100.00	100.00	100.00	100.00	100.00	100.00

CAUSES OF DEATHS.	1865.	1866.	1867.	1868.	1869.	1870.
Hepatitis ...	16.54	14.48	15.04	18.09	18.09	17.47
Remittent and Continued Fevers ...	14.12	12.95	11.15	14.53	16.39	19.72
Dysentery ...	10.56	9.00	11.49	8.30	12.24	9.72
Heat Apoplexy ...	15.27	8.69	14.36	15.57	14.32	7.61
Phthisis pulmonalis ...	6.50	8.38	7.94	8.48	7.98	6.89
Injuries and deaths from violence out of hospital ...	4.58	9.60	7.26	8.30	6.12	8.59
Heart diseases ...	5.98	6.56	6.76	7.61	6.01	7.04
Respiratory diseases ...	4.45	6.56	4.89	4.33	2.62	7.18
Diarrhoea* ...	3.05	2.59	2.36	1.04	1.20	...
Intermittent Fevers ...	3.43	4.27	4.22	1.21	1.42	.42
Delirium tremens ...	1.65	1.98	2.36	2.08	2.41	1.27
All other causes ...	13.87	14.94	12.17	9.86	10.60	14.09
ALL CAUSES ...	100.00	100.00	100.00	100.00	100.00	100.00

\* An indefinite term which has of late years nearly disappeared, as the Returns have become more accurate; on this account I have not associated diarrhoea with dysentery in the table. The diarrhoea of the earlier years of the period meant cholera, chronic, dysentery, or typhoid fever.

† The record of deaths out of hospital is evidently incomplete for this year.



This period of eleven years affords two seasons of excessive sickness, 1860 and 1869, to both of which a special history is attached. The excess of these years is a fair counterbalance against the exceptionally healthy years, 1862, 1864, 1866, and 1868, and the standard of the ten years is evidently a correct representation of a year of average health. That 1867—a notoriously unhealthy year as regards cholera—shows the smallest death-rate of these eleven years, is due less to the fact that it was an unusually healthy year, than to the circumstance that of the 479 men who died from cholera as many bad lives would have succumbed to climatic diseases as would have brought up the ratio to that of other ordinarily healthy years.

*Death-rate per 1,000 of Strength, for the Army of Bengal from 1860 to 1870, after excluding Cholera.*

Unhealthy Years.	Healthy and Ordinary Years.	Standard of Ten Years.
	1867 ... 17.11	
	1868 ... 18.30	
	1862 ... 18.50	1860-69 ... 20.74
1860 ... 24.73	1864 ... 18.55	Cholera ... 9.24
1869 ... 26.43	1866 ... 18.74	
	1863 ... 20.03	29.98
	1865 ... 21.12	
	1870 ... 21.27	
	1861 ... 22.20	

It is with this standard that the death-rate of new regiments is to be compared.

*Death-rate of New Regiments compared with the above standard.*

	Excluding Cholera.	Cholera.	All Causes.
First year ...	32.58	15.52	48.10
Second year ...	24.61	3.33	21.28
Third year ...	16.32	2.09	18.41

These figures seem to teach that a new regiment landed in India attains the normal standard of health in its third year of residence, and that in the first year both climatic and epidemic causes tell powerfully against the new material, which suffers in the second season also from the same causes in a modified form.

Composition of the death-rate of new regiments, after excluding cholera and deaths from violence.

This will be more clearly defined by placing the components of the death-rate of the three first years of residence in contrast:—

*Composition of the Death-rate of New Regiments during the first three years of Indian Service contrasted.*

(CHOLERA AND DEATHS FROM VIOLENCE EXCLUDED.)

CAUSES OF DEATH.	First Year (1864-69).	Second Year (1865-70).	Third Year (1866-70).
	Strength, 14,304	Strength, 14,423	Strength, 13,415*
Fevers ...	8.46	5.20	3.43
Heat Apoplexy ...	8.18	2.01	.82
Dysentery ...	3.98	2.42	1.49
Hepatitis ...	3.71	3.33	2.83
Phthisis pulmonalis ...	2.38	2.15	2.16
Respiratory diseases ...	1.40	.62	.75
Heart diseases ...	.91	1.25	1.12
Delirium tremens ...	.63	.42	.30
All other diseases ...	2.09	2.29	2.23
All diseases ...	31.74	19.69	15.13

The ratio of liability to death from purely climatic diseases—heat fevers, heat apoplexy, and acute dysentery—steadily diminishes during the first three years; and hepatitis, heart disease, and phthisis, the diseases to which the older soldier is more peculiarly subject, have not yet begun to make a decided impression on the death-rate of the new body.

\* The strength of the 1-14th and 62nd Regiments is excluded, since the statistics of 1871 are not yet available.



While the ratio of liability to climatic diseases diminishes, the causes of death alter, showing that the body is passing through distinct changes in its relations to climatic influences. Heat fevers continue to account for one-fourth of the mortality, and dysentery for one-eighth; but heat apoplexy, which in the first year caused 26 per cent. of the total mortality, affords but 10 per cent. in the second year and 5.50 in the third. Again, hepatitis, which caused 12 per cent. of the total mortality in the first year, gives 17 per cent. in the second and 19 per cent. in the third year; heart disease in the first year made up 3 per cent. of the total, in the second 6.34 per cent., and in the third 7.50; and the proportion attributed to phthisis was, in the first year 7.49, in the second 10.92, and in the third 14.50.

*Died out of each hundred deaths.*

	First Year.	Second Year.	Third Year.
Fevers ...	26.65	26.41	23.00
Heat Apoplexy ...	25.79	10.21	5.50
Dysentery ...	12.55	12.32	10.00
Hepatitis ...	11.67	16.90	19.00
Phthisis pulmonalis ...	7.49	10.92	14.50
Respiratory diseases ...	4.40	3.17	5.00
Heart diseases ...	2.86	6.34	7.50
Delirium tremens ...	1.98	2.11	2.00
All other diseases ...	6.61	11.62	13.50
	100.00	100.00	100.00

Under exposure to the extreme of climatic influences, the same manifestations in disease occur in the case of a new body. Heat fevers, heat apoplexy, and dysentery rise to the top; but the proportion is reversed, and dysentery occupies the first place.

*Ratios for diseases developed under exposure among Troops new to the climate of India.*

*Died out of each hundred deaths in 1858 and 1859.*

	Army of 1858— Army of the War Provinces.	Army of 1858— Army as a body.	Army of 1859.
Dysentery ...	38.71	38.68	35.61
Heat Apoplexy ...	21.92	20.42	12.54
Fevers ...	21.63	21.34	18.65
Hepatitis ...	6.58	6.72	13.77
Respiratory diseases ...	2.54	2.78	2.62
Phthisis pulmonalis ...	1.68	2.52	5.04
Delirium tremens ...	.56	.73	1.95
Heart diseases ...	.39	.48	1.60
All other diseases ...	6.09	6.33	8.22
	100.00	100.00	100.00

*Ratio per 1,000 in which the new Army of 1858 died in 1858 and 1859 from the chief causes of mortality.*

*(CHOLERA AND DEATHS FROM VIOLENCE EXCLUDED.)*

	Army of the War Provinces, 1858.	Army of 1858 as a body.	Army of 1859.
Dysentery ...	33.67	39.25	12.58
Heat Apoplexy ...	17.77	22.23	4.40
Fevers ...	18.57	21.93	6.58
Hepatitis ...	5.84	6.67	4.86
Respiratory diseases ...	2.42	2.57	.92
Phthisis pulmonalis ...	2.19	1.60	1.78
Delirium tremens ...	.64	.57	.69
Heart diseases ...	.41	.40	.56
All other diseases ...	5.51	6.17	2.89
All diseases ...	87.02	101.39	35.26

The figures for these two years stand alone. They afford an estimate for the loss likely to occur, should the occasion arise for throwing a new army into the field, and exposing it during the hot season and the rains with insufficient shelter. And the estimate is not overstated, for 1858 was essentially a healthy and a non-epidemic year.



*The Daily Sick-rate of New Regiments compared with that of the Army in general.**Daily sick from all causes per 1,000 of Strength.*

The daily sick-rate of new regiments compared with that of the army in general—(a) Under exposure in 1858, and (b) in newly-arrived regiments in the first and second year, as compared with (c) the standard for the ten years, 1860—69.

	Army of 1858 in the field, (a new body under exposure.)	Army as a body, average of the ten years, 1860—69.	New regiments in first year, 1864—69.	New regiments in second year, 1865—70.
January	82.7	57.7	48.0	54.8
February	74.1	58.8	47.5	53.7
March	85.2	61.2	49.1	51.5
April	113.7	64.9	57.4	58.2
May	137.4	69.2	61.8	68.1
June	157.0	70.5	75.3	70.1
July	140.6	72.7	72.3	69.3
August	143.1	76.3	75.0	71.1
September	153.7	79.2	80.7	81.1
October	137.5	74.4	81.1	80.9
November	100.0	64.3	65.8	67.0
December	83.6	54.8	55.4	48.1
	117.8	67.1	64.0	64.5

Landing in India at the healthiest season of the year, new regiments naturally give in the first months a lower daily sick-rate than those regiments which have their sick remaining from the previous year. This point is illustrated in looking at the daily sick-rate of the same body in the second year, which, although still below the average for the army regarded as a body, is beginning to approximate to the general standard. These remarks apply to the daily sick-rates of January, February, and March; the new body shows consistently the lowest rate, the same body in the year following comes next, and it is superior to the standard formed for the army generally from the statistics of the years 1860—69. With the setting in of the hot season, the daily sick-rate increases month by month, rising from 57 per 1,000 in April to 62 in May, and to 75 in June. With the clouding over of the sky, and the setting in of monsoon influences, further rise is arrested during July and August; but the persistence of heat and moisture brings about special manifestations in disease, and the highest sick-rate of the year is attained in September and October, when 8 per cent. of the strength is constantly under treatment. The ratio of November indicates that the sick are rapidly leaving the hospital, and from December to March following, the sick-rate remains steadily between 52 and 55 per 1,000.

In the second year the same is repeated. There is the sudden rise from 52 to 58 in April; and for the next four months the daily sick continues fixed at 7 per cent., and it rises to 8 per cent. in September and October. The diminution of sickness in November and the fall to a minimum in December is parallel with the diminution and fall observed in the previous year.

In the case of the army of 1858, the daily sick-rate of the hot season was consistently double of that of the standard, for each month from May to October. In May and October the ratio was the same, 137 per 1,000; the maximum was attained in June and September, when the ratios were 157 and 154, the former indicative of the predominance of diseases due to heat influence, and the latter to the almost universal prevalence of the visceral affections determined by heat, moisture, and exposure. In July and August, the interval between the maxima, 140 and 143 per 1,000, were constantly under treatment. The occurrence of high ratios in the cold months implies merely the accumulation of cases of serious sickness remaining over from the unhealthy season.

It is unfair to place the standard of the ten years in comparison with the monthly sickness of new regiments. The statistics of bad stations and bad years, which, as I have said, have had no special effect in raising the sick-rate of new regiments, have in every year added much to the sick-rate of the army as a body. The opening paragraph of the third section of this paper, where the statistics of old and new troops cantoned in the same station in the same year are exhibited in contrast, shows that the daily sick-rate is very much in excess in the case of the young regiments—being in the aggregate of the examples tabulated as 84 to 52 on the average for the year.



These remarks apply to the admission-rate also. The statistics of the new

The admission-rates of the same bodies compared, and their composition in the new bodies contrasted with the standard for the Army.

and old troops cantoned together show the admission-rate of the new regiments as 2,026, in contrast with 1,219 per 1,000 in the case of the old.

*Admission-rates of newly-arrived Regiments contrasted with the standard for the Army in general.*

*Admission-rate per 1,000 of Strength.*

CAUSES OF ADMISSIONS.	Standard of the 10 years 1860-69.	NEWLY-ARRIVED REGIMENTS.		New Army in the field, 1858.
		1864-69, (first year.)	1865-70, (second year.)	
Cholera ...	14.7	18.7	4.5	5.0
Intermittent Fevers ...	439.0	140.0	345.7	1333.3
Remittent and Continued Fevers ...	194.0	383.9	237.7	
Heat Apoplexy ...	4.3	16.8	4.6	55.8
Delirium tremens ...	4.7	3.6	5.3	6.2
Dysentery ...	48.9	66.2	47.3	231.7
Diarrhoea ...	109.4	153.1	88.0	303.5
Hepatitis ...	59.2	35.6	52.4	69.0
Phthisis pulmonalis ...	8.2	12.2	11.3	6.0
Respiratory diseases ...	74.7	87.3	68.9	92.3
Veneral diseases ...	265.5	235.4	238.6	270.6
All other causes ...	532.3	485.6	456.1	725.0
ALL CAUSES ...	1754.9	1638.4	1560.4	3098.4

Many circumstances conduce to make the aggregate of the admission-rate of new troops approach to the aggregate of the standard for the army in general. New troops come from England with constitutions which are supposed to be sound, while the older soldier is constantly liable to the recurrence of disease in the course of the deterioration which his system naturally undergoes under the prolongation of exposure to the climate of India. The radical distinction is, that the newly-arrived soldier suffers from acute disease, and the older soldier from chronic disease; while the admission-rate of the new soldier is very much in excess as regards acute disease, it is much below the average when the statistics of chronic disease are placed side by side.

The same diseases which determine the special constitution of the death-rate in the case of new regiments appear in excess in the admission-rate. The fevers of the hot season are doubled, and the liability to heat apoplexy is quadrupled in the case of the new soldier, and dysentery and diarrhoea also rise much above the standard rate. On the other hand, fevers returned as intermittent are shown to be three times more prevalent among the old than the young, and hepatitis, which in the young gives a ratio of 36, stands on the average of the ten years at 59.

In the second year of residence the admission-rates are rapidly approaching the standard. Heat fevers, heat apoplexy, dysentery, and diarrhoea are running down in the scale; and hepatitis and intermittents have risen in proportion.

But the ratio for intermittents shown in the table for troops in the second year is exaggerated. The 92nd, 85th, and 1-6th Regiments had the misfortune to be cantoned within the area covered by epidemic malaria in 1869; and these three regiments alone, stationed at Jullundur, Meean Meer, and Rawulpindee, out of a strength of 2,500, furnished upwards of 3,000 admissions from malarious fevers between August and December. The remainder of the body in its second year, cantoned on the east of the line limiting the epidemic malaria of the year, gave, in the same months, less than 1,000 admissions out of a strength of 12,000.

It is a contingency, and a fortunate one, that regiments in their first year have suffered so little from intermittents; the history of former years tells how terrible in some cases has been the mortality when a regiment new to India, after the suffering incident to the first hot season, has in the later months



chanced to be included in a provincial area suffering universally from an epochal visitation of malarious fever. An example of this occurring in the period under consideration, was that of the 21st Fusiliers, at Kurrachee, in 1869.

Standing as the figures do in the preceding table, the comparative exclusion of the element of malarious fevers is of advantage, as teaching that the fevers from which the young men chiefly suffer are of climatic and not of specific origin. The figures for 1858, taken month by month, show this perfectly. The characteristic of a non-epidemic year is the fall of the fever-rate from the hot season to the end of the year; while a rapid rise culminating in October and November marks an epidemic season.

*The fever-admissions of 1858 shown month by month, to indicate the characteristics of a non-epidemic year.*

[ALL VARIETIES OF FEVER IN A STRENGTH OF 30,000.]

	January.	February.	March.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.
1858...	706	836	1,710	3,672	5,908	6,547	5,190	5,011	4,146	3,458	1,675	1,090

Although 1858 was a healthy and non-epidemic year, the admission-rate, as shown in the last column of the table on the previous page, was excessively high, heat fevers, dysentery, and heat apoplexy having prevailed to an enormous extent. And this is no exaggerated estimate; for the very same ratios will certainly re-appear, should a new army again be subjected to the same degree of exposure as in 1858.

*Invaliding-rates of newly-arrived regiments contrasted with the rates for the Army as a body.*

We are prepared to find that the invaliding-rate for new regiments is below the average for the army; and while the tables which follow show that it is so, they show also that even in the second and third years almost as many men are invalided as from old regiments. It is in the third year that the new body furnishes very nearly the same ratio of invaliding, and the same details in the composition of the ratio, as the army taken on the average.

*Invaliding-rates in the first and second years of Indian Service contrasted.*

[REGIMENTAL STRENGTH REPRESENTED—14,498 IN FIRST YEAR AND 15,016 IN SECOND YEAR.]

CAUSES OF INVALIDING.	NUMBERS INVALIDED.		INVALIDED PER 1,000.		Army of 1858.
	First year.	Second year.	First year.	Second year.	
Fever ...	24	34	1.66	2.26	5.41
Sunstroke, results of ...	12	6	.83	.40	.57
Dysentery and Diarrhoea ...	48	53	3.32	3.53	5.66
Hepatitis ...	49	122	3.38	8.12	4.66
Spleen enlargement ...	...	3	...	.20	...
Scrofula ...	...	8	...	.53	...
Phthisis pulmonalis ...	95	82	6.55	5.46	1.39
Rheumatism ...	25	38	1.72	2.53	4.36
Syphilis ...	25	31	1.72	2.06	1.01
Stricture of urethra ...	...	4	...	.27	...
Heart disease ...	33	85	...	...	...
Palpitation ...	...	4	2.28	5.93	1.85
Bronchitis and Pleurisy ...	11	32	.76	2.13	1.58
Mental affections ...	16	12	1.11	.80	.55
Cephalæa ...	6	5	.41	.33	...
Epilepsy ...	10	7	.69	.47	.34
Ophthalmia and defective vision ...	2	10	.14	.67	1.39
Deafness ...	3	10	.20	.67	...
Dropsy ...	3	3	.20	.20	...
General debility ...	16	101	1.10	6.73	2.00
Injuries ...	10	23	.69	1.53	6.00
All other causes ...	30	44	2.07	2.93	6.82
	418	717	28.83	47.75	43.59



*Invaliding of third year (1866—70) compared with the Invaliding of the Army as a body, on the average of the years 1865—69.*

	THIRD YEAR.	ARMY OF BEN- GAL., 1865—69.
Fever ...	2.54	3.14
Dysentery ...	1.94	2.62
Hepatitis ...	6.93	6.96
Spleen disease ...	.30	.43
Phthisis pulmonalis ...	3.43	3.65
Rheumatism ...	4.17	3.88
Syphilis ...	2.98	3.19
Heart disease ...	3.21	3.74
Bronchitis and Pleurisy ...	2.09	1.55
Apoplexy and Epilepsy ...	1.27	.79
Ophthalmia ...	.67	.54
Debility from climate ...	8.05	10.19
Injuries ...	.75	.82
All other causes ...	8.41	7.69
Invalided per 1,000 ...	46.74	49.19

In the invaliding-rates of the first year, debility from climate, heart disease, and hepatitis are repressed; the aggregate rate per 1,000 for these three causes of invaliding is in the first year 6.76, and in the second 20.78. Heat fever, sunstroke, and dysentery do not in any year send home a large proportion of the invalids, climatic influences seeking other manifestations by which in the end the constitution is sapped; the aggregate ratios for the three amount only to 5.81 per 1,000 in the first year, and to 6.19 per 1,000 in the second. Phthisis gives a ratio representing nearly one-fourth of the invaliding from disease in the first year; and this disease probably appears naturally in this position, for reasons to which I shall afterwards allude. The ratio, however, as it stands, is higher than what is normal; for one regiment (Her Majesty's 36th in 1864) contributed 39 out of the total of 95 cases, as a sequel to the fever from which it suffered so severely.

As I have said above, it is less acute climatic disease than continued exposure which determines the extent of invaliding. Hence, with all its exposure and all its suffering, the army of 1858 gives an invaliding-rate of only 37.59 per 1,000, after excluding injuries, of which one-third is made up of dysentery, fever, and apoplexy. Hepatitis, heart disease, and debility from climate, represented in the standard of 1865—69 by a ratio of 20.89, show in 1858 a ratio of 8.51 per 1,000 only; and, what is remarkable, phthisis shows a ratio of only 1.39 per 1,000, a result very much at variance with that shown in the case of the new troops in the first and second years, and, indeed, much more favorable than that of any year between 1858 and 1870. It is difficult to account for the phenomenon, unless we suppose that the enormous increase of acute disease afforded in many cases an outlet for the elements of disease which, if retained, would have become manifest in tubercular deposit. It is true that in the case of the army in the field, the death-rate from phthisis is higher than that of the army in any year since 1858; but the increase is not excessive, as might have been expected, and, indeed, it is almost identical with that of the new troops in the later years:—

*Death-rate per 1,000 from Phthisis.*

ARMY IN THE FIELD.	NEW TROOPS.	NEW TROOPS.
1858.	1864—69.	1865—70.
2.19	2.15	2.16

The very interesting question of the etiology of the lung deposit which is apt to take place in young men soon after arrival in India, is further alluded to in the third section, in connection with the consideration of the nature of the typhoid of the unacclimatised.



## SECTION II.

THE STATISTICS OF AGE AND LENGTH OF SERVICE IN NEWLY-ARRIVED  
REGIMENTS CONTRASTED WITH THE STANDARDS FOR THE  
ARMY TAKEN AS A BODY.

Composition by age of the Army of Bengal on the average for the six years 1865—70.

Taking the strength from 1865 to 1870, the composition of the army of Bengal at the different ages was as follows:—

Under 20.	20-24.	25-29.	30-34.	35-39.	40 and upwards.	TOTAL.
4.85	38.38	28.09	20.17	7.24	1.27	100
			28.68			

The natural division of the body is into four; boys, young men, mature soldiers, and old soldiers. The boys below 20, taking the average of these six years, do not constitute one-twentieth of the force; 38 per cent. of the strength was under 25, 28 per cent. above 25 and under 30, and 29 per cent. was above 30 years of age. The diseases and death-rate of the boys is a very important subject for consideration; but, practically, the question resolves itself into the study of three bodies—the young men, the mature men, and the old men.

I have not considered it worth while to make any distinctive ratios for men at the older periods, from 35 to 39 and 40 and upwards. The British soldier who would be reckoned young in England, is, in India, an old man at 30, whether he reaches this age in the course of Indian Service or lands with his regiment.

In newly-arrived regiments, during the same period, the strength of boys has been higher, the strength of young and matured men much the same as the average for the army, and the strength of old men 9 per cent. below the average:—

Constitution of newly-arrived regiments as compared with the standard for the Army generally.

## NEWLY-ARRIVED REGIMENTS, 1864—69.

*Distribution of the Strength by Age on arrival in India.*

Below 20.	20-24.	25-29.	30-34.	35-39.	40 and upwards.	TOTAL.
2,088	5,750	3,993	2,067	751	113	14,802
14.11	39.12	26.97	13.96	5.07	.77	100
			19.80			

The disproportion most evident in this table is the excess of old men, one-fifth of the body being composed of men whose normal ratios of mortality and invaliding stand far above those of the younger men.

For the earlier years of the period, the strengths of the army were, unfortunately, differently divided off; but we may judge that the proportion of men at different ages was very nearly what is shown above for the new regiments:—

Composition by age of the new Army of 1858.

*Army of April 1858—Distribution of the Strength by Age.*

20 and under.	21-25.	27-35.	36 and upwards.	TOTAL.
6,967	18,652	14,361	2,820	42,800
16.28	43.58	33.55	6.59	100

These are the strengths which I shall compare in the following tables; and although the ratios for the two periods 1858—62 and 1863—70 cannot be accurately placed one beside the other for comparison, the general lessons will be found of the same import.



Whichever body we may choose for illustration, the rapidity of the increase of the death-rate with age is most striking.

The ratio of liability to death and invaliding increases rapidly with advancing age.

Whether under exposure, in the routine of cantonment life, or in the special conditions of the newly-arrived body, the phenomenon is constant :—

*Death-rates at the different ages compared (a) in the new Army of 1858, (b) in the Army as a body from 1865 to 1870, and (c and d) in newly-arrived Regiments from 1864 to 1870.*

(a)—Army of 1858.

	20 and under.	21 to 25.	26 to 35.	36 and upwards.	
Died per 1,000 ...	48.80	74.36	108.07	131.91	
Ratio of liability ...	13.44	20.48	29.76	36.32	100.00

(b)—Army as a body, 1865—70.

	(EXCLUDING CHOLERA.)				
	Under 20.	20 to 24.	25 to 29.	30 and upwards.	
Died per 1,000 ...	7.61	13.67	17.41	29.94	
Ratio of liability ...	11.09	19.92	25.37	43.62	100.00

(c)—Newly-arrived Regiments, 1864—69.

	(EXCLUDING CHOLERA.)				
	Under 20.	20 to 24.	25 to 29.	30 and upwards.	
Died per 1,000 ...	12.93	24.87	39.32	47.08	
Ratio of liability ...	10.41	20.02	31.66	37.91	100.00

(d)—Newly-arrived Regiments in second year, 1865—70.

	(EXCLUDING CHOLERA.)				
	Under 20.	20 to 24.	25 to 29.	30 and upwards.	
Died per 1,000 ...	3.95	15.84	23.08	35.61	
Ratio of liability ...	5.03	20.18	29.41	45.38	100.00

I might here show the same phenomenon of increase with age of the invaliding-rate, but this subject will be subsequently considered.

In the first section, I have shown that the diseases which rise to the top in the newly-arrived regiments are—heat fevers, heat apoplexy, and dysentery, hepatitis holding an important, but secondary place in the scale. In the table which follows, the ratio in which the men at

Army of 1858—62. Ratio in which the men at different ages died from the diseases special to the unacclimatised throughout the period.

the different ages died from these diseases between 1858 and 1862 is shown. The first half of the table illustrates very beautifully how, while during this period the death-rate became less year by year, the improvement took place in men at all the periods. But the table as a whole is chiefly intended to show the ratio of liability in the same year of men of different ages. Thus, heat apoplexy is the disease to which the old soldier is always ready to succumb, and in 1858, while 7 per 1,000 of boys of 20 and under died, 36 per 1,000 of men above 35 were lost; or, in other words, if the ratio of liability to die be estimated at 100, the liability in the case of the two classes was 8.51 and 43.80 respectively, or nearly five times as great in the one case as in the other. Or, again, to reverse the case, in 1860, young boys died of fevers at the rate of 5.58 per 1,000, while the men above 35 lost only 2.73 per 1,000 from the



same cause, the ratio of liability being in the case of the young 35·34, and in the case of the old 17·28.

Table showing the ratio in which men of different ages died from Fevers, Heat Apoplexy, Dysentery and Hepatitis between 1858 and 1862.\*

CAUSES OF DEATH.		DIED PER 1,000 OF STRENGTH.				RATIO OF LIABILITY IN PERCENTAGES.				TOTAL.
		20 and under.	21 to 25.	26 to 35.	Upwards of 35.	20 and under.	21 to 25.	26 to 35.	Upwards of 35.	
FEVERS	1858	14·06	16·24	14·76	17·02	22·65	26·16	23·78	27·41	100
	1859	11·52	8·66	5·80	9·59	32·38	24·35	16·31	26·96	100
	1860	5·58	4·28	3·20	2·73	35·34	27·11	20·27	17·28	100
	1862	2·95	4·30	3·00	3·69	21·16	30·85	21·52	26·47	100
HEAT APOPLEXY	1858	7·03	15·23	24·16	36·17	8·51	18·44	29·25	43·80	100
	1859	3·96	5·18	7·53	9·12	15·36	20·08	29·20	35·36	100
	1860	1·79	1·83	2·32	5·13	16·17	16·53	20·96	46·34	100
	1861	·38	·90	1·35	6·25	4·28	10·14	15·20	70·38	100
	1862	·50	·53	1·80	1·64	11·19	11·85	40·27†	36·69†	100
DYSENTERY	1858	22·39	30·08	30·57	38·30	18·45	24·79	25·19	31·57	100
	1859	16·74	14·42	13·53	27·35	23·24	20·02	18·78	37·96	100
	1860	4·78	4·18	5·07	7·18	22·54	19·71	23·90	33·85	100
	1862	·48	3·00	3·81	5·74	3·68	23·03	29·24	44·05	100
HEPATITIS	1858	3·30	4·98	8·01	9·57	12·76	19·26	30·98	37·00	100
	1859	2·34	3·87	6·73	9·12	10·61	17·54	30·51	41·34	100
	1860	1·00	2·02	3·75	5·47	8·17	16·50	30·64	44·69	100
	1862	·00	1·88	4·06	3·69	·00	19·52	42·16	38·32	100

The general significance of the table is this—that the young men will die from fevers in as great a proportion as the old men, sometimes in a much greater proportion; that heat apoplexy, while it may attack men of all ages, is specially the disease of the old soldier; that while under exposure all classes of the unacclimatised are prone to succumb to dysentery nearly in equal proportion, the old soldier continues to die, while the young soldier loses to a great degree his susceptibility to dysentery; and that in the case of hepatitis there is consistently a broad line of distinction between men above and below 25, the ratio of liability being doubled in the case of the older class.

For comparison, I shall place here the aggregates for the last six years to show the great tendency of the young men to succumb to fever and of the old men to die by heat apoplexy, dysentery, and hepatitis.

Army of the Presidency, 1865-70. Ratio of liability to death at the different ages, from Fevers, Heat Apoplexy, Dysentery, and Hepatitis.

	Under 20.	20 to 24.	25 to 29.	30 and upwards.	TOTAL.
Fevers	30·07	32·08	17·85	20·00	100·00
Heat Apoplexy	10·55	13·80	26·15	49·50	100·00
Dysentery	7·21	23·04	29·24	40·51	100·00
Hepatitis	·87	16·78	29·49	52·86	100·00

To link on the statistics of the earlier with the later period, the tables for 1863 and 1864 are interposed; these are arranged after the method followed in the subsequent years. In both years the favourable death-rate of the older soldiers is worthy of note, an occurrence due, no doubt, to the circumstance that the men of the army above 30 had reached this age through Indian Service, and were not men landed in India and passing through the experience incident to new comers. The death-rates for the young men are also very favourable in both years, although the deaths of young men in the three new regiments which came to India in 1864 contributed considerably to the ratio in the latter year.

Died per 1,000 of Strength in 1863 and 1864.

	(EXCLUDING CHOLERA.)			
	Under 20.	20 to 24.	25 to 29.	30 and upwards.
1863	5·98	13·95	24·46	26·16
1864	9·92	9·51	20·78	27·54

\* The Returns for 1862 being imperfect, the ratios for the year are omitted in this Table, except in the case of Heat Apoplexy.

† These are ratios for small numbers. The deaths from Heat Apoplexy in 1862 were 51 only.



The component elements of these rates are also consistent with those of the tables which follow:—

*Distribution of the Strength of the Army according to Age at the beginning of 1863.*

TOTAL STRENGTH.	Under 20.				20 to 24.		25 to 29.		30 to 34.		35 to 39.		40 and upwards.	
	1,339				10,491		15,212		5,642		8,479		468	
41,451														

*Deaths of 1863, and the Death-rates per 1,000 of the Strength at the different Ages.*

CAUSES OF DEATH.	DEATHS OF 1863.				DIED PER 1,000 OF STRENGTHS ABOVE STATED.				RATIO OF LIABILITY IN PERCENTAGES.			
	Under 20.	20 to 24.	25 to 29.	30 and upwards.	Under 20.	20 to 24.	25 to 29.	30 and upwards.	Under 20.	20 to 24.	25 to 29.	30 and upwards.
	Total.	Under 20.	20 to 24.	25 to 29.	Under 20.	20 to 24.	25 to 29.	30 and upwards.	Under 20.	20 to 24.	25 to 29.	30 and upwards.
Cholera	2	81	56	21	1.49	4.91	3.68	2.50	11.84	39.03	29.25	19.88
Fever	3	62	46	27	2.25	3.76	3.02	3.21	18.38	30.72	24.67	26.23
Heat Apoplexy	1	14	25	15	.75	.85	1.64	1.78	14.94	16.93	32.67	35.46
Delirium tremens	...	2	9	6	...	.12	.59	.71	...	8.45	41.55	50.00
Dysentery and Diarrhoea	2	45	68	36	1.49	2.73	4.47	4.28	11.49	21.05	34.46	33.00
Hepatitis	...	20	76	41	...	1.21	5.00	4.88	...	10.91	45.09	44.00
Phthisis pulmonalis	...	25	38	26	...	1.51	2.50	3.09	...	21.27	35.21	43.52
Heart diseases	...	5	12	14	...	.30	.80	1.67	...	10.83	28.88	60.29
All other causes	2	57	98	55	1.49	3.47	6.44	6.54	8.31	19.34	35.90	36.45
All causes	10	311	428	241	7.47	18.86	28.14	28.66	8.99	22.69	33.85	34.47
All causes, excluding Cholera	8	230	372	220	5.98	13.95	24.46	26.16	8.48	19.77	34.67	37.08

*Distribution of the Strength of the Army according to Age at the beginning of 1864.*

TOTAL STRENGTH.	Under 20.				20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 and upwards.
	Under 20.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 and upwards.	30 to 34.	35 to 39.	40 and upwards.
41,661	1,008	15,349	16,262	6,185	9,042	404			

*Deaths of 1864, and the Death-rates per 1,000 of the Strength at the different Ages.*

CAUSES OF DEATH.	DEATHS OF 1864.				DIED PER 1,000 OF THE STRENGTH ABOVE STATED.				RATIO OF LIABILITY IN PERCENTAGES.			
	Under 20.	20 to 24.	25 to 29.	30 and upwards.	Under 20.	20 to 24.	25 to 29.	30 and upwards.	Under 20.	20 to 24.	25 to 29.	30 and upwards.
	Under 20.	20 to 24.	25 to 29.	30 and upwards.	Under 20.	20 to 24.	25 to 29.	30 and upwards.	Under 20.	20 to 24.	25 to 29.	30 and upwards.
Cholera	4	28	44	20	3.97	1.82	2.71	2.21	37.07	17.00	25.30	20.63
Fever	5	37	51	28	4.96	2.41	3.14	3.10	36.45	17.71	23.07	22.77
Heat Apoplexy	...	12	25	32	...	.78	1.54	3.54	...	13.31	26.28	60.41
Delirium tremens	...	...	4	14	...	...	.24	1.55	...	...	13.41	86.59
Dysentery and Diarrhoea	1	16	46	36	.99	1.04	2.83	3.98	11.20	11.77	32.01	45.02
Hepatitis	3	20	57	38	2.98	1.31	3.50	4.20	24.85	10.93	29.19	35.03
Phthisis pulmonalis	...	16	43	8	...	1.04	2.64	.88	...	22.81	57.89	19.30
Heart diseases	...	2	13	24	...	.13	.80	2.66	...	3.62	22.28	74.10
All other causes	1	43	99	69	.99	2.80	6.09	7.63	5.66	15.99	34.78	43.57
All causes	14	174	382	260	13.89	11.33	23.49	29.75	17.70	14.44	29.94	37.92
All causes, excluding Cholera	10	146	338	249	9.92	9.51	20.78	27.54	14.64	14.04	30.67	40.55



It may be well to note that occasionally a ratio of liability shows a remarkable excess and stands out prominently as an apparent exception in the harmony of the tables. Such ratios are generally the equivalent of single cases, as will be seen by reference to the actuals appended.

The ratio of liability indicated must in a few instances be looked at in relation to the actuals shown in the same table, having sometimes no real significance in cases which appear exceptional.

In the table showing the aggregates for the six years 1865—70,\* all such minor sources of discrepancy are removed. The table may be accepted as showing almost in perfection the normal ratios in which men are liable to die at the different ages. This table comes up to my ideal of a standard; and, whether taken as a whole or in detail, I believe it to represent with accuracy the expectations which we may entertain when violently disturbing causes of mortality are not present. The following are the totals:—

*Died per 1,000 on the Average of the six years 1865—70.*

	(EXCLUDING CHOLERA.)			
	Under 20.	20 to 24.	25 to 29.	30 and upwards.
Ratio of liability ..	7.61 11.09	13.67 19.92	17.41 25.37	29.94 43.62

Fever is the special disease of the boys and the young men, in whom, however, the system is gradually prepared for the invasion of climatic disease. The men from 25 to 29 show ratios immensely increased in all diseases of deterioration; heart disease is five times as prevalent as in the former class, heat apoplexy is doubled, and the liability to hepatitis is as 17 to 30. Phthisis, too, is rapidly increasing; and the effects of drunkenness become visible in the tendency to die by delirium tremens, which is first developed at this period of life.

\* For the annual details of the period, see table appended to this Section.

DISEASES	Under 20.	20 to 24.	25 to 29.	30 and upwards.	Ratio of liability
All causes	10	14	17	29	100
Fevers	1	...	...	...	...
Heart disease	...	...	...	...	...
Heat apoplexy	...	...	...	...	...
Hepatitis	...	...	...	...	...
Phthisis	...	...	...	...	...
Delirium tremens	...	...	...	...	...
Drunkenness	...	...	...	...	...
Delirium	...	...	...	...	...
Convulsions	...	...	...	...	...
Paralysis	...	...	...	...	...
Stroke	...	...	...	...	...
Apoplexy	...	...	...	...	...
Consumption	...	...	...	...	...
Scrophulous diseases	...	...	...	...	...
Cholera	...	...	...	...	...

*Distribution according to Age of the Army of the Bengal Presidency, 1865—70.*

AGGREGATE STRENGTH OF THE SIX YEARS.	AGE.					40 and upwards.
	Under 20.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	
216,723	10,509	60,878	83,174	43,727	62,162	2,747

*Number of Deaths, and the Ratios at the different Ages, 1865—70.*

CAUSES OF DEATH.	DEATHS OF 1865—70.				DIED PER 1,000 OF THE STRENGTH ABOVE STATED.				RATIO OF LIABILITY IN PERCENTAGES.				
	Under 20.	20 to 24.	25 to 29.	30 & upwards.	Under 20.	20 to 24.	25 to 29.	30 & upwards.	Under 20.	20 to 24.	25 to 29.	30 & upwards.	Total.
Cholera	52	343	464	430	4.95	5.63	5.58	6.92	21.45	24.39	24.18	29.98	100
Fever	47	291	221	185	4.48	4.78	2.66	2.98	30.07	32.08	17.85	20.00	100
Heat Apoplexy	10	75	194	274	.94	1.23	2.33	4.41	10.55	13.80	26.15	49.50	100
Delirium tremens	...	...	20	67	...	...	.24	1.08	...	...	18.18	81.82	100
Dysentery & Diarrhoea	6	111	192	199	.57	1.82	2.31	3.20	7.21	23.04	29.24	40.51	100
Hepatitis	1	105	253	339	.09	1.73	3.04	5.45	.87	16.78	23.49	52.86	100
Phthisis pulmonalis	3	72	122	133	.29	1.18	1.47	2.14	5.71	23.23	28.94	42.12	100
Heart disease	2	11	77	179	.19	.18	.92	2.88	4.56	4.32	22.06	69.06	100
All other causes	11	167	369	485	1.05	2.75	4.44	7.80	6.55	17.14	27.68	48.63	100
All causes	132	1,175	1,912	2,291	12.56	19.30	22.99	36.86	13.70	21.04	25.07	40.19	100
All causes, excluding Cholera	80	832	1,448	1,861	7.61	13.67	17.41	29.94	11.09	19.92	25.37	43.62	100



I have said that the soldier is old at thirty. The last two columns of the table show how terribly true is the fact. Diseases of deterioration, which were bad enough in the men between 25 and 29, rise in the old soldier to an enormous ratio; and the same is true of his invaliding.

The ratios of mortality and invaliding in the old soldier, the man above 30, compared with those for the men between 25 and 29.

*Statement showing in percentages the liability of the soldier above 30 to die, as compared with the men aged from 25 to 29—derived from the table for 1865—70.*

CAUSES OF DEATH.	25 to 29.	30 and upwards.	TOTAL.
Heat Apoplexy ...	34.57	65.43	100
Delirium tremens ...	18.18	81.82	100
Dysentery ...	41.92	58.08	100
Hepatitis ...	35.80	64.20	100
Phthisis pulmonalis ...	40.72	59.28	100
Heart diseases ...	24.21	75.79	100
All other causes (excluding Fever and Cholera) ...	36.28	63.72	100
All causes (excluding Cholera) ...	36.77	63.23	100

If we look at the ratio of invaliding for the same period the same grand truth is brought out. The ratio of invaliding is consistently doubled in the case of the old soldier, when compared with that for men between 25 and 29.





*Ratio of Invaliding in men above 30, compared with that for men between 25 and 29.*

Year.	INVALIDED PER 1,000.		RATIO OF LIABILITY.		
	25 to 29.	30 and upwards.	25 to 29.	30 and upwards.	TOTAL.
1865	45.13	87.26	34.09	65.91	100
1866	41.73	80.95	34.02	65.98	100
1867	34.30	79.12	30.24	69.76	100
1868	30.99	74.69	29.32	70.68	100
1869	40.03	77.94	33.93	66.07	100
1870	46.84	72.54	39.25	60.75	100
1865—70	39.74	78.34	33.66	66.34	100

What body is it, then, which contributes chiefly to determine the standard of invaliding reached of late years? Not the boys nor the young men, a body of equal strength with the men above 30. The invaliding of the young is but one-third of what it is in men above 30; for of 4,870 invalids aged above 30, who went home in these six years, there were but 1,622 aged from 21 to 24. I am quite prepared to admit, however, that the invaliding in young regiments and among recruits is high, and the table shows that in the two last years the ratio has seriously increased.

The composition of the army as regards the relative number of very young men has certainly tended to increase this invaliding, and the fact is one well to be weighed that its significance may be rightly interpreted. The increase of the ratio in 1869-70 among the young men means, that the numbers new to India have been large, and that the climatic diseases to which the young are specially liable have been epidemically prevalent:—

*Invaliding-rate per 1,000 for young men from 21 to 24, 1865—70.*

1865.	1866.	1867.	1868.	1869.	1870.	1865—70.
17.31	21.96	27.29	23.14	35.92	37.53	26.64.

It has been alleged that, both as regards death and invaliding, the ratios for young boys under 20 are apt to be understated, chiefly by the fact of boys who come to India below 20 being removed into the next class before the end of their first year of service, so that while their strengths appear as on landing, the death or invaliding is recorded among the men aged from 20 upwards. I do not believe that this objection has much weight, but I have in this table of invaliding thrown the boys of the age of 20 into the lower class, retaining the strength as before. This should tell adversely on the ratio for the young boys; but as it stands, it is certainly not inferior to that of the two higher classes, which represents the soldier at his best. I have thought it also worth while to select from the death-rolls of these six years the deaths of boys at the age of 20, which ought perhaps to be divided between the lowest and the second class, and I place it here as affording an additional illustration of the causes by which the death of the young soldier is brought about:—

*Deaths at the Age of 20, 1865—70.*

CAUSES OF DEATH.	1865.	1866.	1867.	1868.	1869.	1870.	Deaths at 20, six years, 1865—70.	Deaths at 20 in Regiments in the first year, 1864—69.
Cholera	3	1	25	2	20	...	51	18
Continued Fever	5	11	5	10	22	13	66	17
Heat Apoplexy	1	1	1	5	5	6	19	5
Dysentery	1	3	1	1	3	1	10	4
Hepatitis	...	...	1	1	...	2	4	...
Phthisis	1	...	1	1	4	3	10	2
Bronchitis & Pneumonia	...	1	...	...	...	1	2	1
Heart disease	...	2	...	...	...	...	2	...
Other diseases	...	1	...	1	2	1	5	...
Accident	...	1	...	1	1	2	5	2
Suicide	...	...	...	...	2	1	3	...
Suffocated while drunk	...	1	...	...	...	...	1	...
	11	22	34	22	59	30	178	49



When we look to the excessive invaliding-rates of the old soldier, we naturally ask, whether the increase of the rates of late years has not been in a great measure due to the fact, that the army has as a body been getting older year by year, and thus furnishing a larger body affording the maximum invaliding ratio. The following table will, I think, suggest that such has been the case. It shows that the number of really efficient men of the army, those from 20 to 30, has year by year been decreasing, by men passing into the older grade. While in 1863 we had 76.48 per cent. of the army composed of men between 20 and 30, in 1870 the proportion was 60.00 per cent. only. The proportion of this, the best material, has been steadily decreasing year by year:—

The proportion of men above 30 has increased year by year from 1865 to 1870, while the most efficient class, the men from 20 to 30, has diminished; and this being the case, we may expect the invaliding-rate to rise relative to the increase of old soldiers.

Statement showing the decrease year by year of the number of men between 20 and 30 who constitute the most efficient body for service in India, and the steady increase in men above 30.

*Men from 20 to 30 : per cent. of the Total Strength of the Army.*

1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.
76.48	75.88	75.71	69.35	65.48	65.00	61.69	60.00

And the ratio of the men above 30 has been rising steadily in like proportion:—

*Men above 30 : per cent. of the Total Strength of the Army.*

1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.
20.29	21.70	20.63	27.30	29.62	30.11	31.83	33.92

In the earlier years of the period, the proportion of old men was one-fifth, in 1869 and 1870 the proportion was one-third, and this third of the army is a body which consistently gives an invaliding ratio of nearly 8 per cent.

*Army of the Bengal Presidency, 1863—70. Composition of the strength at the different ages in each year, showing how the young and the old components have increased, while the most efficient body has progressively diminished in strength.*

AGE.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.
Under 20	3.23	2.42	3.66	3.35	4.90	4.89	6.48	6.08
20 to 24	39.79	36.84	34.32	26.87	22.59	26.88	28.34	29.03
25 to 29	36.69	39.04	41.39	42.48	42.89	38.12	33.35	30.97
30 and upwards	20.29	21.70	20.63	27.30	29.62	30.11	31.83	33.92
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00





*Distribution according to Age of the Strength of Regiments in their Second Year of Indian Service, 1865-70.*

STRENGTH AT BEGINNING OF SECOND YEAR.	Under 20.		20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 and upwards.
	1,518		5,558	4,506	2,146	3,061	127
14,643						788	

*Causes of Deaths in the Second Year of Service, and the Death-rates at the different Ages.*

CAUSES OF DEATH.	NUMBERS OF DEATHS.				DIED PER 1,000 OF THE STRENGTHS ABOVE SEATED.				RATIO OF LIABILITY IN PERCENTAGES.				TOTAL.
	Under 20.	20 to 24.	25 to 29.	30 and upwards.	Under 20.	20 to 24.	25 to 29.	30 and upwards.	Under 20.	20 to 24.	25 to 29.	30 and upwards.	
Cholera	1	12	20	15	66	216	444	490	5.43	17.76	36.51	40.30	100.00
Fevers	3	32	26	14	1.97	5.76	5.77	4.57	10.90	31.88	31.93	25.29	100.00
Heat Apoplexy	...	6	12	11	...	1.08	2.66	3.60	...	14.71	36.24	49.05	100.00
Delirium tremens	...	...	3	3	...	...	.67	.98	...	...	40.61	59.39	100.00
Dysentery and Diarrhoea	2	7	12	14	1.32	1.26	2.66	4.57	13.45	12.84	27.12	46.59	100.00
Hepatitis	...	8	19	21	...	1.44	4.22	6.86	...	11.50	33.71	54.79	100.00
Phthisis pulmonalis	...	14	10	7	...	2.62	2.22	2.29	...	35.85	31.58	32.57	100.00
Heart diseases	...	2	2	14	...	.36	.44	4.57	...	6.71	8.19	85.10	100.00
All other causes	1	19	20	25	.66	3.42	4.44	8.17	3.96	20.49	26.60	48.95	100.00
All Causes	7	100	124	124	4.61	18.00	27.52	40.51	5.09	19.86	30.36	44.69	100.00
All Causes, excluding Cholera	6	88	104	109	3.95	15.84	23.08	35.61	5.03	20.18	29.41	45.38	100.00

The fact that men of newly-arrived regiments die in a much higher ratio than the army in general has been clearly exhibited. The death-rate at different ages in newly-arrived regiments. The rate increases steadily with age. The same is true for the men of all ages:—

*Death-rate per 1,000 at the different Ages. Average for the Army, 1865-70, and for newly-arrived Regiments, 1864-69.*

		(EXCLUDING CHOLERA.)			
		Under 20.	20 to 24.	25 to 29.	30 and upwards.
Army of 1865-70	...	7.61	13.67	17.41	29.94
New Regiments, 1864-69	...	12.93	24.87	39.32	47.08

Decreases in the second year at all ages. But the relative liability to death at the different ages continues, and progresses towards the standard.

In the second year, the diminution which takes place in the death-rate is shown also in the case of each class:—

*Death-rates in the First and Second Years of Indian Service contrasted at the different Ages.*

		(EXCLUDING CHOLERA.)			
		Under 20.	20 to 24.	25 to 29.	30 and upwards.
First year	...	12.93	24.87	39.32	47.08
Second year	...	3.95	15.84	23.08	35.61

But while the death-rates diminish so remarkably, the relative liability to death at the different ages is not much altered, and in the ratios for the second year of residence, we find it fast running towards the standard:—

*Comparative liability to death at different ages contrasted in the case of the newly-arrived and the Army as a body.*

	Under 20.	20 to 24.	25 to 29.	30 and upwards.	TOTAL.
Standard, 1865-70	11.09	19.92	25.37	43.62	100
Regiments in second year	5.03	20.18	29.41	45.38	100
Regiments in first year	10.41	20.02	31.66	37.91	100

Looking at the columns showing the composition of the death-rate in the first year, we have no difficulty in recognising that the young material is that best qualified to stand the climate of India. It is not that the young do not suffer in an equal degree from the diseases of the unacclimatised with the older men. But young constitution possesses the power of resiliency; and while the older man dies, the younger recovers, and is not necessarily damaged for Indian Service by the fact that he has suffered from serious illness in his first year of residence.





*Distribution according to Age of the Strength of Regiments in their Second Year of Indian Service, 1865-70.*

STRENGTH AT BEGINNING OF SECOND YEAR.	Under 20.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 and upwards.
14,643	1,518	5,558	4,506	2,146	3,061	127

*Causes of Invaliding in the Second Year of Service, and the Invaliding-rates at the different Ages.*

CAUSES OF INVALIDING.	NUMBER INVALIDED.				INVALIDED PER 1,000 OF THE STRENGTH ABOVE STATED.				RATIO OF LIABILITY IN PERCENTAGES.			
	20 and under.	21 to 24.	25 to 29.	30 and upwards.	20 and under.	21 to 24.	25 to 29.	30 and upwards.	20 and under.	21 to 24.	25 to 29.	30 and upwards.
	TOTAL.	30 and upwards.	25 to 29.	21 to 24.	18 to 45.	30 to 34.	25 to 29.	21 to 24.	18 to 45.	30 to 34.	25 to 29.	21 to 24.
Fever ...	...	...	...	...	...	...	...	...	...	...	...	...
Dysentery and Diarrhoea ...	...	...	...	...	...	...	...	...	...	...	...	...
Hepatitis ...	...	...	...	...	...	...	...	...	...	...	...	...
Phthisis pulmonalis ...	...	...	...	...	...	...	...	...	...	...	...	...
Heart disease ...	...	...	...	...	...	...	...	...	...	...	...	...
Mania and Epilepsy ...	...	...	...	...	...	...	...	...	...	...	...	...
Cephalaea ...	...	...	...	...	...	...	...	...	...	...	...	...
Debility (due to disease) ...	...	...	...	...	...	...	...	...	...	...	...	...
Rheumatism ...	...	...	...	...	...	...	...	...	...	...	...	...
Syphilis ...	...	...	...	...	...	...	...	...	...	...	...	...
All other causes ...	...	...	...	...	...	...	...	...	...	...	...	...
ALL CAUSES ...	49	232	208	228	32.28	41.74	46.16	74.49	16.58	21.44	23.71	38.27



I have shown how in the third year of residence the invaliding-ratio very

The invaliding-rate is, generally speaking, low at all ages in the first year, excessive at all ages in the second year, and approaches the standard, except in the case of the old men, in the third year of service.

diseases of deterioration. When divided off according to age, the ratios in the second year of residence stand much above the average of the six years 1865-70; it seems, indeed, as if the invaliding of the second year included the men who escaped going home at the close of the first year, as well as the ratio normal for the year itself. The ratios for the first year of residence are lower at all ages, but this is what might have been expected. In the first year disease falls sharply on the newly-arrived, but the elasticity of the system counterbalances the effect of the shock, and during the cold season the constitution is placed in conditions so favourable that the necessity for change to Europe is avoided.

Perhaps the most extraordinary feature in the invaliding tables for the first and second years of residence is the ratio for heart disease. The table for men in the second year suggests, that the liability to this great cause of invaliding is least in old soldiers and highest among the young boys, ranging thus:—

20 and under.	21 to 24.	25 to 29.	30 and upwards.	Total.
32.10	26.30	24.35	17.25	100

Out of a strength, below 24, of 7,076, we find 48 invalided for heart disease; and out of 7,567, of 25 and upwards, 40 only. This is in direct contradiction to the death tables. The tables for the period 1865 to 1870 show, that in these years 13 men only below 24 died; while, in the same period, 256 men of 25 and above died from heart disease. And, again, the tables showing the deaths in the first and second years of residence repeat the same as regards the mortality from heart disease; 3 men only below 24 died, against 26 who died at the late period of life. There is a curious problem, involving the etiology of heart disease, contained in this remarkable antagonism between the relation of the ratios of death and invaliding to age. It seems as if the anæmia of the young, developed under climatic influence, very rapidly determines the tendency to functional disease of the heart, which, again, lays the foundation of the organic disease so extensively developed in old soldiers, as the very large number of deaths from valvular disease and aortic aneurism which occur in every year testifies.

*Distribution according to Age of the Strength of Regiments in their Third Year of Indian Service, 1866-70.\**

STRENGTH AT BEGINNING OF THIRD YEAR.	Under 20.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 and upwards.
13,339	811	5,266	4,244	2,031	848	139

*Causes of Invaliding in the Third Year of Service, and the Invaliding-rates at the different Ages.*

CAUSES OF INVALIDING.	NUMBER INVALIDED.				INVALIDED PER 1,000 OF STRENGTH.				RATIO OF LIABILITY IN PERCENTAGES.				
	20 and under.	21 to 24.	25 to 29.	30 and upwards.	20 and under.	21 to 24.	25 to 29.	30 and upwards.	20 and under.	21 to 24.	25 to 29.	30 and upwards.	TOTAL
Fevers ...	2	6	12	12	2.47	1.14	2.83	3.98	23.70	10.94	27.16	38.20	100
Dysentery and Diarrhoea ...	1	9	11	6	1.23	1.71	2.59	1.99	16.36	22.74	34.45	26.45	100
Hepatitis ...	2	19	28	41	2.47	3.61	6.60	13.58	9.41	13.75	25.13	51.71	100
Phthisis pulmonalis ...	3	14	15	15	3.70	2.66	3.53	4.97	24.90	17.90	23.75	33.45	100
Heart disease and Palpitation ...	4	16	17	21	4.93	3.04	4.01	6.96	26.03	16.05	21.17	36.75	100
Mania ...	...	1	5	12	...	1.18	3.98	...	...	3.55	22.06	74.39	100
Debility ...	6	21	27	54	7.40	3.99	6.36	17.89	20.76	11.20	17.85	50.19	100
Rheumatism ...	1	4	16	46	1.23	.76	3.77	15.24	5.86	3.62	17.95	72.57	100
Syphilis ...	...	10	12	18	...	1.90	2.83	5.96	...	17.77	26.47	55.76	100
All other causes...	6	29	41	64	7.40	5.50	9.66	21.21	16.91	12.56	22.07	48.46	100
ALL CAUSES ...	25	129	184	289	30.83	24.50	43.36	95.76	15.85	12.60	22.30	49.25	100

\* The strength of the 62nd and 1-14th Regiments, which are now in their third year, is struck off.



I have arranged in a parallel form the invaliding of the third year of Indian service also. The 1-14th and 62nd Regiments, which are now in the third year, are necessarily omitted in this tabulation. This table demonstrates strikingly the fact, that it is the old men who are chiefly lost as Indian service increases; for in this third year no less than 96 per 1,000 of men above 30 were removed by invaliding. In short, the body composing the force three years in India was decimated by the invaliding of this single year.

It is better to leave out of view the invaliding for boys under 20, and to view all under 24 as one group; and the more so, because the aspect of the statistics of the two young groups has been damaged by the endeavour to class lads of 20 with boys, without making an adequate addition to the strength of the group.

In the third year, the standard normal for the different ages seems to be attained. As I have said, in the first year the difference in the ratio for the classes is not very great, although the ratio is necessarily heavier for the old men than for the younger. In the second year, the rate for the young is much above what it should be when compared with that of the next class; but young men suffer heavily from invaliding in the second year, from damage to the system during the carrying out of the process of adaptation of the constitution to the climate of India. Even in the second year, however, the ratio for old men is nearly double what it is in the young; and this is to be remarked, that while the ratio for the young men comes down in the third year and settles at a minimum, the loss among the old is rapidly progressive, showing that there is no adaptation to the Indian climate of the system of the old soldier:—

*Invaliding per 1,000 in the first three years of Indian Service at different Ages, as compared with the standard.*

	YOUNG SOLDIERS. 24 and under.	MATURE SOLDIERS. 25 to 29.	OLD SOLDIERS. 30 and upwards.
Standard of 1865-70 ...	26.55	39.74	78.34
Third year ...	25.36	43.36	95.76
Second year ...	39.71	46.16	74.49
First year ...	21.45	35.66	36.61

While it is true that the old men have suffered, and will continue to suffer, the truth is not to be disguised, that the invaliding of young men under 24 has been far above the normal average, chiefly owing to the loss of the second year. Out of 1,762 men lost by invaliding in the first three years of Indian service, 604 were below 25, 534 from 25 to 29, and 624 above 30 years of age.

It is a very serious subject for reflection that this body whose statistics we have been considering, numbering under 15,000, should in three years have lost by death upwards of 1,300, and by invaliding upwards of 1,800 of its strength\* :—

*Table showing the Strength of the Army of Bengal at the different periods of Indian Service, between 1865 and 1870, and the ratio of invaliding in relation to the number of years of residence in India.*

(AN APPROXIMATE STATEMENT.)

SERVICE IN INDIA.	STRENGTH IN EACH YEAR AT THE DIFFERENT PERIODS OF SERVICE.						TOTAL AT EACH PERIOD.	INVALIDED PER 1,000.	
	1865.	1866.	1867.	1868.	1869.	1870.		Army of Bengal, 1865-70.	New Regiments, 1864-70.
Under 1 year ...	3,596	4,785	1,504	6,467	6,550	4,710	27,612	38.53	38.54
1 to 2 years ...	3,721	4,008	4,818	4,111	7,115	4,646	28,419		
2 to 3 " ...	3,100	4,212	3,689	3,208	3,613	5,747	23,569	40.86	40.74
3 to 4 " ...	2,863	2,535	3,842	3,507	3,043	3,552	19,342	45.29	...
4 to 5 " ...	3,759	2,373	2,472	2,190	3,036	2,836	16,666	45.06	...
5 to 6 " ...	3,838	3,094	2,479	2,176	3,319	3,214	18,120	44.92	...
6 to 7 " ...	5,973	4,105	3,472	1,909	2,416	2,688	20,563	44.94	...
Above 7 " ...	12,800	12,175	14,371	10,041	6,864	6,109	62,360	57.65	...
TOTAL OF EACH YEAR	39,650	37,287	36,647	33,609	35,956	33,502	216,651	46.17	...

\* The regiments have, of course, been recruited; I speak of a body whose average strength approximates to 15,000.



And in case it should be objected that the old soldiers who have volunteered from regiments going home from India may have contributed largely to the loss by invaliding of young regiments, I append the following statement, which shows that 100 only, out of the 1,800 invalids, were men who had served beyond three years in India:—

*Statement showing the Number of Soldiers who had served upwards of three years in India, invalided from Regiments in their first three years of Indian Service.*

REGIMENT.	1864.	1865.	1866.	TOTAL.
5th Lancers ...	...	1	3	4
36th Regiment ...	...	1	1	2
55th " ...	...	3	...	3
1-11th Regiment	...	...	6	6
2-12th " ...	...	3	4	7
58th " ...	1	6	...	7
A. Brigade, D. Battery, R. H. Arty.	...	...	...	...
A. " E. " ...	...	1	...	1
A. Brigade, A. Battery, R. H. Arty.	...	...	1	1
A. " B. " ...	...	...	...	...
A. " C. " ...	...	...	...	...
41st Regiment	2	1	7	10
8th Brigade, B. Battery, R. Arty.	...	...	...	...
8th " C. " ...	...	...	...	...
8th " D. " ...	1	...	...	1
1-3rd Regiment	1	...	1	2
1-5th " ...	1	3	5	9
37th " ...	1	...	7	8
8th Brigade, E. Battery, R. Arty.	...	...	1	1
8th " F. " ...	...	...	1	1
8th " G. " ...	...	...	...	...
8th " H. " ...	...	...	2	2
4th Hussars	...	...	4	4
1-6th Regiment	...	1	10	11
2-60th " ...	...	...	...	...
85th " ...	...	...	3	3
92nd " ...	1	1	13	15
1-14th Regiment	...	...	...	...
62nd " ...	1	1	...	2
TOTAL	...	...	...	100

How serious is the import of this loss is further shown in the Table annexed, which shows how the extent of invaliding is affected by length of residence in India. This statement shows, that out of a total of 10,002—the loss from 1865 to 1870—3,122 men were invalided who spent from one to three years only in India. The strength available for the calculation of ratios is carried up to seven years only; but it is remarkable to find, that for the years from the fourth to the seventh the ratio of invaliding is almost identical, which indicates probably that at this period of service the army is at its best,

sustaining year by year a loss which is not, on the one hand, exaggerated by the want of adaptation in the material new to the country, nor, on the other, by the effects of too prolonged exposure to tropical influences :—

*Table showing the extent of Invaliding in relation to Length of Service in India.*

YEARS IN INDIA.	Aggregate of the six years.	INVALIDED IN EACH YEAR.						Invalided per 1,000 of Strength.
		1865.	1866.	1867.	1868.	1869.	1870.	
1 year and under ...	995	184	149	127	164	222	149	38.53
2 years ...	1,164	119	207	129	135	351	223	
3 " ...	963	70	86	170	154	196	287	
4 " ...	796	95	91	145	135	181	149	45.29
5 " ...	751	132	79	111	124	164	141	45.06
6 " ...	814	239	187	55	71	109	153	44.92
7 " ...	924	386	178	144	48	50	118	44.94
8 " ...	867	213	282	176	102	47	47	
			279	251	107	115	43	
				160	106	97	63	
					108	98	73	
						87	101	
							75	
9 " ...	811	16						57.65
10 " ...	469	21	22					
11 " ...	331	28	11	13				
12 " ...	289	20	44	25	12			
13 " ...	130	9	10	15	10	11		
14 " ...	93	14	12	22	18	13	14	
15 " ...	86	20	7	12	13	17	17	
16 " ...	93	26	10	16	17	13	11	
17 " ...	118	30	33	16	19	10	10	
18 " ...	134	26	30	42	22	4	10	
19 " ...	86	18	20	14	24	9	1	
20 " ...	43	10	12	6	6	8	1	
21 " ...	18	4	1	2	5	4	2	
22 " ...	11	2	...	1	2	3	3	
23 " ...	6	...	1	...	...	3	2	
24 " ...	5	1	1	...	1	1	1	
25 " ...	2	1	...	...	...	1	...	
26 " ...	1	1	...	...	...	...	...	
27 " ...	1	...	...	...	1	...	...	
28 " ...	1	...	...	...	1	...	...	
29 " ...	...	...	...	...	...	...	...	
30 " ...	...	...	...	...	...	...	...	
TOTAL ...	10,002	1,685	1,752	1,652	1,405	1,814	1,694	46.17

NOTE.—The space dividing the Table indicates the division between the old army and the new army of 1857-58, which was thirteen years old as regards Indian Service, in 1870.



Is it a matter of necessity that young regiments should suffer this great damage in the early years of residence? This is a question of the gravest moment, and the laws determining disease in the young and unacclimatised demand our most earnest study.

*Deaths of the Army from the chief causes of Mortality in each year from 1865 to 1870, shown in relation to Age.*

DISTRIBUTION ACCORDING TO AGE OF THE ARMY OF THE BENGAL PRESIDENCY, 1865—70.

Year.	Total.	Under 20.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 and upwards.	Total above 30.
1865	39,722	1,453	13,633	16,442	5,755	2,023	416	8,194
1866	37,287	1,250	10,019	15,839	6,899	2,864	416	10,179
1867	36,647	1,796	8,280	15,714	7,634	2,752	471	10,857
1868	33,609	1,642	9,033	12,812	7,127	2,470	525	10,122
1869	35,956	2,331	10,188	11,992	8,290	2,731	424	11,445
1870	33,502	2,037	9,725	10,375	8,022	2,848	495	11,365
Aggregate of the six years	216,723	10,509	60,878	83,174	43,727	15,688	2,747	62,162
					62,162			

*Deaths of the Army from the chief causes of Mortality in each*

CAUSES OF DEATH.	YEAR.	DEATHS OF 1865-70.				DEATHS PER 1,000.				RATIO OF LIABILITY IN PERCENTAGES.				
		Under 20.	20 to 24.	25 to 29.	30 and upwards.	Under 20.	20 to 24.	25 to 29.	30 and upwards.	Under 20.	24.	25 to 29.	30 and upwards.	TOTAL.
CHOLERA	1865	3	27	59	29	2.07	1.98	3.59	3.54	18.52	17.71	32.11	31.66	100
	1866	...	10	22	13	...	1.00	1.39	1.28	...	27.25	37.87	34.88	100
	1867	23	131	183	141	12.81	15.82	11.65	12.99	24.05	29.70	21.87	24.38	100
	1868	7	11	18	21	4.26	1.22	1.41	2.07	47.54	13.62	15.74	23.10	100
	1869	18	158	175	219	7.72	15.51	14.59	19.14	13.55	27.23	25.62	33.60	100
	1870	1	6	7	7	.49	.62	.67	.61	20.50	25.95	28.03	25.52	100
	1865-70	52	343	464	430	4.95	5.63	5.58	6.92	21.45	24.39	24.18	29.98	100
FEVERS	1865	7	47	61	23	4.82	3.45	3.71	2.81	32.59	23.33	25.08	19.00	100
	1866	1	36	39	37	.80	3.59	2.46	3.63	7.63	34.26	23.47	34.64	100
	1867	3	29	25	37	1.67	3.50	1.59	3.41	16.42	34.42	15.63	33.53	100
	1868	10	41	25	15	6.09	4.54	1.95	1.48	43.31	32.29	13.87	10.53	100
	1869	11	75	39	41	4.72	7.36	3.25	3.58	24.96	38.92	17.19	18.93	100
	1870	15	63	32	32	7.37	6.48	3.09	2.82	37.30	32.79	15.64	14.27	100
	1865-70	47	291	221	185	4.48	4.78	2.66	2.98	30.07	32.08	17.85	20.00	100
APOPLEXY	1865	...	11	53	59	...	.81	3.22	7.20	...	7.21	28.67	64.12	100
	1866	2	5	28	27	1.60	.50	1.77	2.65	24.54	7.67	27.15	40.64	100
	1867	1	14	31	43	.55	1.69	1.97	3.06	6.73	20.69	24.11	48.47	100
	1868	3	13	33	43	1.83	1.44	2.58	4.25	18.12	14.26	25.54	42.08	100
	1869	4	21	39	69	1.71	2.06	3.25	6.03	13.10	15.79	24.90	46.21	100
	1870	...	11	10	33	...	1.13	.96	2.90	...	22.64	19.24	58.12	100
	1865-70	10	75	194	274	.94	1.23	2.33	4.41	10.55	13.80	26.15	49.50	100
DELIRIUM TREMENS	1865	...	...	6	11	...	...	.36	1.34	...	...	20.00	80.00	100
	1866	...	...	1	13	...	...	.07	1.28	...	...	5.18	94.82	100
	1867	...	...	3	11	...	...	.19	1.01	...	...	15.83	84.17	100
	1868	...	...	4	8	...	...	.31	.79	...	...	28.18	71.82	100
	1869	...	...	4	17	...	...	.34	1.49	...	...	18.58	81.42	100
	1870	...	...	2	7	...	...	.19	.61	...	...	23.75	76.25	100
	1865-70	...	...	20	67	...	...	.24	1.08	...	...	18.18	81.82	100
DYSENTERY AND DIARRHŒA	1865	1	21	55	31	.69	1.54	3.34	3.78	7.38	16.47	35.72	40.43	100
	1866	1	12	31	30	.80	1.20	1.96	2.95	11.58	17.37	28.36	42.69	100
	1867	...	10	36	37	...	1.21	2.29	3.41	...	17.51	33.14	49.35	100
	1868	3	13	21	17	1.83	1.44	1.64	1.68	27.77	21.85	24.88	25.50	100
	1869	1	38	36	47	.43	3.73	3.00	4.11	3.82	33.09	26.62	36.47	100
	1870	...	17	13	37	...	1.75	1.25	3.26	...	27.95	19.97	52.08	100
	1865-70	6	111	192	199	.57	1.82	2.31	3.20	7.21	23.04	29.24	40.51	100
HEPATITIS	1865	...	16	57	46	...	1.18	3.47	5.61	...	11.50	33.82	54.68	100
	1866	...	11	45	35	...	1.10	2.84	3.44	...	14.91	38.48	46.61	100
	1867	...	7	36	47	...	.85	2.29	4.33	...	11.38	30.66	57.96	100
	1868	...	20	38	50	...	2.21	2.96	4.94	...	21.86	29.28	48.86	100
	1869	1	29	46	95	.43	2.85	3.84	8.30	2.79	18.48	24.90	53.83	100
	1870	...	22	31	66	...	2.26	2.99	5.81	...	20.43	27.04	52.53	100
	1865-70	1	105	253	339	.09	1.73	3.04	5.45	.87	16.78	29.49	52.86	100
PHTHISIS	1865	...	12	27	15	...	.88	1.64	1.83	...	20.23	37.70	42.07	100
	1866	...	10	29	18	...	1.00	1.83	1.77	...	21.74	39.78	38.48	100
	1867	...	11	19	18	...	1.33	1.21	1.66	...	31.67	28.81	39.52	100
	1868	1	11	18	19	.61	1.22	1.41	1.88	11.91	23.83	27.54	36.72	100
	1869	1	20	15	37	.43	1.96	1.25	3.23	6.26	28.53	18.19	47.02	100
	1870	1	8	14	26	.49	.82	1.35	2.29	9.90	16.57	27.27	46.26	100
	1865-70	3	72	122	133	.29	1.18	1.47	2.14	5.71	23.23	28.94	42.12	100



year from 1865 to 1870, shown in relation to Age,—continued.

CAUSES OF DEATH.	YEAR.	DEATHS OF 1865-70.				DIED PER 1,000.				RATIO OF LIABILITY IN PERCENTAGES.				
		Under 20.	20 to 24.	25 to 29.	30 and upwards.	Under 20.	20 to 24.	25 to 29.	30 and upwards.	Under 20.	20 to 24.	25 to 29.	30 and upwards.	TOTAL.
HEART DISEASES	1865	1	1	15	23	·69*	·07	·91	2·81	15·40*	1·56	20·31	62·73	100
	1866	...	8	10	26	...	·80	·63	2·55	...	20·10	15·83	64·07	100
	1867	...	1	17	23	...	·12	1·08	2·12	...	3·61	32·53	63·86	100
	1868	1	1	12	28	·61*	·11	·94	2·77	13·77*	2·48	21·22	62·53	100
	1869	...	...	12	41	...	...	1·00	3·58	...	...	21·83	78·17	100
	1870	...	...	11	38	...	...	1·06	3·34	...	...	24·09	75·91	100
	1865-70	2	11	77	179	·19	·18	·92	2·88	4·56	4·32	22·06	69·06	100
ALL OTHER CAUSES	1865	...	33	74	77	...	2·42	4·50	9·40	...	14·83	27·57	57·60	100
	1866	2	26	80	79	1·60	2·59	5·05	7·76	9·41	15·23	29·71	45·65	100
	1867	3	16	56	69	1·67	1·93	3·57	6·35	12·35	14·28	26·41	46·96	100
	1868	2	23	39	66	1·22	2·54	3·04	6·52	9·16	19·07	22·82	48·95	100
	1869	3	32	55	88	1·29	3·14	4·59	7·69	7·72	18·79	27·47	46·02	100
	1870	1	37	65	106	·49	3·80	6·27	9·33	2·46	19·11	31·52	46·91	100
	1865-70	11	167	369	485	1·05	2·75	4·44	7·80	6·55	17·14	27·68	48·63	100
ALL CAUSES	1865	12	168	407	314	8·27	12·33	24·74	38·32	9·89	14·74	29·57	45·80	100
	1866	6	118	285	278	4·80	11·78	18·00	27·31	7·76	19·03	29·08	44·13	100
	1867	30	219	406	426	16·70	26·45	25·84	39·24	15·43	24·44	23·87	36·26	100
	1868	27	133	208	267	16·45	14·72	16·24	26·38	22·29	19·95	22·01	35·75	100
	1869	39	373	421	654	16·73	36·61	35·11	57·15	11·49	25·15	24·11	39·25	100
	1870	18	164	185	352	8·84	16·86	17·83	30·97	11·87	22·63	23·93	41·57	100
	1865-70	132	1,175	1,912	2,291	12·56	19·30	22·99	36·86	13·70	21·04	25·07	40·19	100
ALL CAUSES, EX- CLUDING CHOLERA	1865	9	141	348	285	6·20	10·35	21·15	34·78	8·56	14·28	29·18	47·98	100
	1866	6	108	263	265	4·80	10·78	16·60	26·03	8·24	18·52	28·52	44·72	100
	1867	7	88	223	285	3·90	10·63	14·19	26·25	7·09	19·34	25·82	47·75	100
	1868	20	122	190	246	12·18	13·51	14·83	24·30	18·79	20·84	22·88	37·49	100
	1869	21	215	246	435	9·01	21·10	20·52	38·01	10·17	23·80	23·15	42·88	100
	1870	17	158	178	345	8·35	16·24	17·16	30·36	11·58	22·52	23·80	42·10	100
	1865-70	80	832	1,448	1,861	7·61	13·67	17·41	29·94	11·09	19·92	25·37	43·62	100

\* The equivalent of a single case.





## III.

TAINED IN THE PRECEDING SECTIONS AND DEDUCED FROM THE MEDICAL FIRST YEAR OF INDIAN SERVICE.

which I have inculcated in general terms in the first section, namely, that there and mortality in new and old regiments. These tables show how the ratios for together differ. It is impossible to over-estimate the importance of the lessons that troops new to India must be most tenderly cared for, if we would avoid a Indian service. I have not selected these six illustrations; they are the whole. But had I been able to bring forward as many more, the truth illustrated would

BENARES, 1865.				MEERUT, 1867.				MEERUT, 1868.			
New Regiment, H. M.'s 68th.	Strength	Total admissions	Fever admissions	New Regiment, H. M.'s 1-3rd.	Strength	Total admissions	Fever admissions	New Regiment, 4th Hussars (arrived in the beginning of March).	Strength	Total admissions	Fever admissions
	Number daily sick	Deaths—All causes, exclud- ing Cholera	" Cholera		Number daily sick	Deaths—All causes, exclud- ing Cholera	" Cholera		Number daily sick	Deaths—All causes, exclud- ing Cholera	" Cholera
	...	...	...		...	...	...		...	...	...
	...	...	...		...	...	...		...	...	...
Old Troops, 7th Dragoon Guards and Artillery.	...	...	...	Old Troops, 19th Hussars and Artillery.	...	...	...	Old Troops, Artillery.	...	...	...
	...	...	...		...	...	...		...	...	...
	...	...	...		...	...	...		...	...	...
	...	...	...		...	...	...		...	...	...
New Regiment, H. M.'s 68th.	...	...	...	New Regiment, H. M.'s 1-3rd.	...	...	...	New Regiment, 4th Hussars (arrived in the beginning of March).	...	...	...
	...	...	...		...	...	...		...	...	...
	...	...	...		...	...	...		...	...	...
	...	...	...		...	...	...		...	...	...
Old Troops, 7th Dragoon Guards and Artillery.	...	...	...	Old Troops, 19th Hussars and Artillery.	...	...	...	Old Troops, Artillery.	...	...	...
	...	...	...		...	...	...		...	...	...
	...	...	...		...	...	...		...	...	...
	...	...	...		...	...	...		...	...	...

† Wing marched for Darjeeling.

\* Volunteers to other regiments struck off before the regiment went home.



## AGGREGATE OF THE PRECEDING TABLE.

*Acclimatised Regiments contrasted with Regiments in their First Year of Indian Service  
cantonment in the same Station in the same year.*

		Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.	For the year.
STRENGTHS	New Troops	2,351	2,138	4,246	4,207	4,195	4,134	4,122	4,085	3,979	3,932	4,111	3,820	3,777
	Old Troops	2,366	2,237	4,488	4,315	4,257	4,251	4,242	4,218	4,174	4,166	4,000	3,828	3,878
TOTAL ADMISSIONS	New Troops	285	216	542	653	815	941	622	955	1,084	608	564	372	7,655
	Old Troops	232	194	526	440	430	384	420	571	497	455	335	245	4,729
FEVER ADMISSIONS	New Troops	18	24	87	177	306	493	260	305	277	192	134	72	2,345
	Old Troops	19	15	55	48	65	97	120	142	106	122	59	26	874
NUMBER DAILY SICK	New Troops	111	111	242	317	365	440	389	385	424	380	315	342	318
	Old Troops	109	111	254	242	232	220	246	237	238	233	184	125	203
TOTAL DEATHS, EXCLUDING CHOLERA	New Troops	1	1	2	10	29	21	10	22	23	22	11	13	165
	Old Troops	2	3	4	3	2	5	1	7	9	7	4	6	53
CHOLERA DEATHS	New Troops	3	...	...	6	...	...	...	55	117	2	...	...	183
	Old Troops	...	...	...	...	...	...	1	13	14	...	...	...	28

*Ratios of Sickness and Mortality in the New and Old Troops contrasted.*

ADMISSION-RATE PER 1,000	New Troops	120.4	101.0	127.7	155.2	194.3	227.6	150.9	233.8	272.4	154.6	137.2	97.4	2026.8
	Old Troops	98.3	86.7	117.2	102.0	101.0	90.3	99.0	135.4	119.1	109.2	83.7	64.0	1219.4
FEVER-RATE PER 1,000	New Troops	7.7	11.2	20.5	42.1	73.0	119.3	63.1	74.7	69.6	48.8	32.6	18.9	620.9
	Old Troops	8.1	6.7	12.3	11.1	15.3	22.8	28.3	33.7	25.4	29.3	14.7	6.8	225.4
DAILY SICK-RATE PER 1,000	New Troops	47.2	51.9	57.0	75.4	87.0	106.4	94.4	94.2	106.6	96.6	76.6	89.5	84.2
	Old Troops	46.2	49.6	56.6	56.1	54.5	51.8	58.0	56.2	57.0	55.9	46.0	32.7	52.4
DEATH-RATE PER 1,000 FROM ALL CAUSES, EXCLUDING CHOLERA	New Troops	.4	.5	.5	2.4	6.9	5.1	2.4	5.4	5.8	5.6	2.7	3.4	43.7
	Old Troops	.8	1.3	.9	.7	.5	1.2	.2	1.7	2.2	1.7	1.0	1.6	13.7
DEATH-RATE PER 1,000 FROM CHOLERA	New Troops	1.3	...	...	1.4	...	...	...	13.5	29.4	.5	...	...	48.5
	Old Troops	...	...	...	...	...	...	.2	3.1	3.4	...	...	...	7.2

The bodies compared are in all cases of nearly equal strength, and the aggregate shown in either case is almost identical. There is but the one difference—the old regiments are composed of acclimatised men, while the new are meeting for the first time the influences peculiar to an Indian climate.

And these are the results:—

(PER 1,000 OF STRENGTH.)

	Admission-rate.	Fever-rate.	Daily Sick-rate.	Death-rate.	Cholera Death-rate.
New Troops	2026.8	620.9	84.2	43.7	48.5
Old Troops	1219.4	225.4	52.4	13.7	7.2

It may be thought that there is something special in the conditions under which the cholera death-rate is so immensely exaggerated in the case of the new troops. The illustration is undoubtedly very striking; but I regard it as showing only in a clearer light the truth, that the unacclimatised, when debilitated towards the close of their first hot season, succumb as a body when the universal epidemic influence declares its presence.

Four of these illustrations teach the same thing, and the case of the Buffs suggests how great is the risk when the year of arrival in India proves to be a year in which an epidemic is in progress:—

*Cholera Deaths of Old and New Regiments cantoned together.*

	Lucknow, 1864.	Lucknow, 1869.	Benares, 1865.	Meerut, 1869.
New Troops	...	27	42	9
Old Troops	...	11	11	None.

The death-rate for all diseases, excluding cholera, is among the old troops, 13.7 per 1,000, and among the new, 43.7, or 30 per 1,000 in excess in the case of the new. The diseases of the hot months tell excessively against the new



soldier. In May and June, among the new troops, 12 per 1,000 are shown as having died, against 1·7 among the old. The diseases of the monsoon season, from August to October, are equally in excess in the body of recently arrived men; they give a ratio of 16·8 in the new, in contradistinction to a ratio of 5·6 in the old.

I have remarked before, that malaria plays no important part in the statistics of troops in their first year, which are arranged in this series of tables. The fever-rate shown in the table now under consideration rapidly and steadily diminishes through the malarious season, that is, from August to the end of the year. Bowel complaints and visceral congestions take the place of the fevers of the hot months under the altered meteorology; and while men die from dysentery, as well as from heat fevers and heat apoplexy before the rains set in, dysentery and hepatitis culminate naturally under the meteorology of the monsoon season. The fevers of the unacclimatised here shown are pure heat fevers. The admission-rate for fever in June is 119 per 1,000 in the new regiments, and 23 in the old; in May it is 73 against 15, and in April 42 against 11. The daily sick-rate and the general admission-rate show the same exaggerations in relation to season.

*Ratios of Sickness, Mortality, and Invaliding in the First and Second Years of Indian Service contrasted in the same Regiments.*

REGIMENTS.	ADMISSION-RATE PER 1,000.		DAILY-RATE PER 1,000.		DAILY-RATE, EXCLUDING CHOLERA.		INVALIDING-RATE PER 1,000.	
	First Year.	Second Year.	First Year.	Second Year.	First Year.	Second Year.	First Year.	Second Year.
36th Regiment	2,427	1,840	79·81	9·90	44·74	9·90	67·71	38·46
55th Regiment	994	800	30·55	4·02	17·31 <sup>a</sup>	4·02	8·15	47·57*
5th Lancers	1,479	1,940	43·93	58·70*	41·84	39·34	10·46	26·92
1-11th Regiment	1,510	1,140	64·44	39·34	51·31	23·75	39·38	34·44
2-12th Regiment, Wing	1,100	970	20·73	12·17	20·73 <sup>b</sup>	12·17	45·35	65·70
" "	1,610	1,090	24·34	8·73	24·34 <sup>c</sup>	8·73	42·69	48·03
58th Regiment	2,520	1,780	55·63	38·24	43·99	26·47	54·54	50·00
A. Brigade, D. Battery, R. H. Art.	2,273	1,170	83·33	15·15	83·33	15·15	30·30	53·03
" E. " "	1,430	900	7·41	No deaths.	7·41	...	74·07	51·85
" B. " "	1,880	1,550	19·70	54·52	13·70	34·01	75·34	61·22
" C. " "	2,060	1,740	55·94	30·08	55·94	15·04	76·92	67·67
41st Regiment	1,620	1,500	49·30	14·49	49·30	7·25	28·17	86·96
8th Brigade, B. Battery, R. Art.	1,600	1,340	28·68	14·09	26·18	14·09	31·17	44·60
" C. " "	1,850	1,790	41·96	28·37	41·96	21·28	48·95	106·38
" D. " "	1,280	1,090	27·59	13·61	27·59	13·61	27·59	54·42
1-3rd Regiment	1,370	1,140	34·25	34·25	13·70	34·25	54·80	54·80
1-5th " "	1,560	950	165·87	18·37	41·24	18·37	20·62	27·55
37th " "	1,400	1,140	25·57	12·23	17·05 <sup>d</sup>	12·23	15·62	23·23
8th Brigade, E. Battery, R. Art.	1,000	720	13·18	11·15	10·25 <sup>e</sup>	11·15	29·28	22·30
" F. " "	1,367	1,420	50·36	29·63	50·36	14·82	21·58	59·26
" G. " "	1,298	1,280	49·65	74·07	49·65	74·07	35·46	88·89
" H. " "	1,134	1,510	70·92	27·59	70·92	6·90	14·18	48·28
4th Hussars	1,538	1,510	27·58	21·07	20·68	21·07	34·48	56·74
1-6th Regiment	1,961	1,500	23·66	21·66	23·66 <sup>f</sup>	21·66	45·16	83·15
" " "	1,501	1,970†	24·30	21·66	24·30 <sup>g</sup>	21·66	7·67	32·49
2-60th " "	1,313	1,390	26·55	24·63	21·40 <sup>h</sup>	12·32	21·49	51·72
85th Regiment	1,931	2,080	28·13	31·41	28·13	28·80	15·35	52·36
92nd " "	1,871	3,590†	39·59	46·05	39·59	17·22	16·60	59·04
62nd " "	1,241	950	105·52	23·17	53·96	41·32	34·77	26·83
1-14th " "	1,260	1,780‡	31·58	15·66	18·42 <sup>i</sup>	15·66	11·84	90·36

(a) Hazarebagh. (b) Bas Bareilly. (c) Secapore. (d) Ferozepore. (e) Bareilly. (f) Meerut. (g) Rawalpindi. (h) Fort William. (i) Cawnpore.

\* Exposed in Rhoadan in the beginning of the second year, and afterwards stationed at Dum-Dum.

† Epidemic malaria of 1900.

‡ This regiment had 300 admissions from venereal affections.



I have placed here the table which precedes, to show in detail, regiment by regiment, what I have already exhibited in the aggregate in the first section of this paper. The annual admission-rates, death-rates, and invaliding-rates of the second year for each regiment and battery are shown in contrast with the rates of the first year. The general facts hold—that by the diminution of the liability to succumb to heat influence, the admission-rate is considerably less in the second year; that the death-rate is remarkably and consistently low in the second year; and that the invaliding-rate of the second year is normally nearly doubled, as contrasted with the rate in the first year of residence.

Many disturbing elements enter into the composition of the admission-rate, and some of these I have noted at the foot of the table. It is very important to know how new troops have been affected by residence in special localities, and for future reference I have indicated the stations in which the death-rate of regiments in the first year did not exceed 25 in the 1,000.

The general laws which determine the aggregate ratios I have sketched in the first section. These I shall illustrate more in detail from the history of the old army in years subsequent to 1858.

Sir Ranald Martin has very well stated the truth, that while the tendency of the British soldier in India is to deterioration and decay, there is acclimatisation to heat, where the constitution is capable of adaptation. The constitution of the young is capable of adaptation. The old soldier landed in India dies or is invalided; and the old soldiers are the men above thirty.

The table annexed illustrates very beautifully the adaptation of the army of 1858 to heat influence. The diseases developed under heat influence in the newly-arrived, I have shown to be heat fevers, heat apoplexy, and dysentery. We follow the ratios of the army of 1858 onwards to 1863, up to which time no new regiment had been added, and the progressive diminution of the ratios for the diseases of the unacclimatised is more than remarkable:—

*Table showing the gradual diminution of the ratios for Heat Fevers, Heat Apoplexy, and Dysentery in the new Army between 1858 and 1863.*

(PER 1,000 OF STRENGTH.)

	HEAT FEVERS.		HEAT APOPLEXY.		DYSENTERY.	
	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
1858	772.9	16.72	42.9	17.77	202.6	27.14
1859	459.4	5.66	8.7	4.10	118.7	10.20
1860	350.5	4.26	6.2	2.56	75.2	4.68
1861	274.8	3.21	2.2	1.34	65.5	3.67
1862	217.3	2.76	1.8	1.19	48.8	2.66
1863	149.6	2.10	2.3	1.09	47.0	2.48

The significance of the above table seems to be this—that every individual landing in India is obliged to pass through a process of adaptation to heat, and that when this is completed he is left in a position better calculated to withstand the influences of the hot season. This acclimatising process need not result in disease. In the young man's constitution the balance between the normal relations of the vascular system and the controlling nervous influence, may never be disturbed or destroyed; but the tendency to end in disease is strong, and any attempt to force the process must terminate in disaster. This is the meaning of the excessive admission-rates and death-rates in the young regiments.

The old man's constitution is little capable of adaptation, and under exposure he dies. The loss of old men in recently-arrived regiments in 1858 was so great as to attract special notice.

The old men of the 6th and 73rd Regiments in particular suffered; indeed, so rapidly did they die off in the case of the 6th, that the regiment was ordered into cantonments at once, and the Commander-in-Chief expressed his fears that under longer exposure the regiment would be rendered useless for service.



I cannot state assuredly that the numbers given in the Regimental Annual Returns, from which the annexed statements are copied, are absolutely correct, and that the ratios are applicable to the precise numbers opposite to which they are placed; but in any case the figures prove how enormous is the loss among old and unacclimatised men when exposed in India to the contingencies of warfare:—

*Loss by Death in H. M.'s 6th and 73rd Regiments in 1858, showing the great liability to death under exposure of men above 30 recently landed in India.*

		Under 20.	20 to 24.	25 to 29.	30 to 35.	Above 35.	Un-known.
H. M.'s 6th Regt.	Strength	143	326	196	83	23	43
	Deaths	4	30	18	38	23	...
	Died per 1,000	28	92	92	458	1,000	...
H. M.'s 73rd Regt.	Strength	22	597	86	41	19	...
	Deaths	1	36	22	21	17	...
	Died per 1,000	45	60	256	512	895	...

Out of these 210 deaths, 165 were caused by heat fevers, heat apoplexy, and acute dysentery. The 6th, exposed in the Shahabad campaign, lost 51 men by apoplexy, 24 by dysentery, and 23 by fever; in the 73rd, dysentery came to the top with 41 deaths, heat fevers gave 21 deaths, and apoplexy 5 only.

Distributed by months, these 165 deaths fall thus\* :—

	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Total.
Heat Fever	4	12	8	6	4	6	2	1	—	1	...	...	44
Heat Apoplexy	—	28	28	...	...	...	...	...	...	...	...	...	56
Dysentery	2	10	3	—	10	17	6	5	5	5	...	...	65
TOTAL	6	50	39	6	14	23	8	6	5	6	...	2	165

The interval between the two manifestations of dysentery, the hot weather and the monsoon culminations, is perfectly marked; heat apoplexy disappears with the clouding over of the sky in July; and heat fever, holding a middle place in its physiological relations between heat apoplexy and dysentery, commencing with a heavy mortality in May and June, is continued until the setting-in of the cold season.

These three causes of death accounted for 82 per cent. of the mortality in the war provinces of 1858. It is interesting to note how their relation to the total mortality changes as the army gets older :—

*Died from Heat Fever, Heat Apoplexy, and Dysentery, per cent. of the total deaths from 1858 to 1863.*

1858.	1859.	1860.	1861.	1862.	1863.
80.44	66.80	47.77	37.11	35.98	31.52

The exposure of 1858 raised the admission-rate for hepatitis very little above the average.

There is no acclimatisation to hepatitis, and in the years from 1858 to 1863 the admission-rate shows but little variation. Hepatitis is, in short, a disease of deterioration, not of acclimatisation :—

The Hepatitis of the Army of India is a disease of deterioration, rather than an acute disease developed under exposure.

*Admission-rate per 1,000 of Strength for Hepatitis.*

1858.	1859.	1860.	1861.	1862.	1863.
67.0	67.0	63.7	60.4	62.4	63.7

The 6th and 73rd Regiments, out of a total mortality of 210, returned 3 deaths only under the head of hepatitis, and the same thing was observed in

\* Previous to 1860, the annual returns were prepared for the twelve months from 1st April to 31st March; this table includes the months from April 1858 to March 1859.



the case of many other regiments. Taking ten regiments, the phenomenon was shown thus:—

*Number of Deaths from Dysentery in the Unacclimatised contrasted with the number of Deaths from Hepatitis.*

(MORTALITY OF NEW REGIMENTS IN 1858.)

Regiment.	Deaths from Hepatitis.	Deaths from Dysentery.
Her Majesty's 6th Regiment ...	1	24
13th " ...	1	18
38th " ...	...	44
48th " ...	3	48
2-60th " ...	...	18
73rd " ...	2	41
79th " ...	1	26
97th " ...	5	48
Rifle Brigade, 2nd Battalion ...	4	33
3rd " ...	1	20
TOTAL ...	18	320

Many of the men who died in the 6th and 73rd Regiments were hard drinkers. Nothing is more inimical to the acclimatising process than the habitual use of alcohol. Intemperance in the old soldier almost certainly leads to death under exposure to heat.

The old man new to India dies from heat apoplexy or delirium tremens, or from both; for heat apoplexy is the usual termination of delirium tremens in the hot season. The Surgeon of the 2nd Dragoon Guards, writing in 1860, makes the following remarks in his Annual Return:—

"There were but 15 men in the regiment above 35 years of age; among these, 8 deaths are recorded for the year. Among the young men under 20, numbering 218, not a single death occurred. In most of the old men, death was probably the result, directly or indirectly, of drink. There have been a great many cases of delirium tremens, and they were chiefly, indeed almost exclusively, confined to the Non-Commissioned Officers."

This quotation affords a text on which I might enlarge to any extent. It is a truth that the old soldier in India does drink, and the steady and well-behaved old soldier is too often no exception to the general rule. In the last seven years, 106 deaths from delirium tremens have been recorded, and of these 20 only have occurred in Privates, Sergeants affording no fewer than 86 deaths out of the total.

The 1-11th Regiment, which arrived in India in the beginning of 1865, suffered heavily in its old men before it had been six months in the country. The strengths on landing are noted as under, and the following were the deaths up to the 30th June:—

	Under 20	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 and upwards.
Strength ...	10	563	188	67	12	4
Died ...	...	1	5	8	3	3

These deaths were all caused by heat fever and heat apoplexy, to which the free use of alcohol predisposed. The Surgeon of the Regiment gives the following explanation:—"The larger portion of those seized were of a decided intemperate character, and many of them craving drunkards. The predisposing causes may have been in many intemperance, and the period of life between 30 and 40 years of age." And he adds regarding the only man who died out of 573 below 24 years of age—"The patient looked older, and he had been much exposed to the influence of the sun, and was brought to the hospital drunk."

The lesson taught by this case is, that it is useless to send to India with their regiments men above 30 who are known to be habitual drunkards. All the figures brought together in the second section show that it is not the man above 30 who is efficient for service in India; and if in addition to his age the old soldier brings with him habits of intemperance, the chances are much in favor of his dying or being invalided before the end of his third year of service. The deterioration of the British soldier is what is to be expected. Our invaliding ratios show that with an army composed of a certain relative number of old and new troops, a standard is reached which may be considered permanent; and our Death Tables tell us, that in all diseases of deterioration, it is the old soldier who goes to the bad, whether by a rapid or a slow process of decay.



Let me place here once more the figures showing the liability of men above 30 to die, as illustrating what is meant in speaking of the deterioration of the British soldier. I shall not as before divide off the boys below 20, but class the men in three groups:—

A steady process of deterioration goes on during Indian Service, and becomes almost universally manifest in the old men as a class.

*Ratio of liability to death of young men, men of mature age, and old men contrasted, on the results of the period 1865—70.*

	24 and under.	25 to 29.	30 and upwards.	TOTAL.
Heat Apoplexy	15.01	29.38	55.61	100
Delirium tremens	00	18.18	81.82	100
Dysentery	22.94	32.31	44.75	100
Hepatitis	14.93	30.46	54.61	100
Phthisis pulmonalis	22.53	31.55	45.92	100
Heart disease	4.52	23.12	72.36	100
All other causes	16.90	30.14	52.96	100
All causes (excluding Cholera)	21.24	28.96	49.80	100

The loss per 1,000 of strength from the same causes stands thus:—

	24 and under.	25 to 29.	30 and upwards.
Heat Apoplexy	1.19	2.33	4.41
Delirium tremens	00	2.4	1.08
Dysentery	1.64	2.31	3.20
Hepatitis	1.49	3.04	5.45
Phthisis pulmonalis	1.05	1.47	2.14
Heart disease	1.18	92	2.88
All other causes	2.49	4.44	7.80
All causes	12.77	17.41	29.94

These statements contain no exaggeration of the truth; and the enormously increased ratio in the case of the old, from diseases of deterioration, means simply that the British soldier can withstand the effects of climate for a limited period only. The army, viewed as a body, can never be expected to furnish a large proportion of old soldiers, adapted by length of residence to withstand under exposure the influences to which the young men will succumb.

The invaliding teaches the same thing. In the previous section I have shown that it is the old men as a class who furnish the invalids, and that diseases of deterioration—diseases special to the old—form the chief components of the invaliding-rates. These are the diseases which determine the invaliding standard attained during the past six years (a standard which is consistently maintained):—

*Invaliding Ratios of the Bengal Army for the Ten Years 1861 to 1870.*

CAUSES OF INVALIDING.	INVALIDED PER 1,000 OF STRENGTH.									
	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.
Fevers	1.96	1.74	2.01	1.63	1.58	2.51	3.15	2.69	4.05	4.84
Dysentery and Diarrhoea	2.54	1.46	1.59	1.63	2.91	2.43	2.51	1.72	3.51	2.64
Hepatitis	3.81	4.84	5.18	5.05	6.31	7.74	6.24	6.22	7.17	8.06
Phthisis pulmonalis	1.56	1.88	2.03	3.32	3.09	3.74	3.09	3.66	4.73	3.72
Heart diseases	1.49	1.68	1.67	3.00	3.47	3.29	3.70	3.85	4.65	3.47
Respiratory diseases	1.34	.93	1.22	1.19	1.45	1.85	.87	1.49	2.19	1.46
Mental affections	.60	.74	.72	.64	1.00	1.05	.49	.90	.96	.56
Epilepsy	.45	.54	.74	.77	.67	1.23	.72	.45	.87	.78
Rheumatism	3.81	5.45	5.47	3.81	5.35	4.11	3.64	3.17	3.48	3.56
Syphilis	.98	2.28	2.42	2.38	3.20	3.66	2.89	2.98	3.36	3.04
Anemia and Debility	2.65	4.00	3.72	5.20	8.89	9.03	11.68	10.13	10.40	11.04
All other causes	6.90	5.96	8.20	8.13	8.95	8.40	8.30	8.33	8.61	9.33
ALL CAUSES	28.09	31.50	34.97	36.75	46.87	49.04	47.28	45.49	53.98	52.50

That we shall by any means adequately counterbalance the effects of the climate of India is not to be expected. The problem is, how far below 7 per cent., which, at a low estimate, is the present loss, we can reduce the annual loss by death and invaliding, which is to be made good by recruiting in England:—

*Aggregate Loss per 1,000 by Death and Invaliding in each year from 1860 to 1870.*

1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.
80.88	74.02	59.61	60.05	57.85	71.11	69.15	78.23	66.38	96.87	74.40



How soon the climate begins to tell on the constitution of the newly-	the causes of invaliding
Details of invaliding in the early years nearly the same in all regiments.	the second and third years

*Invaliding of the Regiments and Batteries which landed from England between 1864 and 1869.*

*Invaliding of First Year.*

CAUSES OF INVALIDING.	Total Invalided.	1884.			1885.			1886.			1887.				1888.					1889.							
		8th Lancers.	30th Regiment.	50th Regiment.	A. D. Royal Horse Artillery.	A. B. Royal Horse Artillery.	A. C. Royal Horse Artillery.	A. A. Royal Horse Artillery.	A. B. Royal Horse Artillery.	A. C. Royal Artillery.	S-D. Royal Artillery.	1-3rd Regiment.	1-6th Regiment.	37th Regiment.	S-E. Royal Artillery.	S-F. Royal Artillery.	S-G. Royal Artillery.	S-H. Royal Artillery.	4th Hussars.	1-6th Regiment.	2-6th Regiment.	85th Regiment.	92nd Regiment.	67th Regiment.	1-14th Regiment.		
Fever and Insolation	36	1	11	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
Dysentery	48	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
Hepatitis	49	...	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
Spleen disease	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		
Phthisis pulmonalis	95	39	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4			
Rheumatism	25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			
Syphilis	25	1	...	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
Heart disease	33	2	...	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
Bronchitis	11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			
Ophthalmia	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			
Otitis and Deafness	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			
Mental affections	16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			
Cephalgia	6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			
Epilepsy	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			
Injuries	10	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			
Debility from climate	16	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			
All other causes	33	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			
ALL CAUSES	418	5	56	8	4	10	11	11	4	25	6	4	8	14	8	20	3	5	2	5	21	6	17	12	13	29	9

*Invaliding of Second Year.*

	1865.		1866.		1867.		1868.		1869.		1870.	
	...	...	...	...	...	...	...	...	...	...	...	...
Fever and Insolation	40	1	1	1	2	...	3	1	1	...	1	1
Dysentery	53	4	14	1	...	3	2	1	1	...	1	5
Hepatitis	122	2	4	13	2	1	2	1	1	4	...	26
Spleen disease	3	...	1	...	...	...	...	...	...	...	...	...
Phthisis pulmonalis	82	9	5	7	...	...	4	1	...	1	...	3
Rheumatism	38	2	1	5	1	1	1	2	1	2	...	1



arrived is proved by this table, which shows how, taking regiment by regiment, are the same in all, and how the diseases of deterioration are general even in of Indian Service:—

	Invaliding of Third Year.															ALL CAUSES
	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	
Syphilis	35	2	1	2	1	1	2	3	3	3	3	3	3	3	3	...
Heart disease	89	5	1	1	1	1	1	1	1	1	1	1	1	1	1	...
Bronchitis	32	1	1	1	1	1	1	1	1	1	1	1	1	1	1	...
Ophthalmia	10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	...
Otitis and Deafness	10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	...
Mental affections	12	1	1	1	1	1	1	1	1	1	1	1	1	1	1	...
Cephalaea	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	...
Epilepsy	7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	...
Injuries	23	3	3	3	3	3	3	3	3	3	3	3	3	3	3	...
Debility from climate	101	5	2	5	1	3	3	3	3	3	3	3	3	3	3	...
All other causes	55	1	1	1	1	1	1	1	1	1	1	1	1	1	1	...
ALL CAUSES	717	13	29	47	29	49	41	7	7	9	9	9	12	37	15	...
Invaliding of Third Year.																
	Invaliding of Third Year.															ALL CAUSES
	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	
Fever and Insolation	51	3	2	3	3	3	3	3	3	3	3	3	3	3	3	...
Dysentery	26	3	3	3	3	3	3	3	3	3	3	3	3	3	3	...
Hepatitis	93	3	3	3	3	3	3	3	3	3	3	3	3	3	3	...
Spleen disease	4	2	4	4	4	4	4	4	4	4	4	4	4	4	4	...
Phthisis pulmonalis	46	2	4	4	4	4	4	4	4	4	4	4	4	4	4	...
Rheumatism	56	5	5	5	5	5	5	5	5	5	5	5	5	5	5	...
Syphilis	40	2	2	2	2	2	2	2	2	2	2	2	2	2	2	...
Heart disease	43	1	2	2	2	2	2	2	2	2	2	2	2	2	2	...
Bronchitis and Pleurisy	28	2	2	2	2	2	2	2	2	2	2	2	2	2	2	...
Ophthalmia	9	4	4	4	4	4	4	4	4	4	4	4	4	4	4	...
General debility	108	4	4	4	4	4	4	4	4	4	4	4	4	4	4	...
Injuries	10	3	3	3	3	3	3	3	3	3	3	3	3	3	3	...
All other causes	113	3	3	3	3	3	3	3	3	3	3	3	3	3	3	...
ALL CAUSES	627	16	43	30	29	47	19	5	6	10	8	7	7	47	52	...



We may accept as true the general opinion prevalent of late years, that young lads below 20 are very apt to suffer severely from sickness in the first year; and it is certain that the ratios both of death and invaliding have been much higher among newly-arrived soldiers below 24 than in theory they should be. We may, therefore, with advantage seek to ascertain what are the diseases to which the young lads are chiefly liable, and how the effects of the agencies causing these diseases may best be mitigated:—

*Deaths of boys of 20 and below 20, 1865—70.*

	Below 20.	20 years of age.	TOTAL.
Cholera ...	52	51	103
Continued Fever ...	47	66	113
Heat Apoplexy ...	10	19	29
Dysentery ...	6	10	16
Phthisis pulmonalis ...	3	10	13
Hepatitis ...	1	4	5
Heart disease ...	2	2	4
All other causes ...	11	16	27
All causes ...	132	178	310
Excluding cholera ...	80	127	207

Cholera accounts for one-third of the mortality of the boys shown in this table. It is obvious, therefore, that young lads should not, if it can be avoided, be placed in a position where they are likely to meet cholera in epidemic strength. Youth does not save the boys, and their want of acclimatisation tells against them in the encounter with cholera.

In the routine of cantonment life, the death-rate for dysentery is not exaggerated in the young, and among them the hepatitis of deterioration has scarcely been developed; these two causes give but 21 deaths out of the total. Phthisis, which, as we shall see, is very apt to be developed during the acclimatising process, comes next, with 13 deaths. Heart disease shows 4 deaths only, and this number has perhaps been increased by error in diagnosis. Of the total of 27 deaths under the head "All other causes," accidental deaths account for more than half, and the other items are insignificant.

Of the total of 207 deaths, excluding cholera deaths, 142 were caused by continued fevers and heat apoplexy—113 by fever, and 29 by apoplexy. Heat apoplexy is, as a rule, but another stage of heat fever; and, virtually, the same influence determines both of these manifestations of disease.

The continued fever from which boys die, is, in almost every instance, true typhoid fever. Although it occurs in every month, it is in the hot months that three-fourths of the deaths from typhoid occur. The typhoid lesion is the characteristic of the fatal fever of the unacclimatised, and the phenomena of the fever are those of true enteric fever. It is not only among the boys that this fever becomes developed; young men up to 24 are equally liable to suffer, and cases will be found pretty numerous among men of the third group, and, occasionally, the fever is seen even in men above 30.

In his report for 1868, the Sanitary Commissioner has given the details for 35 deaths from typhoid which occurred in this Presidency, and of 9 of men belonging to Bengal regiments, who died in the Kurrachee Depôt. Out of the total of 44, all but 7 occurred in men below 25. Out of 27 deaths in 1869, 7 men were above 25, and 20 below this age; and out of 62 deaths in 1870, 50 were below 25, 9 between 26 and 28, and 3 above 30.

All of the deaths of 1868 occurred among regiments in the first year of service, or among recruits; and the fact I have found to be almost universally



true, that it is young men in their first year of service who succumb to typhoid:—

*Deaths from Typhoid Fever in 1868, 1869, and 1870, shown in relation to the season of their occurrence.*

	1868.	1869.	1870.	TOTAL.
January ...	1	1	...	2
February ...	1	3	4	8
March ...	...	...	6	6
April ...	1	2	6	9
May ...	4	5	18	27
June ..	14	4	4	22
July ...	2	3	5	10
August ...	6	3	5	14
September ...	4	3	5	12
October ...	1	2	4	7
November ...	...	1	...	1
December ...	1	...	5	6
	35	27	62	124

These figures show very clearly that the fever from which the young men die is a fever of the hot season. The totals above given convey, however, a very inadequate idea of the part which typhoid plays among the newly-arrived young men. My experience of the statistics of new troops leads me to draw the inference, that the typhoid lesion is in almost every case present when the continued fever of the hot season proves fatal in the young.

In the current year, up to July, 71 deaths from fevers have been recorded; of these, 35 have been acknowledged to be true typhoids, and 36 are returned as remittent and continued fevers. We know, however, that very many of the deaths of boys and young men were in reality caused by typhoid, although the disease was returned under the different designation; and probably three-fourths of all these fever deaths were due to true enteric fever.

Nearly all of the deaths from enteric fever were in boys and men in their first year; they were distributed over 18 stations and 23 different corps.

The ages are shown in the Statement annexed:—

*Deaths of the European Army from Fevers, January to July 1871.*

FEVERS RETURNED AS ENTERIC FEVERS.		FEVERS RETURNED AS REMITTENT AND CONTINUED FEVERS.	
Age.	Deaths.	Age.	Deaths.
18	5	16	1
19	7	18	1
20	7	19	3
21	4	20	5
22	1	21	1
23	2	22	2
24	2	23	1
25	2	24	4
26	2	25	3
27	2	26	3
30	1	27	1
		28	1
		29	3
		30	2
		31	1
		32	1
		34	2
		40	1
	35		36

The disease is true typhoid. Being a fever of the hot months, the nervous symptoms are usually very severe, so that the disease is at first apt to be mistaken even for typhus by the inexperienced. But to the careful observer the disease soon declares itself, and every symptom shows, that it is the true enteric fever of Europe which is developed in the young and unacclimatised.



A single illustration will suffice to indicate the nature of the disease. I select a case recorded by Dr. Becher in the weekly returns of the detachment of the 104th, stationed in Gwalior Fortress, in the hot season of 1865. It will be seen that the gravity of the nervous symptoms led him at first to suspect the case to be one of typhus. Dr. Becher's notes are as follows:—

*Fortress Gwalior, week ending 28th April 1865.*—"The case returned under 'febris continua' is that of a young recruit who arrived from England last autumn. He was admitted on the 23rd with very intense fever, great prostration, and head symptoms. No remission of fever has taken place, and he passed the whole week in a state of more or less stupor, with muttering, low delirium. The general symptoms are those of typhus, but as the pathognomonic symptoms of that disease have not yet appeared, the case is returned under febris continua."

*5th May.*—"The case of febris continua, remarked upon last week, proved to be one of typhus fever. On the 30th (7th day of the disease), the characteristic macular exanthema appeared on abdomen and chest, and the same night profuse epistaxis took place. He continued during the week in more or less profound stupor. There is no remission of the fever; prostration of strength has increased, but nervous excitement and muscular agitation are less. Within the last days symptoms of bronchitis became developed, and complete deafness appears to have set in—all symptoms eminently characteristic of the disease."

*12th May.*—"The case of typhoid fever progressing favorably during the past week, the 3rd of the disease; the bronchial affection has continued in a mild degree. Unmistakable signs of typhoid affection of the ileum (diarrhœa with characteristic evacuations, tympanites and regurgitation in the ileo-cœcal region) set in, and still continue in a moderate degree. The nervous and cerebral symptoms are much improved, though deafness continues absolute; the febrile symptoms are gradually decreasing, and the case promises now (22nd day) to enter the stage of convalescence."

*19th May.*—"The signs of typhoid affection of ileum were noticed during the 3rd week. During the present (4th) week, the diarrhœa continued more or less; exhaustion of strength and wasting of tissues increased very much, and with it nervous excitement and febrile action. But the last few days have brought great improvement; diarrhœa has almost ceased, frequency of pulse and temperature are falling, and the nervous system is becoming amenable to the influence of sedatives."

*26th May.*—"The case of typhoid fever has fairly entered the stage of convalescence during the past week. The affection of the ears still continues; the muscular strength is reduced to the lowest possible degree; but the mental powers are gradually returning."

*2nd June.*—"Convalescence in the case of typhoid fever is progressing favorably."

Some have supposed that the typhoid so prevalent of late years is a disease new to India. This is not the case. I find a most perfect description of typhoid given by Dr. Stewart in his report for the 9th Lancers as far back as 1844.

Typhoid is not a disease new to India. Want of careful observation has caused its existence to be overlooked. Typhoid between 1844 and 1856.

Going back to the decade preceding that under consideration, the following which I have selected from the annual report of Her Majesty's 96th Regiment, then in its first year, for 1851-52, links on the history of the past with that of recent times. It is interesting, as showing that twenty years ago young and weakly lads were as liable to succumb to typhoid as at present. The Surgeon writes: "The regiment marched from Cawnpore and was in excellent health on arrival at Lahore. Until 1st April, the men were compelled to occupy their tents, which were under no shade, and the thermometer inside was as high as 104°. The chief feature of the continued fever was pain in the forehead, excessive heat of skin, white tongue, and prostration. In from three to four days the symptoms would subside and the patients recovered. But in weakly, debilitated lads chiefly, the skin would continue hot, the tongue became dry and brown, there was great prostration, and a small quick, hurried pulse. Much care was necessary to guide the patient to convalescence; for diarrhœa



in some instances set in,\* and death was the result. Some such cases occurred in recruits who joined the regiment soon after its arrival at this station, and some were even brought in in this state. Thus the months April, May, and June passed."

It is very curious to find recent history repeating the fact noticed in the last sentence. Many recruits have died in the Punjab of late years while marching to join their regiments. These young men expose themselves to the sun on the march, and fall into typhoid and die. Nearly all the deaths recorded between December and April are those of boys on the march.

I shall add one illustration more from the history of these ten years. It is taken from the report of Her Majesty's 27th, also in its first year of Indian Service:—

"Many of the cases treated were very tedious in their progress. In the fatal cases almost all assumed the remittent or typhoid type, and on *post mortem* examination the small intestines presented that form of glandular ulceration so usual in the typhoid fever of temperate climates. In one case in particular, the immediate cause of death was profuse and sudden intestinal hæmorrhage, proceeding from the ulcerated surface of the ileum."

The frequent occurrence of typhoid in the new army of 1858, and in the new regiments raised for service in India subsequent to the mutiny, was remarked on by many medical officers; and throughout the reports for the years from 1858 to 1863, the occurrence of true typhoid in the young soldier has been constantly incidentally noticed.

A few illustrations taken from my notes will serve to introduce the subject of the nature of the typhoid of the newly-arrived regiments and to show the character of the disease. They are selected to prove the universal distribution of the disease, and as demonstrating the presence of typhoid in nearly every cantonment throughout the Presidency, from Peshawur to Lower Bengal.

The cases are isolated. We do not find many cases classed together, constituting an outbreak of typhoid. Such a thing as an outbreak of typhoid was not, as far as I know, recorded in all these years. The indefinite manner in which mention is made of the phenomena in the cases which follow, shows, that the occurrence was regarded by the medical officer as a mere contingency, and not a thing to be looked forward to in the young and unacclimatised, and to be guarded against and treated on the principles on which typhoid ought to be treated when it does occur:—

"The cases which occurred at Peshawur were pure typhoid fever, with rose-colored spots, and were complicated with abdominal irritation, bronchitis, or pneumonia."

"The most intractable cases were those which at an early stage exhibited a low typhoid character; small, quick pulse; dry and black tongue; great wakefulness; and the tendency to diarrhœa. In two of the three fatal cases, the lower end of the small intestines was found extensively ulcerated."

"This man died after 17 days' illness. The characteristics of the fever were a relaxed state of the bowels and marked febrile symptoms. The *post mortem* examination showed ulcerated patches of the mucous membrane of the ileum."

"In the one fatal case, Peyer's glands were inflamed and ulcerated in several points. In the three cases of typhoid, the symptoms were so well marked on admission as to admit of the disease being at once designated as typhoid fever."

\* The diarrhœa of typhoid.



"Three fatal cases of continued fever, which occurred in May, August, and September, presented symptoms decidedly typhoid; the *post mortem* examination showed ulceration of the small intestines."

"In a death by continued fever, the eruption was well marked; diarrhoea set in, with the usual depression, and on *post mortem* examination ulceration of the ileum and cæcum was found."

CASE 1. *Admitted 18th September.*—"Fever was at first distinctly periodic. *Post mortem* examination revealed very extensive disease in the small intestines; the glands of the ileum were found in every stage of ulceration from simple congestion to actual gangrene, and the intestine was on the point of giving way in several places."

CASE 2. *Died 8th day after admission.*—"The fever was apparently slight, but became typhoid; extensive patches of ulceration were found immediately above the ileo-cæcal valve, one ulcer reaching to the peritoneal coat."

A case is returned as intermittent fever. Death occurred after 38 days' illness from perforation of the ileum through a gangrenous slough.

"A man died yesterday from remittent fever. The case is remarkable, for at the *post mortem* examination very severe inflammation of the small intestines was found. During life there were no symptoms of this disease at all. There was slight diarrhoea when he first came into hospital, but this soon subsided. The abdomen was carefully examined daily, but there were no symptoms of inflammation. The man was a recruit and joined the battery this year" (aged 20).

"There is another bad case of remittent fever. The accession of fever is now slight, but he is very debilitated, and very nervous about himself. This man is also a recruit."

The sequel was as follows:—

"The case of fever referred to last week died suddenly on the morning of the 25th. There was no effusion on the brain; the lungs were congested, but everywhere crepitant. The small intestines were healthy except for about two feet above the cæcum; here the internal coat was highly congested, and there were about a dozen circular ulcers scattered over this space, with raised and thickened edges. The glands did not appear to be enlarged. The large intestines were healthy."

"In a young man of 20, who had not long joined, the symptoms at first were those of ordinary continued fever; but the fever soon took on a typhoid character, with great prostration and considerable cerebral disturbance. An uncontrollable diarrhoea assisted in reducing the patient's strength; pulmonary congestion supervened, and he died on the 22nd day. Small intestines were generally congested and ulcerated and the glands much enlarged."

"Two cases of continued fever which proved fatal were of a well-marked typhoid type, accompanied with ochrey evacuations, and occasionally low delirium. At the *post mortem* examination the bowels were found ulcerated."

"In the only case of remittent fever which occurred, the patient sank on the 18th day. On *post mortem* examination the small intestines were found ulcerated in many places, and Peyer's patches very prominent."

"Two deaths in August from continued fever. One died in typhoid on the 16th day, and there was found after death extensive ulceration and infiltration of Peyer's glands. There was little diarrhoea during life."

Patient aged 21. "The symptoms of the fever were of an unusually persistent character, which the usual treatment did not check."



"Epigastric pain became distressing, and he was clearly suffering from peritonitis. On *post mortem* examination the ileum was extensively inflamed and the mucous surface abraded, and one small round perforating ulcer about a quarter of an inch in diameter. The mucous membrane of the large intestine was free from ulceration."

"Remittent fever prevailed in June and July, and frequently ran to a low continued typhoid form. Some of the cases were very intractable and severe, and the head was affected at an early period. Two cases terminated fatally, and in both the characteristic patches of effusion into Peyer's glands were present."

"The fatal cases of fever were frequently of a low type, affecting the head; in several cases there were found indications of local disease in the small intestines."

Aged 20; admitted August 24th. Symptoms of remittent fever; died on third day after admission: "Morbid appearances were entirely confined to the lower third of the small intestines, the mucous membrane of which was closely studded over with enlarged mucous glands, the size of a hemp-seed; there were numerous ulcers also found with fungous surfaces."

Agra, 1862, Her Majesty's 35th. June.—Continued fever: "The man had been for some days quite recovered, but the fever returned, and he rapidly became exhausted."

"On *post mortem* examination, numerous deep ulcers were found in the small intestine."

Agra, 1863, 23rd Fusiliers. Two deaths in April from typhoid and continued fever; both attended with intestinal ulceration, diarrhœa, and eruption.

Aged 20. Fever, with pain in right iliac region; died comatose on 7th day. Congestion of the lower part of the ileum was found, with enlargement of Peyer's glands.

"The case of remittent fever and diarrhœa was attacked with peritonitis three days ago, and proved fatal. Deep ulcers were found in the ileum, but decided perforations could not be detected."

Admitted 10th April, with severe continued fever accompanied with diarrhœa. The diarrhœa subsequently much abated, but he fell into a typhoid state and died on 16th:

"Spleen, three times its natural size; liver, also enlarged; mesenteric glands, infiltrated with tubercle; solitary glands of lower part of ileum, infiltrated, inflamed, and deeply ulcerated with ragged, thickened edges."

Barcilly, 1863. A death by peritonitis, ulceration and perforation of the ileum in fever; returned as intermittent.

Futtehgurh, 1863. A case of true typhoid fever, with rose-coloured spots, which ended in recovery, is mentioned.

"A recruit, six weeks in India, admitted with slight fever, which soon assumed the remittent form; exacerbations coming on about noon. On the fourth day after admission he became delirious and had melænic purging. Died six days afterwards. Two large patches of ulceration were found near the caput cœcum, in the small intestine."

"Lieutenant S. had suffered for some time from low remittent fever. Shortly after his arrival, gentle perspiration broke out, and he became cool. But still he had an

evident difficulty in concentrating his thoughts, and a disinclination to reply to questions by other than monosyllables, as if the effort of talking were weakening and painful. Bowels were gently moved three times by a small dose of purgative medicine. He had very slight fever for the three following days and no purging; the tongue became cleaner, and the inclination for food returned. He was suddenly seized with great pain in the abdomen, more particularly noticed on pressure over the right iliac region. Peritonitis immediately



followed and he died. *Post mortem* examination disclosed inflammation of the small intestine, with ulceration of the ileum in two places and escape of its contents."

"The Hospital Sergeant was under treatment in his quarters for remittent fever and diarrhœa, and had been taking lead and opium and quinine for about 10 days. He became suddenly collapsed, and died with all the usual symptoms of peritonitis in six hours. A small ulcer was found in the ileum, which had opened into the cavity of the peritoneum. A few other circular ulcers were discovered in the lower part of the ileum."

"Two fatal cases of remittent fever occurred in April. Diarrhœa continued a prominent and troublesome complication throughout. Symptoms of disturbance of the brain manifested themselves about the 5th or 7th day. The tongue became dry and brown, and the teeth covered with sordes; the skin, except when the fever remitted, was hot and dry. In the one case, after death numerous small ulcers were found in the small intestines; in the second case, an ulcer had almost eaten its way through the coats of the bowel."

"A man was admitted with diarrhœa on 1st March. The diarrhœa was cured; but as he remained weak and dyspeptic he was retained in hospital. On 10th April, he was suddenly seized with peritonitis, and died the same night. A single small ulcer of the ileum had opened into the abdominal cavity."

"Admitted 12th April, with fever preceded by shivering. A month after admission, his appetite began to fail, and he lost flesh rapidly. The abdomen became tender and tympanitic, and an abscess formed in the muscles over Poupart's ligament. He died on 17th May. The viscera were found glued together, with fluid in the abdominal cavity, owing to ulceration of the small intestine, which had perforated the peritoneum."

"In a man who had been admitted with ulcer of the mouth, many ulcerations of the ileum were found after death, the existence of which was not suspected during life."

1. The man was attacked with fever of a low type, accompanied with looseness of the bowels; the symptoms so far resembled dysentery that at one time he was re-admitted under this head; but the *post mortem* examination showed no disease of the colon, but extensive destruction of the glands of the ileum."

2. "A man of the 29th Regiment was seized with fever at Sherghotty, but was so far recovered as to be considered a convalescent. Shortly before his arrival at Raneegunge he felt worse; his tongue was found dry, but not coated; no sordes; slight head symptoms; no tenderness on pressure over the abdomen. He took plenty of nourishment, but sunk after three days. The colon was perfectly healthy, but extensive ulceration of the glands of the ileum was found."

*July 24th.*—"The man had felt unwell for 12 hours, since bathing in a tank after dinner. Tongue furred; headache excessive; 28th, slight delirium; 29th, very restless, and in the evening profuse diarrhœa; *August 6th*, only partially conscious; 7th, died."

"Patches of ulceration were found on the mucous membrane of the ileum."

"Recently, at Chinsurah, a low typhoid form of remittent fever appeared among the troops quartered there. The first case of it was in hospital, when I took over the medical charge of the dépôt, and he died three days afterwards. Between the 25th November and 4th December seven cases occurred, of which two proved fatal, including one officer."



"The remittent fever assumed a well-marked typhoid character, such as is seen in England, but which I have never before seen in this country. The cases exhibited rose-coloured spots, they were attended with diarrhœa, and *post mortem* examination showed ulceration of the intestines. Exacerbation generally took place at 3 o'clock in the morning and at 3 o'clock in the afternoon. Head symptoms set in at a very early stage of the disease; there was deafness, confusion of ideas, and tremor of the extremities ultimately assuming the character of subsultus tendinum, with spasmodic twitching about the mouth and eyes, great prostration, and low muttering delirium. In this state they continued, with occasional attacks of epistaxis during an exacerbation, gradually sinking lower and lower, until they died. At a very early stage of the disease, difficulty in protruding the tongue, accompanied by difficulty in articulation and swallowing, were present; and in those cases that proved fatal, complete paralysis took place several hours before death. When these symptoms began to improve, it was the first sign of convalescence, which was in every case very protracted."

These cases occurred chiefly in young recruits; but with the arrival of new regiments in 1864, the study of typhoid assumed a new interest and importance.

Since the arrival of new regiments and large bodies of recruits, the subject has assumed an aspect of great importance—Typhoid of H. M.'s 36th.

The very first regiment that came to India after 1858 was decimated in the first year, and chiefly by typhoid. But even with so grave an experience, Dr. Bell failed to apprehend the great significance of the facts which he was placing on record. The following is the narrative which he gives:—

"The regiment continued in good health until April, when the increasing heat of the weather began to tell upon the young unseasoned soldiers, and fevers became prevalent. They presented no great variety. A few have been returned as common continued; there were only 24 cases of intermittent; the rest were returned as remittent. Of these last, at least ten cases might with equal correctness have been called typhoid; it was difficult to say on admission, and perhaps unimportant, whether they were remittents with a typhoid tendency, or typhoid with a remittent tendency. My own opinion is, that the local complication determined the type; but the result is the same, and one for which I was wholly unprepared from my experience of six years in Madras, namely, that a typhoid fever almost identical with that of Europe, with ulceration of Peyer's glands, prevails in this country, and is as fatal as at home. It seems the same disease in every respect, but that there are no petechiæ,\* and that there is a greater tendency to remissions. From the enquiries I have made, I believe it to be a new disease in this country, and it is certainly a very fatal one. I can assign no probable cause for it. It is unnecessary to describe the symptoms: in the treatment, the indications were to abstain from purgatives and all irritating medicines, and to support the patient by beef-tea and wine liberally. The disease prevailed all through the hot season, and proved fatal in seven cases."

The fact is, that the 36th Regiment as a body was saturated with typhoid poison; and that the disease was typhoid is proved by referring to the ages of the men who died, or were invalided for remittent fever and phthisis. There were 130 men above 30 years of age with the regiment when it landed. Of these, not one died from remittent fever or phthisis, and four only were invalided under these heads. Of the younger men, 20 died from remittent fever and phthisis, and 51 were invalided on the same account—a loss of 30 per 1,000 in the older class, and of 108 per 1,000 in the younger. From all causes, this regiment lost in its first year 68 men under 24, 19 being entered as 20 years old or under.

Dr. Bell goes on to explain, that the phthisis for which 39 young men of the 36th were invalided, was in reality the filling up of the lungs subsequent to the attack of fever; so that it is necessary to place these cases to the account of typhoid. The same phenomenon is

Filling up of the lungs subsequent to the attack of typhoid—a phenomenon observed in the typhoid of 1851, as well as of 1864.

\* This is a mistake; the characteristic eruption is almost invariably present.



noticed in the report from which I have already quoted, the report of the 96th Regiment for 1851-52, in the following terms :—

“In many of the fatal cases tubercular disease of the lungs was found in a passive state, or in the act of softening; whilst in the same individual there was enlargement of the glands of the mesentery. Phthisis has exceeded the average, and it is thought that this climate is especially adapted to its development. But the prevalence may have been due to excessive debility induced by attacks of fever.”

The invaliding rolls of the new regiments show how important a place phthisis holds; and the possibility of the physiological connection of the lung infiltration with that which takes place in Peyer's glands and in the mesenteric glands should not be overlooked.

I do not propose to discuss the physiological significance of the typhoid of the unacclimatised. I wish to impress the practical truth, that every body of young men which comes to India, may be expected to suffer from typhoid in the first hot season; not because of a special poisoning derived from the locality in which it may be placed, but because in the young, when the influence of heat tells on the nervous system, infiltration of Peyer's glands follows, the characteristic eruption is manifested, and the fever pursues its course and ends in resolution or in death.

From observation, I am inclined to believe that the physiological resolution of a typhoid commences on the fourteenth day. In cases where the onset is sudden and well defined, the nervous symptoms will probably be the prominent feature of the fever during the first week; and when great heat is present, death by heat apoplexy is apt to ensue. About the eighth day, the eruption is likely to be found, if carefully looked for. On the fourteenth day, the sloughs over Peyer's glands will be found to have separated, and may be detected in the stools. The patient may be at the worst at this time, and no improvement either in the appearance or pulse, indicative of a crisis, may occur. But as the commencement of the resolution of a pneumonia dates physiologically from the fourteenth day, the same phenomenon, I am inclined to believe, will be found to hold in the case of the typhoid of India. It is about the twenty-first day, under favourable conditions, that the fever abates, and the pulse sinks below 100, in the natural course of convalescence.

The 5th Lancers and the 55th Regiment, which came to India, with the 36th, in 1864, also suffered from typhoid, although not to the same degree. I might follow the history of every regiment and battery which has arrived between 1864 and 1871,\* and the truth would hold throughout, that not one of these bodies has escaped typhoid in its first year of residence. I have had repeated opportunities of calling attention to this fact; sometimes even in anticipation of the arrival in India of regiments which have suffered subsequently. Thus, when it was proposed to place the 1-17th Regiment on arrival from England, in the spring of 1870, in the new barracks at Allahabad, I considered it a certainty that if cantoned at this station, the typhoid of the young would be developed in intensity, and that the new buildings and the conditions of the locality would be blamed for the excessive loss that would follow. The regiment was eventually sent to Lucknow, and the experience of the 36th was repeated; a history of typhoid runs through the returns of the year, and 16 men died from continued fever, of whom 14 were below 25, and 2 of 27 and 28 years of age.

Of late, the subject has forced itself upon the attention of regimental and administrative medical officers. So many young men and new regiments have landed in India, and so constant has been the occurrence of typhoid, that the phenomenon could not escape observation.

Various theories have been advanced to account for the individual instances of the outbreak of typhoid when it has occurred. Importation and the condition of the water-supply are urged by various writers as the cause of the

\* A paper on the typhoid of Her Majesty's 63rd Regiment, which reached Hazareebaugh from England in December 1870, by Assistant Surgeons Hannah and O'Farrell, appears in the *Indian Medical Gazette* for October 1871.



manifestations of typhoid. Years ago the same theory of importation was started. Mr. Cornish brought it forward to account for the fact, that at St. Thomas' Mount at Madras, the tendency of many of the fever cases, especially those which occur in recruits or new arrivals, was to assume the typhoid character, suggesting that the germ was imported by the troops which arrived in 1857-58. Dr. Munro thinks it possible that the typhoid fever from which the 92nd suffered so heavily, may have come with them from Ireland. Dr. Skene considers that the bad water-supply of Meean Meer accounts for the typhoid of the 85th; and Dr. Barclay considers that the water-supply of Bangalore is not above suspicion, and may be the cause of the typhoid which attacks the young men. Mr. Hanbury, under whose care the young men of his regiment suffered extremely at Deesa in Bombay, approached very near what I consider to be the truth, when he observed, that the local causes which he searches for may have been the cause of the typhoid, provided we leave out of sight the possibility of typhoid occurring in the young and unacclimatised without the intervention of such agencies. "It is worthy of particular mention," he adds, "that two-thirds of the total mortality assigned to fever in the regiment, occurred among the young men recently landed, as indicating the impropriety of sending young unformed lads to this country as recruits from England, that the average age of the subjects of these fatal cases was only 20 years and 6 months."\*

Let me repeat in concluding this most important subject—important alike to the sanitary officer and to the student of the etiology of typhoid—that I know of no single circumstance that would suggest to me that the type of the fever of which I am speaking is determined by local causes. Typhoid has no geography, and it is of universal occurrence; taking, for example, the deaths recorded in 1869, as they stand in our death-rolls, the 27 deaths are returned from 21 stations.

But in making this broad assertion I would not be misunderstood. That there is a zymotic element developed in every individual case of typhoid I believe to be a fact, and a truth that should be acted on in every case as soon as typhoid makes its appearance in a body of men. I believe that such calamities as those of the 36th, would be much mitigated were the first cases carefully separated; for it is not possible to imagine, that in this case mere community of condition caused nearly one-tenth of the regiment to fall into typhoid. Typhoid should be regarded as contagious in the same degree as erysipelas or the non-specific cachexies of our jails, and sanitary measures should proceed on such an assumption. Such cases as the outbreak at the Bishop's School at Simla in 1866, so well recorded by Dr. Clark,† in which 17 cases occurred among 69 boys and young men, teach, that a zymotic poison does exist to which young men succumb as communities and not as individuals.

A further theory suggests, that typhoid may be acquired by contagion from the native population. I know of no single record of the existence of typhoid among the native population. In the records of the Native Army I do not know of a single death attributed to typhoid which is not open to the suspicion that it has been wrongly diagnosed or carelessly returned; and out of 41,246 deaths among the jail population, which I have recorded between 1859 and 1870, I do not know of any death which may have been returned as typhoid, which is not equally liable to the same suspicion. I do not make this broad statement willingly, and I would rather that its accuracy were called in question, and that well-authenticated cases were put on record. If it should be the case that the liability or non-liability to typhoid is a remarkable race distinction, it is important that the point should be established. It has been my wish in recording the deaths of the Native Army and of the Jails to eliminate deaths from typhoid, with a view to the study of the etiology of the disease as it may exist among the native population; but as yet I have no data to go upon, although my compilations have been made from nominal rolls in which all particulars of interest are supposed to be noted after each death.

It is an extraordinary fact that the records of the Native Army and Jail Population afford no authentic history of typhoid.

\* Army Blue Book for 1859, p. 119.

† Indian Annals, XXIII, page 145.



## CONCLUSION.

In these pages, I have tried to show how the ratios for new and acclimatised troops differ, and how the ratios vary with age among the newly-arrived as contrasted with those of the army generally; and I have endeavoured to impress the chief lessons suggested by the study of these ratios, by contrasting the history of old and new troops, and old and young men, placed in parallel circumstances.

To sum up, in every aspect in which we have viewed the soldier, the truth has forced itself upon us, that his constitution is prone to decay under the influences to which he is subjected during the period of his service in India; as a young man he succumbs to one class of diseases, as an old soldier to another. The old man is not efficient for a lengthened residence if he comes old to India; and if his constitution is bad, or his habits intemperate, he dies. Young boys, who have to take their chance in common with the men of the regiment, are apt during the process of adaptation to heat to die, or to contract disease which may lead to their being sent back to England as invalids, before they have attained the age at which a man becomes an efficient soldier in India; and a year absolutely healthy for the native, and favourable to the acclimatised European, is that in which the young suffer, as a rule, most severely, since it is generally characterised by a prolongation of the hot season. Regiments coming to India for the first time require to be tenderly cared for, since the exaggeration of climatic agencies, or the presence of epidemic influences, tell upon such bodies far more than on those which have been habituated to cantonment life in India. The soldier at the best is adapted for a limited period only of Indian Service, and he should begin his service young, as soon as his constitution is formed; the age at which the soldier is efficient may be reckoned to terminate soon after 30.

The selection of stations adapted for regiments at the different periods of their service is in every case of great importance, and in the case of regiments arriving from England, a judicious selection of a station may tell much for good or evil in the future. Provided the material be good, a hot station is not necessarily an unhealthy one for a new regiment. Agra, Ferozepore, and Cawnpore have not proved unhealthy to the new regiments which have occupied these stations; the fever-rate is necessarily high, but it is no detriment that the young man should pass through a seasoning fever, provided his constitution is left unimpaired. Bareilly has shown itself to be a first class station for a new regiment, and this part of India seems peculiarly adapted for new troops. Stations subject to the minor degree of heat influence, such as Fort William and Hazareebaugh, seem also well suited for newly-arrived regiments.

In every station there is the chance that the new troops may meet the influences of an epidemic year, and they cannot be ensured against such a contingency. Agra, Ferozepore, or Hazareebaugh may show the maximum of health in one year, and in the next, under epidemic influences, the maximum of disease. Judging from past experience, the occupation of stations such as Fort William, Bareilly, or Sealkote would afford a great chance of exemption from epidemic influences.

It seems a mistake to hurry a regiment to the hills which has suffered heavily in its first year. The 36th Regiment regained its vigour in the second year in Rohilkund after passing through the extreme of suffering at Lucknow in its first year; and there can, I think, be little doubt, that the wing of the 58th removed from Benares to Darjeeling at the close of its first year, did suffer in comparison with the wing which was not removed, on being brought down to Allahabad and subjected to the influences of an unhealthy year, although on rejoining it was in a state of absolute health and vigour. The fact, that the whole body of a regiment has passed through the hospital with heat fever, should be regarded



rather as giving an assurance that the men will be able to stand the heat of the second year. I speak of heat only, and not of heat in combination with epidemic influences.

It has been proposed to send young men and young regiments to the hills on first landing in India. The men would certainly retain their vigour, especially if employed actively at a sufficient elevation; and six months of active exercise in the plains up to the commencement of the hot season, would do much towards acclimatising the men to the effects of heat. In theory, a regiment spending the two first years of its service in this manner should be perfectly fit to take its turn in the hottest station without detriment. Such a proposition must, of course, be looked at in connexion with the enormous losses which in recent times regiments newly arriving have sustained within the first three years after coming to India, which are shown at the close of the second Section.\*

It seems opposed to sound principle that young boys who come out as recruits should be promiscuously scattered over India, in good stations and in bad, as soon as they are landed. In the last six years, 13,000 recruits have been received by the regiments of this Presidency; and if there be a principle on which the young men should be acclimatised, this principle has been set aside in the case of this large body of young and unacclimatised material. There may be objections on military grounds, but I should be inclined to consider, that the lads coming to India as recruits would serve the State better were they acclimatised on principle for the two first years. This simply implies, that they should be kept together as a body at a first-class station, such as Bareilly or Sealkote, and that they should be judiciously exercised, and not forced into disease by being ranked with men who can stand with impunity an amount of exposure under which the young lads must go down. Bareilly and Sealkote are situated beyond the range of the epidemic influences so deadly to the newly-arrived, or, at least, are very rarely reached by such influences. Both are hot stations, and the recruit might take his place in any regiment after having spent two years in such a climate. The recruits even in these healthy localities would suffer both from heat fever and typhoid; but such a consideration would be of secondary importance, provided we could recognise it as a truth, that the young men were being adapted for further service in India on principles substantially sound.

The table which follows shows the changes which have taken place in the regiments composing the army during the past six years. There have been removed by death 5,546, by invaliding 9,958, by expiry of service 9,425, and by other causes 1,151; and to make up for these losses, 13,252 recruits have been received, regiments leaving India have given back 5,962 men, and of the men invalided to England 858 have returned. The items which balance the account are detailed in the following statement:—†

\* See Appendix B., showing the Statistics of Road-making Parties, detached, for the hot season, from stations in the plains during the ten years from 1863 to 1872.

† The statement is a regimental one, and for regiments present during the year; hence the strength remaining does not correspond with that carried forward to the next year.







Table showing the results of twelve years of Indian Service in a body of men who landed in India with their Regiments in the end of 1857, and embarked for England in 1869 and 1870.

REGIMENT.	Date of arrival in India.	SERVICE IN INDIA.		Date of leaving India.	Strength on arrival in India.	STRENGTH ON ARRIVAL AT DIFFERENT AGES.						Number out of the preceding strength with Regiment at date of embarkation.	DETAILS OF THE SURVIVORS.								
		Years.	Months.			Under 20 years.	20 to 24.	25 to 29.	30 to 34.	35 to 39.	40 and upwards.		Age.			Service in years.					
													Under 30.	30 to 34.	35 to 39.	40 and upwards.	11 to 15.	16 to 20.	21 to 25.	26 and upwards.	
2nd Dragoon Guards	27th Nov. 1857	12	1	31st Dec. 1869	582	28	331	175	34	11	3	78	1	48	23	6	63	10	4	1	
7th Hussars	30th Nov. 1857	12	3	28th Feb. 1870	518	40	297	116	43	22	...	50	1	21	27	1	35	15	...	...	
17th Regiment	24th Nov. 1857	13	0	2nd Dec. 1870	986	349	445	124	49	19	...	74	4	32	28	10	44	26	4	...	
77th Regiment	15th June 1858	11	10	14th April 1870	510	48	261	150	31	15	5	58	3	39	14	2	42	15	1	...	
82nd Regiment	12th Oct. 1857	12	3	17th Jan. 1870	823	279	323	139	129	22	...	165	...	112	82	1	+	+	+	...	
88th Regiment	2nd Nov. 1857	13	0	17th Nov. 1870	953	99	534	213	89	16	2	82	11	37	32	2	54	28	...	...	
93th Regiment	26th June 1857	13	3	2nd Oct. 1870	725	156	290	157	79	58	15	57	5	21	20	11	13	43	1	...	
Royal Artillery, 14th Brigade*	End of 1857	12	0	Nov. 1869	670	44	301	226	81	18	...	82	1	52	23	6	67	10	5	...	
					5,836	1,043	2,752	1,300	535	181	25	676	26	362	249	39	...	...	...	...	
Loss from the different regiments.																					
CAUSES OF LOSS.		2nd D. Guards.	7th Hussars.	17th Regt.	77th Regt.	82nd Regt.	88th Regt.	93th Regt.	R. Art., 14th Brigade.	2nd D. Guards.	7th Hussars.	17th Regt.	77th Regt.	82nd Regt.	88th Regt.	93th Regt.	R. Art., 14th Brigade.	Totals for the body.	Totals per 1,000 of strength.	Loss from the different causes per cent. of the total loss.	
Died from disease		154	146	119	186	223	227	103	198	264.6	281.8	120.7	364.7	250.0	238.2	142.1	205.5	1,356	232.4	26.3	
Killed or died from wounds		5	18	...	...	22	33	5	6	8.6	34.8	...	...	24.7	34.6	6.9	9.0	89	15.2	1.7	
Invalided on account of wounds		7	15	...	...	12	23	1	6	12.0	29.0	...	...	13.4	24.1	1.4	9.0	64	11.0	1.3	
Invalided on account of disease		104	73	242	96	209	190	155	157	178.7	140.9	245.4	188.2	234.3	199.4	213.8	234.3	1,236	210.1	23.8	
Discharged time-expired		87	179	324	31	127	34	279	68	149.5	345.6	328.6	60.8	142.4	35.7	384.8	101.5	1,129	193.4	21.9	
Purchased their discharged		21	25	10	8	12	25	24	6	36.1	48.3	10.2	15.7	13.4	26.2	33.1	9.0	131	22.4	2.5	
Transferred to other regiments		120	12	217	130	92	339	96	147	206.2	23.1	220.1	254.9	103.2	355.7	132.4	219.4	1,153	197.6	22.3	
Removed for other reasons		6	...	...	1	...	...	5	...	10.3	...	...	2.0	...	...	6.9	...	12	2.1	.2	
AGGREGATE LOSS		504	468	912	452	697	871	668	588	866.0	903.5	925.0	886.3	781.4	913.9	921.4	877.7	5,160	884.2	100.0	
Remain with the Regiment		78	50	74	58	195	82	57	82	134.0	96.5	75.0	113.7	218.6	86.1	78.6	122.3	676	115.8	...	
CAME TO INDIA		582	518	986	510	892	953	725	670	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	5,836	1000.0	...	

\* Excluding the B. Battery, the return for which is incorrect, and the G. Battery, which served for five years of the period in China and Japan.

† Not stated.

The final table shows what has been, in eight regiments, the result of twelve years of Indian Service among the men who landed with the regiment when it came to India. The aggregate of the body on landing was 5,836; out of this body, 676 men embarked for England with the regiments on their return. The loss amounted to 5,160, and was made up thus:—died 1,356, killed in action 89, and invalided on account of wounds 64, invalided for disease 1,226, discharged time-expired 1,129, purchased their discharge 131, transferred to other regiments or removed otherwise 1,165. In the thousand, 469 died or were invalided, 193 were discharged time-expired, 200 were transferred, 22 purchased their discharge, and 116 remain with the regiment. And the percentage of loss was made up in the following proportion:—death and invaliding 53, discharged time-expired 22, transfers 22, and purchase of discharge 3, out of each hundred who came to India.

Regiment	Year of Landing	Total on Landing	Total on Return	Loss	Percentage of Loss	Died	Killed in Action	Invalided for Wounds	Invalided for Disease	Discharged Time-expired	Purchased Discharge	Transferred to other Regiments or removed otherwise	Remain with Regiment
1st Regiment	1855	1,000	400	600	60	100	0	0	0	0	0	0	0
2nd Regiment	1856	1,000	450	550	55	100	0	0	0	0	0	0	0
3rd Regiment	1857	1,000	500	500	50	100	0	0	0	0	0	0	0
4th Regiment	1858	1,000	550	450	45	100	0	0	0	0	0	0	0
5th Regiment	1859	1,000	600	400	40	100	0	0	0	0	0	0	0
6th Regiment	1860	1,000	650	350	35	100	0	0	0	0	0	0	0
7th Regiment	1861	1,000	700	300	30	100	0	0	0	0	0	0	0
8th Regiment	1862	1,000	750	250	25	100	0	0	0	0	0	0	0
9th Regiment	1863	1,000	800	200	20	100	0	0	0	0	0	0	0
10th Regiment	1864	1,000	850	150	15	100	0	0	0	0	0	0	0
11th Regiment	1865	1,000	900	100	10	100	0	0	0	0	0	0	0
12th Regiment	1866	1,000	950	50	5	100	0	0	0	0	0	0	0
13th Regiment	1867	1,000	1,000	0	0	100	0	0	0	0	0	0	0
14th Regiment	1868	1,000	1,000	0	0	100	0	0	0	0	0	0	0
15th Regiment	1869	1,000	1,000	0	0	100	0	0	0	0	0	0	0
16th Regiment	1870	1,000	1,000	0	0	100	0	0	0	0	0	0	0
17th Regiment	1871	1,000	1,000	0	0	100	0	0	0	0	0	0	0
18th Regiment	1872	1,000	1,000	0	0	100	0	0	0	0	0	0	0
19th Regiment	1873	1,000	1,000	0	0	100	0	0	0	0	0	0	0
20th Regiment	1874	1,000	1,000	0	0	100	0	0	0	0	0	0	0
21st Regiment	1875	1,000	1,000	0	0	100	0	0	0	0	0	0	0
22nd Regiment	1876	1,000	1,000	0	0	100	0	0	0	0	0	0	0
23rd Regiment	1877	1,000	1,000	0	0	100	0	0	0	0	0	0	0
24th Regiment	1878	1,000	1,000	0	0	100	0	0	0	0	0	0	0
25th Regiment	1879	1,000	1,000	0	0	100	0	0	0	0	0	0	0
26th Regiment	1880	1,000	1,000	0	0	100	0	0	0	0	0	0	0
27th Regiment	1881	1,000	1,000	0	0	100	0	0	0	0	0	0	0
28th Regiment	1882	1,000	1,000	0	0	100	0	0	0	0	0	0	0
29th Regiment	1883	1,000	1,000	0	0	100	0	0	0	0	0	0	0
30th Regiment	1884	1,000	1,000	0	0	100	0	0	0	0	0	0	0
31st Regiment	1885	1,000	1,000	0	0	100	0	0	0	0	0	0	0
32nd Regiment	1886	1,000	1,000	0	0	100	0	0	0	0	0	0	0
33rd Regiment	1887	1,000	1,000	0	0	100	0	0	0	0	0	0	0
34th Regiment	1888	1,000	1,000	0	0	100	0	0	0	0	0	0	0
35th Regiment	1889	1,000	1,000	0	0	100	0	0	0	0	0	0	0
36th Regiment	1890	1,000	1,000	0	0	100	0	0	0	0	0	0	0
37th Regiment	1891	1,000	1,000	0	0	100	0	0	0	0	0	0	0
38th Regiment	1892	1,000	1,000	0	0	100	0	0	0	0	0	0	0
39th Regiment	1893	1,000	1,000	0	0	100	0	0	0	0	0	0	0
40th Regiment	1894	1,000	1,000	0	0	100	0	0	0	0	0	0	0
41st Regiment	1895	1,000	1,000	0	0	100	0	0	0	0	0	0	0
42nd Regiment	1896	1,000	1,000	0	0	100	0	0	0	0	0	0	0
43rd Regiment	1897	1,000	1,000	0	0	100	0	0	0	0	0	0	0
44th Regiment	1898	1,000	1,000	0	0	100	0	0	0	0	0	0	0
45th Regiment	1899	1,000	1,000	0	0	100	0	0	0	0	0	0	0
46th Regiment	1900	1,000	1,000	0	0	100	0	0	0	0	0	0	0
47th Regiment	1901	1,000	1,000	0	0	100	0	0	0	0	0	0	0
48th Regiment	1902	1,000	1,000	0	0	100	0	0	0	0	0	0	0
49th Regiment	1903	1,000	1,000	0	0	100	0	0	0	0	0	0	0
50th Regiment	1904	1,000	1,000	0	0	100	0	0	0	0	0	0	0
51st Regiment	1905	1,000	1,000	0	0	100	0	0	0	0	0	0	0
52nd Regiment	1906	1,000	1,000	0	0	100	0	0	0	0	0	0	0
53rd Regiment	1907	1,000	1,000	0	0	100	0	0	0	0	0	0	0
54th Regiment	1908	1,000	1,000	0	0	100	0	0	0	0	0	0	0
55th Regiment	1909	1,000	1,000	0	0	100	0	0	0	0	0	0	0
56th Regiment	1910	1,000	1,000	0	0	100	0	0	0	0	0	0	0
57th Regiment	1911	1,000	1,000	0	0	100	0	0	0	0	0	0	0
58th Regiment	1912	1,000	1,000	0	0	100	0	0	0	0	0	0	0
59th Regiment	1913	1,000	1,000	0	0	100	0	0	0	0	0	0	0
60th Regiment	1914	1,000	1,000	0	0	100	0	0	0	0	0	0	0
61st Regiment	1915	1,000	1,000	0	0	100	0	0	0	0	0	0	0
62nd Regiment	1916	1,000	1,000	0	0	100	0	0	0	0	0	0	0
63rd Regiment	1917	1,000	1,000	0	0	100	0	0	0	0	0	0	0
64th Regiment	1918	1,000	1,000	0	0	100	0	0	0	0	0	0	0
65th Regiment	1919	1,000	1,000	0	0	100	0	0	0	0	0	0	0
66th Regiment	1920	1,000	1,000	0	0	100	0	0	0	0	0	0	0
67th Regiment	1921	1,000	1,000	0	0	100	0	0	0	0	0	0	0
68th Regiment	1922	1,000	1,000	0	0	100	0	0	0	0	0	0	0
69th Regiment	1923	1,000	1,000	0	0	100	0	0	0	0	0	0	0
70th Regiment	1924	1,000	1,000	0	0	100	0	0	0	0	0	0	0
71st Regiment	1925	1,000	1,000	0	0	100	0	0	0	0	0	0	0
72nd Regiment	1926	1,000	1,000	0	0	100	0	0	0	0	0	0	0
73rd Regiment	1927	1,000	1,000	0	0	100	0	0	0	0	0	0	0
74th Regiment	1928	1,000	1,000	0	0	100	0	0	0	0	0	0	0
75th Regiment	1929	1,000	1,000	0	0	100	0	0	0	0	0	0	0
76th Regiment	1930	1,000	1,000	0	0	100	0	0	0	0	0	0	0
77th Regiment	1931	1,000	1,000	0	0	100	0	0	0	0	0	0	0
78th Regiment	1932	1,000	1,000	0	0	100	0	0	0	0	0	0	0
79th Regiment	1933	1,000	1,000	0	0	100	0	0	0	0	0	0	0
80th Regiment	1934	1,000	1,000	0	0	100	0	0	0	0	0	0	0
81st Regiment	1935	1,000	1,000	0	0	100	0	0	0	0	0	0	0
82nd Regiment	1936	1,000	1,000	0	0	100	0	0	0	0	0	0	0
83rd Regiment	1937	1,000	1,000	0	0	100	0	0	0	0	0	0	0
84th Regiment	1938	1,000	1,000	0	0	100	0	0	0	0	0	0	0
85th Regiment	1939	1,000	1,000	0	0	100	0	0	0	0	0	0	0
86th Regiment	1940	1,000	1,000	0	0	100	0	0	0	0	0	0	0
87th Regiment	1941	1,000	1,000	0	0	100	0	0	0	0	0	0	0
88th Regiment	1942	1,000	1,000	0	0	100	0	0	0	0	0	0	0
89th Regiment	1943	1,000	1,000	0	0	100	0	0	0	0	0	0	0
90th Regiment	1944	1,000	1,000	0	0	100	0	0	0	0	0	0	0
91st Regiment	1945	1,000	1,000	0	0	100	0	0	0	0	0	0	0
92nd Regiment	1946	1,000	1,000	0	0	100	0	0	0	0	0	0	0
93rd Regiment	1947	1,000	1,000	0	0	100	0	0	0	0	0	0	0
94th Regiment	1948	1,000	1,000	0	0	100	0	0	0	0	0	0	0
95th Regiment	1949	1,000	1,000	0	0	100	0	0	0	0	0	0	0
96th Regiment	1950	1,000	1,000	0	0	100	0	0	0	0	0	0	0
97th Regiment	1951	1,000	1,000	0	0	100	0	0	0	0	0	0	0
98th Regiment	1952	1,000	1,000	0	0	100	0	0	0	0	0	0	0
99th Regiment	1953	1,000	1,000	0	0	100	0	0	0	0	0	0	0
100th Regiment	1954	1,000	1,000	0	0	100	0	0	0	0	0	0	0



## APPENDIX A.

### AGGREGATE STATISTICS OF NEWLY-ARRIVED REGIMENTS.

## NEWLY-ARRIVED REGIMENTS IN THE FIELD, 1858.

(The aggregate of the Sickness and Mortality among the European Troops employed on Field Service in the Gangetic Provinces and in Oude and Rohilkund during the Year.)

(The Army of Central India was not on the Strength of the Bengal Presidency in 1858, and is not included in this Statement.)

MONTHS.	Average Strength.	Average Number Daily Sick.	Number Daily Sick per 1,000 of Strength.	Number of Deaths.	Died per 1,000 of Strength.	CAUSES OF DEATHS FROM DISEASE.*											
						Cholera.	Small pox.	Fever.	Apoplexy.	Delirium Tremens.	Dysentery.	Diarrhoea.	Hepatitis.	Respiratory Diseases.	Heart Diseases.	Phthisis Pulmonalis.	All other causes.
January	26,234	2,170	82.7	85	3.24	3	2	13	...	1	33	7	11	10	...	3	2
February	27,001	2,001	74.1	54	2.00	...	1	15	2	...	17	8	4	1	1	4	1
March	28,394	2,419	85.2	101	3.56	5	5	28	1	...	37	8	5	5	...	...	7
April	29,507	3,353	113.7	249	8.44	5	29	86	9	...	75	23	11	2	...	4	5
May	30,663	4,214	137.4	818	26.68	8	28	173	415	5	110	26	17	8	1	3	24
June	28,824	4,526	157.0	398	13.81	1	6	80	177	...	66	20	18	12	3	3	12
July	29,867	4,198	140.6	206	6.90	6	...	46	40	3	56	12	24	4	1	4	10
August	30,376	4,348	143.1	287	9.45	7	...	42	3	1	160	29	23	5	1	7	9
September	31,145	4,786	153.7	363	11.66	2	...	64	15	2	185	42	29	6	...	5	13
October	31,535	4,325	137.5	247	7.83	2	...	60	2	4	102	33	19	6	2	7	10
November	31,130	3,110	100.0	148	4.76	...	...	32	1	...	53	12	20	10	1	5	14
December	34,868	2,916	83.6	123	3.53	2	...	18	1	1	53	9	19	8	2	3	7
						41	71	657	666	17	947	229	200	77	12	48	114
Died per 1,000 of the Average Strength.																	
For the year ...	29,962	3,531	117.8	3,079	102.76	1.37	2.37	21.93	22.23	.57	39.25	6.67	2.57	.40	1.60	3.80	

## AGGREGATE STATISTICS OF NEWLY-ARRIVED REGIMENTS.

CAUSES OF ADMISSIONS.	NUMBER OF ADMISSIONS INTO HOSPITAL IN EACH MONTH.												For the Year.	Admitted per 1,000 of Strength.	Died out of each hundred treated.
	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sep.	Oct.	Nov.	Dec.			
Cholera ...	5	2	22	17	18	14	19	21	20	5	2	5	150	5.0	27.33
Small pox ...	...	10	27	145	56	39	7	...	...	...	...	8	202	9.7	24.32
Fever, Intermittent ...	{ 706	836	1,710	3,672	5,908	6,547	5,190	5,011	4,146	3,458	1,675	1,090	39,949	1333.3	1.64
„ Remittent ...															
„ Continued ...	1	3	5	14	911	536	135	21	28	9	2	6	1,671	55.8	39.85
Apoplexy ...	13	5	5	5	12	18	27	19	21	28	19	13	185	6.2	9.19
Delirium Tremens ...	264	234	312	587	448	398	494	1,221	1,033	907	558	485	6,941	231.7	13.64
Dysentery ...	386	360	704	894	933	677	948	1,393	1,094	834	464	408	9,095	303.5	2.52
Diarrhoea ...	68	92	118	138	149	189	169	205	235	282	217	204	2,066	69.0	9.68
Hepatitis ...	200	241	218	259	197	184	233	232	189	234	260	320	2,767	92.3	2.77
Respiratory Diseases ...	5	10	6	7	14	30	27	19	16	21	14	10	179	6.0	26.81
Phthisis Pulmonalis ...	120	185	179	170	123	125	210	208	174	227	195	255	2,171	72.4	
Rheumatism ...	512	554	622	526	480	485	660	712	678	836	861	1,181	8,107	270.6	
Veneral Diseases ...	89	167	208	190	116	143	204	226	151	212	151	199	2,056	68.6	
Eye Diseases ...	280	316	400	410	540	539	677	579	510	496	370	408	5,525	184.4	51
Abscess and Ulcer ...	488	418	876	524	386	236	256	279	238	352	397	413	4,863	162.3	
Wounds and Accidents ...	268	315	374	474	724	766	795	782	659	703	449	509	6,818	227.6	
All other Causes ...															
	3,405	3,748	5,786	8,032	11,015	10,926	10,051	10,928	9,192	8,604	5,634	5,514	92,835		
Admitted per 1,000 of the Average Strength in each Month.															
	129.8	138.8	203.8	272.2	359.2	379.1	336.5	359.8	295.1	272.8	181.0	158.1	3098.4		

\* This Table provides an estimate of the loss from disease likely to follow the employment in the field of a newly-landed army. All deaths from violence are excluded. The death-rate here given does not, however, show the full extent of the loss arising from exposure in the field; for in the hospitals at Calcutta 229 men died, and of these deaths upwards of one-half were caused by disease contracted in Upper India.



## NEWLY-ARRIVED REGIMENTS IN CANTONMENTS, 1864—69.

(The aggregate of the Sickness and Mortality, during the first twelve months of their residence in India, of the Regiments and Batteries which arrived from Europe from 1864 to 1869, inclusive.)

MONTHS.	Average Strength.	Average Number Daily Sick.	Number Daily Sick per 1,000 of Strength.	Number of Deaths.	Died per 1,000 of Strength.*	CAUSES OF DEATHS.																			
						Cholera.	Small pox.	Fever, Intermittent.	Fever, Remittent and Continued.	Apoplexy.	Delirium Tremens.	Dysentery.	Diarrhoea.	Hepatitis.	Spleen Disease.	Respiratory Diseases.	Heart Diseases.	Phthisis Pulmonalis.	Dropsy.	Scurvy.	Atrophy and Anæmia.	Wounds and Accidents.	Suicide.	All other Causes.	
January	14,015	673	48.0	22	1.36	3	2	...	3	...	...	...	...	3	...	1	1	3	1	...	...	...	...	...	3
February	14,567	692	47.5	12	.82	...	...	...	5	...	...	...	1	...	...	...	2	1	...	...	...	...	...	...	1
March	14,684	722	49.1	25	1.50	3	1	...	6	1	...	6	...	3	...	2	1	...	...	...	...	...	...	...	1
April	14,566	836	57.4	39	1.44	18	...	...	9	12	...	12	...	4	...	2	1	...	...	...	...	...	...	...	1
May	14,507	896	61.8	48	3.17	2	...	...	19	15	1	1	1	4	...	1	1	1	...	...	...	...	...	1	1
June	14,374	1,082	75.3	106	7.23	2	1	...	21	65	4	1	...	2	...	3	2	3	...	...	...	...	1	1	...
July	14,350	1,038	72.3	47	2.51	11	...	...	5	19	...	5	...	3	...	3	...	1	...	...	...	...	...	...	...
August	14,228	1,067	75.0	118	4.22	58	...	...	16	11	1	9	1	6	...	1	...	8	...	...	...	...	1	1	5
September	14,084	1,136	80.7	172	3.69	120	...	...	18	4	1	10	...	6	...	...	1	8	...	...	...	...	1	1	2
October	13,987	1,134	81.1	39	2.64	2	...	...	6	...	1	9	...	10	...	3	2	3	...	...	...	...	...	...	3
November	13,990	921	65.8	38	2.57	2	...	1	10	...	1	4	1	11	...	2	...	3	...	...	1	...	...	...	2
December	14,290	791	55.4	22	1.47	1	...	...	2	...	...	6	...	1	...	1	1	3	1	...	...	...	2	...	4
						222	4	1	120	117	9	54	3	53	...	20	13	34	2	...	1	8	4	23	
Died per 1,000 of the Average Strength.																									
For the year ...	14,304	916	64.0	688	48.10	15.32	.28	8.46	8.18	.63	3.77	.21	3.71	...	1.40	.91	2.38	.14	...	.07	.56	.28	1.60		

CAUSES OF ADMISSIONS.	NUMBER OF ADMISSIONS INTO HOSPITAL IN EACH MONTH.												Total Admitted during the Year.	Admitted per 1,000 of Strength.	Died out of each hundred treated.
	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.			
Cholera	4	...	3	23	2	3	13	77	137	2	2	1	267	18.7	83.15
Small pox	9	3	7	5	12	6	...	...	...	...	...	2	44	3.1	9.09
Fever, Intermittent	113	113	65	81	56	74	34	139	244	332	434	317	2,002	140.0	.05
" Remittent and Continued	76	90	172	476	688	1,353	761	673	490	414	207	91	5,491	383.9	2.18
Apoplexy	...	...	3	3	24	120	25	60	6	...	...	...	241	16.8	48.55
Delirium Tremens	5	3	3	3	4	5	...	2	5	9	...	6	51	3.6	17.65
Dysentery	40	45	53	48	55	66	86	129	149	130	81	65	947	66.2	5.70
Diarrhoea	134	93	156	294	171	132	142	330	388	166	90	94	2,190	153.1	.14
Hepatitis	28	25	30	21	36	58	41	58	57	53	50	52	509	35.6	10.41
Spleen Disease	...	...	3	1	1	2	3	3	3	2	...	...	18	1.2	...
Respiratory Diseases	136	90	120	135	166	102	68	95	75	100	81	81	1,249	87.3	1.60
Phthisis Pulmonalis	7	4	8	11	20	21	20	15	26	27	8	8	175	12.2	19.43
Scurvy	2	2	...	...	...	...	...	...	...	1	...	...	5	.4	...
Rheumatism	72	58	42	68	62	61	65	54	54	67	69	61	733	51.2	...
Veneral Diseases	347	287	291	256	285	255	185	249	268	330	328	286	3,367	235.4	...
Eye Diseases	43	34	36	37	52	51	55	90	87	62	53	33	633	44.3	...
Abscess and Ulcer	158	115	173	177	176	227	238	203	184	140	134	88	2,013	140.7	...
Wounds and Accidents	128	94	114	74	75	76	45	78	70	73	97	122	1,046	73.1	...
All other Causes	161	132	180	209	231	279	248	258	254	212	157	134	2,455	171.6	...
	1,463	1,188	1,459	1,922	2,116	2,891	2,029	2,513	2,497	2,120	1,797	1,441	23,436		
Admitted per 1,000 of the Average Strength in each Month.															
	104.4	81.6	99.4	131.9	145.8	201.1	141.4	176.6	177.3	151.6	128.4	100.8	1638.4		

\* In the monthly ratios Cholera is excluded.



## NEWLY-ARRIVED REGIMENTS IN THE SECOND YEAR OF SERVICE, 1865-70.

(Continuation of the Statistics of the body represented in the preceding Table; this Table is to be studied in contrast with that which precedes.)

MONTHS.		Average Strength.	Average Number Daily Sick.	Number Daily Sick per 1,000 of Strength.	Number of Deaths.	Died per 1,000 of Strength.*	CAUSES OF DEATHS.																		
							Cholera.	Small pox.	Fever, Intermittent.	Fever, Remittent and Continued.	Apoplexy.	Delirium Tremens.	Dysentery.	Diarrhoea.	Hepatitis.	Spleen Disease.	Respiratory Diseases.	Heart Diseases.	Phthisis Pulmonalis.	Dropsy.	Scurvy.	Atrophy and Anæmia.	Wounds and Accidents.	Suicide.	All other Causes.
January	...	14,495	794	54.8	19	1.31	..	2	...	4	...	1	...	2	...	1	1	3	1	...	...	3	...	1	
February	...	14,478	777	53.7	7	.48	...	...	1	2	...	...	...	1	...	1	1	1	...	...	...	...	...	...	
March	...	14,710	757	51.5	10	.61	1	1	...	...	...	1	...	1	...	1	...	1	...	...	...	...	...	4	
April	...	14,621	851	58.2	38	2.39	3	1	...	7	2	1	4	2	8	...	2	...	1	...	...	2	1	1	
May	...	14,570	993	68.1	36	1.37	16	...	...	7	...	1	3	...	4	...	...	1	3	...	...	1	...	...	
June	...	14,475	1,015	70.1	28	1.93	...	1	1	3	11	1	1	...	2	...	1	3	...	...	...	1	1	2	
July	...	14,439	1,000	69.3	25	1.66	1	...	1	5	7	1	1	...	1	...	3	2	...	...	...	2	...	1	
August	...	14,426	1,026	71.1	56	2.36	22	...	...	10	6	3	2	4	...	...	4	...	...	...	2	1	...	2	
September	...	14,312	1,161	81.1	47	3.00	4	...	...	13	1	1	6	1	7	...	1	2	5	...	1	...	1	3	
October	...	14,344	1,161	80.9	42	2.86	1	...	...	12	2	...	4	2	10	...	1	2	4	...	...	1	1	2	
November	...	14,081	944	67.0	29	2.06	...	...	...	6	...	...	4	...	7	...	...	1	3	...	...	1	2	3	
December	...	14,123	679	48.1	18	1.27	...	...	2	1	...	...	1	...	1	...	1	1	4	...	...	2	2	3	
							48	5	5	70	29	6	28	7	48	...	9	18	31	1	1	4	15	8	22
Died per 1,000 of the Average Strength.																									
For the year	...	14,423	930	64.5	355	24.61	3.33	.35	5.20	2.01	.42	1.94	.48	3.33	...	.62	1.25	2.15	.07	.07	.28	1.04	.55	1.52	

CAUSES OF ADMISSIONS.	NUMBER OF ADMISSIONS INTO HOSPITAL IN EACH MONTH.												Total Admitted during the Year.	Admitted per 1,000 of Strength.	Died out of each hundred treated.
	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.			
Cholera	..	1	2	5	19	..	3	29	4	1	..	1	65	4.5	73.85
Small pox	11	3	6	4	2	2	..	..	..	..	..	..	28	2.0	17.86
Fever, Intermittent	144	95	118	114	122	175	203	328	744	1,100	1,321	522	4,986†	345.7†	10
„ Remittent and Continued.	45	46	99	316	567	671	417	522	314	250	115	67	3,429	237.7	2.04
Apoplexy	..	..	2	4	6	26	11	13	1	3	1	..	67	4.6	43.28
Delirium Tremens	8	4	2	10	11	6	2	3	13	7	6	5	77	5.3	7.79
Dysentery	46	20	34	67	71	52	44	112	96	60	52	29	683	47.3	4.10
Diarrhoea	73	51	54	161	120	101	118	220	127	113	76	55	1,269	88.0	.55
Hepatitis	43	35	71	56	76	66	70	75	82	76	66	40	756	52.4	6.35
Spleen Disease	2	2	..	1	3	1	9	3	6	4	3	1	35	2.4	..
Respiratory Diseases	127	72	80	81	100	98	62	83	80	74	61	75	993	68.9	.91
Phthisis Pulmonalis	10	6	10	15	11	21	13	24	16	19	12	6	163	11.3	19.02
Scurvy	1	2	4	1	..	1	3	1	1	..	..	..	14	1.0	..
Rheumatism	65	84	95	54	73	66	85	85	88	68	77	63	903	62.6	..
Veneral Diseases	418	308	361	354	317	228	266	227	221	266	227	248	3,441	238.6	..
Eye Diseases	29	27	30	47	47	36	28	54	48	34	29	473	32.8	..	69
Abscess and Ulcer	123	97	105	129	141	178	170	153	141	101	96	75	1,509	104.6	..
Wounds and Accidents	114	109	135	93	101	77	72	77	79	82	87	68	1,094	75.9	..
All other Causes	149	151	205	181	234	284	250	279	249	221	175	143	2,521	174.8	..
	1,408	1,113	1,413	1,693	2,021	2,089	1,826	2,288	2,326	2,493	2,409	1,427	22,506		
Admitted per 1,000 of the Average Strength in each Month.															
	97.1	76.9	96.1	115.8	138.7	144.3	126.5	158.6	162.5	173.8	171.1	101.0	1560.4		

\* In the monthly ratios Cholera is excluded.

† The high admission-rate for fever in September, October and November is a local phenomenon, caused by the presence of Epidemic Malaria in the Punjab in 1869.





ROAD-MAKING PARTIES DETACHED FROM STATIONS IN THE PLAINS,  
AND EMPLOYED IN THE HILLS DURING THE HOT SEASON, IN THE TEN  
YEARS FROM 1863 TO 1872.

(Showing the results of the temporary removal of climatic influences from men who have served in  
the plains of India.)

MONTHS.	Average Strength.	Average Number Daily Sick.	Number Daily Sick per 1,000 of Strength.	Number of Deaths.	DIED IN THE SIX MONTHS PER 1,000 OF STRENGTH.		CAUSES OF DEATHS.												
					From disease.	From accidents.	Cholera.	Smallpox.	Fever.	Apoplexy.	Dysentery.	Diarrhoea.	Hepatitis.	Respiratory Diseases.	Heart Diseases.	Phthisis Pulmonalis.	Delirium Tremens.	All other diseases.	Accidents.
January ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
February ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
March ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
April ..	1,630	27	..	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3
May ..	7,677	217	28.3	3	..	..	..	..	1	..	..	..	..	..	..	..	..	..	2
June ..	7,790	277	35.6	7	..	..	..	..	..	..	..	..	1	2	1	..	1	..	2
July ..	7,839	298	38.0	4	..	..	..	..	1	..	1	..	..	..	1	..	2	..	1
August ..	7,231	267	37.1	4	..	..	..	..	1	..	..	..	..	1	..	..	..	..	..
September ..	7,269	266	36.6	3	..	..	..	..	..	..	..	1	..	..	..	..	..	..	2
October ..	6,014	210	34.9	3	..	..	..	..	2	..	..	..	..	..	..	1	..	..	..
November ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
December ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Died per 1,000 of the Average Strength.																			
For six Months	7,576*	260	34.3	27	2.24†	1.32	..	..	.96	..	.13	..	.13	.13	.40	.26	.13	.40	1.32

CAUSES OF ADMISSIONS.	NUMBER OF ADMISSIONS INTO HOSPITAL IN EACH MONTH.												Total Admitted during the year.	Admitted per 1,000 of Strength.	Died out of each hundred cases treated.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.			
Cholera ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Small pox ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Fever, Intermittent...	..	..	..	42	290	323	295	287	296	110	..	..	1,559	20.8	..
" Remittent and Continued	..	..	..	10	48	37	47	31	32	9	..	..	214	28.2	2.34
Apoplexy ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Delirium Tremens ..	..	..	..	..	..	..	1	1	2	1	..	..	5	7	20.0
Dysentery ..	..	..	..	3	32	27	16	15	11	9	..	..	113	14.9	.88
Diarrhoea ..	..	..	..	9	40	47	50	48	51	21	..	..	275	36.3	..
Hepatitis ..	..	..	..	1	24	51	26	7	25	13	..	..	147	19.4	.68
Spleen Disease ..	..	..	..	..	3	1	6	2	3	2	..	..	17	2.3	..
Respiratory Diseases ..	..	..	..	9	56	49	33	37	26	22	..	..	232	30.6	.43
Phthisis Pulmonalis ..	..	..	..	..	2	..	5	1	2	..	..	..	8	1.0	25.00
Rheumatism ..	..	..	..	3	35	44	50	53	39	31	..	..	264	34.8	..
Veneral Diseases ..	..	..	..	29	121	95	96	84	72	54	..	..	542	71.6	..
Eye Diseases ..	..	..	..	2	12	10	9	9	10	11	..	..	69	9.1	..
Abscess and Ulcer ..	..	..	..	7	39	40	35	37	28	23	..	..	269	27.6	..
Wounds and Accidents ..	..	..	..	7	69	93	74	61	73	61	..	..	438	57.8	..
All other causes ..	..	..	..	10	50	71	63	87	65	41	..	..	387	51.1	..
TOTAL ..	..	..	..	123	827	808	822	780	651	408	..	..	4,479	..	..
Admitted per 1,000 of the Average Strength in each Month.															
..	..	..	..	..	107.7	111.4	104.9	107.9	89.5	67.8	..	..	591.2	..	..

\* Supplementing the strength of April by that of October.

† At the rate of 4.49 per 1,000 for the year. It must be kept in view, that the months for which road-making parties are detached, are those in which the great bulk of the mortality in the Plains occurs.



In forwarding to Government the results in road-making parties for the seven seasons, from 1863 to 1869, the following remarks, which are in nearly every detail applicable to the experience of the ten years 1863—72, were added:—

"It is necessary to keep in mind that the resulting ratios represent the occurrences of the six unhealthy months of the year, during which alone, in Upper India, the climatic and epidemic influences prejudicial to the European prevail. The contents of the table must be reviewed in contrast to the ratios for the army as a body for the months from May to October. In other words, we must keep in mind what the same body of men would have suffered, had it been kept in the plains, in place of being sent to the hills for these months.

"This table shows that the number daily in hospital has not in any month exceeded  $3\frac{1}{2}$  per cent. of the strength, and that on the average of the six months, the number under treatment has been under 3 per cent.

"Next, it shows that in these seven years, 19 men only have died while employed with these parties, a mortality which gives a ratio of 8.18 per 1,000 per annum.

"But when the details of these deaths are looked to, it is seen that 9 out of the 19 were accidental deaths; 8 men were killed, or died from injuries, and 1 was suffocated while drunk.

"The ratio from disease, excluding these accidental deaths, was 4.30 per 1,000 per annum.

"Of the 10 casualties from disease, 6 would, in all probability, have occurred under any conditions afforded to the individuals.

"Not a single death attributed to cholera, heat apoplexy, diarrhoea, hepatitis or acute disease of the chest, is recorded in the table; an extraordinary testimony to the salubrity of the Indian climate when the various influences of the unhealthy season are mitigated or annulled.

"The effects of healthy employment are also conspicuous in the fact that but three cases of delirium tremens have been brought to notice during these seven years, and these were probably of a mild character, as no fatal event followed.

"In taking account of the admissions of the period, the well-known fact that the transfer of men who have suffered from diseases due to the effects of climate to the most healthy localities, is not, even in the most healthy years, attended with the immediate restoration of the balance necessary to prevent the re-appearance of the form of climatic disease from which the patient has suffered, must not be lost sight of. This fact I have elsewhere illustrated in relation to the hill stations of this Presidency.\* And I call attention to it now, that the inference may not be drawn, that the working parties have suffered in the ratios exhibited, as a consequence of the climate of the hills or of exposure. Many of the parties have been removed from sickly stations and from sickly regiments, and in no case have the men been selected as being robust and adapted for labour.

"The ratio of deaths to admissions shows how slight have been the majority of these attacks, and how well the patients have been situated for recovery. It may be assumed that the diseases were in most cases secondary, and were not primary affections; and the inference is confirmed by the ratio of daily sickness already quoted.

"I would beg to direct earnest attention to the truth which is taught by this table. After having done our best to ameliorate the condition of the soldier, and to mitigate the effects of the influences to which our stations of the plains must always remain subject, success must be but partial. And at the best, the experience of the plain stations can never yield results such as are here shown. As an experiment, the highest success has attended the employment of the British soldier in such work at a sufficient elevation; and as occasion appears, the opportunity of thus utilising the energies of the soldier should not be lost."

\* Report quoted by Mr. Strachey in his paper on Hill Stations.—Sanitary Commissioner's No. 485 of 7th July 1864, page 4.

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It is necessary to keep in mind that the working system of the government of the...  
In following to Government the results, the following remarks, which are in nearly...  
every detail applicable to the experience of the first years 1863-72, were...  
added:—

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